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THE VALUATION OF WATERFRONT PROPERTIES ALONG THE COASTLINE OF KENYA

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This thesis is my original work and has not been presented for a degree in any other University.

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This thesis has been submitted for examination with our approval as University Supervisors.

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ABSTRACT

Kenya is one of the coastal states that lie in the eastern part of Africa. For a long time now Kenyan valuation practice has been concentrated on land-based resources. Valuation of farms, houses, offices, industrial etc. are now quite familiar in everyday life. However, a "new" area is now becoming important in world resources affairs, an area in which the valuation profession in Kenya can also participate. This area is the coastal or marine environment, where many sectors of the economy such as [illegible], transport and research are now increasingly turning to use. Whereas professional [illegible] in other countries have expanded their scope into those environments, the valuation profession in Kenya has been [illegible] to realise it's potential in the same. And because the full economic potential of the resources of the Kenyan coast is not known with certainty it is logical to carry out studies of their estimation.

Unlike land-based resources, waterfront properties along the coastline possess somewhat peculiar characteristics which imply that a free market or a purely price competitive mechanism will not allocate these resources properly. It is even worse for the methods of valuation which can be employed in such cases. Identification and

exploitation of resources have to be climaxed by proper methods of their estimation to be worthwhile.

Two notable characteristics of the waterfront properties located along the Kenyan coastline are the extremities in values of similar properties, sometimes even in the same localities and the exclusive use of the market comparison method in such property valuations. This study contends that extremities in values have arisen from the use of improper methods for valuing waterfront properties. And the method being used currently in the valuation disregards a number of important factors, most of which are difficult to quantify using the market comparison method. This study aims, therefore, to present better ways of valuing waterfront lands.

The valuation of waterfront lands is influenced by both site-oriented, such as view, size and non-site-oriented variables like reasons for sale, date of transaction and so on. Evidence from the valuation practices in the study area suggests that only site-oriented characteristics of property are considered during valuations and this leads to either under valuation or overvaluation of these properties. Although some factors are not directly on the property being valued, they are actually significant influences of value, and ignoring them altogether is not reasonable. The [illegible] method proposed in this study considers both site and non site oriented factors.

Using conventional multiple regression analysis (CMRA) it [illegible] shown that the choice of value- influencing [illegible] is more scientific, more reasonable and less [illegible] than in the ordinary Comparison Method. [illegible] of influencing variables for valuation purposes is a necessary step if proper values have to be estimated. Many valuations have had faults because of inability to identify and measure these factors.

Several regression methods of valuation have been tried in this study, ranging from the simple multiple regression analysis to rank transformation regression. [illegible] the methods has its merits and demerits, in most cases in terms of their usefulness and accuracy in valuing waterfront lands. Conventional Multiple Regression Analysis (CMRA) and Rank Transformation Regression (RTR) were found to be the best of the lot, accounting for 49% and 51% of the variation in property values in the area respectively. However, RTR seems to have the methodological problem of how to rank factors affecting value before using them in the procedure. While it is appealing and quite rational to rank factors, the criteria to be used for the ranking is contentious. CMRA was therefore, found to be a 'better' method, it produced better results in the various tests the models underwent and can easily be understood and applied. Using the same methods, it was found that SIZE of property is the most important factor affecting value in the study area. The larger the size, the higher the value, although other factors such as width of the beach area (AREA), VIEW of the ocean waters, availability of water SPORTS on the beach etc, have also to be considered. Furthermore, no single factor alone can be used as the only basis for estimating values of waterfront lands.

Despite the study advocating for the use of CMRA in waterfront valuations, there are very few instances where the valuer will not use some form of comparison in the valuation process. Whether it is in the choice of independent variables or in the measurement of these variables, the principles of comparison have to be utilised to arrive at objective values. After all, valuation is all about the market, and if the valuer disregards the market trends then his valuation will be somewhat incomplete.

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CHAPTER ONE

INTRODUCTION AND PROBLEM STATEMENT

INTRODUCTION

Sometime in 1982 in Europe, a well-known firm of international chartered surveyors included in its advertising reference to the fact that two-thirds of the world was covered by water and the remainder was covered by the firm concerned (Richard Ellis, 1982). This is no doubt an exaggerated, imaginative and eye-catching statement which makes its point in professional advertising. But in actual fact it shows to what extent water covers the earth, hence its significance.
Researchers have claimed that about 75% of the earth is covered by water (Huisman, 1972; Gehm and Bregman, 1976; Walker, 1976; McLeary, 1983;). The bulk of this water resource is ocean water, or salt water that surrounds most of the land resource. The importance of these water resources is not the waters alone, but the benefits and uses that can be derived from these waters and their associated resources. And the coast has always had great appeal, presently about two-thirds of the world's population lives within a narrow belt directly landward from the coastal edge (Soucie, 1983:6).

The total stock of water and waterfront properties is constant all over the world, except for occasional man-made additions. The Japanese, for example, have managed to create more waterfront prefectures. The Dutch have also attempted such exercises, albeit in the polders. In Canton, China, rather than creating more waterfront properties, residents have decided to erect floating houses on the ocean waters and shores, for lack of overland space. The total stock of waterfront properties should, therefore be regarded as a natural gift needing to be preserved or allocated with great care and skill. Up to the middle of the 19th century the uses of the ocean were confined mostly to vessels and fishing activities. These activities were conducted by the local communities and their activities still exist, but the size of the communities has now increased and the scope of the activities has been greatly expanded.

With the advent of technology over the use of these resources over time, the pressure on coastal resources has grown. Increases in population, wealth, mobility and the quest for more leisure time are some of the factors responsible for the intensified use of the coastal resources. The quest for more leisure especially, has drawn more and more people to the coastal areas all over the world. The situation is more pronounced in developing countries, where people from the developed world visit in increasing numbers to see the developing world. Even in some developed countries, the intensity of use of coastal resources has increased tremendously over the last twenty years.

This growing pressure has resulted into increased conflicts over who is to use these resources of the coastal zone, when they should be used and how they should be exploited. Beaches, their fronting lands, and estuaries have been the first to feel the impact of growing populations. Cases of overcrowded beaches (e.g. in Lagos), mushrooming of seaside low-income settlements (e.g. in Shanghai, China), degradation of natural beaches (e.g. in Dar-es-Salaam, Tanzania), and construction of more hotels, parks and shopping complexes on waterfront lands are now quite common. All these activities destroy the aesthetic value which is intended to attract people to the coast.

In developed countries, both the on-shore and off-shore areas of the coast are fully utilized, but in developing countries like Kenya, most activities are confined to the shores, the beaches and the adjacent lands. There is little going on in the open sea; perhaps because of lack of finance, lack of marine research and the low level of technology available. In such countries therefore, the areas fronting the beach and the beaches themselves are the places where man's interference is felt most. It is

these areas, which this study focuses on.
Coastal resources are concentrated in a narrow land where the continent meets the tidal zone, but are used by a population scattered all across the land mass. Coastal resources are important in meeting mankind's future requirements for food, energy, minerals and space. Some countries and communities depend for their survival and future on maritime resources e.g the Ambigas and Islamic Jalajir tribes of south-west India, Quintana Roo people of Mexico, Fiji, Vanuatu and parts of Japan (Berkes, 1989). They require skilled people and immense knowledge to exploit these resources to the fullest extent, and the protection of their heritage from predators and vandals, both local and international.

Coastal resources are subject to peculiar problems and uses which imply that a free market or a purely competitive economy will not allocate most of these resources properly. For one, they are common property of open-access in that there is little or no direct control as to who can use them or to what extent. For another, coastal resources may be used for several different purposes simultaneously, whether these uses are complimentary or compatible.

Since the coastal resources are very important, a lot of attention is now being given to their use and management. In fact of all the natural resource environmental policy problems facing coastal states, the most pressing appear to be centred on coastal zone resources.For example,in the Philipine island of Palawan,which is considered very beautiful and has excellent beaches, reefs, waterfalls etc. serious environmental degradation has caused concern to the community. The Philipine government initiated and implemented an integrated environmental plan in 1986 (Winpenny, 1991 :160). And in the Chesapeake Bay area of British Columbia, in the United States, overlapping jurisdictions over the use and management of the bay area have generated complex problems(Berkes,1989 :130).

PROBLEM STATEMENT

Kenya is one of the coastal states in the eastern part of Africa. It has a shore length of about 395km from Kiamboni in the north bordering Somalia to Vanga in the south bordering Tanzania (See map 1). This length includes that around the various islands such as Lamu, Pate, Manda and the whole Lamu Archipelago in the north. Others are Mombasa island (Mvita), Chale, Funzi, and Wasini islands in the south coast. The shoreline length/area ratio for Kenya is 0.00109, one of the lowest in the world. Kenya's area of the continental shelf is about 12,453 km expressed as 4200 nautical miles (Hickman, 1986 :40).

The coast of Kenya therefore encompasses the country's territorial sea, the exclusive economic zone and the continental margins. The full coastal environment of Kenya consists of a variety of rich resources both tangible and intangible. However, to date much still remains to be done in surveying Kenya's coastal resources. So far there have been practically no surveys of mineral resources or the potential for the utilization of wind and solar energy at the coast. Only a few surveys have been carried out, on algae, turtles and mangroves (Okidi 1978:7).

Four main activities are required for the analysis of any country's coastal resources. These are identification, estimation, exploitation and conservation. It appears that these activities are presently at such low levels in Kenya that no full utilization of all marine resources has been achieved. The identification and estimation of stocks of fisheries, beachlands, mangrove forests, navigational economies and possible mineral resources seem to be beyond the capacity of present Kenyan marine establishments.

MAP 1 THE POSITION OF THE COASTLINE OF KENYA

This inadequacy stems from the normal budgetary and technological constraints of personnel and funds.

Since the full economic potential of the Kenya coast is not known, there is an urgent need to carry out comprehensive surveys and research on the coastal resources. This can enhance the exploitation and conservation of these resources. Many smaller coastal countries have developed economically from the use their coastal resources e.g. Liberia, Fiji and Tonga, Peru and Kiribati in the Pacific Ocean (Commonwealth Surveying and Land Economy, 1988 :8). Time is now ripe for Kenya to follow suit. She cannot continue to brood endlessly over her immense coastal strip, like the proverbial beggar who sat on a bag of gold.

One logical step towards exploitation of marine resources (coastal resources, specifically) is to estimate them for, as Lord Kelvin (1924-1907) once remarked:

> When you can measure what you are speaking about and express it in numbers, you know something about it, but when you cannot measure it in numbers, your knowledge is of a meagre and unsatisfactory kind. (Quoted in Pontecorvo and Mesznik, 1976:104).

Estimates of coastal resources may guide the government, planners, [illegible], scientists, naval and maritime experts in what exists along the Kenyan coastal waterfront. Such estimates can then be used to guide the experts on how to negotiate any sales of marine properties, any development options available, and what research materials available can be used by various scientific disciplines. Subsequent exploitation of these resources can aid economic development of the country, either directly or indirectly. Estimates of these resources can also be used as parameters in the computation of fees and charges to users of waterfront facilities.

It is in the estimation of these properties where this study formulates its problem. First, it was observed by the researcher that despite all the above-mentioned potentials of the Kenyan coastline, and despite the long occupation of some parts, the overall development[1] is still below expectations. Some areas were in fact opened up in the last five years or so. One reason for this situation is that there has been lack of proper assessment of the present and future values and potentials of the waterfront lands along the coastline, thereby limiting their uses to very few.

. "Development" here means full and proper exploitation of oastal resources, e.g. extensive beach developments, marine ering yards, use of modern fishing techniques and use of the l lands for a variety of research stations and provision of . Many other uses abound.

The values of such waterfront lands have been assumed to be the same as those of normal mainlands except for some upward adjustments or sometimes downward adjustments. Kline has indeed noted with concern at the manner in which:

> In recent years many appraisors have been forced to use sales of waterfront acreage and lots suitable for building development to which they have made substantial downward adjustments (sometimes as much as 100% to 175%), in an effort to equate the sold waterfront land that is open for development with the subject waterfront land that is not (1984 :54).

According to Kline, (and this researcher shares Kline's views), many property agencies and valuers have harshly criticised this adjustment method, and subsequently many valuation reports have been rejected.

Further more, a pilot survey of the values of the coastal waterfront properties along the coastline of Kenya indicated their extremities. While some properties were valued very lowly, others in the same locality and with almost similar characteristics were valued very highly. At the same time, some properties which appeared to be very attractive and situated in strategic positions within waterfront localities such as Nyali and Diani Beach were valued or sold at unreasonably low prices.

For example, the preliminary survey by the researcher revealed the following patterns of values for 19 of the 26 properties which were either valued or had changed hands.

Table 1.1 Patterns of waterfront property values during a pilot survey.

Plot No.	Locality	Average value Per Acre Kshs.	Date Sold
146	Galu Kinondo	36,000/=	April, 1986
130	" "	202,703/=	May, 1986
3	Tiwi Beach	139,860/=	August, 1987
9	" "	17,937/=	Feb.,1987
40	Diani Beach	322,581/=	April, 1987
18	" "	16,000/=	October,1987
119	" "	360,000/=	April, 1987
275	Kilifi Beach	350,000/=	Feb., 1987
276	" "	65,000/=	Feb., 1987
56	Bamburi Beach	422,078/=	Nov., 1987
59	" "	606,061/=	April, 1987
314	Nyali Beach	211,111/=	Dec., 1987
44	" "	1,000,000/=	August, 1986
43	" "	646,204/=	June, 1987
58	" "	2,083,333/=	January,1988
47	" "	545,455/=	January,1988
123	Mikindani (Mombasa)	85,714/=	August, 1985
128	Old Town (Mombasa)	873,999/=	March, 1986
93	Watamu Beach	280,000/=	

Source: Field Work by the author, 1987.

In most of the above cases, properties located in the same place would be similar in many aspects, such as orientation, soil type, type of use, the openness of the properties to the view of the ocean etc. There were also some notable contrasts, amongst similar properties, for example, differences in terms of the beautiful scenery, the size of each plot and lengths of water frontages. However, even with these varied similarities and contrasts, one would not expect such large disparities in values as has been found to be the case. Other later examples which confirmed the research problem included the following:

Plot No.93 in Watamu Beach,	Shs, 280,000/=	January, 1990
Plot No.95 " "	Shs, 1,000,000/=	February,1990
Plot No.202 in Kanamai Beach,	Shs, 1,833,333/=	Sept.,1990
Plot No.233 " " "	Shs, 150,000/=	August, 1990
Plot No.137 in Kikambala Beach,	Shs, 615,385/=	Jan.,1990
Plot No.158 " "	Shs, 100,000/=,	January, 1990
Plot No.184 " "	Shs, 1,285,714/=,	January, 1990
Plot No.222 Shimoni Beach ,	Shs, 30,000/=,	August, 1990
Plot No.213 " "	Shs, 633,333/=,	August, 1990
Plot No.243 " "	Shs, 105,882/=,	August 1990

Along the coastline of Kenya are found waterfront lands which may not be polluted, are swampy, and sometimes inaccessible. They could also be too shallow or unusable for most leisure pursuits, or just unattractive. Such lands are normally very cheap to buy and perhaps inexpensive to develop. But then how do we value them, what is the basis of such valuations and yet the market for them is hardly present? Is it logical to equate

lands on the waterfront with those not on the waterfront? Are we justified in comparing developed waterfront lands with those of their kind which are not developed?
Water front properties are in areas with dynamic interconnected ecosystems, and they are the link between the mainland and the marine environment. It is noted that coastal waterfront lands may not be special, any way. But their zone affects other nearby lands, although there may be no precise measure of these consequences. Among their effects includes their being used as buffer zones between land and water, and their use as docks and berths for whatever should cross from land to sea and vice versa. In fact the waterfront coastal zone is not a strip of land and water disconnected from the rest of the land. It is rather a special place with special problems and therefore warrants different approaches in its analysis and subsequent assessment. Its assessment requires the assignment of objective value to elements which are at least partially unquantifiable in their worth. Where this is not done, the result is an assessment plagued with mere guesswork based on improper comparisons.

Probably the greatest difficulty in valuing or pricing waterfront properties could be that they are gifts of nature possessing natural scenic values and beauties that can only be quantified by the eyes and enjoyment of the users. For instance, how much should users like fishermen, swimmers and sunbathers pay, on what basis should they pay and what is there to force them to pay? It is the contention of this study that these and other pertinent issues and considerations given above have in many coastal valuations been either totally ignored or partially considered. The consequence has been properties assessed on inadequate judgements and practices.

During the same preliminary surveys and even by casual observation of the various assessments carried out for waterfront properties in the study area, it became clear that the comparison method was the main one in use. Of the 26 properties which were surveyed, 24 of them had had their values and prices determined through the market comparison method. The other methods, such as Income approach were mainly employed in the study area for properties which are already developed and are either income generating or are capable of generating some income. Our concern in this study is vacant water front lands, which may mostly be used as recreation lands, agricultural farms, industrial areas, marine parks or may be developed for various other uses.

It is the addirtion of most appraisors to the market approach when valuing waterfront properties that is being challenged by this study. Is the comparison method the relevant and correct method for valuing such properties? If not, can we propose better methods which can take into account the non-quantifiable special qualities of the waterfront lands, such as the presence of the ocean waters? In general, are these methods of valuation specially suited to valuing waterfront lands all over the world, and are they adequate? These are the questions and problems this study aims to probe into.

Objectives of the Study

The main objective of this study is to propose better and appropriate methods to be used in the valuation of waterfront properties. In order to achieve this objective, the study proposes to:

(i) determine and evaluate the methods which are commonly used in the valuation of such properties

(ii) propose better methods or tools in the methods which would appropriately reflect true values of waterfront properties.

The Study Hypothesis

The basic hypothesis of this study is that the [illegible] inappropriate methods in the valuation of waterfront properties along the coastline of Kenya is the major cause of extreme land values (both under valuation and over valuation) in the region. While some properties are 'unfairly' undervalued, others are priced very highly without much justification. If the true values of these coastal resources were known with certainty then their exploitation and conservation would be more rational than they have been so far. This would make it possible for the coastal region and the country in general to expand the uses of the available coastal resources. It is the methods of valuing such properties that are being appraised in this study; with a view to proposing a suitable valuation method to suit the valuation of coastal resources in Kenya and elsewhere.

Scope of The Study

The investigator aimed to study the valuation of waterfront properties along the Kenyan coast. He examined the current methods used in valuing these resources, and evaluated them by comparing alternative methods of doing similar exercises.

The resources which have been involved are land near or along the sea front, and the coastal wetlands with their mangrove forests. These resources also include shoreline land, which is a function of the level of the sea. The level of the sea water is not constant in relation to the shore, due to tidal action. There is also the foreshore, the area between the mean high and the mean low tide, or the wet sand area. Depending on the slope and other geological factors, this area can be wide. There is also the area extending beyond the mean high tide line inshore, the dry-sand area or backshore. Its inland extent is usually defined by the presence of vegetation or a change in the physiography of the land. The bulk of this study has been devoted to this area. The coastal zone may extend much further beyond the landward or seaward limits of the shoreline, but it is an ill-defined area because no clear definition or consensus exists.

Coastal wetlands have also been studied. These are areas which border on coastal waters where the dominant vegetation is composed of salt-tolerant plants. These lands are periodically exposed and flooded by salt water through tide and normal storm action. Mangrove forests are found in these lands.

Other biological underground and undersea resources or fuels have not been studied because their valuations require sophisticated scientific studies and equipment beyond the scope and affordability of this study. The valuation of undersea resources such as minerals and oil: for instance, requires minerals prospecting and feasibility studies. What can be offered as a method may be irrelevant because we are not sure whether these resources are there or not. Services derived from the use of water front properties have not been studied directly, even though they affect the value of water front properties. Their effects on the subject resources have been appraised.

The study area is essentially the entire coastline of Kenya, and this is a narrow belt extending less than two kilometres from the shoreline. By covering sampled sites in the whole area, the results provided a good representation for all the coastline. The 331 study cases used here were the ones obtainable from the various sources of information. As the waterfront market is highly confidential, it was prudent to take the cases that were given by these sources, rather than having to choose and sample them. The period of study was from 1985 to 1990 because information for periods before 1985 would be of little guide to the proposed valuation exercise. In any case, such information proved difficult to obtain.

Research Methodology

The methods used in this study encompassed the gathering of secondary information from written sources obtainable from various areas. The bulk of these sources were books, journals, magazines, pamphlets, articles and reports in newspapers, all collected from various libraries in the University of Nairobi. Other libraries which were consulted include the United Nations Centre for Human Settlements (Habitat) library at Gigiri, the British Council library in Mombasa, the McMillan library in Nairobi and the Kenya National Archives.

There was also a lot of information sent by other academicians from the United States of America, Britain, Nigeria and Australia. These consisted of books and journals on marine resources and articles on relevant coastal issues, whose copies could not be obtained in Kenya

However, the bulk of the information required for the study was collected by the researcher himself, assisted briefly by ten research assistants. Such information was gathered from local and international real property bulletins and the local newspapers, which contain daily records of property news. The rest of information was collected by the researcher himself through travel, observations and interviews in the study area. Various collection sheets were used in various places. The major suppliers of data were the district land offices, private valuers, the Mombasa Municipal valuation offices and local residents, tourists and workers in the waterfront lands. Included were also sellers and buyers of such property

A total of 96 of [illegible] people were interviewed, as categorized in Table 1.2 below. Owing to the secretive nature of the waterfront property market and, to some extent, the sensitivity of the same, it was not possible to target a certain number of persons to interview. In many cases, the researcher had either to cancel proposed interviews with certain targeted interviewees or remove their names from the proposed list of informers. This was especially the case with lawyers, auctioneers, loan agencies and mortgage banks and financial institutions. It was also not easy to extract information from beach hotels' management staff, who presumably would have more information on waterfront-related matters. The list of 96 people is, therefore, a collection of those people who were available and willing to volunteer the information required for the purposes of this research.

Table 1.2 Categorization of people interviewed during the research work.

Occupation of informants	No. interviewed
Land officers	12
Valuers	14
Estate managers	10
Local residents	13
Beach workers	13
Tourists	8
Property buyers	8
Property sellers	18
Total	96

Source: Field work

The information collected from the various sources outlined above comprised the following : the geography of the study area; the living conditions and occupations of the indigenous peoples; the general property market climate in the study region; specific properties which changed hands during the period covered by the study (1985 - 1990); the methods which were used in valuing such properties; the main factors considered during the transfer of these properties; the most important factors influencing waterfront properties in the area; views from various people including valuers, property owners, sellers and buyers concerning the property market and the influencing variables on waterfront properties; and the nature of the tourist industry along the entire marine environment.

Having collected the necessary information it [illegible] logical to scrutinize and analyse the same. Analysis was then done using regression analysis, particularly stepwise regression. The purpose of using this method was to identify and rank the most important variables from the final equation. These computations were carried out by computers in the Housing and Building Research Institute (formerly H.R.D.U.) and at the Institute of Computer Science at Chiromo Campus. Both of these institutions are in the University of Nairobi. The results from the regression methods were analysed and presented in various ways, and then they were compared with values of property obtained using the market comparison approach. This market approach was found to be the main method used in valuing waterfront properties in the study area. The results of the "best" regression model were compared with the market values obtained in fieldwork, and the "best" regression model proved to be of better reasoning and interpretation than the Comparison Method.

It is these overall results which were analyzed and appraised vis a vis the previous ones in order to test the hypothesis and also to achieve the study objectives. Findings, conclusions and recommendations were then based on the outcome of these tests. In the entire study, it became necessary to make use of many types of graphical presentations such as maps, charts, tables, and sketches.

Organisation of the Study

Including this introductory chapter, there are in all nine chapters to this study. Chapter Two describes the nature of waterfront properties generally all over the world. Chapter Three is about waterfront property markets generally in the world and in the Coast of Kenya specifically, as observed during fieldwork.

Chapter Four describes the study area. This chapter also talks about the physical features found in the study area and the people living there.

The next, Chapter Five, is devoted to literature on waterfront property matters, their methods of valuation and any aspects related to waterfront properties which have been expressed by other writers.

Chapters Six is on the use of regression statistics in valuation of property as demonstrated by other writers and valuers. Chapters Seven and Eight contain the analysis of data, beginning with the initial basics and ending up with specific best regression models in Chapter Eight. Chapter Nine presents the findings of the study, the conclusions drawn from these findings and the relevant recommendations. It also contains a brief list of the areas for further research in the field of valuation of waterfront
lands.

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CHAPTER TWO

COASTAL WATERFRONT PROPERTIES

INTRODUCTION

The preceeding chapter has introduced the problem in hand and the objectives and methods of how to solve the study problem. The present chapter will now describe coastal or marine waterfront properties and resources themselves, and analyze their essence in all aspects. The discussion is generally on waterfront properties found along any coast, not necessarily the coast of Kenya alone. Apart from the importance of these resources, the chapter also discusses the reasons why some of those resources have been abused.

The Properties Themselves and Their Essence

There are two terminological hurdles which need to be overcome at the onset of this study. Both revolve around definition of important terms. The first is about a resource. A "resource" has been defined by Selman (1981:61) as an element of the natural environment appraised by man to be of value, but whose supply falls short of demand. A resource is as much as a cultural concept as a physical entity. This implies that a resource must be scarce, falling short of present and/or future requirements, and a specific use for the resource must have been identified.

Natural resources on the other hand are "those unaltered natural stores which are useful to mankind in any way", meaning that the aspect of scarcity has been concealed (Allen, 1966:3).

These two definitions are important because the properties at the centre of this study are resources, both natural and man-made, a distinction which will become clear as the properties are described later.

The second terminological conflict is found in the use of the terms: waterfront, coastal and marine, to describe the subject properties.

Waterfront properties refer to any property facing a body of water, be it a lake or ocean. The properties under study are facing the Indian Ocean, hence are waterfront or oceanfront properties.

Coastal properties mainly refer to all properties located in the coast region, not necessarily along the coastline or shorefront, although the first apparent meaning is that of properties located along the seafront.

Marine properties refer to any coastal water-oriented resources found in, or below the ocean. This term appears to reflect the true location of the properties under study although to some extent, the term "marine" [illegible] underwater [illegible] resources.

There [illegible], [illegible], be [illegible] confusion over the terminological identity of the resources being studied. They could be termed coastal, waterfront properties or oceanfront properties and marine properties.

Marine properties can be classified in a variety of ways just like land based properties. Amongst these classifications are the following:-

1. Tangibility i.e. whether the properties are real quantifiable properties or not

Tangibles	Intangibles
Fishes, shells	Transportation
Other marine animals	Communication
Forests	Tidal energy
Minerals	Wind energy
Lands, [illegible] & floodplain	Scenic view
Oil	Climate
Gas	Recreation and water sports
Water	Other Services

2. According to life: Those which are living and those which are non-living.

Living/biological	Non-living
Marine algae	Minerals
Fishes	Waters

Corals	Lands and sands
Mangrove forests	Oil
Marine animals other than fish	Gas

According to location: Here there are three groups:-

Along the shores	In the water	Below the water
Beach lands	Fishes	Minerals
Beach sands	Corals	Oil
Floodplains	Animals	Gas
Research environments	Energy	Algae
Marshlands		

According to nature of availability, where there are two descriptions each bearing many other names.-

(a) "Inexhaustible" natural resources or properties which can never get finished through use by man e.g. atmosphere and water in its cycle, although man's use could result in drastic qualitative changes in the composition of these resources.

(b) "Exhaustible properties" or resources are those that can be depleted over time e.g. the beach lands, quarries, sand pits, etc. Within this category are those properties which are replaceable and maintainable or renewable. e.g. water, land, forests, wildlife and soils.

Again, there are those properties which are irreplaceable such as minerals, fuels, and land in its natural condition. Land in its natural state is indispensable due to the values which originate from a combination of scenery and location. Once exploited, the original or natural values in such lands cannot be wholly recaptured (Allen, 1966:6). [illegible] of these resources are shown in diagram 2.1.

Be what they are marine properties are the environment in which it is widely thought that life originated. Sea water is an excellent sanctuary for a variety of life, the seas themselves having been populated by life for the longest period. In fact, probably all natural elements [illegible] present in solution in the sea, and animal life [illegible] adjusted to the salinities of ocean water, which are reflected in the composition of blood and other body fluids (Dasman, 1984:239). In addition, the ocean makes, stores and distributes solar energy in the world, energy which sustains life systems, and controls the temperatures of the earth's surface. The energy also manipulates the earth's hydrological cycle.

The whole marine environment has always been a source of food and minerals, [illegible] for communications, [illegible] for habitation and a dumping place for various types of wastes (RICS, 1985:2). It is in the marine environment where very many types of activities take place, some of which do not have their dry land counterparts e.g. deep sea mining and fishing, aqua and mariculture, and many more.

Coastal environments have economic, social, psychological and aesthetic attractiveness not found elsewhere. These features attract more people, who sometimes disrupt the very fragile ecological arrangements.

It is for these and other reasons discussed later in this section that people from various walks of life depend on coastal environments for their livelihood. Scientists are interested in the structure and function of the highly productive and unique ecosystems found in the area between land and sea. Industrialists look for water quantities of the oceans, and accessibility through water transportation. Individuals go for the beautiful beaches and sceneries, while policy planners are concerned with policies that do not disrupt either the structure or function of the coastal zones (Economidou, 1982:93).

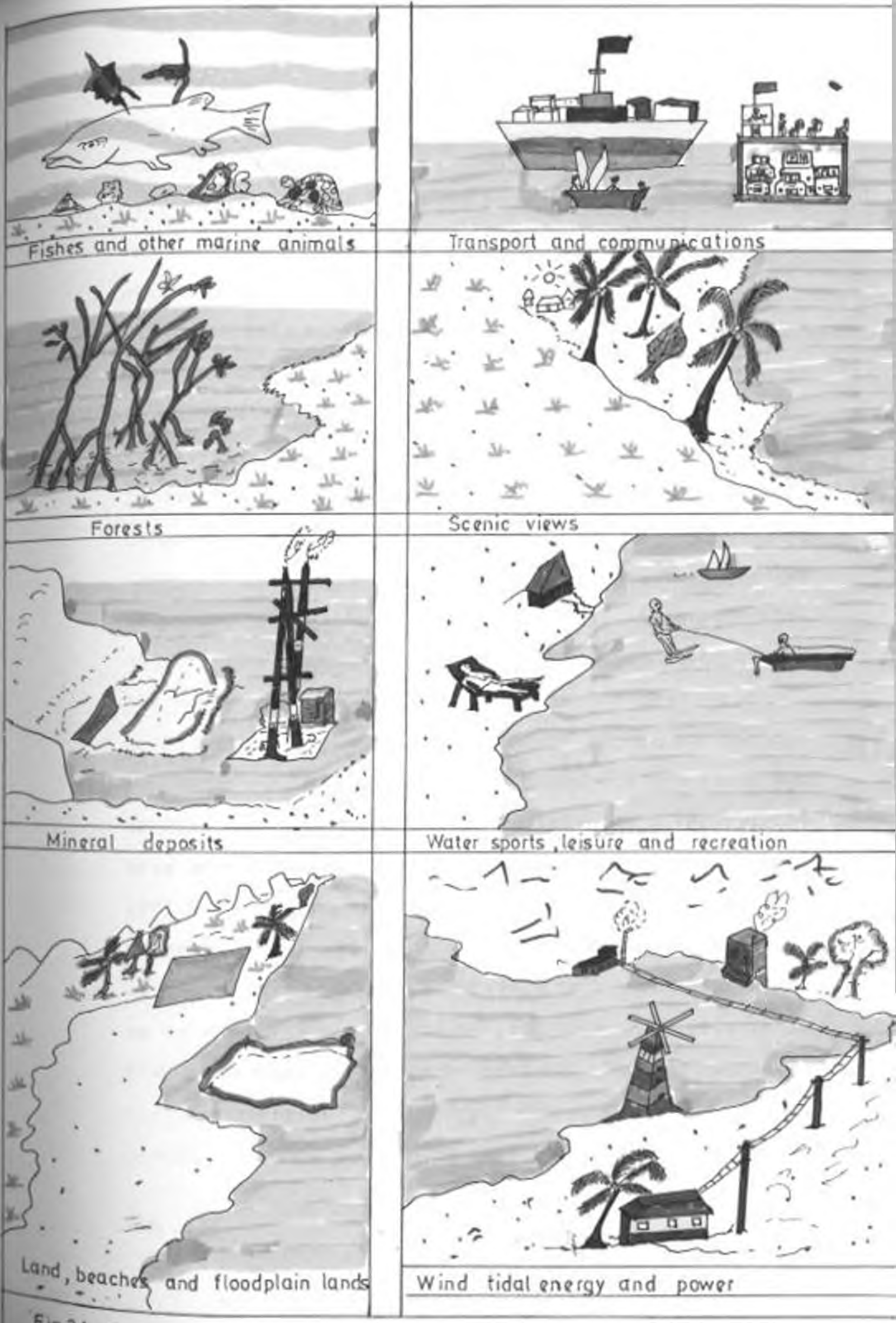

Fig.2.1 Examples of marine resources of the coastline

Many coastal states or rather, countries with oceans or coastlines have found that their marine environments are very beneficial, except in many developing countries which have somehow failed to make use of these numerous marine benefits.

The importance of the marine area and its properties can best be shown by describing a few of these properties.

1. Coastal Lands

In the marine environment, it may not be very easy to completely separate land from water. This is because the limit of coastal land seawards is a narrow one which keeps changing with the tides. However, it is said that coastal lands comprise the dry land bordering the ocean. The seaward limit is delineated by the neritic zone, which includes the lowest tidal areas, swamps and shallow sea water ponds. The dry land boundary of coastal lands is also not definite, and can be taken to cover all the area where limestone rocks are found (Hite and Stepp, 1971:5). In some coasts, this area is very extensive, covering tens of kilometres. In others, like the coast of Kenya, this area is a relatively narrow one, extending up to may be 5km from the neritic zone. The figure in the next pages shows these boundaries. The coastal lands are characterized [illegible] ch sands and waters, rocky shores, cliffs which may be low or high and lands [illegible]

Most of these lands are relatively flat, being constituted of limestone and sandstones. Although in most places overshadowed with uncertainty and lack of definition in zoning and regulation, they are the most intensively used parts of the marine environment (Smith, 1985:113). They are the areas where the ocean influences are clearly felt, and then transferred to the main land. Scientists have established that it is in these coastal zones where the greatest life is found, especially in the neritic zone where ocean waters and waters from land mix to form habitats for a variety of marine life. The coastal swamps and tidal marshes within the neritic zone provide a source of ingredients to marine life. Many species of animals and birds find sanctuary in these places.

Coastal zones naturally attract commercial and industrial activities because of the possibility of cheap transportation [illegible] ocean waters. [illegible] amounts of ocean waters are also extensively used for industrial uses, which mean savings in water expenses.

Many property developers find coastal lands ideal places for various types of investments ranging from [illegible] houses to tourist hotels, coastal marinas, boat building and water sports. Some aggressive developers, especially in land-hungry cities, dredge and fill tidal lands to create platforms for houses and other similar developments. Waterborne recreation, for instance, is quite an attractive area for investment. The expectation is that recreation will make the site more attractive to the prospective home or hotel buyer (Dasman, 1984:291). As a result, waterfront lands have become scarce and very expensive in many places, yet they are cheap and abundant in other places. Many investors and developers undertake expensive work on these lands because the net returns justify such expenditures. The demand for access to recreation water fronting coastal lands is therefore high and growing.

Coastal lands are also known to have a variety of minerals, the most common of which are sand and limestone deposits. Quarrying of these deposits is quite a good commercial venture, and in some coastal lands where these deposits are quite extensive, quarrying has been [illegible] for decades. The sand and limestone deposits are used for construction purposes, and manufacture of industrial products such as glass. It is common to find lime industries and cement works located in coastal lands. The trend worldwide is that the industrial sector is increasingly turning to [illegible] sites where they can have locational advantages in manufacture and exploitation of mineral resources.

Coastal lands are also the homes of ports and harbours, military bases and scientific research establishments. Ports and harbours are the direct link of one country with the rest of the world and international trade is easily carried out through ports. Fig. 2.2: Coastal lands delimitation.

Many [illegible] whose coastal lands have good [illegible] such as USA, Canada, [illegible] Africa, Britain, Australia, Liberia and many others have become famous in trade and commerce. In contrast, most landlocked countries are disadvantaged because of not having [illegible]. The trading ability of such countries is, therefore, relatively low, being dependent on air and land inlets and outlets.

The container revolution in shipping has, however, caused many old docks and ports to close down [illegible]. These ports, once very busy and essential waterside areas have become disused and are often heavily silted. They still have warehouses and ancillary buildings which are sound and attractive but difficult or uneconomic to convert to other purposes. Draining and

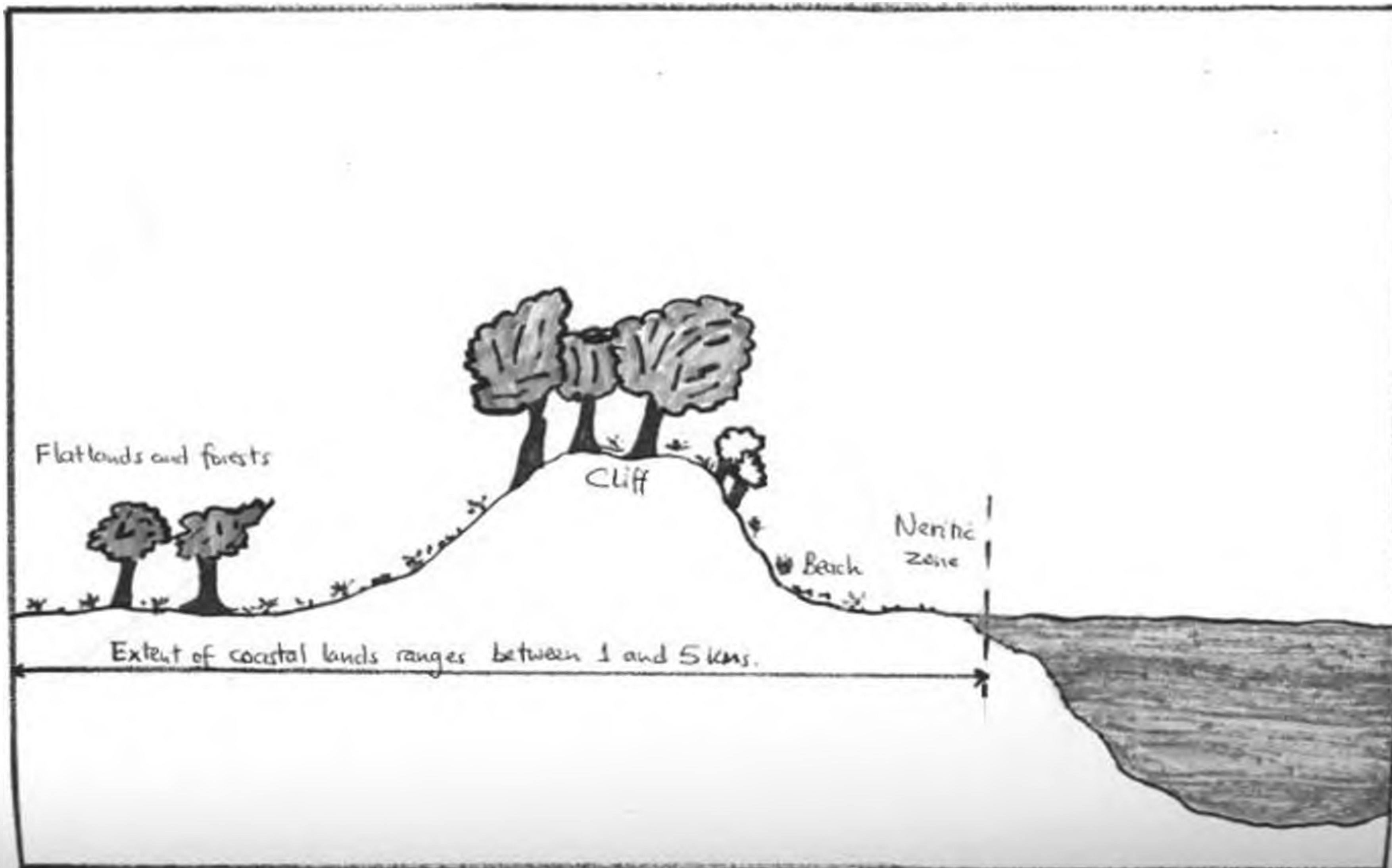

FIG. 2.2. COASTAL LANDS DELIMITATION

[illegible] the water [illegible] is expensive and results only in [illegible] land the [illegible] of which is low and generally unsuitable for anything but the lightest of structures (Adio, 1977 [illegible]

2 Fisheries

Marine environments are relatively uniform in their nature, but it is this uniformity which makes it difficult to classify aquatic habitats and communities, unlike on dry land. The most available living resource in the coastal zone is fisheries, a term which includes all fish and their related species such as prawns, crustaceans, crabs, etc. Ocean fisheries are vast and have a high biotic potential. Fisheries continue to survive simply because, although only few of eggs laid hardly survive because of predators and unfavourable environmental conditions, the capacity for rapid growth is there. Ocean fisheries are capable of contributing to world food supply at all times. They contribute to much needed protein which is deficient in the diets of a high percentage of the world population. George Brogstrom once calculated that the world fisheries yield in the mid 1960s represented protein equivalent to all cattle in the world (Dasmann, 1984:254).

Estimates have shown that fishery products are only exceeded by beef, pork and poultry as leading protein foods in the world. In many countries, fishery products rank first (Allen, 1966 268). Various animal feeds, valuable oils, fertilizer and raw materials for plastics and glues make up some of the by-products from commercial fisheries. The availability of more nutrients, concentrations and [illegible] potential [illegible] makes inshore waters yield more fisheries than the open ocean waters. Many types of fish are found in this zone and various types of fishermen from the subsistence ones to the commercial fishermen find it cheaper and easier to fish in the inshore zones.

Statistics indicate that [illegible]0% of Kenya's fish catch over the recent years has come from such inshore areas. Surveys in offshore [illegible] estimate a potential offshore yield of 5000-9000 metric tonnes annually, which suggests that Kenya could potentially double or triple its total marine fish catch (Daily Nation, 28/10/99:5).

In all the other areas of the world, fisheries constitute an important economic and cultural product. In many developing countries coastal fishing is less developed than in industrialized countries. This is because fishing in the former is mostly at subsistence level, the methods of fishing are not sophisticated and too many accidents restrict fishing.

In industrialized countries coastal fishing is an important commercial enterprise, and many communities rely on fisheries. In the Atlantic Ocean and its gulfs around the Florida Bay and St. Lawrence Seaway, two thirds of the fish are caught in the neritic zone. In the Philippines, Indonesia and the West Indies, [illegible] in West Africa and the Mediterranean [illegible] [illegible] both commercial and subsistence levels. Most coastal communities in these areas rely on fishing for their livelihood.

i. Minerals and Energy

Marine environments have been known to contain a great range of minerals and also are a source of natural energy. The ocean itself contains all known chemical elements and is probably the source of all living molecules. Minerals are, therefore, found from the edges of the coastal lands up to the deep waters of the ocean. On the coastal lands are found limestone and coal deposits. In the deep oceans are found deposits of hydrocarbons containing oil, the most important fuel on earth, and natural gas, all which are now essential in the industrial and domestic world. The major oil reserves of the earth are found below the oceans. The North Sea, for instance, is a major oil producer, together with the areas around Japan, Indonesia, the Persian Gulf and the USA. Due to the presence of these minerals, such areas have always been centres of controversies and warfare, hence the need to develop proper marine boundaries.

Salt deposits are also found extensively in coastal environments, the Malindi and Gongoni areas of Kenya's

North Coast being very good examples. The origin of the saltness of the sea, however, remains a cause for speculation. The vast amount of common salt may have been derived from rocks in contact with the sea, but the major portion of it was probably derived from river water (Beckinsale, 1966:131). In fact salinity of the surface waters of the ocean varies from about 37 per 1000 parts in the tropics to 32 per 1000 parts in the polar areas. Marine environments also have vast reserves of tidal, wave and wind energy which if converted to use can enhance the energy supply on earth. This inexhaustible resource has been little exploited in many parts of the world due to lack of funds, research and required technologies for conversion and utilisation. It is only in a few of the industrialized nations such as U.S.A that efforts have been made towards this direction.

4. **Shoreline Forests**

The coastal zone bordering the deep ocean is vegetated with waterborne plants of various types. The most common type is the mangrove tree, which normally grows into a large forest area. Mangrove forests are found mostly in tropical and subtropical areas, in upper levels of estuaries and sheltered parts of the seashore. Often the forests develop mud flats which are exposed at low tides. A common mangrove species is rhizophora, which is supported above mud swamps by prop roots (Tait, 1972:205). These roots contain air spaces providing oxygen to the underground root system in the waterlogged mud. There is also a system of aerial roots, called pillar roots. These support the tree branches. They also reduce water movement, thereby trapping and stabilizing the mud so that the mangrove forest tends to grow in extent. As this happens, broad swampy areas emerge which are dissected by drainage channels through which the sea flows with the rise and fall of the tide. The expansion of the mangrove forest is accompanied by the growth of smaller salt-marsh plants between the mangrove trees

The importance of these shoreline forests is that they are home to diverse animal communities. In the roots of the trees are found bivalves, fish, mollusca, serpulid worms and crustaceans. These animals are also found in the mud, together with burrowing crabs. The branches are infested with insects, lizards, snakes and a large number of birds. It is in these forests where scientific research experiments are conducted and many research stations are located nearby e.g. the Kenya Marine Fisheries Institute at Mkomani, Mombasa, the Gazi Seashore in the South and the area around Mombasa Island. Mangrove trees are used a lot for construction in many

coastal parts of the world. In Kenya, this is the case, and some parts of Lamu Archipelago export mangrove poles to the Middle East for construction. Above all, marine forests are important tourist attractions because the forests are mostly converted to marine parks and national reserves. Examples here include the Malindi and Watamu Marine National parks.
Coastal wetlands, which include salt marshes, swamps, mudflats, lagoons, meadows, ponds and lowlands are subject to influences of coastal waters. The value of these wetlands, which has always been underestimated, depends on how they could be modified to be more useful. In addition, coastal wetlands are foundations of estuarine productivity, providing food and shelter for marine life.

Other uses also abound. Mud flats, for example, are sometimes reclaimed to be used for many other industrial and commercial purposes, a practice which is common in Florida, U.S.A and the Netherlands. Lagoons, which are large bodies of open shallow water protected from oceanic forces by a barrier beach are very ideal sites for tourist hotels. The Turtle Bay Beach Hotel in Watamu,

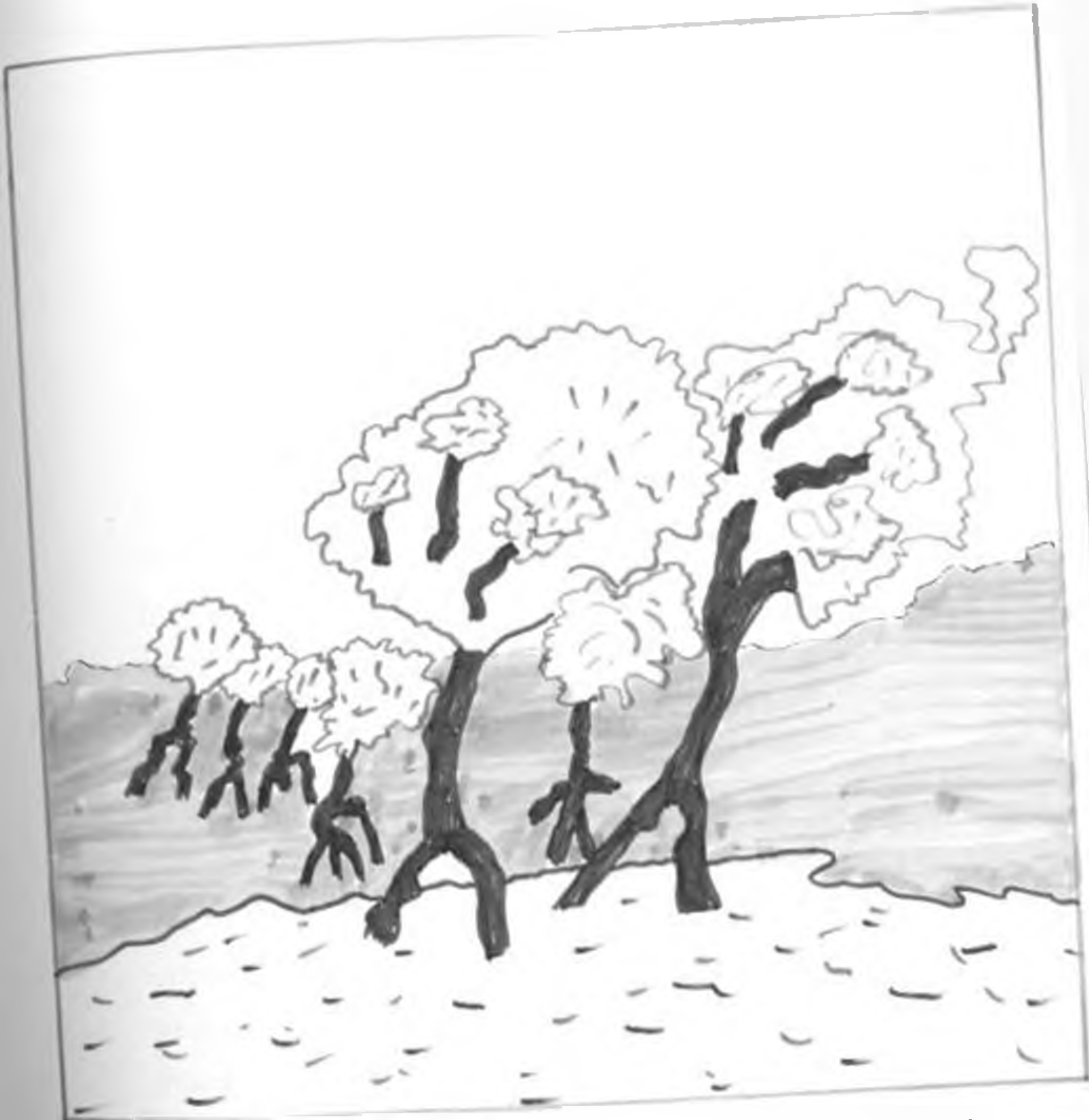

FIG. 2.3. A MANGROVE FOREST AT THE COAST

and the Lagoon Reef Hotel in Diani beach are two examples of such hotels in Kenya.

5 Ocean Waters

Ocean waters themselves are an important resource. Although this study is limited to the edges of these waters, their importance extends further to the open ocean. Apart from the animals and minerals found in or near them, ocean waters are useful for commerce, communication and travelling. Ocean transportation is essential for bulky materials which need not be transported very fast. Navigation on water provides a satisfying form of recreation, and the use of the water for navigation is non-consumptive, although to some extent it may impair the water quality through fuel discharges. Ocean transport routes form life lines throughout the world as many countries look to these routes for supply and for profitable outlets of their products (Allen, 1966:130).

For a long time now, ocean waters have been used for outdoor recreation in the form of water sports such as windsurfing, scuba diving, yatching and dhow rides. These activities, together with the fact that many people get to enjoy their outdoor recreation through their eyes, have made ocean water attractive leisure callers. The decision of a judge in Kentucky, USA, that the use of ocean waters to look it constitutes "no use at all" is, therefore, not valid (Allen, 1966:132).

A coastal landscape fronting an ocean or sea derives its high value from the presence of the waters, and the use of that water. Further, much of the price of ocean front residential properties is represented in the unearned control of the water scenery. In China, some parts of the city of Canton are entirely floating on water. The so-called "boat people" of China have found the ocean a good platform on which to construct their homes, and they have lived there for centuries now.

However, the majority of these resources are now being interfered with by the activities of man, whose pressures could lead to total destruction if not checked. For example, coastal land resources are the scenes of intense competition between public and private interests, between economic and environmental values, and between diverse land and water uses: residence, business, industry, transportation, recreating and conservation (Platt, 1978:170). Dredging of inlets and port entrances, draining of swamps and the erection of coastal installations change offshore currents. The effect is that existing beaches are eroded and sand deposited in places where it is not wanted. Near shore coral reefs are slowly disintegrated by those who look for fish, corals and shells for business. Tidal marshes, swamps and pools are blasted by those who collect marine life for fun or profit (Dasman, 1984:259).

There is also the problem of pollution into the ocean waters, pollution from municipal and domestic sewage, farm wastes and industrial wastes, mostly carried to the oceans by rivers and streams, and even by direct discharge of domestic and industrial wastes into the oceans

Fisheries are worst affected by both natural and artificial predators. They may be trapped or marooned in tidal pools and eventually dry up. Increases in population and the demand for more fisheries have led to 'better' methods of fishing which threaten fish stocks. The main motives for fishing are for food, profit and sport, but those are negated by expanded efforts which pursue upto the last surviving members of fish species. In Kenya, for example, the overfishing of the inshore waters of the coastline is endangering not only the coastline's ecological balance, but also threatening the existence of beautiful beaches on which the prime part of the national tourist industry is founded.

Regarding pressures from leisure seekers, as the popularity of ocean waters and their natural environment grows, the space for the enjoyment effectively shrinks. Once the best of the accessible sailing water, [illegible] full capacity, is exhausted, inferior areas are [illegible]. If this is not checked by a coordinated national plan, there will be inevitable deterioration in the natural coastal environments.

If the ocean and their coastal environments have been so important why has there been a delay, in many countries, in taking advantage of the ocean's resources? Some respected authorities, amongst them the RICS have given the following reasons for this reluctance:

1. It is only since the last century that the properties of the sea have been systematically investigated and recorded.
2. Only in the last few decades has there been invented the tools with which to exploit many of the resources of the sea.
3. It is only in the last century that man's relationship with the sea has began to go beyond the hunter gatherer stage (RICS, 1988:21).

Amongst other reasons, this is why in the last four decades or so, many coastal states have concentrated on defining and agreeing on coastal and ocean boundaries especially beyond their immediate shores. The United Nations Convention on the Law of the Sea in 1982 established the principles for determining rights to the seabed.

It can, therefore, be argued that many countries have realized that by ignoring the coastal lands and ocean they are losing a valuable and essential resource. They have now seen the possibility of the area of land and [illegible] interface offering new opportunities for mankind's development.

The next chapter discusses the nature and operations of waterfront property markets. It first briefly describes the global market and then dwells on the Kenyan waterfront property market, its features, the participants and the resultant property values.

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CHAPTER THREE

WATERFRONT PROPERTY MARKETS

INTRODUCTION

Properties and resources located along the shorefront are found in all countries which are fronted by oceans or seas, in most cases these acting as their boundaries. Although most of the properties in these coastal zones are state-owned, quite a sizeable portion are privately-owned. In either case, regulations and restrictions on the use of these properties has turned out to be a significant and controversial issue to both state administrators and private owners. Then there are also the users, mostly the public, who believe that they have a right of enjoying the coastal properties.

It would appear as if it is only recently that the marine environment has been found to be of necessary use to mankind. It has been observed that in most parts of the world this marine environment is not sufficiently understood for the nature and extent of its uses for man to be fully assessed (Smith, 1990 [illegible]). And in many coastal states, most people's experience and interest of the sea is now based on its attractions for recreation, holidays and seabed activities. For instance, although the majority of the world's coastal population reside along the coastline, very few would regard themselves as coastal dwellers first and foremost. That means these people may have very little to do with the coastal resources.

Consequently, there are very many coastal communities which either do not actively utilize the coastal resources or misuse the resources altogether. Both of these instances are brought about by the lack of technology and finance, and the absence or lenience of laws governing the use of coastal and marine resources. Moreover, coastal communities themselves have shied away from using these resources, in most cases concentrating on near shore [illegible] fishing and coastal lands subsistence farming. On the other hand, more able and keen foreigners have taken up these coastal areas and developed them to their best uses, thus pushing the coastal communities' interests further away from the coastal zone. This practice is quite common in Latin America, tropical Africa and Asia.

However, it would be unreasonable to conclude that coastal people in many regions do not own or use the [illegible] at all. Quite a number do own, occupy and use the resources, sometimes through state assistance or through private investment efforts. Due to lack of capital [illegible] coastal communities and the lack of development technology, a wealth of coastal property in developing countries is normally declared for sale, transfer or other exchange. This is quite different from the situation in developed countries, or those countries whose marine sector is active and has been commercialized. In these countries, marketing or marine resources has gained prominence, probably surpassing that of dry land properties, due to the demand for recreation and allied services. Probably the only regions where coastal lands are traded the least are the areas near the North Pole, beyond the Arctic Circle. This is because of the few land uses possible in these areas, where the land is always frozen with ice. The rest of the regions of the world have an active market, especially in the tropical areas, in which islands appear to witness more active real estate transactions than their mainland coasts.

A major reason for this phenomenon is that tropical islands contain some of the most attractive and beautiful coasts in the world, coasts which are desired for their recreation value by many people, both local and foreign. Their demand is thus very high, and sharing of the lands in these islands even in the short run is always a crucial issue in the economics of the countries owning them.

The Kenyan Case

Like in many other countries fronted by oceans, Kenya has a sizeable amount of properties fronting the vast Indian Ocean, which forms the country's eastern boundary. The Kenya coastline runs from Ras Kiamboni in the north bordering Somalia to Vanga in the south, at the border with Tanzania. Within this coastal zone, there are various types of properties, ranging from the ocean waters themselves to vacant lands, developed beaches, harbours, marshlands, marine forests and marine parks amongst many more.

In general, the real estate market for coastal lands in Kenya appears to be very active. This could be due to the stable economy, but mainly to the individualisation of land tenure along the coast which enables individuals to trade off their properties at will. The issues of land tenure and its effects on property developments and values are discussed in Chapter Four.

In order to understand the waterfront property market generally in the world and Kenya in particular, analysis of property values and related information from various sources was conducted, with the help of five research assistants. The main sources included international property journals, mailed questionnaires to property experts in few countries and the three local daily newspapers (Daily Nation, The Standard and The Kenya

Times) and [illegible] [illegible] the period from 1980 [illegible]. [illegible] period was chosen because information on water front properties changing hands before 1980 was either not easily available, or was 'too old' to compare with current information.

Information on property sales from daily papers proved to be a good indicator of the property market in the country even though there are a number of weaknesses with such data. First, most of what is found in these newspapers is information on offers to sell, lease or buy, but not actual transactions. Secondly, the information [illegible] published daily excludes transactions or offers which are normally not published, yet there is evidence to show that such transactions and offers do take place, quietly. Furthermore, it [illegible] to find the same properties being advertised in each of the daily papers on a single day. However, information from these papers offered the greatest source of market data. And although unpublished offers or transactions are excluded, the majority of transactions are published. It is, therefore, [illegible] [illegible] that this daily information provides an up to date record of the property market in Kenya. Many property buyers get the properties they need from newspaper advertisements, and the majority of properties that sell quickly are those that have been advertised in such daily papers.

information from estate agents, valuers and developers of greater authenticity, is difficult to obtain because most is treated as confidential. Very few of such agents are ready to divulge such sales data, and where they do, they only give sales involving small properties, under the excuse that they are 'protecting their clients'.

Between 1980 and 1990, approximately one thousand nine hundred and seventy two (1972) ocean front properties were offered for sale through the property columns of the daily newspapers in Kenya. Out of these 31.49% were residential houses in form of bungalows and maisonettes, 56.44% were vacant plots fronting the ocean and about 2.94% were residential blocks of flats. A sizeable amount of the remaining properties comprises cottages, farms and hotels. At the same time one thousand six hundred and four (1604) water front properties were offered for rent, out of which 60.47% were residential houses, 16.65% were flats and 10.79% were cottages. Hotel rooms constituted 8.17% of the offers, but this low figure will be explained in due course. Table 3.1 gives these breakdowns.

Table 3.1: Number of waterfront properties offered for sale and rent, 1980-90

Type	Sale	%	Rental	% of Total
Hotel/rooms	4	0.2	131	8.17
Flats	58	2.94	267	16.65
Houses	621	31.49	970	60.47
Vacant plots	1113	56.44	0	0
Shops	17	0.86	9	0.56
Offices	5	0.25	15	0.94
Cottages	57	2.89	173	10.79
Godowns	4	0.2	23	1.43
Farms	82	4.16	3	0.19
Lighthouses	11	0.56	11	0.69
Bedsitters	0	0	2	0.12
Total	1972	100	1604	100

Source: Author's Field work

Of all the said properties, only 4 complete waterfront hotels were offered for sale, which included the Sindbad Hotel and Lawfords Hotel in Malindi and the Golden Beach Hotel in Diani. This shows that hotel properties along the coastline are either doing very good business or that once acquired they cannot easily change hands. It is not easy to get frontage for such hotels, and plots for such uses are selling at very high prices.

Properties such as shops and offices, which normally occur together (i.e. under one building) along the coastline are not so popular either for sale or for rent. This is because most of them are part of the shopping complexes attached to beach hotels, port wharfs or clubs, the ownership of which is in the hands of the proprietors of the parent hotel, wharf or club.

It has been mentioned that coastline lands are fertile and can be successfully utilized for commercial agriculture. The survey revealed that 82 farms of sizes ranging from 10 to 150 acres along the coastline were offered for sale in the period under review. Industrial use of coastline properties, such as godowns, storage houses and plants is also quite substantial, although most of the waterfront land in ports and harbours is not traded in the market for it belongs to the state. Even the majority of the godowns changing hands are only on rental basis, emphasizing the scarcity of waterfront sites for constructing new industrial buildings. Lighthouses, which are structures equipped with powerful lights to aid in navigation, are also not traded in the market, either for rent or for sale. These structures or their facilities are found either on the water or very near the shoreline. The selling and/or letting of these structures is dominated by shipping agencies, marine salvage engineering firms and pilot clubs.

Field survey by this investigator revealed that the market for coastline waterfront properties is dominated by residential houses and flats either for sale or for rent, cottages, mostly for rent and vacant plots for sale. This is because of the desire of most people to stay near the beaches, where they can enjoy the cool sea breezes and the colourful water scenery. However, it was further found out that a big proportion of waterfront land is occupied by port and harbour facilities. Some of this land may be seen to be vacant but in actual fact it is kept for future development and expansion of port and harbour facilities. The areas being referred to are in and around Mombasa's Old Port and the Kilindini Harbour, Lamu and Pate harbours, Malindi Jetty and landing frontage, Kiamboni Port and the small island ports of Gazi, Funzi, Vanga, Bodo and Wasini in the South Coast.

Another large proportion of the waterfront lands is taken by beach and tourist hotels, clubs and marinas[1]. During the fieldwork, it was found out that not many hotel rooms, club or marina facilities get advertised to the same extent as houses or other types of properties in the region. This is because the hotels, clubs and marinas are either always fully occupied, or the prospective tenants or buyers are so well informed about this submarket that advertising is not very common.

Many water sports enthusiasts, who make use of waterfront clubs and marinas have made it their habit to frequent the same places every time they are in the coast, a habit which is common the world over. And many of them engage

[1] A marina is a waterfront facility offering anchoring for recreational and small commercial shipping and it includes electricity and water supplies, rest rooms, parking, repairs of boats, aquatic sports goods, etc. (Smith, 1974, p.120).

in popularizing to others the places they visit, thereby extending the rental or sale market to their colleagues. A few examples abound in Kenya: the Leopard Beach Hotel in Diani is popular with German tourists, Restaurant Le Pichet in the north Mtwapa area is liked by the French, Vulcano Restaurant in Diani is mainly visited by Italians. Wind-surferers would rather camp at Nomad cottages in Diani or the Driftwood Club in Malindi, scuba divers visit Diani Reef Hotel and Watamu beach's Sea Farers, deep sea fishermen will go to Bahari Club or the Dolphin, etc. That means each type of user has identified and segregated his submarket such that there is little need for advertising the accommodation and facilities offered.

The only time that serious offers are made for sale or lease in this class of property is during the low tourist season from April to July. It is at this time that vigorous campaigns are made to woo local 'tourists' or those few foreigners around to take advantage of the low season rates. Except for vacant plots which are offered for sale, the rest of the properties are rental-dominated. This shows that most waterfront properties are time shared. Time-sharing in real estate is the extension of the condominium concept, where the unit is further divided, in terms of time, with the result that many people can occupy the same space at a greatly reduced cost to the consumer and resulting increase in profit to the developer (Crosson and Dannis, 1977:165). The table below shows the estimated number of properties either sold or rented in the study area from 1980-1990.

Table 3.2: Estimated number of developed properties either sold or rented in the study area, 1980-90

Type of property	Units sold	Units rented
Residential flats	58	267
Residential houses	621	970
Cottages	57	173

Source: Field work, 1990

Factors considered during exchange of waterfront properties in the market

While selling or letting waterfront properties, most sellers owners, agents or buyers would put emphasis on the following characteristics. This list is not given in order of importance because different properties exhibit different important characteristics.

1. Size of land itself or size of the accommodation

offered

2. Openness to seaview or ocean view.

3. Nearness or distance to an important facility e.g. harbour.

Size of the water frontage.

5. Distance of plot or property from the shoreline.

6. Availability of swimming pool.

7. Type of beach, sandy or rocky.

8. Public access to beach.

9. Duration of lease, or letting, whether daily, weekly or other.

10. Suitability of the property for other uses.

11. Availability of security.

12. Provision of infrastructure and basic services e.g. roads, water and power.

13. For hotels and houses, presence of extra services e.g. air conditioners, balconies, private baths, sporting grounds, furnished or not.

Further analysis of market information shows that size of land and/or accommodation offered forms the basis upon which sellers and buyers can price and buy their properties. However, two factors, the distance the property is from the shoreline, and whether the property affords a seaview or not appear to have the greatest influence on the final value of waterfront properties, as far as sellers, owners, buyers or renters are concerned

(Maina Chege, Coast Beachlands and others). Once a property is identified as being near the ocean or overlooking the sea, the next consideration is whether that property possesses all the services and facilities required (Interviews with respondents, e.g. Khaemba, Nairobi Homes, Maina Chege and Company).

Some prospective clients of waterfront properties attach particular importance to the type of beach along the front, especially those clients who are searching for accommodation and sports facilities. Sparkling white sandy beaches are preferred to dull brown sands. Beaches composed of brown sands are, therefore, unpopular with waterfront property clients. Fortunately, the bulk of the beaches along the Kenya coastline consist of white sparkling sands. Areas without such beach sands include Waa, Ngomeni, Hambrui and Kipini.

The other characteristic which is of limited importance is loan arrangement to prospective purchasers, perhaps because most developments of properties on the coastline involve huge sums of money such that very few financiers do indulge themselves in such lending. Information collected during both the property market survey and the actual fieldwork in the study area indicates that buying, selling or letting of waterfront properties does not rely on a single characteristic to influence buyers, sellers or renters. In the majority of the cases a combination of factors would lead to the final decision in the exchange of waterfront properties.

It has been found that there are not many specialized letting or selling agents solely for waterfront properties the world over. The few that are there specialized only when they were beginning, but diversified into other properties later in the course of time. That means, there are sellers or letting who have completely monopolised this property market. For instance, the large valuation and estate management companies in Kenya, traditionally known to be the main participants in the real estate market, have had minimal participation in the waterfront property market. Perhaps this is because these large companies are mainly located in Nairobi, about 500km away from the Coast. The only time such companies get involved in waterfront lands is when they have branches at the Coast e.g. Nairobi Homes Ltd. and Town Properties Ltd. both have branches in Mombasa.

Individuals as owners or acting as agents happen to command a very big share of the waterfront property market, about 60%. One explanation for this is that there may be very high commissions in these property dealings, such that many individuals get involved as agents, or most owners, aware of the high commissions they have to surrender to agents, decide to conduct the selling, buying or letting by themselves or through relatives. The waterfront property market has therefore been left to smaller estate agents, small property companies and individuals. Most of these are based at the Coast where they can easily see and inspect the subject properties. There are a few of such companies which are based upcountry but who engage in waterfront properties, but their scales or operation are very low. These include Robert Huthama and Company, Florin Enterprises and Rainbow Properties. Table 3.3 gives a breakdown of the share of different types of sellers or letting agents for waterfront properties studied during the 1980-89 period.

Table 3.3: Share of property offers by sellers and renters of waterfront properties

Type of offerer	% of properties offered (rent or sale)
Land valuation and management firms	1.2
Private individuals, owners and developers	9.2
Small estate agents	39.7
Unnamed companies and individuals	50.1

Source: Author's Field work

The large percentage accorded by unnamed companies and individuals confirms that many more properties may not be openly advertised or offered for sale or rent. And most of the companies which offered some properties in the market but are not real estate companies did so because they had interest in the properties they offered, either as owners or agents of owners. Such companies included Savannah Tours, Blue Ocean Beach Village, Tiwi Villas Limited, Pronto Travel Services Limited and Bamburi Beach Hotel. The share of market activity for the small scale estate and property agents who deal with waterfront properties in the Coast of Kenya is given below.

Table 3.4: Coast-based estate agents and their market offerings, 1980-1990

Name of agent	No. of properties marketed	% of total properties marketed by coast firms
Pelly Properties	219	19.57
Salama Properties	193	17.25
Jebri Holdings	149	13.32
Valley Investments	120	10.72
Jiwa Properties	89	7.95
Kama Properties	49	4.38
Chawla Estate Agency	23	2.06
Datoo & Companies	20	1.79
Mvita Properties	20	1.79
Shimoni Enterprises	14	1.25
Monty Enterprises	14	1.25
H.C Mehta & Sons	16	1.43
Gigi and Company	13	1.16
Manujee Brothers	11	0.98
Butts Beach Properties	4	0.36

Source: Author's Field work

Prices of waterfront properties are relatively higher than those of overland properties and, therefore, large sums of money are required for both their purchase and meaningful exploitation. Most prospective and eventual buyers of such properties are the rich, either from upcountry Kenya, from Europe or the local rich Asian and Arab communities. These are people who buy waterfront properties for different developmental objectives such as hotel developments, bars, clubs, farms etc. But quite a good number purchase these lands for purely speculative purposes. It is sad to note that the indigenous coastal people, being relatively poorer, have been eliminated from the waterfront property market.

The waterfront property market within the Coast also exhibits some trends which are repeated almost every year. Every year the lowest tourist season coincides with the long rains in the country. This period begins from April and ends in July, during which fewer numbers of properties are offered than from August to March. And while the low tourist season is on, more properties are sold than leased. There are two explanations for this. First, many would-be purchasers of waterfront properties find it easier to obtain vacant properties (availability). Secondly, because the properties are not fully utilized by foreign tourists, their prices are lower than during the peak tourist season. At the same time, rental units are heavily marketed because there are many vacant premises, and in a bid to woo local tourists, the rents are lowered and thus marketing campaigns for waterfront properties are intensified.

As the high tourist season[1] begins in August, coinciding with a short dry season, more waterfront properties are [illegible], and this trend continues until March, with [illegible] intervals of low tourist activity in November and December, perhaps because of Christmas holidays all over the world. During this time many waterfront properties are [illegible] for rent because many tourists need short-[illegible]. Interestingly, the sale of waterfront properties also goes up. The likely explanation, observed from the field survey, is that sellers of these properties cash in on the tourist boom for higher prices for these properties. Once in a while some tourists get interested and purchase property in the coastline for friends or relatives, at very high prices. Alternatively, some sellers expect their properties to be bought by some developers and owners of existing waterfront properties catering for tourists mainly as

[1] Although the high tourist season begins from late July to December, there is always high tourist period between January and March. At times the January-March season is busier than the August-December period, while in other years it may be the reverse.

extensions to their premises or to start other tourist facilities altogether.

It therefore follows that prices and rents for waterfront properties obey the trend of the tourist seasons; during the high tourist season prices are higher than during the low tourist season. For instance, while vacant plots may be sold from KShs. 50,000/= during the low tourist season, depending on the size and distance from the shoreline amongst other things, the same plot could fetch up to five times that value during the peak tourist season. Rental charges also behave in a similar manner, although the rate of rental increase is not as much. A summary of approximate price and rental charges from various types of waterfront properties is given in the Fig. 3.1 with times differentiated between low and peak tourist seasons.

On average, it has been found that properties fronting the ocean, other factors being similar will fetch higher values than those located further away from the ocean waters as shown in Table 3.5

FIG.3.1. PRICES AND RENTS OF PROPERTIES ACCORDING TO TOURIST SEASO

TYPE OF PROPERTY	UNIT	LOW SEASON	HIGH SEASON
 HOTELS & RESTAURANTS	SINGLE ROOM	400/per day	675/= per da per person
	DOUBLE ROOM	1000/= per day	1750/= per day
 FLATS	2 BEDROOMS	60/= to 80/= per day	190/= per d
	3 BEDROOMS	2000/= per month	4000/= to 6(...) per month
	4 BEDROOMS	3500/= to 5000/= per month	Over 700(...) per mont
 HOUSES AND BUNGALOWS	2 BEDROOMS	3000/= per month	SAME
	3 BEDROOMS	4000/= per month	SAME
	4 BEDROOMS	Over 6000/= per month	SAME
 VACANT PLOTS	1 ACRE	10,000/= to 1.5M/=	
 SHOPPING & OFFICE COMPLEXES	OCCUPIED SPACE PER SQ. M.	120/= per sq m per month (Minimum)	
 COTTAGES, VILLAS & CHALETS	1 BEDROOM	200/= per day	450/= per day
	2 BEDROOMS	450/= per day	800/= per day
	3 BEDROOMS	800/= per day	1200/= per day
 FARMS	1 ACRE	150,000/= per acre (Minimum)	
 LIGHTHOUSES AND GODOWNS	WHOLE LIGHTHOUSE	2000/= per month (Minim...) 4000/= per month (avera...)	
	GODOWN SPACE PER SQ M	25c/= per sq m. per month (Minimum)	

Table 3.5: <u>Prices of properties according to distance from the shoreline in different places along the coastline</u>

4th row	3rd row	2nd row	1st row	Place
15,000/= -20,000/= per acre vacant plot	40,000/= -60,000/= per acre	about 150,000/= per acre	Minimum 30,000/= per acre	Lamu
about 10,000/= per acre vacant plot	20,000/= -40,000/= per acre	Minimum 50,000/= per acre	Minimum 350,000/=	Malindi Watamu
Minimum 20,000/= per acre	40,000/= per acre per acre	80,000/= 120,000/= peracre	Minimum 150,000/=	Kilifi
Minimum 30,000/= per acre (semi-serviced plot)	Minimum 50,000/= per acre (vacant plot)	Minimum 200,000/= per acre (vacant plot)	Minimum 600,000/= per acre	Mombasa
Minimum 50,000/= per acre (vacant plot)	70,000/= -150,000/= per acre vacant 350,000/= per acre developed	130,000/= 240,000/= per acre vacant plot	Minimum 380,000/= per acre	Diani Kinondo
80,000/= to 25,000/= per acre vacant plot	70,000/= to 90,000/= per acre	about 200,000/= per acre	Minimum 250,000/= per acre vacant plot	Gazi Msambweni
7,000/= per acre	30,000/= -40,000/= per acre	50,000/= per acre per acre	about 100,000/=	Vanga

Source: Field work

Certainly, differences in value of properties occur depending on the popularity of the location, the nearness to an important waterfront property and proximity or nearness to a major town. Thus prices and values of first row lots will be different in and around Mombasa Island from those near Vanga town. The future for waterfront properties appears to be quite promising for many users, and the market seems likely to continue to be open and very much unregulated. In general, however, the fluctuations are minor between the seasons, so that it may not be obvious to see the difference in values in one area.

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CHAPTER FOUR

THE STUDY AREAS

Geographical Setting

The coastline of Kenya is approximately 420km long, and the country's territorial sea extends to 370km from the coastline. Within this area is a narrow and low plain ranging from 0-30 m above sea level. This plain is widest at the river deltas of Athi (Galana or Sabaki) around Malindi and Tana River around Kipinin and Ungama Bay near Lamu. In these places the width of the coast extends beyond 10km. The lengths of beach frontages vary with the area in question. Some places have overhanging cliffs and barrier reefs, while others have rias and clean sands. In places like Ungama Bay, Lamu and the southern coast, Mangrove trees lie along the fronting lands. Lengths of lands fronting the ocean waters for all areas along the coastline are outlined below. It will be noticed that these lengths are longer than the 420km length of the entire coastline. This is because the former includes lengths of all property fronting the waters, even in creaks and rias, while the later only measures the lengths of the lands facing the ocean proper.

Table 4.1: Lengths of waterfront lands along the coastline

Place	Length of frontage (km)
Vanga and Islands	34
Shimoni, Ramisi, Funzi and Wasini Islands	66
Msambweni and Gazi	25
Galu, Diani, Tiwi	24
Waa, Shelly beach	16
Likoni, Mtongwe, Mbaraki	50
Old Port, Tudor, English Point	40
Nyali, Bamburi, Shanzu	13
Mtwapa Creek	30
Kikambala, Mnarani	40
Kilifi Creek	37
Kilifi North	29
Watamu, Malindi, Ngomeni	98
Gongoni to Kipini	90
Tana River mouth	28
Lamu Archipelago	380
Kiwaiyu Island to Kiamboni	112
Total	1112

Source: Mombasa Tourist Information Office.

The northern limit of Kenya's coastline is Kiamboni town, bordering Somalia and the southern extent is Vanga, bordering Tanzania. The whole coastal plain contains coral platforms, sand dunes, tidal flats, river estuaries, creeks and mangrove vegetation. Indeed 'the region is unique in minor varieties of potential arising from the inherent physical diversity. This complexity is directly related to the geological history of the area' (Ominde:21).

The proper coastal plain lies at an altitude of less than 30m above sea level. It is largely underlain by young (most recent, geologically) pleistocene deposits of corals and sands. Coral and sandstone formations, through their porosity, greatly affect the fertility and moisture-holding capacity of the soil. Only few areas of fertile alluvial and residual soils abound, the Ramisi valley in the south coast being a notable example. Despite this characteristic and contrary to Ominde's contention (1968, p.51), the coast soils are suited to intensive forms of land utilisation. Much of the coastland is made up of coral, which once lay beneath the sea. It was later raised by earth movements to stand as a platform, with low cliffs above the present beaches of coral sand (Money:9).

The coral reef of the coast starts from Lamu all the way

to Mombasa, and down south to Shimoni, especially off Shelly beach, off Diani beach and in the atolls of Shimoni. Creeks, into which water flows are found at Mtwapa, Shimoni, Mida, Kilifi and Mombasa west. River estuaries and bays have been formed as a result of tidal action e.g. at Ngomeni and Ungama, north of Malindi and at Watamu bay.
In addition to the coral reefs, which are extended landwards in the form of coral limestones, the other soil types include clays and limestones. Sandstones are a type of leached soil, poorly drained and either brown or greyish in colour. They are extensively found in the coastline. Clays and silts dominate the swamp areas and mangrove forest regions. These normally lead to muddy beaches which are only inhabited by birds and other marine animals.

The coastal sedimentary rocks and coral reef produce three types of beaches along Kenya's coastline. Sandy beaches consist of rather fine brownish sand, and these beaches are found in the north e.g. around Watamu, Malindi and Lamu. Then there are the dazzling white sandy beaches of coral rock origin, which are invariably found along the south coast. Rocky beaches are found in those areas where marine activity has failed to break up the hard waterfronting rocks and cliffs.

The coastal soils are not only important for the nice beaches but are also fertile, and farming in the coastal zone is an important activity. Many types of crops are grown along the coastline, such as maize, coconuts, cashewnuts, cassava, simsim and vegetables. In some places within the coastline, the sedimentary rocks are utilized for their mineral deposits, sand deposits and building stone. Sand for building purposes is found in Lamu, Kilifi, Ng'ombeni, Waa, Tiwi, Msambweni, Majoreni and Vanga. Salt deposits are found at Ngomeni and Gongoni, north of Malindi. A cement factory is at Bamburi, north of Mombasa Island. Sand used for industrial manufacture of glass is found at Gazi, Msambweni and Mrima in the south coast. There are many small islands which are very near the shore all along the coastline. These islands are inhabited by local people, although some are relatively vacant and are used as tourist sites, e.g. Chale, Sii, Ndau and Kiwaiyu.

Vegetation

The entire coastline is an averagely forested region, with mangrove vegetation directly at the waterfront. Mangroves are only found around tidal creeks and river estuaries such as at Bodo, Msambweni, Funzi, Gazi and Shimoni in the south coast, around Mombasa west, at Mtwapa, Mnarani in Kilifi, Mambrui and Lamu. Next to the mangrove zone is woodland and bush vegetation, with some evergreen and deciduous trees. Behind this zone is the savannah grassland, composed of small shrubs and trees, grass and bushes. The furthest landward extent of the coastline is marked by the Nyika dryland vegetation consisting of thickets and dry bushes, in which baobab trees dominate. Some time ago all these areas were deeply forested but owing to pressures from farming, settlement, tourist resort developments and the quest for building materials, many areas have been cleared. Remnants remain a few areas like Witu in Lamu, Gede, Kilifi and in the southern-most coast. Figure 4.1 shows cross-sections of some areas and their vegetation types. There are only a few large permanent rivers in the coastal region, notably Tana River, the Galana (Sabaki or Athi River), Rare, Mwachi, Ramisi and many other smaller ones, which are largely seasonal, such as Ndzovuni and Mkurumudzi. Most of these rivers originate from highlands and mountains in the hinterland. In general, the water table within the coastline is very high, and most waters from underground are very salty[1]. This is due to the fact that sea water creeps underground from the ocean and encroaches into the nearby lands. And owing to the prevalence of sandstone soils which are

[1]Surprisingly, there are some wells on the waterfront which [illegible] pure, non-salty water e.g. on Lamu Island, at Kongo in the [illegible] Beach, at Shella in Malindi and at Mambrui.

easily drained, water scarcity in the area is quite common. A series of century old local open wells have been replaced with machine-pumped wells which end up malfunctioning after some time.

Climate and its influence on property values

The climate in the coastal area can be said to be warm, humid and moist, characterized by sudden changes of the weather even in a few hours. Temperatures are always high, from 20°C to 36°C maximum. Rain falls heaviest in the coastline area, but this declines as one travels inland. But the region does not receive as heavy amounts of rain as the highland areas of Kenya, mainly because of the generally straight shape of the coast, which ensures that onshore winds tend to blow parallel to the coast and, therefore, cannot penetrate further inland.

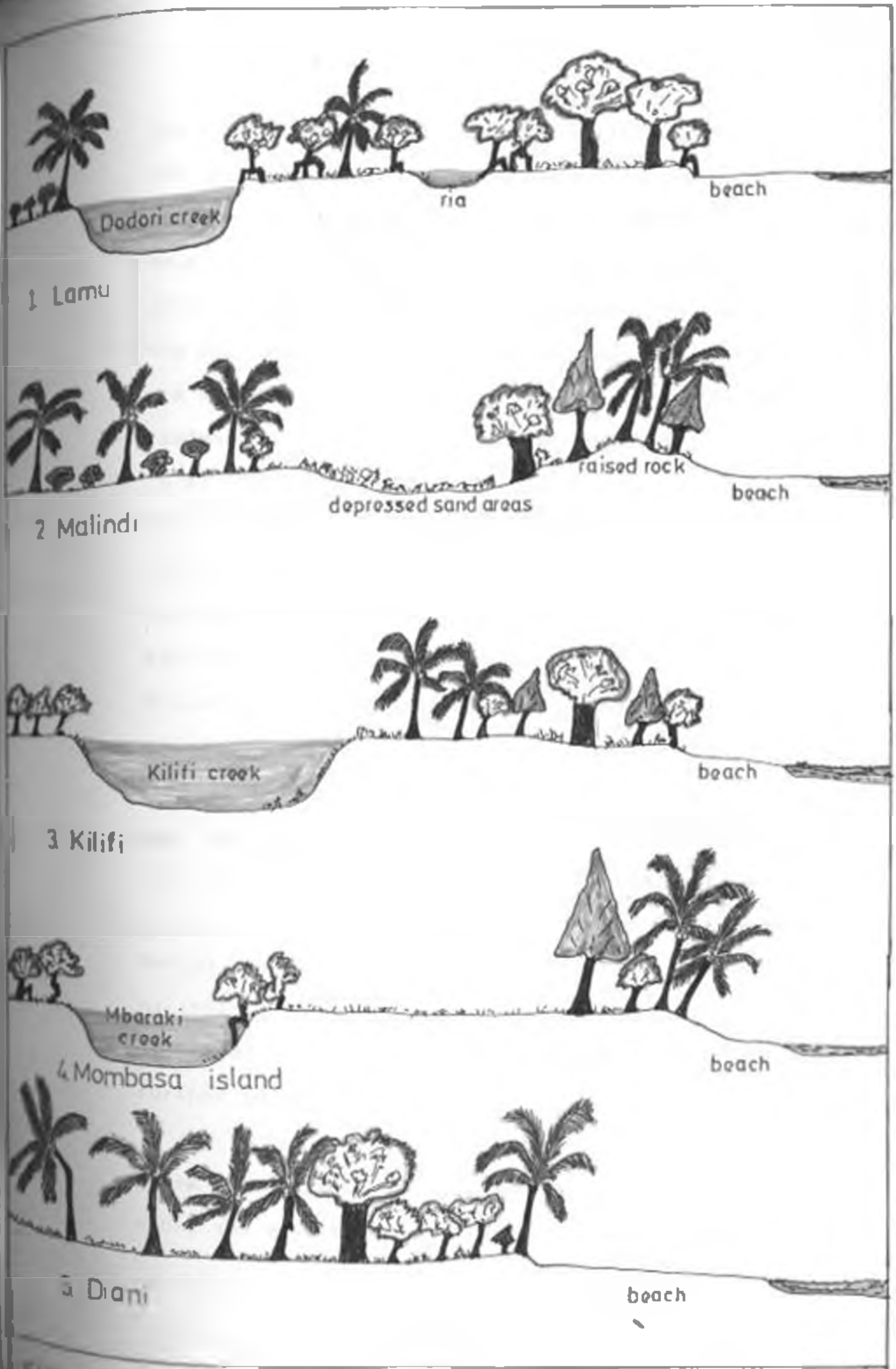


FIG 4.1: CROSS SECTIONS TO SHOW VEGETATION TYPES

The coastal climate is further influenced obviously by the presence of the Indian Ocean, over which winds blowing are heavily laden with moisture which brings rain. This amount of moisture is increased by the effects of the warm Mozambican current to the south and the cold Somali current to the north. And then there are the monsoon winds blowing from the dry south west Asia landmass. Between January and March, the north east (N.E) dry monsoon blow over the Somali current, causing the dry period at the coast. Between March and September the direction of these winds is such that they blow over the Kenya coast, They hence bring rain from the south east part of the Indian Ocean.
Following from the rain amounts falling every year, one can distinguish a pattern of rainfall zones in the coastal region, with rain densities diminishing as one goes inland. The heaviest rain (1270-1525mm annually) falls in the region from Shimoni in the south to Kilifi in the north. This narrow stretch is about 10km wide. Behind the stretch is the zone stretching from north of Malindi to Lungalunga in the south, in which 1015mm to 1270mm of rain fall every year. The other zones are further inland.

There is an effect of the climate on the property values along and within the coastline. Other things constant, such as the beautiful beach scenery and amenities, land values tend to diminish inland from the waterfront. This is probably related to the pattern of rainfall, such that values are higher for properties in the heaviest rainfall areas, and values are lowest in the areas with lowest rainfall amounts per year. Many more land uses can be attempted in the heavy rainfall zones than in the lowest rainfall zones.

In relative terms it would therefore appear that within the coastal zone land values are affected by distance from the ocean, amount of rainfall, fertility of the land and the level of infrastructure and services provided on or near the parcel of land. However, for properties further away from the ocean vicinity, the purpose of acquiring the land and the final use of that land would be more decisive factors. Take the case or a plot required for farming, for example. The soil fertility and the level of infrastructure near it would be more important than the distance from the shoreline.

Physical Infrastructure

The coastline is inadequately provided with infrastructure required for many purposes. Roads, which provide the main means of access and linkage, are barely enough in the area. In total there are 154.9km of tarmac or bitumen roads serving the entire coastal waterfront, and about 590.2km of earth or murram roads serving an area about 1260 sq.km.

Indeed the only area served with permanent tarmacked roads is Mombasa Island and parts of its environs. The principal pain road along the coastline is the tarmac road which starts from Lunga Lunga in the south up to Malindi. Few areas located in busy tourist sites are lucky to have paved roads up to the beach, the rest of the areas may not even have roads. Malindi, Watamu, Kilifi township, Nyali, Mombasa and Diani beach sites are the only ones served with paved roads. It is therefore difficult to reach some areas of the coastline by road e.g. Lamu and its northern regions, and parts of the south coast. Because of such inaccessibility, land values along the ocean fronts of such areas are relatively lower than in areas better served with roads. Railways are only found along the Mombasa west area up to the Kilindini harbour. Bridges between water inlets and estuaries have been provided in most places, although other crossing places still need them. The largest of these bridges is the New Nyali bridge, linking Mombasa to the north mainland. There are two causeways linking Mombasa Island to the west mainland, but the south coast is reached via the inadequate Likoni Ferry.

Water pipes serve most of the coastline, although the far northern and southern regions of the coastline do not have this facility. Sewage disposal systems are very poor, and in fact many of the coastline towns do not have proper sewage systems, e.g. Lamu and part of Malindi. Telephone and electricity lines are well deployed, but not all over the coastline. Electric power lines, especially, have only been connected to busy tourist areas, leaving coastline areas which are inhabited by local people without any electricity supply. This is also the case with telephone lines.

The People

The entire coastline is inhabited by a large variety of people. Most areas are settled by the indigenous Mijikenda Bantu people (Digo, Duruma, Giriama, Rabai, Ribe, Chonyi, Kambe, Kauma and Jibana) and the Pokomo, scattered evenly in the region. The other inhabitants are the people of mixed races between the locals and Arab or Asian descendants. These comprise the Amu, Wagunya, Segeju, Tswaka, Jomvu and many other smaller groups, at most calling themselves the Swahili. Mombasa Island is entirely occupied by people of Asian (Hindu) and Arab origin, the latter having greatly intermarried with the Mijikenda. Malindi is also largely occupied by this group, and so is Lamu.

However, there are large numbers of Europeans, especially in oceanfront lands, and now a big number of upcountry Africans have also settled in the coastline, in fact as far as Lamu and Lunga Lunga. Some of these people own many properties along the coastline.

Clusters of population are to be found all along the coast front. An important feature is the decreasing density of population from the humid coast to the drier interior. For instance, densities along the coastal plain reach as high as 2500 per sq.km. while in the interior this goes down to about 62 per sq.km. (Kilifi District Development Plan, 1984). There is also a general increase in population density from Malindi southwards to the Tanzania border. The northern coastal plain beyond Malindi has had less population because of the decline of ancient centres of trade and commerce (Ominde, 1968:105).

The immediate coastal fringe consisting or lagoons and coral rocks, either exposed or covered by a layer of sandy limestones is, however, sparsely populated except in the major towns and tourist complexes. The immediate fringe has been left vacant for farming or forestry.

An important question is whether the population density or its increase has had any effect on waterfront property values. Simple population theories suggest that increases in population may increase the demand for land and therefore value of that land, depending on many other aspects of that land. On the coastal plain this may appear to be true, but only for properties further away from the oceanfront. On the immediate waterfront there is very little evidence to suggest that such an effect exists. The high rise in prices of waterfront lands is a result of demand for the uses of waterfront lands, but not necessarily from the high population increases further inland.

In the Lamu region, for instance, the influx of upcountry people to the settlement schemes around has increased the population to 84,175, over the last ten years. Waterfront land values have on their part risen from Shs. 30,000 to 100,000 per acre. In Malindi, where the population has increased almost three times since 1979, waterfront land values have skyrocketed to about Shs. 800,000/= per acre from a mere Shs. 20,000/= per acre in 1979. However, none of these increased in waterfront land values can be directly attributed to the high increases in population. For one, most of the waterfront lands are government lands kept aside for public beaches and a few residences, thus they are not places for settlement. For another, the indigenous coastal people have always lived in clusters further away from the waterfront, reserving the areas near the ocean for [illegible]

[illegible]

only be correlated for lands further away from the ocean front, and waterfront land in towns such as Mombasa and Lamu.

Property Ownership Along the Coastline of Kenya

Land tenure is a very important because it can affect the amount of land released for development. Many cases abound which prove that where land tenure is guaranteed or secure, development on that land will take place (Kitay, 1985:7) and vice-versa.

Along the Kenyan coastline the question of land ownership is closely linked with the long history of occupation and colonization by the Arabs, Portuguese and British rulers. Of these three rulers, the Portuguese have been completely phased out of the area, the British are found in small numbers, while the Arabs are still dominant as far as property ownership is concerned.

Before the Arabs came to settle in the Kenyan coast in the 7th century, the nine indigenous coastal tribes of the coast appeared to be the rightful owners of the land. These tribes are said to have originated from Somalia but were driven southwards by the Galla, and during their return from Tanzania they settled as various clusters within thirty miles (48 km) of the coastline (Mbithi & Barnes, 1975:44). Under the customary laws of these people, individual ownership of land was unknown and irrelevant to their cultural and moral systems (King'oriah and Ngugi, 1989:3). The only claim that any member of these tribes could lay on the land was the right to reap the crop and the fruit of the land (Mathai Commission, 1978:1).

The Arabs ruled the coastal region of Kenya and Tanzania for many centuries. During their time, the Arab-Swahili Muslim law of land alienation was recognized and practised, where cultivated land was referred to as 'federal land' (Mbithi and Barnes, 1975:44). The land became the property of the individual who cultivated it once crops reached maturity, with full rights to alienate and sell the land. In addition to this, there was a tenancy at-will relationship between an individual who cultivates and builds a house on a piece of land, after getting permission from an Arab landowner.

There is, however, some doubt as to whether the indigenous people of the coastline of Kenya were practising this type of land tenure fully. It appears that these people continued with their communal ownership, while the Arabs, Asians and Swahilis were applying for the Islamic land tenure system. This co-existence of the two systems of land ownership would probably have safely survived for long had it not been for two phenomenal events: the slave trade, and the subsequent partition of East Africa, in the 1980s.

slavery and slave trade, which lasted for almost eleven centuries in Eastern Africa (King'oriah and Ngugi, 1989:4) had a direct impact on land ownership in the coastal strip, leading to physical displacement of the indigenous, original inhabitants of the area. According to the Mathai Commission (1978:26), not only were the indigenous coastal people sold into slavery, or used extensively as agricultural labourers on land, but also, escape was the only way of fleeing. As a result, original Africans finally lost control of their indigenous lands within the coastal strip. An option left to them was to stay in their lost lands either as slaves or squatters. Their lands fell into the hands of Arab and Swahili lords.
Even after abolition of slavery and slave trade, the indigenous people found themselves settling on lands they once owned as squatters, either knowingly or unknowingly. Mbithi in fact explains that squatting was rather easily carried out since landowners frequently lived in towns and rarely visited their farmlands, or had entirely abandoned their land (1975:52).

The partition of East Africa in 1886 further worsened the position of African inhabitants of the coast, and made matters better for Arabs, Swahilis and European settlers through the Imperial British East African Company under

William Mackinnon, the British government took over all land within the Kenyan ten mile coastal strip which was not owned by Arabs and Swahilis. These lands were supposedly owned communally by the indigenous people. On the other hand, the British rule recognized and confirmed claims of ownership of land by Swahilis, Arabs and Asians, to whom freehold titles were issued.

This nature of land ownership in the coastal strip continued throughout the British colonial era in the present century. All land in the strip not registered as freehold was taken as crown land. It is only in very rare cases that the indigenous natives of the coastal strip would be given freehold titles to land (Stren, 1971 36), because it was assumed African held land under communal nature.

Land ownership in the coastal strip today differs little from what it was during the colonial era. The independent Kenya Republic merely copied what the IBEA company did when it took over in 1888. All claims registered in the colonial period were recognized and ratified. And like in the colonial era, the only consolation for the evicted indigenous people of the coast was the introduction of settlement schemes in the region. But it is only Gede scheme which is within the famous 10 mile coastal strip, the rest of the settlement schemes including Mambrui, Bura, Majimboni and Shimba

Hills are very far from the oceanfront.

Most land along the coastline is owned by Asians and Arabs, some of whom are absent physically but preside over their lands using local agents and relatives. Trust land is found in areas formerly occupied by indigenous coastal people before independence. Trust land is vested in County Councils for benefits and on behalf of the inhabitants. The two other types of ownership are also present, i.e. government land and private land. Private ownership is either under groups, companies or individuals, while trust land has been converted to either group or individual ownership (Ngari, 1973:20). In addition, there are lands under settlement schemes and wakf land which is land set aside for Muslim religious and social functions. The proportion of land ownership along the coastline is outlined in Table 5.4 in the next page.

The tourist industry and its influence on waterfront properties

Tourism has been one of the largest income earners for Kenya, after coffee and tea. In the 1988/89 period, tourism in fact overtook coffee to become the largest foreign exchange earner, with earnings of KShs. 8.6 billion.

Table [illegible] Dispersion of different categories of land ownership along the coastline of Kenya

Ownership	Land size (acres)	%
Settlements	12,065.41	5.82
Company land	15,471.37	7.46
Trust land	34,090.922	16.46
State land	46,405.766	22.39
Private land	99,229.375	47.87
Total	297,253.863	100

Source: Ngari (1973), with an update from information offered by the Lands Office in Mombasa.

In 1990 alone, tourism earned Kenya an amount of about KShs. 10.7 billion, accounting for 43% of the country's foreign exchange earnings (Ministry of Tourism, 1990). Over the years, this industry has grown and expanded to cover many aspects and geographical sites. Evidence has it that over 60% of the tourists who come to Kenya every year land in Mombasa, and almost 90% of all the tourists who visit Kenya every year insist on visiting the coastal region before they wind up their tours in Kenya.

Tourism is important because, in addition to being a foreign exchange earner, it provides direct and indirect employment to many people in transport, restaurants, hotels, parks and advertising trades. Tourism also helps to encourage the protection of natural habitats, wild game cultures and traditions, and historical monuments. Furthermore, when tourism increases, there is a direct increase in demand for goods and services not only in the place visited in particular, but in the country as a whole. Of importance also are the improvements made to the services and facilities which are used by tourists, such as transport and communication routes, sanitation, water and electricity lines, restaurants and hotels. The overall effect of these characteristics has increased physical and economic development of the area(s) visited by the tourists. Along the coastline and further inland, the effects of tourism are clearly felt. Many people have been employed in tourism and its allied concerns. For example, in Malindi town alone, over 80% of the jobs and trades available are either directly in tourism or in the associated sectors (Swazuri, 1986:63). Except for Lamu and Kiunga, however, a good number of the jobs and businesses in the busy tourist areas have been taken by people not originating from the coastal region. Surveys in some of the places indicated that lack of or inadequate education on the part of indigenous people was seen as the main reason for this situation.

Cultures and traditions in the coastal region have been retained to a great extent, although in some towns such as Mombasa, Ukunda and Halindi or even Watamu, the influence of tourism has been to threaten the people's cultures and traditions. The ability of most areas along the coastline to withstand tourist influence has in fact contributed to more tourists pouring in to see these people. In the study cultures have little changed perhaps because most of the coastline inhabitants are, to some extent, non-participants in the busy tourist industry.

Natural habitats, will game and historical monuments have been well-preserved along the coastline e.g. the numerous marine parks, natural reserves and forests, monuments such as Gedi Ruins, Vasco Da Gama's pillar, Fort Jesus, Lamu artifacts, etc. In fact more of these natural habitats are likely to be increased along man-made tourist attraction sites such as Mamba (crocodile) villages, traditional villages and dance camps and many others

Physical developments in the coastal region has occurred as a result of tourism. Roads to important tourist sites along the coastline have ben provided, the airport in Mombasa has vastly expanded and built to modern standards. Electricity and telephones have been spaced further. A notable feature is the increase in the amount of house and hotel development along the coastline. Areas which were uninhabited a few years ago now have fully-developed hotels, restaurants and cottages, e.g. Msambweni beach, Shimoni and Vanga beach lands. Between 1988 and 1993 alone, about 400 such developments had taken place. This has, therefore, increased values of most waterfront and adjacent lands and other physical properties, properties which are becoming more scarce and more dear as the tourist industry expands.

As a result of the ever-increasing volume of traffic, largely arising out of tourism business, the government decided to construct the overdue Kilifi Bridge to replace the inadequate Kilifi Ferry at Mnarani. Since its completion in 1991 the bridge has facilitated easy access to and from the north coast beaches and regions. It is now evident that the Kilifi bridge has opened up the north in the same way the New Nyali bridge did to the areas north of the Mombasa Island.

On the other hand, tourism in the coastal region is a function of beautiful unpolluted beaches, the sunny climate which occurs at the same time with winter in Europe, the major source of tourists, a rich habitat of wildlife, contrasting landscape sceneries, historical sites and artifacts, cultural wealth amongst the coastal peoples, and the available accommodation for the tourists (Waters and Odero, 1986:102).

As for specific land values, tourism and its allied developments has had a profound effect. In those areas which have been tourist havens all along, values of land there have skyrocketed as more redevelopments of the land and facilities are carried out. For instance, the addition of new hotels near existing ones to cater for the increasing number of tourists in the Diani beaches pushed land values from KShs. 200,000/= per acre in 1986 to KShs. 800,000/= per acre in 1990. The upgrading of tourist facilities at Mnarani on the Kilifi creek raised land values from a mere KShs. 180,000/= per acre in 1985 to a modest KShs. 600,000/= per acre in 1989. And the opening up of Ngomeni in Malindi to construction of tourist lodges realised land values which were unthought of a few years ago. The table in the next page shows examples of those effects.

Table 4:3: Effect of tourist developments on land values in selected areas

Place and LR No. of plot sold	Value before tourist development	Type of tourist development nearby	Value of adjacent plots after tourist development
LR No. 10171 Mtwapa beach	Shs 180,000/- per acre (1987)	Beach and tourist hotel	Shs.700,000/= per acre (1989)
LR No. KWL/MSAMB/A/1541 [illegible] beach	Shs 90,000/= per acre (1985)	Beach cottages, hotels	Shs.660,000/= per acre (1990)

LR No. 1962 Malindi Beach	Shs.500,000/= per acre (1987)	Beach hotels shopping centre	Shs.1,000,000/= per acre 1990
LR No. KWL/GALU/KIND/657 Galu Beach	Shs.560,000= per acre (1987)	Beach hotels	1,100,000/= per acre (1990)
LR No. 1/77, Shelly Beach	Shs.390,000/= per acre (1988)	Beach H. shopping centre, apartments	Shs.1,700,000/= per acre (1990)

Source: Field survey analysis
Note: All properties are on first row

Utilization and Conservation of Waterfront Properties Along the Coastline of Kenya

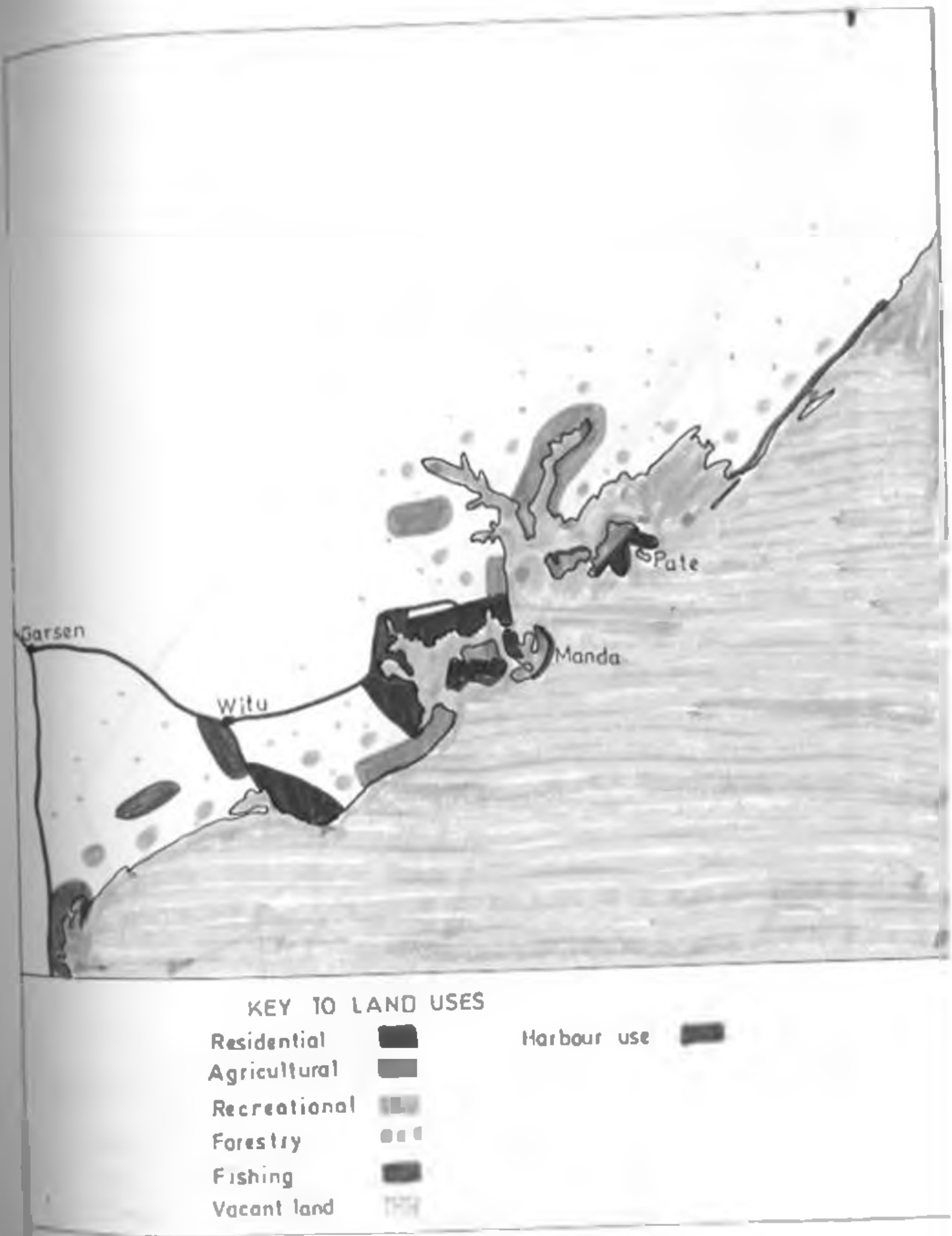
Land along the coastline of Kenya is utilized for many purposes, depending on the place concerned. Ownership is also in different classes, from leases to freeholds, from public, private company to trust land ownership. Although there is no rule that all lands fronting the ocean should be used for specific purposes, a generalized pattern emerges, which suggests a regular system of land use. For instance, all creek lands are either vacant or used for boat houses. Where there are swamps and muddy beaches, the commonest use is mangrove forest harvesting, and in all rias and islands, fishing is the most important activity. The marine waters themselves form large reservoirs for fish and other marine resources, most of which remain untapped.

Lamu District has the largest area of ocean frontage land yet that land is the least developed. The prevailing land use within the Lamu coastline is residential use, forestry use and very little of farming. Some parts of the main islands of Lamu, Pate and Faza are used as tourist sites, beaches and hotel apartments but this use is less extensive due to inaccessibility of most parts of the district, and the lack of infrastructure and services. Map 2 shows these uses.

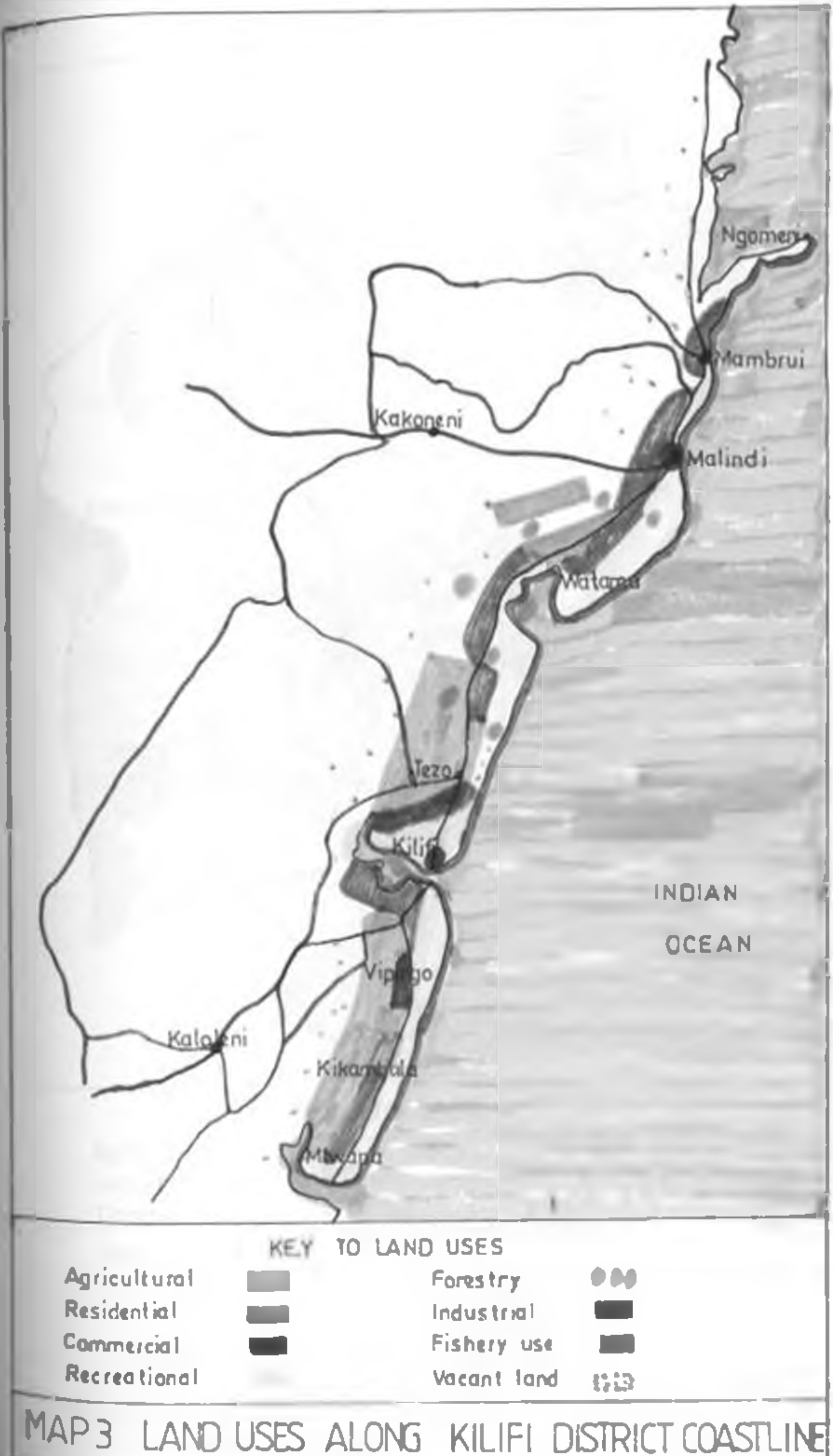
In Kilifi, the situation is much better; more of the coastline is utilized that in Lamu. Here there are more varieties of uses at a higher intensity. The creeks at Mtwapa, Mida, Kilifi (Mnarani), Fundisha Bay and Ngomeni offer very high potential for aqua and marine culture currently untapped because of poor or lack of technical knowledge and poor infrastructure. Along the coastline are extensive undeveloped beaches coupled with a good collection of historic sites and monuments. These collectively contribute to the vast natural potential for tourism attraction of which only part is being exploited (District Development Plan, [illegible], p.8). The dominant land use along Kilifi coastline is farming, followed by tourist developments and residential use. In a number of places, mixed land uses are common. Map 3 shows these different land uses.

It is in Mombasa District where the intensity and variety of land uses is highest, first because of the functions of Mombasa Island as the provincial headquarters and secondly because of the large population and good infrastructural services. The land uses range from dock facilities to residences and naval bases. Map 4 shows these uses in Mombasa District.

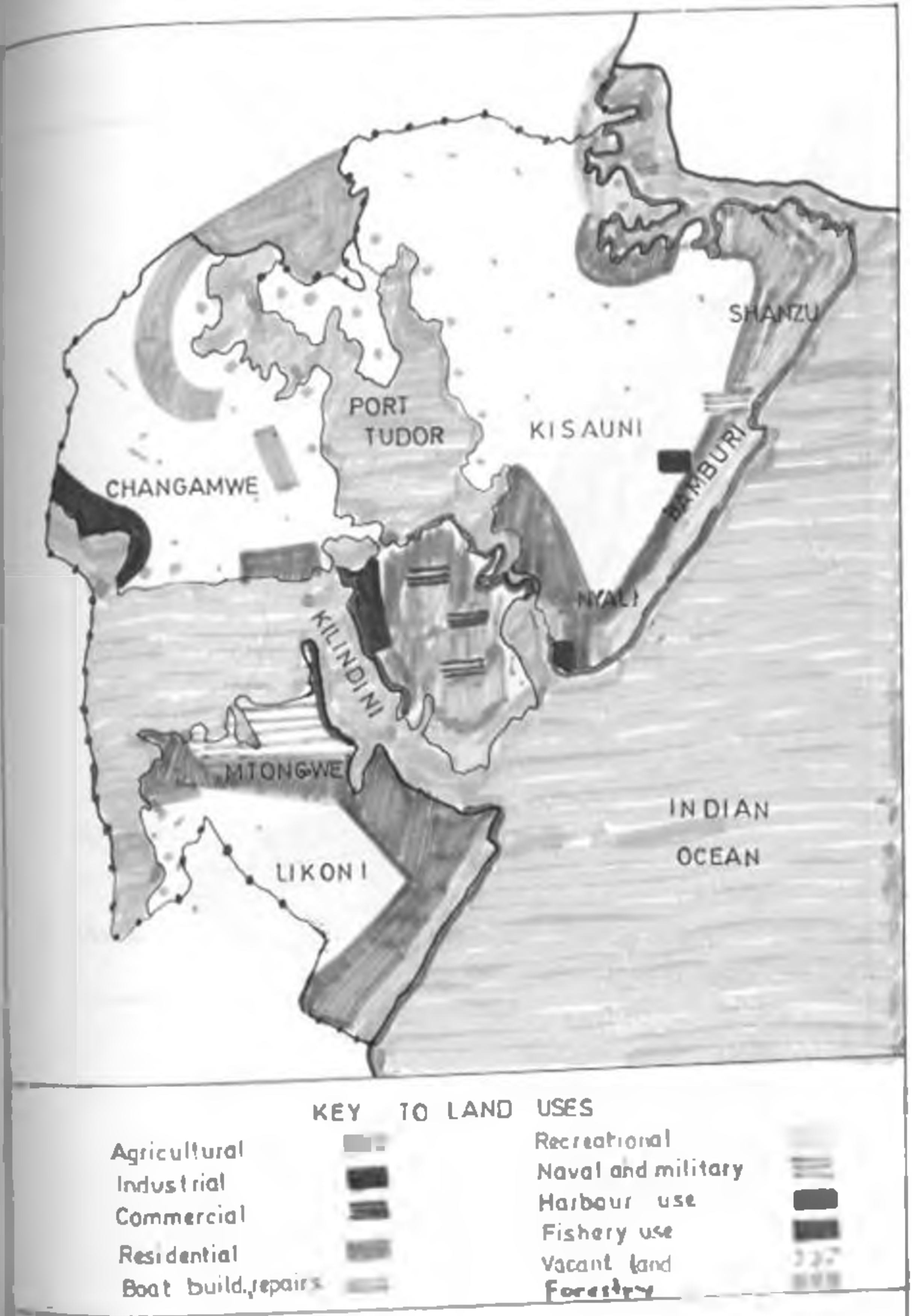
In Kwale District, most land along the coastline is used as residential land, agricultural land and for tourist hotels (accommodation). Residences are found in the Diani beach complex, Msambweni, Vanga and Shimoni areas, while agriculture is practised in places like Fungu, Waa, Kinondo, Funzi and Wasini Islands. Very many areas are, however, inhabited and the high potential for various uses is barely exploited. Map 5 shows the way land is utilized along the coastline of Kwale District. Out of all types of uses of land and other resources within the Kenyan coastline, three of them need further explanation.



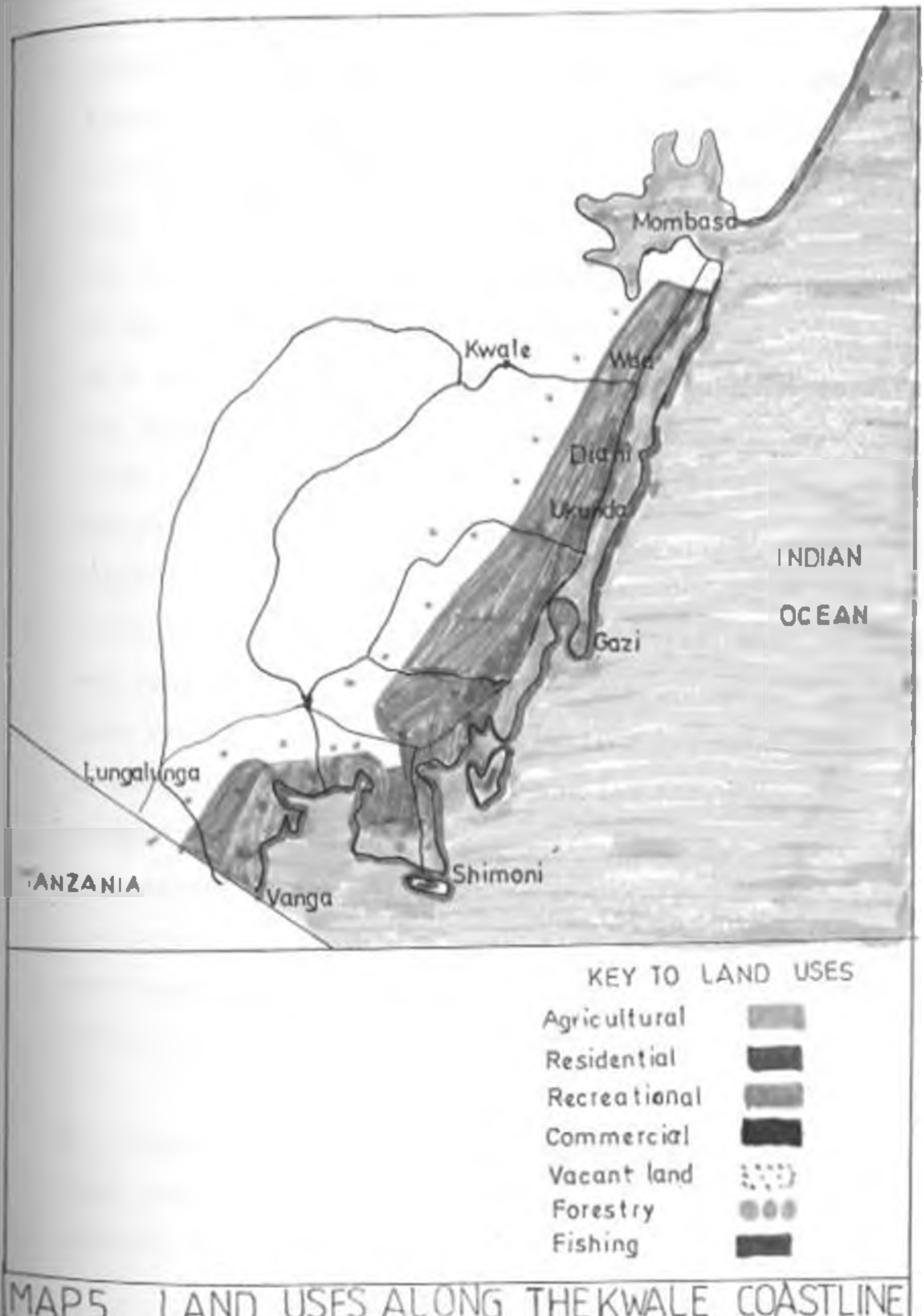
MAP 2 LAND USES ALONG THE LAMU COASTLINE



MAP 3 LAND USES ALONG KILIFI DISTRICT COASTLINE



MAP 4 LAND USES ALONG MOMBASA DISTRICTS COASTLINE



MAP 5 LAND USES ALONG THE KWALE COASTLINE

1. Mangrove and other forestry uses

The entire coastline is endowed with large quantities of forests, both mangrove and non-mangrove. Mangrove forests, mostly found in swamps, perform vital functions in the coastal ecosystem. They supply inshore waters with nutrients from their leaves, and also provide food for fish. Mangroves are of economic importance for poles of various sizes used in constructing houses, boats and as a source of firewood. Concentrated mangrove forests are found in Lamu and its islands, Fundisha Bay, Mida Creek, Mtwapa Creek, Kilifi Creek in Kilifi, in the Makupa area of Mombasa, Kipevu, Port Reitz, Tsunza and Mikindani in Mombasa District. In the south coast, mangroves are found at Gazi, Kinondo, Funzi, Bodo, Wasini and Vanga. Very many people are engaged in exploiting this resource all along the coastline and land adjacent to mangrove forests is used either for rice cultivation, or sand collection, or left vacant. This is because the land extent is much affected by the tides. At low tides the land is visible, at very high tides, the land is submerged. The other types of forests found in the outer zone of the beach front are mostly used for firewood.

2. Harbour/port/docking uses

Land used for these purposes should ideally have a good network of infrastructure and services, because the nature of work involved ranges from simple to highly sophisticated tasks. However, the requirement for these facilities and services has only been fulfilled around Mombasa Island. Here, all types of works related to docking can be undertaken. The land is thus composed of railway lines, roads, pipelines, oil and cement storage tanks, permanent wharfs and crane stands, repaid workshops for ships and marine vessels, etc.

In the other areas of the coast where docking is practised, facilities are barely enough to handle large ocean-going vessels. Attempts are being made to modernize the ports of Malindi and Lamu, but traditional fishing harbours still remain at Pate, Faza, Wasini and Funzi Islands, at Gazi, Bodo, Mtwapa, Shimoni, Vanga and Kiunga. The lands adjacent or near to these harbour places are used for activities mostly related to the docking facilities and their supportive services. Values are relatively high and vacant plots are rarely available nearby.

) <u>The ocean waters and their uses</u>

In the coastline of Kenya, rarely are the Indian Ocean waters used for domestic purposes. There are no distillation plants to make the water fit for such uses. The major industrial use made of these ocean waters is perhaps as a dumping place for industrial and domestic

foul wastes. A number of places are used for dumping wastes, examples of which include Kibarani area near the Mombasa Makupa Causeway, Mkomani and Mikindani shores, Malindi north shores, Witu and Majoreni shores.
Ocean waters are mainly used as transport routes for local (domestic) and international vessels, for sporting boats, fishing expeditions, recreation, water sports, etc. And then there are the marine products obtainable from the ocean waters. These include fish, other marine animals, shells, weeds and plants.

Fishes constitute the largest product out of the Kenyan ocean waters. Together with other smaller marine animals and plants, their harvests have created occupations and employment for very many people along the coastline. A large number of coastal seaside villages are entirely devoted to fishing such as Lamu, Faza, Witu, Kiamboni, etc. Yet the fishing potential of the Kenyan ocean waters has not been exploited to the maximum, because of reasons ranging from poor technologies to lack of funds and equipment. In Mombasa district, for instance, the marine inshores have an annual fish production potential of 15,000 metric tonnes, but at the moment only 7,000 metric tonnes are being produced (District Development Plan, 1988-93, p.47).
In Lamu, Kwale and Kilifi districts, demersal fish (those

found in inshore waters) are more commonly fished than pelagic fish (those found in the deep sea). Common methods of fishing include fish traps, trap baskets, gill nets and ring nets utilized from dug-out canoes, boats and small ships. Fish farming has, however, not been taken seriously in these areas, although the potential of production is very high. The table in the next page gives the quantity of fish and marine products and their values for the coastal districts from 1985 to 1990.

MAP 6. FISH-LANDING DEPOTS ALONG THE COASTLINE OF KENYA

Table 4.4: Quantity and value of fish and marine products in coastal districts, 1985-90

Year	District	Metric tonnes (000)	Value in Shs (000)
1985	Kwale	725	6,875
	Kilifi	782	6,226
	Mombasa	3,448	39,993
	Lamu	1,229	6,652
1986	Kwale	849	7,724
	Kilifi	761	7,694
	Mombasa	3,755	45,822
	Lamu	1,210	7,399
1987	Kwale	921	19,379
	Kilifi	1,038	10,193
	Mombasa	4,447	71,828
	Lamu	1,309	8,532
1988	Kwale	820	8,984
	Kilifi	1,042	10,360
	Mombasa	4,049	76,658
	Lamu	1,158	10,291
1989	Kwale	745	9,027
	Kilifi	886	11,698
	Mombasa	4,841	84,785
	Lamu	1,077	12,256
1990*	Kwale	736	9,929
	Kilifi	850	13,452.7
	Mombasa	5,100	97,502
	Lamu	1,100	14,707

* Projected estimates

Source: Annual Fishery Bulletins by the Fisheries Department, Ministry of Regional Development, Nairobi

Owing to this occupation of fishing, a number of fish landing depots have been established over time, as can be seen in Map 6.

Conservation of resources in the coastline

Conservation of resources within and along the coastline is necessary because of the intensity of use of the available resources and the danger of some of the sources being used as dumping sites for various types of wastes. Furthermore, lack of conservation could cause serious environmental degradation, loss of marine life, marine-related occupations and the whole marine ecosystem. There are a number of national reserves, either for forestry or marine resources. These include:

Boni National Reserve

Dodori National Reserve

Kiunga Marine National Reserve

Malindi/Watamu Marine National Park

Arabuko-Sokoke Forest

Kisite Mpunguti Marine National Park

Wasini Marine National Park

These reserves are to ensure that forests and marine life are well looked after, and are available for viewing by visitors or used by the government as when required. In addition, there are man-made conservation areas in some places. These are found in ares where limestone quarrying has been abandoned and huge open pits remain. The Bamburi Cement Company, for instance, has had 87 acres of such land reclaimed, planted with trees and in which rearing of cattle and fish is done. Mamba Village is another place where crocodiles are reared in a formerly abandoned quarry. So is the SOS Nyali Village, which was built on an abandoned quarry and now rears cattle, goats and fish. However, a number of abandoned quarries exist in several parts of the coastline.

Pollution of the ocean waters around the major towns and islands has not been severe so far, but human wastes and industrial wastes are posing dangers in Mombasa and Malindi. An exceptional case is the July 1988 oil spill in the Kipevu and Kibarani area, near the port of Kilindini, which has left the waters oily, dark and plants dead since them. Other interesting efforts are those geared towards conserving whole Swahili cultural environments, such as for the Old Town of Mombasa and Lamu. These projects are still underway and it is hoped their success will be a major conservation achievement.

Finally, there are places of historical importance and monuments within the coastline which have been kept intact the government. These places include Fort Jesus, and Old Port, in Mombasa Island, Jimba and Gede Ruins in Malindi, Lamu Museum, Jumba la Mtwana, Takwa National Monument, Vasco da Gama's pillar, Kongo Mosque, Gazi court house and the Chalo Island resort site.

The following chapter reviews the various methods which have been proposed and used by other scholars in the valuation of resources on the waterfront. It explores the principles of valuation involved and the judgements made therefrom. Starting with the basic principles, the chapter ends up with suggestions of how to use multiple regression analysis in the valuation of waterfront properties.

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CHAPTER FIVE

A REVIEW OF REAL PROPERTY VALUATION METHODS

Valuation could simply be described as the art of imputing prices and values to goods and services. To understand valuation, the meaning of value must also be defined properly. Both definitions, that of value and that of valuation have occupied the minds of many valuers and economists throughout time.

A consensus on the definition of either word has not been pronounced, debates are still going on, and researchers are eagerly chasing these seemingly elusive ideals. Our interest here is not to join this semantic marathon, but to underline the fact that it is working definitions which should be adopted. Unfortunately this attitude postpones the search for agreed definitions of value and valuation. So value gives the worth of something, a property or services, while valuation is the act of bringing out, calculating or arriving at this worth.

The practice and theory of valuation, although very essential in life has been so much ignored by many economists, that Bonbright wrote:

> Perhaps they have rested under the impression that these practical issues involve merely a mass of detailed technique and meaningless convention, unsusceptible to analysis by reference to any major

principles of economic theory. But in neglecting the field of appraisal, they have missed some of the most important factors in market price determination, to say nothing of private fixing by legal fiat (Bonbright, p.80, quoted by Murray, 1973:77).

Valuation is, therefore, important in the general economy, and its principles can be applied to help resolve many economic problems. In fact valuation can be claimed to be the only section of economics which relies on empirical verification of hypothesis (Murray, 1973:83). Important national and international economic transactions are smoothly carried through by use of valuation practices, which are accepted by all including courts, businessmen, the administration, etc.

The valuer in his practice proves his theories and applies them to solve real problems; mostly relying on analysis of existing information. These accumulated facts are the basis of his results. Using valuation, one can calculate the expected market values or prices of properties, sometimes without the subject properties changing hands. But the practice and principles of valuation enable the valuer to examine transactions in detail, come up with proper information and use basic existing information to arrive at the required value.

Valuation practice, therefore, applies existing information and knowledge to be used as the yardstick and basis for judging prices and values of property. There are three major principles of valuation which to some extent dictate the methods of valuation to be used in assessing the value of a property. Like value and valuation, the definitions of these principles have been areas of contention.

1. The Principle of Highest and Best Use

There are many definitions of highest and best use. Highest and best use is the basis for a wide range of investment decisions and appraisal measures. It is that reasonably proximate use which will support the highest present value (Kinnard & Messner, 1973:419). Wendt described it as "that use which maximizes the difference between the discounted after tax cash flow and the equity investment for alternative uses" (1972:167). The Appraisal Institute defines it as "that use which at the time of appraisal is the most profitable likely use". It may also be defined as the available use and program of future utilization that produces the highest present land value. And Boyce described highest and best use as "that use, from among reasonably probable and legal alternative uses, found to be physically possible, approximately supported, financially feasible and which results in highest land value" (1975:107).

The highest and best use of a property is therefore that use which is most likely to produce the greatest net return over a given period of time. The net return may be in the form of income, satisfaction, benefits or any other, depending on the type of property involved. Highest and best use is a dynamic concept dependent on changing market conditions.

The principle assumes that each property will be used to the best of its characteristics and suitability. If a property is not utilized to its highest and best use, then that property is most likely going to be underestimated in value. The implication therefore is that for appropriate valuation, properties should be utilized in their highest and best uses. This means that the principle of highest and best use is the most fundamental in appraising real estate. In terms of incomes, highest and best use is the logical, legal and most probably use that will produce the highest net return to the investor over a substantial period of time (Albritton, 1979:406).

However, the principle of highest and best use has always come under intense criticism, both in its definition and application. Boyce, for example, claims that 'highest' and 'best use' are simply terms inherited from the times of Adam Smith, when maximum profit was always 'best for society' yet 'society had not reached a point where it could find a consensus on land use priorities and social objectives'(1975:108).Given the present level of society advancement,Boyce would appear to suggest that such terms are no longer valid.Graaskamp is almost of the same opinion,that "the term 'highest and best use' is an anachronism from laissez-faire attitudes of the 19th century(which) have undergone a revolution in meaning like the concept of fee simple title.At worst, it implies certainty of one man's judgement...even when it is apparent that there are many vested interests in the cash flows that are affected by a given land use decision"(1992:627).Graaskamp recommends the replacement of the term with the terminology of 'most fitting use' or 'most probable use'.

Although agreeing with most of the definitions of 'highest and best use',Summers was concerned that "institutional,social and political problems prevent such straight-forward definitions from holding in all cases...e.g it is wrong to retire good quality agricultural land and therefore reduce the food supply in order to provide water to municipal and/or industrial users,even if they can pay for it"(1981:13).Highest and best use can hence lead to disbenefits.And Whipple([illegible]:529) also argues that determination of "the [illegible] pr[illegible]e use can only be possible after making an [illegible] property['s] most productive features... [whi]ch entails collecting information from many [sour]ces,some of which are difficult to assess and [quan]tify". Some of these sources include physical, legal, [loc]ational and aesthetic characteristics. According to [Whi]pple, "such considerations lead to a selection of the [illegible] (which) is not necessarily [illegible] as its highest and best use. The latter concept, [illegible] maximization as the sole criterion for [illegible] land, is now a discredited one" (1991:330). Many other writers,including Vandell(1982:267) and [illegible] (1982:56) agree with Whipple that the term 'most pr[obable] use' is preferred to highest and best use.

[There is] therefore, a consensus, at least for the time being [illegible] continue using the term 'highest and best use' in the wake of the experiences of [illegible] valuers.Constam (1977:78) has in fact conceded that "There are no magic formulae that I know which can be applied in estimating...highest and best use.There is no substitution for research, investigation, analysis, [l]ogic and imagination".

2. The principle of [illegible]ution

[illegible] principle [illegible] in all the three major approaches to valuation. It states that when a property is replaceable, its value tends to be set at the cost of acquiring an equally desirable and valuable property (Constam, 1977:77). Kinnard and Messner add that the upper limit of value of a property tends to be set by the cost of acquisition of an equally desirable substitute, provided there are no delays in effecting the substitution. A prudent purchaser would pay no more than the cost of acquiring such a substitute on the open market (1973:420). That means if the cost of acquiring a property is to be accurately estimated, the sales prices of truly comparable competitive items must be compared with one another. Using this principle, the value of a new property could be developed from the value of a similar old and disused property.

The principle is mainly used for properties which are designed and used for a specific purpose, which do not have comparable sales in the market to base their valuations on. These properties are rarely sold, and where they are, they generally need to be replaced by alternative premises which have to be newly built since alternatives rarely exist (Britton, Davis & Johnson, 1979:15). Alternatively, the value of one existing property could be used to estimate the value of a similar property to be erected in the future. The principle mainly applies to replaceable real properties such as buildings.

3. The principle of utility

For a property to have value, it must have utility, it must be scarce and purchasing power on the part of the would-be buyers must be there. Utility refers to the manner in which a property could be of use; if the property is useless, or has no possibility of being turned into alternative use then it cannot command any value. Scarcity refers to demand, the desire to purchase a property. The more scarce a property or service, the more valuable or expensive that property or service becomes. An oversupply of a good or service removes scarcity and places the good or service within the reach of more would-be purchasers. Scarcity gives rise to value (Millington, 1975:33). Value itself occurs in several ways. Use value is the present worth of future benefits forecast or anticipated to be receivable from the ownership of an asset (S.R.E.A, 1960:11). It is the value of an economic good to its owner-user which is based on the productivity of the economic good to a specific individual. As Boyce says, use value may not represent market value (1975:106). Market or exchange value has been defined by many people (e.g. Boyce, 1975:104; Howcroft, 1978:242; Ratcliff, 1975:486 and Entreken, 1980:423). The two most referred to definitions are as follows:

1. The price which a property will bring in a competitive market under all conditions requisite to a fair sale, which would result from negotiations between a buyer and seller, each acting prudently, with knowledge and without undue stimulus (S.R.E.A, 1960:64).
2. The highest price in terms of money which a property will bring if exposed for sale on the open market with a reasonable time to find a purchaser, buying with full knowledge of all the uses to which it is adapted and for which it is capable of being used (Kinnaird, 1971:13).

Although these two are the most used definitions, Ratcliff, amongst others, criticised them for being rather theoretical. Ratcliff argues that "The client is not interested in a market value determined in some hypothetical, non-existent perfect market peopled only by prudent and relaxed buyers and sellers, fully informed and under no pressure to act" (1975:486). Imperfections in the real estate market make it completely impossible to reach such situations. The debates on these issues are yet to end (see for instance,Miller and Gilbeau,1988:8;Lizieri and Rowland,1993:82; and Wiltshaw,1991:17), amongst others. Fortunately,the practice in valuation has been to operate with working definitions of whatever aspect one is dealing with, given the purpose of the valuation. At least this removes the pressure on valuers whenever they have to carry out specific valuations, and as Horsley (1992:502) states '...there are various terms at the core of valuation standards ...(of which)...if valuers continue to redefine...or argue about their exact meaning(s) in various contexts, then the standards cannot survive. There must be agreement over not only the worth of the standards overall, but also on what they mean'. These three basic principles of valuation, together with the definitions of value and valuation form the philosophical cornerstones for the methods used in valuing property.

Common real property valuation methods were developed from the early theories of value. The three basic methods which evolved were the Market Approach, the Income Approach and the Cost Approach. However, valuation involves dealing with complex and unregulated markets which bring forth all ranges of properties. To cope with these complexities these basic methods were refined and others (e.g. Brown & Johnson, 1980; Sykes and Young, 1981; Gettel, 1978:90, etc) were added e.g. computer-assisted methods. Most, if not all, methods of valuation are still being reviewed as real property transactions become even more complicated and new tools and technologies are discovered. However, there are no significant new changes in the basic principles of valuation.

Perhaps of significance is that the method developed or to be used will depend on the type of property to be valued. There are some methods tailored, although not limited, to some specific classes of property e.g. income approach is mainly used in properties which either generate or have a potential for generating income.

On the other hand, there are certain types of properties which are subject to valuation by specific methods, for instance public buildings such as schools, can be valued using the cost of replacement method. This is because such properties are rarely traded in the open market and therefore no sales information exists for them. Then there are those methods of valuation which are almost liberal, can be used for many types of classes. The best example here is the market approach, which can be used in all cases except where market or sales data are not available.

Followed by this one are those classes or properties which are almost non-aligned, they lend themselves to valuation by almost all methods e.g. shop property in urban areas. Finally, there are those unique properties which, at first seemingly impossible to value, cannot be valued using one method but a combination of methods. These properties may sometimes exceed the norm, by requiring special methods other than the common ones, and at times more logic and experience in their valuation than would be the case with other properties. The most common methods of valuation are as follows:-

1. The Direct Comparison Method

Also called the Market Approach or Sales Comparison method, is the simplest and most direct approach in arriving at a value. It involves comparing the property to be valued with the prices obtained for other similar properties (Lawrence and Rees, 1978:13 - 14). The process of estimating value by the comparison method entails four steps:

(a) Analysis of the property to be valued: This is done in terms of the property's best use and potential uses, its physical characteristics, location factors, market trends, regulations and restrictions affecting the property, and so on.

(b) Selection of comparable properties: Other property having the same or nearly the same characteristics as the subject property are selected. And these comparables must be properties that have been sold in the open market or those for which offers for sale or purchase have been made.

(c) Analysis of comparable properties: Information to be analysed for the comparable property includes the number of sales involved, the period the sale took place and the economic climate at that time, and the motivating forces behind the sale, if these can be discovered.

(d) Comparison of subject property with comparable property: Comparison between the two is made either on an overall area basis or by the use of cubic units of area. Like will always be compared with like, and the similarities should be in terms of use of the properties, location, design and age, size and accommodation, the market conditions prevailing during the sale of both properties, and the nature of transactions.

[illegible] The Cost of Replacement or Contractor's Method of Valuation

It is also called Summation Method. By its definition, the total value of a property will be equal to the market value of the land or site, added to the cost of the improvements on that land. The contractor's method is based on economic theory considerations: no investor will purchase a property if the price of that property is over and above the amount of money he can spend to create an equivalent property

This method is used for special-purpose properties which are [illegible], such that no sales comparison [illegible] Pichard, 19[illegible] [illegible] such properties are sold, they need to be replaced with alternative premises which are to be newly constructed. The cost required is the cost of providing equivalent alternative accommodation. The price of land could be obtained from [illegible] and building costs per square unit of built up [illegible] (Millington, 1975:65).

[illegible] of improvement involves an estimation of the current [illegible] of either reproducing or replacing the existing property. If the property is not improved, e.g. there are no buildings on the land, it is then assumed to have been developed to its highest and best use. Reproduction cost is the cost of producing or creating a duplicate or replica improvement or building on the basis of current prices using the same or similar materials. Reproduction costs are used in the cost method only if the improvements are relatively new.

Replacement costs are used for old buildings or improvements and they are the costs of building or creating an improvement having the same or equivalent utility on the basis of current prices, standards and design regulations. Thus for old buildings, is deducted cost of depreciation from the total cost to arrive at the required value of the property.

Income or Investment Method

In this method the property is regarded as an investment either producing or capable of producing some income. The value of such property will depend on that stream of income capable of being produced over a certain time span. The income obtained during that period is converted into a capital value at the date of valuation, this process of conversion being termed Discounting or Capitalising. The final discounted value obtained is called the present value or worth of that property. The basic principle is that an investor wishes to invest capital to obtain an annual return thereof in the form of a net income which represents an acceptable rate of return. This method works best in those instances where property ownership is separated from use or ownership of the same.

In the renting of property, for instance, the value of that property is the amount of capital required to purchase the interest, and this value is clearly dependent on the amount of rent which any occupier would be prepared to pay for occupation and the level of return which an investor would require on his capital.

The investment method entail determining the net income [illegible] property can produce periodically. This is [illegible] by deducting outgoings from the gross returns. Outgoings [illegible] include repairs and maintenance, management costs, insurance cover, local authority rates and vacancies or voids in the property. Then a rate of conversion, or discount rate is derived from the market, taking into account the various risk types involved. Finally, there is the mathematical process of capitalizing the net income into the capital or market value of the property.

These three methods are the basic methods used for valuing real property. They have also been derived from the main principles of valuation. However, a combination of property ownership and usage have become so complex that more methods have had to be introduced. But these other methods have been derived from the three basic valuation methods.

4. Residual Method

This method is rather similar to the Income Approach, in that the property is assumed to be developed to its [illegible] and best use, such that a gross income [is] estimated. The expected costs are subtracted from this gross income, and the profit margin is obtained. Given the value of the finished development, the cost of producing it and the profits expected, the difference represents the sum which can be paid for the land. This [illegible] implements some sort of residue hence the name Residual Method.

This method was [illegible] the reasoning that developers are constantly destroying and replacing property to meet the changing needs of users. In such developments [illegible] one could easily arrive at their value by direct comparison with the sale or rent of similar [illegible] property, which is to be developed in a [illegible] many instances, this may be [illegible] due to the unique nature of the property in question and the proposed development.

[illegible] The Profits Method

[illegible] like the Residual Approach in that it is [illegible] value properties which are so unique that comparison with other [illegible] properties is not possible e.g. a petroleum-filling station. The amount of business sales in such properties determines the amount of profits and the profits in turn determine the price someone will pay for the property. Therefore, the amount of the profits is capitalized, just like in Income Approach, to obtain the capital value of the property.

The above [illegible] the main methods of valuation, but as [illegible] hinted, [illegible] methods could be used [illegible] combination to value a type of property which does not lend itself to one method of valuation.

Review of current methods for valuing waterfront properties

Valuation practice has developed many methods for valuing different types of properties, from tangibles to intangibles. But factors considered in the valuation of waterfront properties are rather unique and associated with a specialised type of appraisal service, although they may be similar to other properties (McMichael, 1951:179).

Waterfront properties have a unique characteristic of scarcity. Coastal environments are gifts of nature not producible by man. They cannot be expanded or 'created' by man. Increases in the demand for the coastal properties and their services cannot be easily satisfied by increases in supply like in other ordinary goods. Where there is demand for such property therefore, the valuer must proceed to measure the unique naturally added elements of value in proper terms.

Most of the valuers who have tackled waterfront properties in the marine environment, or those who have studied valuation of marine resources have dwelt more on the valuation of easements, rights, licenses, services and lesser interests rather than the solid properties [illegible] e.g. Dugan ([illegible] 7?6), [illegible], John[illegible] and Cuddington (1381 [illegible]), Summers (1981 9) and [illegible] ([illegible] 203), to name a few. The reasoning behind this [illegible] could be that the properties in the marine [illegible] are either taken to be similar to those on land, or that they are considered so different that many valuers have doubts over the relevant methodologies [illegible] are simply confused. Take the case of McMichael, [illegible], [illegible] the 'waterfront lands are subject to valuation on the same basis as other types of [illegible] properties.' But then he contradicts himself [illegible] his concluding remarks when he says:

> [illegible], the best appraiser of waterfront property [illegible] who has studied and specialised in this [illegible] over a period of years. The problems are so different from those encountered in ordinary appraising commitments that only by specialization can the best service in this field be rendered (1951:315).

[illegible] and Fisher, who have given serious attention to the valuation of natural environments were worried that for instance, 'although methods for estimating the demand for outdoor recreation are known, neither time nor available research encourage a serious professiona[illegible] [illegible] towards the application of such methods'

(1975:174). Similar worries were echoed by Schulze, [illegible] and [illegible] who complained that obtaining information for individual valuation of non-market [illegible] such as [illegible] marine properties, can be costly. In many cases, they allege, to actually derive true values, a 'market' must be created where one did not [illegible]. But to construct and operate such a market may be [illegible] costly, especially if there are [illegible] associated with its operation (1981: 52).

[illegible] (1975 195) and Raleigh (1982:549), although [illegible] their experiences in different encounters, [illegible] on the uniqueness of coastal marine property [illegible]. Thompson, having attempted to value a [illegible] fish farm, found such a valuation highly specialized and of very limited application. He thought [illegible] studying the fish farm industry, look for an ideal farm, inspect the subject property, and for a start develop a feasibility summary. Later, Thompson accepted that appraisers of special-purpose property, like coastal properties, should be prepared to exceed the norm in their investigative efforts and then accept the fact that their judgements will be based on an inferior exactitude.

Almost on the same note, Raleigh ventured into valuing a [illegible] beach, a beach which is almost below the flood [illegible] area, which is prone to storm erosion. Although such an area seems amenable to danger, beach property [illegible] desirable, and people are so mad about having a home on the water that they build practically on anything. After the rigorous appraisal exercise, Raleigh concludes that valuing a barrier beach is an extremely difficult and unique problem. He was convinced that when valuing such a [illegible] and/or buildings on it, one ought to study the state and local community regulations for building upon land subject to wave wash, and probably include some assumptions not necessary for the usual appraisal report.

Most appraisers, however, agree that marine properties, either along the coast or in the ocean itself have characteristics which are special, not found in land-based properties. There is hence reason to accept that the approaches for valuing marine properties would be rather different from those used in valuing landed property. Land along the coastline, for instance, is always rapidly increasing in value due to the high demand from private and public users. Many factors make the land attractive, either because it is mountainous, or of unusual topography, or of geological interest. But the single most desirable characteristic for coastline land [illegible] the presence of ocean water. Water to view, water which has fish [illegible] other beautiful and economic animals water [illegible] of food it is a major value factor to most sites and users.

Ownership of such coastline or beach lands is in the hands of a few, creating a semi-monopoly situation. The land bought along the beach can best be described on [illegible] of such lands, and floodplain areas in terms of site boundary, depth and configuration of the land beneath the surface is difficult because of the changing waves and tidal levels (Grover, 1980:12). Tidal levels and their surge (rise and fall) durations in fact determine the value of a harbour. If water remains low for a long time vessels are prevented from entering and docking. This causes delays in cargo handling, which is [illegible] back into the value of the site upon which the vessel docks.

[illegible] can also be easily exhausted if they are misused by human beings or if the barriers against tides and waves are destroyed by man or nature e.g. Kunduchi Beach, Dar-es-salaam, and Victoria Beach, Lagos. A [illegible] assumption in such exhaustible resources is that they have value only when extracted, or regarded as stores for future extractions. But unlike other resources, beach lands have another value, which is realized only if they are not extracted.

Characteristics like those described here have made [illegible] properties rather exceptional and special.

thereby requiring more research and thought in their valuations. Most coastal lands and their associated properties are valued for their scenery, the ocean water, wildlife and the fish they support. And although little systematic study has been done to measure the value of these [illegible] amenities, it is agreed amongst real estate valuers that these amenities add to the base value of the property. The only obstacle is that amenities, being intangible qualities, are difficult to measure and compute (Ring, 1970:121).

Such principles prompted McMichael (1951:200) to suggest that although most waterfront properties may be valued on frontage or square metre basis, the effect of amenities [illegible]. Therefore, the value of waterfront land is a function of nearness to other services. Implicitly this could be written as:

V (per area or sq.m) = f (nearness to X_1, X_2 .... X_n)

where (X_1 ..... X_n) = amenities or services

McMichael further argues that waterfront properties are valued on the basis of one's ability to reproduce them under equally satisfying conditions. There is usually a base price per area or square metre underlying waterfront lands in an [illegible] area. This may be added to [illegible] adapted from, according to the factors available in a given area. Such factors include the condition of the market and business conditions, actual and potential utility, site, shape, topography, access to water from land, analysis of the hinterland, etc. (McMichael, 1951:316).

The problem with McMichael's proposition is that he has not explained how the value per square metre or area has been estimated. And the square metre basis is just a derivation from either the Market Approach or Cost Method of valuation such that it cannot be considered as a separate method on its own. The replacement option McMichael suggests in its own involves comparing replacement costs of a set of properties. This may not be possible for coastal properties. And McMichael does not explain what value attributable to the other factors (variables) should be added or subtracted from the base square metre value. The calculation of these values remains a mystery.

Kline was arguing almost along the same lines when he proposed the Development Approach to value waterfront properties. He argues that many valuers have been forced to use sales of waterfront acreage and lots suitable for building development, to which they have made substantial downward adjustments (sometimes as much as 100%) in an effort to equate the sold waterfront land that is open for development with the subject waterfront land that is not. This is like valuing one property with amenities, and another without. As a result, Kline says, most valuation agencies 'have looked harshly on this type of adjusted market data: many valuation reports have been subsequently rejected'. The combination of market and residual approach is the solution. After one gets the data on sales price of comparable property per unit, the next step is to employ the development procedure to value coastal undeveloped land, just like for developed land (1984:55).

Kline's illustrated method is as follows:

Development Procedure Calculation

Gross sale price of (waterfront) lots	
(20 lots 40ft width @ $250 per front)	$200,000
Less development costs	2,000
Engineering and surveying	2,000
Legal costs	2,000
Cost of grading a parking lot and	
road access	1,500
Overhead and sales expenses (3.5%)	7,000
Real estate taxes	4,000
Total	$16,500
Net before return on capital	
and profit	$183,500

Discount 2 years (absorption period)

14% is 20.8277

Average monthly return 183,500 / 24 = 7,646

Percent worth of capital and profit =

7646 x 20.8277 = $159,245

Developer's profit @ 25% of gross sales

$159,245 - $50,000= indicate land value

= $109,245

approx. $109,200

Unfortunately, Kline's method may be defective in that sales data may be hard to find because few people know about buyer motivation in these types of sales. Indeed similar views were expressed by Constam who, having attempted to value water lots, agrees that the valuation of water lots and, therefore, coastal properties is complicated by the absence of comparable sales (1977:70). The Development Approach as proposed by Kline would be workable in an area where a type of use is the only permitted use. In fact Kline and many other valuers have insisted that the valuation of coastal properties should be based on the principle of highest and best use. This insistence is rather a surprise, to some extent, because the concept of highest and best use for waterfront lands are difficult to demonstrate, due to the open-access nature and multiple use of waterfront properties. And although Floyd, for instance, used this principle to attempt a method for valuing flood plain lands, he did not hesitate to admit that 'current techniques for appraising flood plain lands, however, are inadequate due to difficulties in defining highest and best use, obtaining sufficient data, and understanding the impact of land-use controls' (1983:202).

Perhaps the major rationale in the adoption of the principles of highest and best use to value waterfront coastal lands is the reasoning that when a resource has very many different highly potential uses, its value depends on the final use to which it is put. This final use is necessarily taken to be the best use simply because it has out-bidded the rest. This may be true in only most but not all cases. In the coastal zones, for example, there are many kinds of recreation activities, from those requiring highly developed facilities and resulting in relatively little development, or none! These result in either low density use or none at all. Furthermore, the coastal resources take on different values as the demand for their services varies (Krutilla and Fisher, 1975:156). A waterfront lot on which a home has been constructed would be less valuable than one which houses a cottage, restaurant and yatch club.
Most typical buyers in the marine lands want to gain beach access for swimming, boat launching or mooring,

[illegible] and other recreational [illegible] are usually amongst the highest and [illegible] are the uses which motivate public and [illegible] require the coastal lands (Kiino, 198[illegible]

[illegible] of the principle of highest and best use [illegible] Floyd, who attempted to value coastal [illegible]. A floodplain is a strip of land bordering [illegible], built up by the stream's oceans [illegible] sediment or sands during times of high water [illegible] in the wetland or tidal area on the [illegible]. The landward extent of a floodplain is the [illegible] alluvial material and water during high [illegible] here are limited to marine parks, [illegible], agriculture and maybe, recreation.

[illegible]oyd comes up with the idea that the appraisal of floodplain lands requires an unusually large measure of [illegible] knowledge and sound judgement by the individual [illegible], but the required valuation guidelines are very [illegible]. He suggested the use of Market Approach, Income [illegible] and the Development Method for valuing such [illegible] lands, either separately or combined. His [illegible]neral methodological guidelines are given as follows:

Type of flood -plain land	No Land use controls	With Flood plain zoning	With mandatory dedication of parkland
Small Portion of a large tract	Floodplain small percentage of average	Possible reduction in uses and value	May raise Floodplain value to entire tract
Narrow flood plain	'Amenity' value of stream would bring floodplain to average value or higher	Unchanged	Unchanged
Located in high value residential area	Value of floodplain is average value diminished	Precludes filling and reduces potential value	May raise floodplain value to average value of entire tract.
Entire tract in floodplain residential area	Parkland value unless economiccally feasible to fill	Parkland value only	May increase value by selling to adjoining owner to satisfy open space requirements
Agricultural land	Income Approach based on agricultural use	Unchanged	Not applicable.

Source: Floyd, 1983: 120

The message from Floyd is that no one method can successfully be used in the valuation of waterfront lands, although he did not on his part suguest an alternative method. But while this may be true for some waterfront properties it may not be the case for others.

Another application of the principle of highest and best use is the one used to value coastal wetlands, those vegetated lands along the coastline which are periodically flooded by tidal waters. To some extent, they are similar to barrier beaches. Coastal wetlands have historically been filled or dredged to accommodate the needs of human settlements, agriculture and industry all over the world. But at this level it is absolutely necessary to agree with Economidou that even though "it is now known that the importance of wetlands lies not in their potential of modification, but in their natural function as the foundation of estuarine productivity ... the value of all wetlands, has in the past, been underestimated" (Economidou, 1984:98).

Like many others, Economidou does not provide a means of valuing wetlands. Similarly, Poulos (1975:124) poses more questions than providing answers when he asks ". . . what value does the marshland offer? Since we (Americans) are governed by the price system, what monetary value can be placed on wetlands!" Poulos, however, admits that the difficulty in valuing wetlands is that their worth lies in their contribution to society in their total support role. The individual owner of such wetland parcels receives little direct dollar benefit from their ecological functions. Mankind benefits, but this does not put dollars (or income) into the owner's pockets.

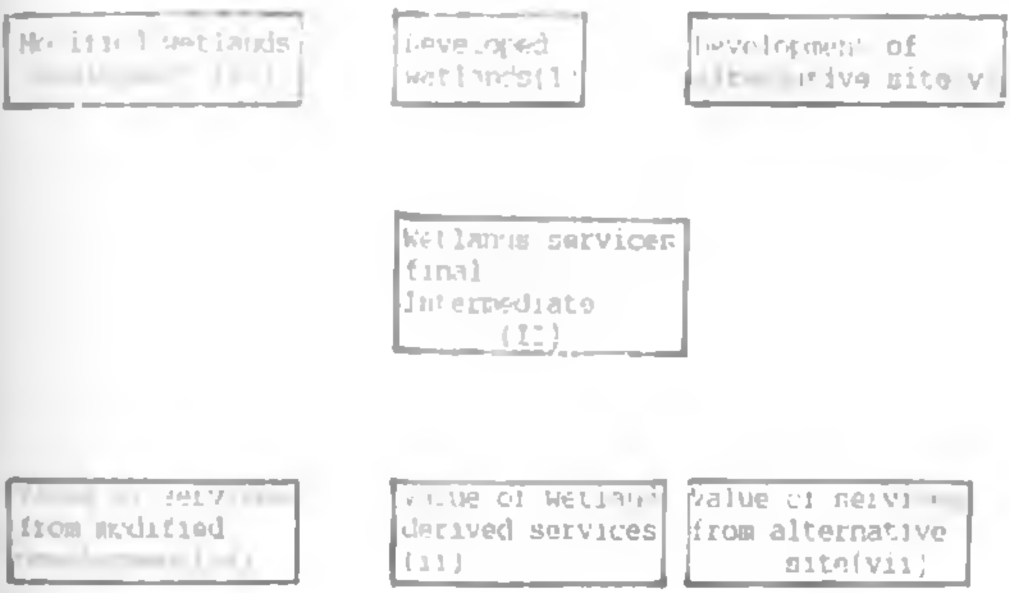
Perhaps Batie and Mabbs-Zeno had the same views when they outlined the importance of using economic value measurements in such appraisals. According to their arguments, development value estimates of wetlands can be useful in public decisions which must be made to protect natural wetlands from conversion (from highest and best use) to other uses (1985:2).

Wetlands can only be utilized for instance, alternatively, or used instead of being preserved, if the anticipated public and private benefit of the proposed activity exceeds the anticipated public and private detriment. This implies use of cost benefit analysis (CBA) in the valuation of these properties, a method which will be reviewed later. Even if this is going to be used, Batie and Mabbs-Zeno complain that

> ". . the ecological information necessary to develop monetary measures of the value of wetlands in their natural state and thereby to weigh the social costs of wetlands destruction is lacking. In most cases, the linkages between the existence

of a specific wetland area and levels of environmental services are not well established. Furthermore, [illegible] of the previous research efforts to provide information on economic values are flawed by the use of inappropriate economic methods" (1985 1).

Given the current inability to provide economic values of natural wetland areas, Batie and Mabbs-Zeno suggest a model for the same. This model is illustrated below.



Source: Batie and Mabbs-Zeno p.3.

In all cases, the value of wetlands development is the difference between the economic surpluses earned with developed wetlands and the economic surpluses which would have been earned without the wetlands development. In [illegible] the application of the development procedure of valuation, a derivative of the Income Approach to value. The next question is how to measure these economic surpluses.

The principle of highest and best use was also applied in the marine environment in a very unusual appraisal assignment. The exercise was exciting and quite challenging at the same time. The appraiser, Zoll, was attempting to value land under a lake, which could be likened to land under the ocean in our study area. Zoll proposed that land under a lake (or ocean) has its highest and best use that of a basin within which to contain the waters of the lake (or ocean).

The subject property includes only the land under the water. Because the water is used by the public for recreational purposes and only the top 10 feet (3m) by the utility, there is a dual use of the complete fee interest (Zoll, 1987:424). Zoll proposed the sales comparison approach in two ways, for dual use and single use, provided these are the highest and best uses.

In the single use (complete fee) case, it is assumed that the lake does not exist and that the subject land is available for agricultural or any other purpose. Sales of agricultural land (or other use) without improvements and without lake influence are considered. To get the complete fee value of the land under the lake multiply the average price of land in the vicinity used for agriculture by the total acreage of the land under the lake. This is obtained by measuring the edges of the water extent.

This, therefore, means that one can get the value of land under ocean water e.g. the land near the shores or in harbours, by comparing it with land commanding the highest and best use, near the ocean. If that land is used for agriculture, and this is the highest and best use, then apply the average price on the land under the ocean water. If agriculture is not the best use, then look for the best use and do the same. The only problem here would be that the comparison does not consider the lake waters for, the highest used land that is being compared (agricultural land) is without water. Yet like should be compared with like.

Probably this weakness is explained by Zoll's initial assumption that the water of the lake is assumed to be non-existent. In fact, Zoll obtained information which indicates that unit prices of land fronting a lake are compared with those of land nearby but not fronting the lake. It is then assumed that the increase in unit price for the lake frontage is attributable to the existence of the lake. But in establishing a unit price for the lake, the increase over the unit price for non lake frontage is deducted, and this is where he makes an error. Zoll's reasoning is that this method is useful where the lake is under one ownership, and the shoreline property (of the lake) is under another.

The question of dual ownership of coastal waterfront properties is similar to the one Zoll describes: the beach or shore could be owned by someone else, while the ocean waters are normally owned by the state. But this does not necessarily exclude the value enhanced by the water presence or view. In fact, to the contrary, it should add more value to the non-ocean or lake land. If the adjoining land and the land covered by water have equal utility, then they should have equal value! Grover asks "Who is to say that the area occupied and covered by the ocean going vessel is less valuable than the area of land adjoining, bearing her cargo? That the manouvering area is not worth as much as the infrastructure on land such as roadways?" (1980:12).

Zoll's second approach, where he assumes that the lake or ocean water is used for more than one purpose (dual use) more or less comes to the same conclusion. He in fact relied on Chapter 137 of Missouri Law of Assessment and Levy of Property taxes which goes "where the property is held or used for more than one use... the county assessor shall allocate to each classification the percentage (%) of true value in money of the property devoted to each [illegible] rover (1930:12, 13) and Constam (1977:71-79) used different methods to estimate the value of a water lot[1], although both rested their presumptions on the same principle of highest and best use. Constam says that the value of a water lot, reflecting highest and best use is the value of an equivalent parcel of land less the cost of fill. Stated in another way, it is the value of an equivalent parcel of land, less the cost of creating a parcel of vacant land in the area covered by a water lot. This approach is also based on the principles of substitution and utility. A water lot, for instance, must have utility before it can have value. The potential highest and best use must recognise that the use of that water lot is directly related to a platform for development. In order to value water lots, Constam compared them first with vacant lands and then with air rights.

	Vacant land	Water lot
1	Can be legally defined and located	Similarly, although boundaries change with levels of water.

[1] A water lot has been taken to be a legally defined area of land covered by water that may either be contiguous or attached to dry land or may be separated entirely from dry land, and may be partially filled, or not filled. Examples include lagoons, swamps, tidal lands, etc.

2.	Value is a function of highest and best use	- similarly -
3.	Highest and best use could be subject to/determined by government regulation	- similarly -
4.	Location factor i.e. attributes of the site, as opposed to all the surrounding lands	Location factor directly related to the immediate adjoining dry lands.
5.	Covered by air above it, which can be subdivided, sold, or leased in the form of air rights	- similarly -
	[illegible] ready for development	Water may form a floating platform or may be filled to create a platform.

The comparison between air rights and water lots is as follows, the rationale behind the comparison being that because air rights have been valued, they could give an indication for methods to value water lots.

<u>Air rights</u>: Can be subdivided into vertical planes and sold or leased, where they are separated from the land below.

Water lots: The air space above them is equivalent to air rights, and can be subdivided.

Air rights: Permit use of air space by a user who is not (necessarily) the owner of the land underlying the air space.

Water lots: Result in creation of a floating freehold.

Air [illegible] Can create a horizontal plane above the land. The air rights usually reflect utility over the entire horizontal plane.

Water lots: Existence of water creates a horizontal plane above the land, but water lots reflect a limited utility over the plane created by the water

Air rights: Once divided, their sale represents a [illegible] real property, whose effect is to create two users where one (that of land) existed before.

Water lots: The effect of a sale or lease is to create a user where none existed before.

Air rights: The utility of the land below is restricted and reduced with an accompanying reduction in value.

Water lots: The utility of the land below is improved but only to the extent that utility is created above.

[illegible]y. Constam argues that the value of air rights or a water lot platform, is the part of the value of the real property covered by the air rights or by the water. Because the use of air rights, or a water lot is represented by the use of a platform or lot above a specified horizontal plane, the value is represented by the value of a similar-sized parcel at ground level less the cost of the necessary construction to create the subject lot at a given height.

Therefore, the market value of air rights (MVAR) may be arrived at by use of the following equation: MVAR = EQ-C-L-M-R, where EQ = the value of the equivalent parcel of land in fee simple, C = costs to construct the platform, L = the loss in value, if any, due to the loss of flexibility and utility, M - any loss attributable to extra costs involved in maintenance. R = the loss attributable to the lack of the right to use the air space (for productive purposes) lying between the ground and the plane of the air rights. Similarly, the market value of water lot (MVWL) may be arrived at using the following equation: MVWL = EQ-C-L-M, where these variables are similar to those used in valuing air rights.

The difficulties faced in these methods as outlined by Constam (1977:79) include the absence of truly comparable sales. Where market evidence exists for waterfront lands with water lots and those without, conclusions can be drawn from this evidence indicating the contribution or the value of the water lots. In the absence of market evidence, rental evidence for the use of water lots may be processed and capitalized to provide an indication of value.

Because the underlying principles are the same, the methods given by Grover (1980:12) would differ little from those given by Constam. On his part, Grover proposes four methods for the valuation of coastal wetlands, which he calls submerged lands.

1) <u>Direct comparison</u>

Select 300 or 400 sales of similar water lots, choose the best and most recent amongst them, make appropriate adjustments, and apply to the subject water lot. Adjustments are for location and time of sale, amongst many. The problems with this method are now quite familiar: how to get the comparable sales and the percentage of contribution one needs to adjust for.

2) Alternatively, if there are no comparable sales of water lots, use <u>the next best</u> things: marshlands, tidal flats, etc. to compare with. Again, the problem is that these sales are simply not comparable.

[illegible] approach, which is similar to the one proposed by Constam. Assume that the water is useless, and to make the area it occupies usable, either the water must be kept away from the submerged land, or the land must be filled.
The theory behind this method is that the value of the water area is the value of the land so created, less the cost of creation. Interestingly, the deeper the water the less its value, because costs of platform or land creation are higher. Furthermore, the created land may not be serviced, yet the upland adjoining it could be well-serviced. It is hoped that Grover did not imply that the platform created in a deep harbour like Kilindini is less valuable than the one created in a shallower port like Lamu.

The other method proposed by Grover is similar to the one above, only that he gives it another name: the platform method, where the value of the water takes its value from the land to be created, less the costs of making the platform and the capitalized maintenance costs, less the nuisance of a very damp basement (Grover,1980:12).

Owing to the difficulty in obtaining a specific method of valuing water lot areas in marine environments, some people argue that by itself the land covered by water has no value, but that the adjoining upland (coast/shore) should benefit from an enhanced value by virtue of its attendant water area. This is interesting, for it would appear the other way: that coastal land gains more value by being near the ocean waters, hence the ocean waters should have more value because they provide additional value to the coastland! Who is richer: the person who borrows a loan or the one who gives out that loan? This difficult question has made some valuers, mostly in Canada, to fall back to the percentage premise, where the water area is accorded a certain percentage of the value of the adjoining coast land. This percentage is normally kept between 40-50%.

This suggests that it is the coast land which is more valuable than the water area. Rather than a reasoning, this looks like an excuse, because we really do not have a sufficient data base on which to form a satisfactory value prediction of either the land or the fronting water, taken simultaneously. If the value of the water area is considered a percentage of the adjoining land, then comparison comes in. But the question is whether these two properties are really comparables: is serviced land (the adjoining coastal land) being related to unserviced water? (Grover, 1980:13).

And so the methods have been forwarded. The Provincial Department of Lands in Canada assess leases on land covered by water, depending on the use. High use water will take full upland value or a high rated percentage of it. Low use water is at 50% upland value, waste or excess water at a lower nominal rate.

The public works of Canada adopts a utility value approach to water lot lease valuation. The upland or coastland value represents 100% utility, and this rate is applied directly to those portions of the water lot which are being utilized to the full potential of the adjoining land. The rate decreases in direct proportion to any decrease in utility, for example floats and berths are valued at 50% of the upland zone rate; inter tidal areas or areas of poor quality fill are valued at 10-35% while unused areas are at 5-10%. It appears that each authority, or each valuer takes his own method, and if there can be such differences in opinion in Canada alone, the disparities throughout the world should be enormous.

There are other special type of properties found on the ocean front, although they are also found on dry land environments. But because the coastal area is so desirable, because very many people would do anything to enjoy these facilities, they pose as rather different properties from those on land. Examples include

... accommodation, sports facilities, dock

... and ... engineering sites. ... most ... have not seen the need to develop specific ... for valuing these properties simply because they ... located on the ocean front. Most have recommended the use of ... market approach if comparables are available, income approach or the cost approach to value. ... approach ... it problem is only that ... the ... of the commonly-owned ... and ...

... approach, the problem is getting proper ... otherwise, ... given by Crossen and Dannis (1977, 16), the value of an interval under time-sharing ... of many variables, the most notable ...

... of resort (i.e., ocean, mountain, etc.)
Number of bedrooms
... of living ...
Location of unit in project (i.e., golf course, water, etc.) Quality of construction
Quality of furniture
Quality of resort (including recreational facilities)
Financing

It is the location of the resort and the location of the ... project whose values should be made to [illegible] value (ocean front time shared [illegible]). [illegible] approach cannot be used for time sharing appraisal because time-share intervals are purchased for use by the owner, his family or guests [illegible] as an investment upon which a return is expected. The purchaser of an interval development is [illegible] a vacation or a parking, loading or off loading [illegible] wharf.

[illegible] properties are also used for amenities, preserved [illegible] for research stations and marine park areas. Normally, if not controlled, conflicts arise in the coastal [illegible] between exploitation of commodity resources and [illegible] for their preservation and [illegible] [illegible]. It has been noticed that some [illegible] would rather [illegible] the use of cost benefit analysis (CBA) [illegible] estimate the value of such marine environments [illegible] is where the value of the site will be incurred or obtained by utilizing the site for some use other than another. If a site is to be used as marine park because the benefits of the park would be [illegible] and economically more desirable than the [illegible] if any, a hotel, the value of that site is the value of the benefits generated by the marine park. But [illegible] [illegible] and Fisher ([illegible]75:47) point out, CBA does not [illegible] provide an equation or proper methodology for [illegible] approximate value of a site in [illegible] or exchangeable terms.

That question is still not easy, and although Krutilla [illegible] attempted, they conceded that in such valuations 'careful analysis using relevant concepts can [illegible] in a variety of cases without pretending to be [illegible] of valuing all attributes of natural phenomena [illegible]'.

The next chapter looks at how several valuers and [illegible] have attempted to apply regression procedures in the valuation of property. The purpose of doing this [illegible] of regression in valuation [illegible] although there may be a number of problems [illegible] encountered.

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CHAPTER SIX

TRIAL AND ERROR IN THE USE OF MULTIPLE REGRESSION

ANALYSIS IN WATERFRONT VALUATIONS

One implication from the above preview of valuation methods is that there are several weaknesses inherent in the current normal or common valuation methods as far as valuing waterfront properties is concerned. Similarly, there appears to be unique characteristics in waterfront properties which cannot be easily appraised using these common methods. The search for more and better methods is [illegible] on,although the real[illegible] that whatever the 'new' and better methods being sought for, they will be derived from existing basic methods of valuation.If not,then these 'better' methods will still rely on the same principles used by the common methods of valuation.

The Meaning and Use of Multiple Regression Analysis

Statistics, as defined by Lapin (1987:2) 'is a body of methods and theory that is applied to numeral evidence when making decisions in the face of uncertainty'. Statistics has been used for many years either as a discipline on its own, or as a tool to be used for many types of studies and quantification. Our effort have been directed to one statistical method which has been attempted to appraise property. This method, called Regression Analysis (which henceforth in this work will be denoted 'MRA') allows us to use the known value of two or more variables to estimate the unknown value of the one and independent variable. In its traditional form, MRA results in equation of the order

Y=a + b1x1 +b2x2 +......bnxn

where Y is the dependent variable whose value we do not know, a is the Y-intercept and b is the shape of the line, representing the change in Y due to a one-unit change in the value of X1, which itself is the value of an independent variablo.

The reasoning behind the use of MRA is that once the values of the independent variables are known, they can be used together with the constants to determine the value of the dependent variable, Y. Furthermore, the complete equation can determine the contribution of each independent variable. This ability is essential in determining, for instance, the effect of ocean water on a beach plot along the coastline.

Darling (1973:26) applied this principle to value benefits generated by urban water parks, which can easily be applied to waterfront properties.

To calculate the portion of each property's value attributable to park proximity, Darling used the linear formula:

$$P_i = c(3000-W_i) \quad (1)$$

Where

P_i = property value of the ith property attributable to the park

c = the coefficient of distance measured by regression analysis

W_i = distance of the ith property to the lake

The total property value attributable to the park is simply

$$TP = \sum_{i=1}^{n} P_i = \sum_{i=1}^{n} c(3000-W_i) \quad (2)$$

To quantify the effect of the lake (sea or ocean) on property value, Darling (1978:28) ran regression analysis for the following implicit equation:

$$P = f(I, L, N, W, T)$$

where

P = Property value

I = Improvements

L = Lot size

N = Neighbourhood environmental variables

W = Distance from water

T = Trend factor

Improvement data was in terms of square metre of living area, number of rooms, residential space, and number of baths. Neighbourhood environmental variables included population density, average crime rate, average income, average rent, racial composition and zoning. But there are a number of weaknesses in this method. Benefits are more easily determined for projects whose outputs are sold in the open market, but for those which do not sell in the open market some measure other than price is required. Perhaps, as proposed by Krutilla and Fisher (1975:6), cost benefit analysis would be more meaningful. Sales price has been used as the dependent variable with its value already given, yet in actual fact we are looking for the method used to arrive at it. Also, although the method measures benefits reflected in the surrounding property values, it may not reflect the total value as perceived by residents. And the model disregards benefits obtained or enjoyed by park (beach or ocean) users who come from outside the area whose land values are affected.

McMillan criticised Darling's method on the same grounds as above. McMillan agrees that increments in property values attributable to parks (or beaches, for our case) is usually not an adequate measure of the benefits parks or beaches afford. Estimates of benefits based on sales prices will only be accurate if assessed values and taxes do not account for proximity to parks. And since studies of this type have not made tax adjustments, McMillan feels that benefits have been underestimated (1980:379-380). Unfortunately, McMillan ends there and does not offer any more solutions to the method of appraising such benefits. His only contribution is to conclude that '... since the procedure by Darling and others has substantial potential for evaluating amenities (and nuisances) in urban areas, it is hoped that this note will facilitate the more accurate estimation of the benefits (and costs) they generate'.

Perhaps a better explanation was the one offered by Brown who suggested the use of stepwise regression, especially where there is a large number of independent variables. Brown says '... this (stepwise regression) procedure selects the independent variables, one step at a time, in the order of their importance ... the in and-out procedure ... selects as the first independent variable the one which has the highest absolute correlation with the dependent variable. In each ensuing step the variable entered is the variable with the highest partial correlation after accounting for the previously entered variable. And ... if an entered variable becomes insignificant due to overlap with more recently entered variables (multi-collinearity), it is deleted and a new step begins. If later in the stepping procedure the variable becomes significant again, it will be re-entered' (1974:576).

Using this technique, Brown proposed a model for valuing grazing land in South Dakota, which included 19 independent variables against the dependent variable, property value. His predictive equation was:

$$Y = -3021.42 + 46.24X_2 - 9.04X_{14} + 619.48X + 504.60X_{14} \quad \ldots.(3)$$

The variables included in the analysis were:

Y	=	market value (dependent variable)
X_1	=	total animal units
X_2	=	total acres
X_3	=	acres in grazing
X_4	=	acres in other
X_5	=	shelter (trees and draws)
X_6	=	access
X_8	=	fencing
X_9	=	topography
X_{10}	=	range site (acres below normal)
X_{11}	=	range site (acres normal)
X_{12}	=	range site (acres above normal)
X_{13}	=	range condition
X_{14}	=	range utilization
X_{15}	=	land capability (acres in class I and II)
X_{16}	=	land capability (acres in class III)
X_{17}	=	land capability (acres in class IV)

X_{18} = land capability (acres in class VI and VII)

X_{19} = land capability (total)

The analysis showed that 12 of the independent variables were not significant in the determination of the value of the property.

Schott and White went further than Brown. They compounded the use of MRA in property value, which they say '... is to estimate the relationship between selected property characteristics and property value. It measures the simultaneous influence of a number of independent variables (or factors) on one dependent variable (property value). In other words, multiple factors such as soil types, distance to markets, and numbers of acres may be 'regressed' upon the dependent variable (property value) to provide an explanation of factors affecting value' (1977:429). The regression equation is of the following form:

$$P = b_1C_1 + \ldots\ldots + b_nC_n + b_{n+1} + \ldots\ldots b_mX_k \quad (4)$$

where

P = sales price per acre (or value)

b_i = regression coefficients

C_i = land class variables

X_i = other independent variables

The procedure for implementing this regression analysis involved several usual steps as follows

1. Selecting a sales sample
2. Specifying property characteristics
3. Collecting and verifying the data
4. Selecting and analyzing the variables
5. Coding property characteristics
6. Applying the regression
7. Analyzing the regression results

Using statistical analysis Schott and White came up with the estimated regression equation, along with standard errors of the regression coefficients as follows:

$$P = 6.32(1A) + 5.77(1B) + 5.38(1C) + 3.46(W1\text{-}W2)$$
$$(0.60) \quad (0.96) \quad (2.34) \quad (045)$$
$$+ 2.40(W3) + 264\ RF + 206(1\text{-}16)$$
$$(1.25) \quad (101) \quad (104)$$

Where

P = average 1975 price per acre of agricultural land 1A, 1B, 1C, W1 and W2 and W3 are land classes

RF = a dummy variable for land with river frontage

1-16= a dummy variable for land located adjacent to an interstate highway

The two dummy variables can be considered as yes/no variables; if the property has the particular characteristic, the expected price would be raised by the value of the regression coefficient. For example, land with river frontage is worth an additional $264 per acre and land adjacent to an interstate highway is worth an additional $206 per acre.

While the above method is somehow similar in its results to the other methods, Schott and White make it more appealing by saying that 'if ... the estimated relationship is statistically significant, it may be used as a predictor of expected sales price (or value)'. They argue further that MRA as a method of valuation reaches a degree of statistical reliability unobtainable by conventional appraisal methods, and that one of MRA's major advantage over orthodox appraisal procedure is that it is more objective, even though proper usage requires large amounts of data. The other problem with MRA is found when valuing vacant lands, for which very few variables exist to be put in the statistical equation. And this problem could be crucial in the valuation of coastal lands, some of which are vacant.

Batie and Mabbs Zeno (1985:5-6) also attempted MRA in valuation, although their use of linear regression was rather more elementary. They were attempting to appraise recreational lands, and then measure the contribution of each factor to the final value or price of that land.

The estimated coefficients for the regression model were used to predict the selling price of any wetlands lot (for recreation) as a function of that lot's various characteristics. Most of the factors used in this regression model were measured as binary variables reflecting whether a specific lot possesses some attribute. Other attributes considered but not included the model report are, for instance,

1. Whether the lot is adjacent to a port area
2. Whether the lot is adjacent to a yatch club
3. Whether the lot is composed of filled wetlands

The complete regression equation for recreational lot values was as follows:

$Y = 4730 + X_1 + X_2 + X_3 + X_4 + X_5 - X_6$

$R = 0.719$

$n = 980$

where

Y = price paid to subdivider in 1976 dollars (value of the plot)

X_1 = WATER = dummy variable with the value of 0 for lots away from water or 1 for waterfront lots

X_2 = CANAL = dummy variable with value 0 for lots not fronting a canal or 1 for lots fronting a canal

X_3 = TIME = quarter in which lot was sold beginning with the first quarter of 1969 equal to 1 (12 represents the last quarter of 1971)

X_4 = AREA = lot size in square feet (sq.m)

X_5 = SEWER = dummy variable with the value of 0 for lots not on the sewer line or 1 for lots on the sewer line

X_6 = WETLANDS = dummy variable with the value 0 for lots not adjacent to wetlands or 1 for lots adjacent to wetlands

The price for all wetland lots is determine by summing up those obtained through regression. It was found that whether a lot is adjacent to water (i.e. waterfront lands) or a canal (canal fronting lands) was the most important factor contributing to lot price (value), although all the factors included were found to be statistically significant.

Conventional MRA has since been used in valuation because it offers a commonly used statistical approach for selecting the critical value indicators for a specific property type within a predetermined location. MRA can also assign relative weights to each of these value indicators. The resulting MRA best-fitting equation derived from recent sales data can be used to estimate the value of properties both sold and unsold.

These arguments were used by Cronan, Epley and Perry

(1986:19-31) to compare and finally propose the use of MRA and Rank Transformation Regression (RTR). MRA was used to develop the linear property valuation model as below to value residential units.

$$P = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10})$$

where

P	=	sale price
X_1	=	heat area
X_2	=	year built
X_3	=	quality of the home
X_4	=	number of storeys
X_5	=	number of rooms
X_6	=	number of bedrooms
X_7	=	number of baths
X_8	=	size of the lot (land or plot)
X_9	=	value of the lot
X_{10}	=	loan to value ratio

The SAS statistical package was utilized to generate the regression equations. Two criteria, R-squared and MSE (Mean Square Error) were used to determine the independent variable in the 'best' linear model. A stepwise procedure was used to determine the model with the lowest MSE. These steps were done to produce two models, MPA and RTR (Rank Transformation Regression). The MRA model considered the following factors as being more statistically significant:

heated area (HEAT APEA)

quality of the home (QUAL), and

lot value (LOTVALUE)

The RTR model considered the following factors as being statistically more significant:

Heated area (HEAT AREA)

Year built (YRBUILT)

Value of lot (LOTVALUE)

The two models were compared on the ability to estimate prices for three samples of residential units. Data from each of the three samples were applied to coefficients of the two models to produce a comparison.

Rank Transformation Regression (RTR) was suggested by Conover and Iman (1976:1349; and 1981:124). According to their terminology, let X_{ij} be the jth observation vector from population i, j = 1, 2 ... n and i = 1, ... k. The p components of X_{ij} are denoted X_{ijm} m = 1, 2 ... p. The rank transformation method involves ranking the mth component of all observations X_{ij} from smallest (rank 1) to the largest (rank $N = n_1 + n_2 \ldots + n_k$). Each component m = 1 to m = p is ranked separately. Simply stated therefore, the value of each variable of a multivariate sample is replaced by its rank from 1 to n for all the observations. Conventional regression analysis is then performed on the ranks.

In essence, therefore, RTR is similar to MRA except that the technique requires the valuer to rank the factors affecting property before applying convectional MRA tests on them.

The results of the comparison between MRA and RTR equations on the samples selected by Cronan, Epley and Perry (1986:24) indicated that RTR performed 'better' than MRA model in terms of errors, mean absolute deviation (MAD) and size of samples 'finally'. Says the trio, 'the rank transformation procedure estimates property value for small samples with less error than the MRA procedure. Practically, the appraiser uses comparables and attempts to generate a model that is statistically appropriate and that yields accurate price estimates. The rank transformation regression method produces such a model'(1986: 25)

However, RTR model suffers from a number of limitations. One of them is its applicability to sets of data which do not conform to the likes of the data used by the authors when they proposed the method. How is the ranking done? Is it a computerized process? Perhaps ranking would be done by the valuer, but how does he choose the first rank and the rest? Further analysis shows that the RTR method is more accurate with small samples only, but with samples as large as 30, the accuracy is as good as for MRA.

The principles and theoretical framework required in the application and use of MRA in property valuation, therefore, appear to be the same as those in ordinary valuation methods. No computer technology,or MRA technique on its own can produce an appraisal without the human valuer providing the required data and initial variable characteristics. In addition, the theoretical and practical knowledge of the valuer, and the use of comparable sales are very essential elements in MRA property valuations So says Locke 'The comparison sales approach appears to represent the common framework in which computer assisted statistical methods of valuation are developed. Regression models using cross-sectional and time-series data are based primarily on comparative sales'(1987:536).

The reliance on comparable sales is understandable given that there is no substitute for data in valuation practice. Even 'imaginary' data used to compute value indices in investment properties or unmarketable properties (such as social halls) will rely, in one way or another, on some kind of market information. Fraser and Blackwell (1988;198) indeed agree that 'Evidence of market value based on information, other than the sale price of...property, would have to be overwhelming to influence a valuer to reject the sale price of the subject entirely'. The fact is that the valuer is heavily biased towards sales prices of other property in the market, whether this market is real or artificial. MRA provides the appraiser with the ability to test the real estate market objectively, to determine which variables are influencing the prices paid for the comparable sales collected, and how much weight to place on each. The valuer actually does the same in traditional market approach but usually applies subjective weights to the variables (Smith,1979:248).

Pros and Cons of Using MRA in Valuation

Despite its obvious appeal in valuations, MRA as a tool has had to wait until the complete sophistication of the computer for it to be used in valuations. In addition, the current wide application of MRA in valuation has not been achieved easily. Perhaps the main reason was not the lack of computers, after all. As early as 1969, Hinshaw (283-288) used MRA to predict the selling price of property using past sales of comparable properties as the basis of prediction. A major advantage which Hinshaw advanced then (which is valid even today) was that MRA was objective and impartial in arriving at value, compared to other subjective methods of valuation. Immediately after, fear and rage amongst valuers were sparked-off. In the same year, for instance,Lessinger (1969:507) criticised the way MRA was being applied in that the fundamental assumptions of the method were being violated by the characteristics and inefficiencies of the property market. Linear relationships between dependent variables and the independent variable were being assumed and forced, the sales data was assumed to be normally distributed and measured on a continuous scale, and worst of all, outliers or extreme observations were being excluded from the analysis! Lessinger and others questioned the justifications for such 'glaring' weaknesses and also the logic in using dummy variables. From that time, many valuers remained unconvinced of the benefits of using MRA, either because they saw it as underrating the subjective judgemental aspects of the comparative method of valuation,or they did not understand it, or they did not have access to the large amounts of comparable data which are required to operate the technique successfully (Adair and McGreal,1989:59). To several other valuers, MRA terminology, symbols and its mathematical jargon are anathema, and Fraser and Blackwell have said that MRA is a 'complex process... difficult to put in layman's terms and is thus (neither) favoured in law nor by practising valuers, or by anyone else except those with mathematical sophistication. Even the latter are frustrated by some of its clumsy features" (1988:197-198).

It is no wonder, therefore, that MRA has not received the attention it deserves in valuation practice. One would have expected MRA to have been used in many types of valuations other than in residential and commercial properties, where the method enjoys allot of application. Similarly, one would have expected many valuers to write books the use of MRA in valuations, other than occasional articles in a few journals in Britain and the United States. Even in these countries, the profession has generally shunned the integration of statistical inference, and where it has been used, as Rodgers did in 1986 in Scotland, MRA is only used 'as an aid to the valuer who remains the final arbiter in estimating the assessed value' (1986:103-106).

In developing countries, the reluctance to computerise the valuation profession and the fact that there is shortage of computers and suitable data bases are some of the obstacles inhibiting the use of MRA. Yet there is considerable approval of MRA as a better tool in valuation, even amongst the few that have used and written about it. Valuation involves the use and assembly of many factors and, whereas it is quite impossible to analyse and reconcile all the factors without errors or omissions of bias due to subjectivity, many of such valuers see MRA as an aid to minimizing such errors. Indeed the method is a reasonable improvement to the traditional comparison method.

Given the advantages of the MRA technique in terms of objectivity, uniformity of approach, speed and cost savings, there is an increasing awareness among some valuers that MRA and computer assisted valuation is a growing and developing area of valuation practice (Adair and McGreal,1987:59). Amongst such valuers are Hogarth and Makridakis who, after reviewing 175 research papers on statistical forecasting methods, concluded that scientifically-based methods such as MRA are superior to intuitive decision making (1981:60). Fraser and McGreal also used MRA to value real estate property in Melbourne,Australia and came up with a model having R-squared of 87.9%. They concluded that despite lack of field checks for computer-produced values,MRA endeavours demonstrated the capability of producing values close or more superior to those achievable by manual methods (1989:199).

Donelly (1991 :350 360) is another valuer who attempted MRA to value properties in the United States of America and at the same time to test MRA's worth in the practice. Donelly argues against the comparison approach that, since there isn't always a set of comparables having similar features,biases may accrue from the work of an individual who selects the properties for the comparisons. In addition, the traditional approach relies upon very few properties for the analysis. In the process, much valuable information is discarded.MRA procedures, on the other hand, allow more extensive use of the information obtained, it determines which characteristics are important, it does not require an exhaustive list of attributes but only sufficient information to model the observed outcomes.

In another valuation exercise, Adair and McGreal (1989:57) applied MRA to value terraced houses in Britain. They too emphasized that MRA measures statistically the relative influence of several factors and explains in an objective manner how value or price is dependent upon a particular set of independent variables. The fact that combined influences and effects of several variables can be measured is of considerable practical relevance to valuation, where capital value may be the dependent variable and other property characteristics are treated as independent variables. Adair and McGreal to some extent console the conservative valuer 'that MRA is neither being used to challenge his professional role nor is it doing something of which the valuer is unaware. Indeed...by approaching the estimation of value from an objective viewpoint, MRA can assist the valuer by giving a supporting opinion or highlighting circumstances where a re-appraisal of value is necessary'(67). Similar consolations were echoed by Smith who said that MRA is not used just as a "little black box" that magically produces an appraised value for property (1979 248).

One of the most controversial issues in the use of MRA in property valuation is in the choice of the most important influencing variables. While most valuers claim that it is in this aspect where MRA is most superior, the criticisms against MRA's methodology of choosing variables are no fewer. It is interesting to see how a single point can both be a method's strongest appeal and then its weakest element at the same time. In his application of MRA in valuation, Smith (1979:248) insists that 'it is in the process of verifying sales and talking with informed individuals where the appraiser should begin to isolate those factors (variables) which appear to be affecting the price paid for properties bought in the open market'. By analysing these variables, using regression, the appraiser will isolate those important variables. Unfortunately, Smith does not show how this is done practically. Whipple (1974:267), one of the foremost of critics of computer-based valuations, says that MRA does not have a good theory on the choice of influencing variables, and in the absence of such a theory 'the best we can do...is to select those variables which intuitively seem reasonable and hope (if we use the general linear model) that they are at least linearly related to the true causal factors'. Whipple, in fact, argues that no valuation theory has so far attempted to solve this problem, because valuers have tended to ignore factors external to the property,contending themselves with a myopic and largely site-oriented approach.

Fraser and Blackwell had allot of difficulty in explaining how they chose the factors for their MRA equation. Apart from stating that regression was used to identify those variables which most affected value, Fraser and McGreal did not show how the variables were isolated from the rest. So says the duo, '...prior to this, a good deal of effort was expended to identify variables which had been used for value modelling purposes in other studies...The list (obtained) was supplemented with variables...(selected by)..using experience gained by one of us ...in the...market, and the services of a real estate entrepreneur who had so developed properties in the locality'. Can such variables be accepted in regression equations? One wonders! Fraser and Blackwell concede that in practice, selecting and weighting variables is the greatest single problem because there is no objective way of choosing them (1988:186).

Salivin also faced the same problem when he attempted to develop a computer assisted regression valuation method for rural properties. After collecting relevant data through manual inspections, Salivin decided that "The variables included in the collection were those thought by the valuer to be significant in their contribution to the value of the property" (1981:6). There is doubt as to whether the results Salivin obtained were of any scientific significance and whether the valuations were more objective than subjective.

Locke ,in fact, criticised Salivin's study on the grounds that 'models built on decision maker's cues (valuer selected variables) and assessed against decision maker's response (valuation), such as in these studies, are fraught with potential problems ..(because)... there is no certainty that the valuer's decisions are consistent' (1987:537)

Another weakness of using MRA in valuation is the need for voluminous information for a single valuation job. This is because regression calculations will only give realistic coefficients if these are based on many observations. In contrast, the valuer applying the traditional comparison method requires only a good knowledge of the local market built up over many years and about three or four comparables to arrive at the required value. The cut off point for the minimum number of comparables sufficient for MRA application is yet to be agreed on. While statisticians argue that a minimum of thirty (30) cases is necessary, Shenkel (1978:86) for instance, insists that at least a hundred (100) comparable sales are a must for a single valuation job.

Some valuers, such as Smith, have said that in theory, a regression can be attempted if the number of sales exceeds the number of variables by one (1970:252). This, therefore, implies the need for large amounts of data because practically there are no fewer than five variables which can be said to influence any single property.

Multicollinearity, the combined influence of a number of independent variables on the dependent variable, has always been a problem in MRA. Despite all the remedial steps available, it has been difficult to completely distinguish the influence on value associated with any single variable, many times an overlap of explanation occurs.

Related to this, there is the act of transforming data to make the error terms approach a normal distribution whenever MRA assumptions are not satisfied. This is done using either logarithms, or square roots, etc. Whipple (1974:265) examined this problem and said that a problem of interpretation is likely to surface. He asks 'For example, what substantive interpretation could we give to the statement that "Y is highly correlated with the reciprocal of the log of the fourth root of X"?'. Although variable transformations may produce better results, the processes are tedious, arbitrary and too technical for valuers. It is also difficult to convince and impress clients using transformed factors, clients whose main aim is to be shown a figure of value and the reasons behind it. Variable transformation also has the tendency to replace market or property analysis, which is an essential and important step in valuation. Analysis is an attempt to find out what factors were responsible for the market values realised in past transactions. Although analysis cannot prove with precision what happened in the past, with proper records and mathematical analysis, it can be used to give reasonably accurate estimates of today's market values.

Cronan, Epley and Perry looked harshly at the transformation of variables in valuation and pointed out that such transformations are not possible when there exists negative data or zero values (1986:23). Furthermore, they complain over the practice in MRA of "throwing out" extreme values (outliers) simply because they can bias the results of the regression analysis. Given that 'property pricing models are usually developed on a small number of observations ... (and)...each observation is an important element', throwing out some variables is like strangling the valuation exercise.

Several practitioners and valuation theoretists have complained that MRA does not, after all, produce enough accuracy given the investment of time, money and skills required to set up the system. One of these people, Cooper, has said that "in fact a number of reasons can be advanced for not bothering with methods which tend to complicate the valuation process, prolong the time involved and, maybe ... (in the end) not achieve any worthwhile increase in accuracy or viability" (1984:98). Other valuers, such as Whipple, have indeed questioned the rationale for introducing MRA in valuation in the first place. Whipple laments 'One gets the impression that some American valuers have "discovered " multiple regression in the form of a packaged computer programme without really appreciating what it is they are doing. Where it has been used, it often has not been applied particularly well, and there is reason to suspect that it may not be the appropriate theoretical model' (1974:264). Many other similar complaints and doubts have actually been raised. Pendleton (1965:73) noted predicted prices with accuracies of only ± 7% of open market value using MRA, and said that many other studies have not achieved such accuracy. And Mackmin (1985:384) has noted how most valuers submit that they can value to within 5% of open market value using MRA. Similarly, Boyle (1984:285) considered that the value of the standard error of estimate is indicative of the predictive powers of a regression model , but he infers that a high value of the standard error will at best achieve 'valuation to within a few $1000s of the true value'.

To take the argument further, Adair and McGreal attribute this lack of accuracy in MRA valuations to either inadequate data or other statistical requirements, or even inappropriate applications. In most cases, such complications occur together, but sceptics within the valuation profession are seldom satisfied with such explanations, or even with lame excuses like those offered by Fraser and Blackwell that "...differences... may be related to data quality. Most of the property data was collected by undergraduate students...A disparity in interpretation between the different groups of collectors may explain some of the variations " (1988:199).

What is being questioned is actually the rationale behind using MRA in valuation against the results. In other words, can't we achieve good results in ordinary valuation techniques without using the computer? Should we employ all those skills and allocate all that time in order to produce results whose implications are doubtful? A major objection to the use of MRA in valuations, as given by Cooper, is that although (mathematical) skills and equipment are necessary;these cost money, and the returns from the average valuation assignment would be insufficient,to cover the expense (1984:98). How many valuers can be prepared to take the cost, more or so the risk of inadequate valuations?

It is interesting to see that even today, with all the fancy computers coming up every other day, quite a number of valuers are still apprehensive of them. Perhaps it is not the fear of the computation and methodology as such, but the reasons behind such methodologies and computations. Really, such valuers should not be blindly accused of being naive, or too conservative. The theory and reasons behind any valuation method , and the market information should be clearly elaborated before using that method. Brown (1985:33) has suggested that the accuracy of valuation is not just a function of the sophistication of models employed, but it reflects the translation of an available information set into an expected value. According to Cooper, using statistics is no substitute for thinking and personal judgement. There is no substitute for experience,yet button-pushing techniques require no expertise, no consideration, no special knowledge of the market etc. A valuer using statistics must be aware of the theoretical structure of his model, must be able to select the correct range of price-influencing variables and choose the appropriate method of measuring their influence (1984:98).

Smith has also given his reservations in using MPA in valuing property, that 'it must be kept in mind that the computer does not think...it will provide regression analysis on any variables it is given. It may produce surprisingly good results on idiotic variables (it may also produce very poor statistics on very reasonable variables)...but. . the appraiser must explain the variables logically and why they have been used in the regression analysis' (1979:249). This takes us back to good theory and reasoning in valuation, and these are very important, if not paramount considerations. Lambert cautions that all the formulae and mathematical calculations advocated for in valuation textbooks and journals tend to be redundant unless the conclusions are consistent with the market (1988:2). Another valuer, Brown, concludes that the regression-based defences of valuation practice so far published are insufficiently rigorous to allay doubts about the accuracy of valuations (1992:77). Adair and McGreal echo those sentiments and add that '...given the statistical rigours ,assumptions and other associated problems together with the lack of suitable data bases, it is hardly surprising that many in the profession still remain sceptical about the use of quantitative methods of valuation (1988:61).

With all these pitfalls and risks against the advantages and appeals, this study will attempt to use MRA in the valuation of waterfront properties along the coastline of Kenya. This exercise starts from the next chapter.

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CHAPTER SEVEN

VALUATION ANALYSIS: THE SEARCH FOR THE BASIC REQUIREMENTS

INTRODUCTION

The literature reviewed in Chapter Four has provided a number of characteristics of valuation methods used in waterfront appraisals. Amongst the important characteristics are:

1. That although ocean front properties are unique and slightly differentiated from land-based properties, the principles applied in their valuation are the same as those applied in valuing any other property.
2. That most ocean front properties can be valued using the common valuation methods such as Income Approach, Comparable Sales Method, etc. although a lot of modifications in these methods would be required. For some properties, a combination of these methods appears to be the solution.
3. That the use of comparable sales data forms the basis of valuation of many other types of properties, ocean front properties included. Also, comparison data is essential in many methods of valuation, including statistical models and computer-assisted appraisals.
4. That the major weaknesses pointed out in the

current methods of valuing waterfront properties relate to the inability to take care of the locational uniqueness of coastal waterfront properties.

A Critique of the Sales Comparison Approach

We may recall (from pp.13 of this work) that this research aimed at the valuation of vacant waterfront plots, and that almost all such properties in the study area had been valued using the Comparison Method. We may note that the Cost or Contractor's Method is not applicable in the subject properties because a large number of market transactions are available, the lack of which is the domain of the Cost Approach (Connelau and Baldwin,1992:50). And the Income Approach may also not be useful because the vacant plots are not producing any income, and even if they did, it would be difficult and perhaps pointless to obtain 'imaginary' cash flows and expenditure patterns for the most profitable and probable uses.

Despite its wide application and use in waterfront property valuations along the coast of Kenya and for many properties elsewhere, the Comparison Method has a number of drawbacks. Some have argued that the method is based on 'past information...(which) has no relevance in (present) calculations' (Brown,1992:205), and that it 'produces a form of spot price reflecting historic transactions which may have been based on the rational utilisation of the available information set then' (Lizieri and Rowland,1993:82). There are always doubts as to whether such rationality and information would be similar to the present situation.

Other valuers, such as Wiltshaw (1993 :86) complain that the Comparison Approach assumes, almost religiously, that past information is accurate, that 'Realized sales prices are considered to be exactly as stated. The characteristics of comparables are also treated as though they are measured precisely. This is assumed whatever the particular measurement scale is used :a continuous characteristic eg. gross external area, is considered to be as accurately measured as a binary characteristic...Similar remarks apply to the property to be valued'. Thus the method makes sweeping assumptions,most of which may not hold in all situations. The reliance of the Comparison Method on past (comparable) information appears to have attracted the most of criticisms. Is past data to be trusted to value properties presently and in the future ? Baum (1993:295) warns that 'What are now thought of as conventional valuation techniques are essentially backward looking, based on comparisons of old transactions. It has to be assumed that during the (usually long) marketing period there is no change in value!'.

Another valuer, Wiltshaw (1993:6), attacks the Comparison Method from various angles. He asks, for example, what determines the appropriate number of comparables ? Which (particular) property characteristics do we use to adjust comparable prices ? Why is it possible for adjusted comparables to be different if they reflect a common base, and how is the final value of the property determined? And if adjusted comparable prices differ, isn't there an additional subjective element in the determination of the final valuation ?

Another weakness of the Market Data Approach is its requirement that 'like should be compared with like ', which strictly emphasizes comparability in every sense of the word. Many, including Swazuri (1990:4) and Whipple (1991:330) have argued that comparability is not always easy to obtain. Indeed there is a truism in the real estate world that no two properties are exactly alike and this makes valid comparisons a difficult matter, even in the case of vacant waterfront sites where there may be allot of recent transactions available as yardsticks. The worst part is when motivations for exchange of property are to be compared, and when the conditions during the transactions have to be ascertained. Adjusting the comparable sales price to reflect these aspects is 'almost' impossible.

In general, therefore, there is much in the Comparison Method to make it analytical weak, ad hoc, covert and at least ambiguous. But the method continuos to survive, and its use is entrenched into almost every valuation audience worldwide. This is partly due to the fact that 'there does appear to have been a (high) degree of inertia insofar as there has been no significant critique of its analytical structure' (Wiltshaw,1991:5).

Upto now, no follow ups have been made on the weaknesses of the Market Data Approach to practically discredit it. Wiltshaw further argues that perhaps the most important reasons for the continued use and survival of this method is that '...it is based on key facts generated by the market...there is considerable common sense appeal to the valuer, vendor, and purchaser in the argument that the property not sold will have a value comparable to realised prices'(1919:6). The method is, therefore, straightforward, the adjusted comparable prices 'sympathetically' reflect the particular features of the property to be valued, and valuers feel that because they understand the method's dangers, they can take care of them. The foremost rationale for using the Comparison Approach, so says Whipple, '...is that buyers and sellers will behave today as they did in the recent past if market conditions and all other relevant factors are the same' (1991:332). Arguably, therefore, many valuers tend to submit that even with its limitations, the Comparison Method is the most reliable for predicting the behaviour of market participants.

So then the question is whether a method can be proposed which, while applying all the principles of valuation and relying on the comparable sales, can be used to value coastal properties with the precision of accounting for the uniqueness of these properties. This is the main objective of this study.

Description of the Proposed Regression Method

The practice of valuation deals with figures and numbers related to property. These figures and numbers are part of the broad subject of statistics; which is very useful in the valuation profession. Against this background, however, and has been explained in Chapter Six above, very few valuers and indeed valuation procedures have used this important tool. Cooper (1984:91) argues that the reasons for the paucity of statistical methodology in valuation practice would be the result of three circumstances namely

(a) the absence of statistical techniques in valuation education until recent times,

(b) the logistical problems in employing multivariate techniques which have existed until the last few years, and

(c) the attitudinal inertia of the profession which has been a product of education standards of the past.

All the three reasons advanced by Cooper apply in the case of Kenya, where, although valuation is an old profession, statistical techniques for valuers were introduced in the teaching of valuation only in 1984. The use of statistics in valuation procedures has now become commonplace in some advanced countries of the world and its use in countries like Kenya is imminent now. Indeed there is no reason why statistics should not be used widely in valuation in such countries. The modern valuer cannot be expected to continue handling and processing valuation data manually or using only traditional methods forever.

There are many statistical tools applicable in valuation procedures, ranging from descriptive statistics to taxonomy and inferential statistics. In this study, a number of these techniques have been applied to the information collected from the field in order to judge the best fit technique. The techniques used are:

1. **Conventional Multiple Regression Analysis**, herein referred to as CMRA. This technique has been

extensively described in Chapter Six above.

2. Forward Selection Regression, herein referred to as FSR. In this technique, as outlined by Norusis, the first variable considered for entry into the equation is the one with the largest positive or negative correlation with the dependent variable. Once one variable is entered, the statistics for variables not in the equation are used to select the next one. The variable with the largest partial correlation in absolute value is the next candidate because choosing such a variable is equivalent to selecting the variable with the largest F value. The procedure stops when there are no other variables that meet the entry requirement (1988: B224-225).
3. Backward Elimination Regression, herein referred to as BER. This process works backward from the Forward Selection process. It first enters all the independent variables in the equation and then removes them step by step. There is a minimum F value which a variable must attain in order to remain in the equation. Any variable not meeting this F value is removed, such that only the most important influencing variables remain. Ideally, the equation obtained from backward elimination

ought to be similar to the one from forward selection. Norusis demonstrated, however, that forward and backward selection procedures can give different results even with comparable entry and removal criteria (1988: B226)

4. **Stepwise Regression Analysis**, herein referred to as SRA. This technique has also been described adequately in Chapter Six above. This is, in principle, a combination of both forward selection and backward elimination regression procedures, and using it alone should, to some extent, be enough In describing the method, Norusis says that the first variable is selected in the same manner as in forward selection, but that if the variable fails to meet entry requirements, the procedure terminates with no independent variables in the equation. The impression from this is that the regression equation will not be produced, once the first variable fails to enter the equation. If it passes entry requirements, it enters the equation, paving way for the next variable to be considered. Like in forward selection, this next variable should have the next highest partial correlation. Then the first entered variable is examined for removal, just using the same criterion in backward elimination. Subsequent variables are considered

for entry and then removed, until no more variables meet neither the entry nor removal criteria (Norusis, 1988: B227). Those variables which 'survive' the back and forth procedures are the ones considered to be relevant for predicting the dependent variable. The three procedures ie backward elimination, forward selection and stepwise selection may not always give the same result and further scrutiny is required in such circumstances.

5. **Rank Transformation Regression**, herein referred to as RTR. This technique was also partly reviewed in Chapter Six above. This method has been chosen here because of its conventional appeal of ranking variables first before 'regressing' them.

Very little literature, however, seems to have been put forward on rank transformation regression. Conover and Iman (1976, 1979 and 1981) seem to have been the main proponents of this method. Others who have attempted RTR include Hettmansperger (1978), Richardson and Thalheimer (1979) and of late, Epley, Cronan and Perry (1986). This does not in case mean that other valuers should not attempt the technique. Perhaps new ideas may help to shape a method and extend its applications.

In essence, RTR is similar to MRA except that the technique requires the valuer to rank the factors affecting property before applying conventional MRA tests on them. The technique may turn out to be more rigorous than MRA, and is fraught with potential problems. One of RTR's major methodological problems is how to rank the variables in their order of importance. We have already seen the problem of deciding what factors to include when valuing property. RTP introduces an additional problem of how to rank these variables. Are the variables ranked by intuition or by regression? Conover and Iman have suggested that an entire set of observations is ranked from smallest to largest, with the smallest observation having rank 1, the second smallest rank 2, and so on. Average ranks are assigned in case of ties. But there is no clear cut elaboration of this method, despite the possibility that many problems can derail the whole process (1981: 124).

In the first place, Cronan, Epley and Perry criticise conventional MRA on the grounds that:

a. it does not follow appraisal theory which requires the appraiser to first rank the comparables (variables) from "best" to "worst";

b. it uses univariate comparisons of property characteristics to arrive at a final ranking of the factors;

c. the normality of the error terms, the stability of coefficients, and a relatively high R are difficult to achieve in a small sample.

Then, Cronan, Epley and Perry argue and prove that the RTR method:

a. complies with appraisal theory, by analysing data which has already been ranked;

b. uses a multivariate comparison procedure, ie it compares all the variables together to arrive at the final ranking;

c is well suited for small samples which is the normal case in property valuations;

d produces a more theoretically appropriate equation with a higher degree of accuracy once the variable selection is completed;

e. does not yield [illegible] weights to value indicators in the conventional sense, rather,the model provides an ordinal interpretation, where the coefficient explains the relative increase (or decrease) in price ranking as a result of a one-rank increase in the variables;

f. reduces the influence of outliers, because only the most important variables are used.

The rationale behind ranking variables before applying regression on them is also explained by the three authors.. Many authors and appraisers who favour a ranking technique argue that the buyer cannot place a separate price on each independent property feature, which is the case in conventional MRA. The hypothesis underlying ranking is that the buyer sees each property feature as part of an integrated and complex package which is not easily delineated and priced independently. It appears, therefore, that once the ranking procedure is done well, perhaps scientifically, RTR performs better than conventional MRA.

Correlation has been put together with regression because correlation in itself alone cannot predict values, and also it can be used as one of the preliminary steps in regression analysis.

Information required for the exercise was collected through observation by the author, through the use of questionnaires, property check lists and interviews with various types of interested parties in waterfront properties. These included 12 land officers, 14 valuers, 10 estate agents, 13 local residents, 13 beach workers, 8 tourists, 8 property buyers and 18 property sellers (or their agents). These 96 people were scattered all over the coastline, from Lamu in the north to Vanga in the south coast of Kenya.

A total of 331 vacant properties which changed hands from

1985 to 1990 were considered for this study. Each one of these properties was found along the waterfront or only a few hundred metres away from the shoreline. And for each property changing hands, the method used to arrive at the final exchange price was sought for. This was to find out whether there were different methods used to value the waterfront properties before sale or for any other purpose. It was found that in all these 331 properties the only method of valuation used before any property was offered for sale, or before any property was actually bought was the Market or Comparison Approach. Landlords, estate agents and valuers involved in the waterfront property market confessed that this was the only method available to them, and the only one they trusted.

For each property, the following characteristics were recorded after physical inspection of the property and going through property records in land offices and valuation offices :

1. value of the property
2. date of exchange,
3. location of the property,
4. size of the plot,
5. distance from the shoreline
6. whether a view of the ocean is possible,

7. size of water frontage,

8. depth of fronting water,

9. type and availability of beach,

10. the nearest important tourist facility.

11. the distance from that facility.

12. whether there is access to the beach or not,

13. availability or non-availability of water sports,

14. amount and type of infrastructure and services,

15. current use of fronting water, and its intensity,

16. value of fish and other marine products from that locality,

17. topography of the plot,

18. the distance from a major town,

19. width of the beach area,

20. tourist season in which the plot exchanged hands,

21. volume of tourist trade in the locality,

22. motivation or reason for the sale or exchange of the property,

23. level of mosquito infection in the area.

It should be understood that all these variables were stated by the various people who were interviewed, people who take part in the waterfront property market in the coastline of Kenya. These variables were, therefore, not identified by the researcher alone.

Analysis of Variables

All the above-mentioned variables were analysed and reduced into measurable terms before they were used in the MRA valuation procedures. All these variables were utilised in one way or another, so that even the least important had a chance of being experimented on.

1.Value of the property (VALUE)

This gives the value of the property obtained at the time of sale or exchange. The value is given in Kenya shilings, and is the dependent variable for the analysis. The value obtained at the time of inspection is then brought to the present in order to make it consistent with the current market. It is also to facilitate calculation of variables and presentation of results as if the information has just been collected, instead of having to report them as historical data. This was done using the Amount of #1 (or shilling) valuation table, which seeks to give the amount to which a sum of money invested will accumulate to at a given period of time at a certain rate of interest.

Its formula is $(1+i)^n$,

where i is the rate of interest

n is the number of years, and

1 is the principal amount (in pounds or shillings).

Using this table, any amount used to purchase waterfront property is equalled to the 'amount invested' in any given year, as shown by the definition in the published Parry's tables. A rate of interest of 30%, which is the estimated average lending rate in Kenya at the moment (1994) is then applied to the formula and multiplied by the purchase price of the property. In this way, all values of properties which have changed hands since 1985 are brought to their present values.

Sales price was used here as a proxy for value, although it is known that market price and value are not coincident (Whipple,1974:267). In most cases, sales prices, whether forced or voluntary, are either higher or lower than the value to the vendor or purchaser. And in a proper efficient market (the ideal market) expected price will be identical to and the same as expected value.

Given the fact that we cannot achieve perfection in the real property market, it is better to equate sales price with value in this study. In reality, the interrelationships between market variables are so complex that systematic mis-valuation of the sectors of the market is the order of the day (Lizieri and Rowland,1993:81).

The 'pound' given in Parry's valuation tables was replaced with the Kenya shilling. It is not peculiar to replace the 'pound' with an equivalent currency in valuation works, the aim is to utilise the tables for the situation one is operating in[1]. The conversion is thus

Amount of 1 shilling in 9 years(sold in 1985)	=	10.6043
Amount of 1 shilling in 8 years(sold in 1986)	=	8.1573
Amount of 1 shilling in 7 years(sold in 1987)	=	6.2749
Amount of 1 shilling in 6 years(sold in 1988)	=	4.8269
Amount of 1 shilling in 5 years(sold in 1989)	=	3.7129
Amount of 1 shilling in 4 years(sold in 1990)	=	2.8561.

For example, property number 133 was sold in 1986 for a price of Shs. 270,000. We multiply this price by 8.1573 (Amount of 1 shilling in 8 years) and the result is Shs.

[1]See, for instance, P.M. Syagga's work in Real Estate Valuation Handbook with Special Reference to Kenya, unpublished Textbook, Department of Land development, University of Nairobi.

2,202,471. as today's value of plot No.133. Each value is multiplied by the corresponding coefficient for all the 331 observations and the resultant figures are inserted in the column for the observed dependent variable. This adjustment automatically eliminates the need to consider the time or date of the transactions.

2. Location of the property (LOC)

Property dealers in the study area believe that there are some areas along the coastline, which are more desirable, popular and exclusively famed because of many factors. These factors include the history of the area, the unique locality as far as the Indian Ocean is concerned, the facilities and services available and the generally clean surroundings. Other factors include an area's natural attractiveness, its nearness or remoteness from settled areas, the availability of tourist-related facilities and services such as, diving clubs, night clubs, wind surfing etc. All these factors combine to make a region or locality to be more favourable than another. Some locations are 'nice' or 'good' on their own, because they have all these features combined in a remarkable way, for example Nyali, Shanzu, Bamburi and Diani Beach areas. In most cases, location is measured in terms of an area's relative 'betterness' or 'poorness' to another location.

Measuring 'location', however, is not as simple as it appears, especially when one has to convert 'location' into quantifiable units. Those who have avoided to measure location directly have opted to consider properties in one locality as being homogeneous, so that each locality is a separate sub-market. In such a case, the 'location' factor is uniform for all properties therein. But where 'location' has to be considered in a wider spectrum, like in this study, very few methods have been proposed for its measurement. Adair and McGreal, for example, presented 'location' as a dummy, i.e depending on whether a property is situated in the specific region or outside it. In high-priced areas, properties would score 1, while in low-priced areas properties would score 0 for location (1987:64). The problem which this approach brings out is that micro-locational factors within given spatial areas can greatly influence value. What was also not explained by Adair and McGreal is how the 'high priced' and the 'low priced' areas are determined. In their case, presumably, these were based on some known values of properties in those areas.

Locke also considered the location factor and found that there is a difference in estimated values between properties in a sub-locality and those within an entire region (1987:538). The model using a regional locational measure normally produces lower predicting powers than that using properties found within the same locality. Unfortunately, Locke reports,no findings regarding the efficiency of these alternative approaches are reported. To measure location, all the values of properties for the 331 study cases were analysed and averaged per acre for each place in each year since 1985. These values were then brought to their 1994 (present) values using the capitalisation rates as given above. The obtained location value is a present value average per acre for all the years. It is this value which is taken to represent the location variable. The values for each region or locality were compared with those of another and a comparison index obtained. For example, it was found that average values in Kikambala/ Kanamai area were KShs. 1,588,294. per acre, and those for Mtwapa, which is a few kms. away were KShs.1,357,621. per acre. All other factors remaining constant, a property in Kikambala would be considered to be in a slightly more superior location than one in Mtwapa. Using this measuring scale for location, the highest ranked location in the study area is the zone covering Tudor, Oceanic Hotel and Florida on Mombasa Island, and Shanzu, Bamburi and Nyali to the north of Mombasa. The lowest ranked area is around

Yungi/Funzi/Wasini islands. The location values in terms of average property values per acre are given in Table 7.1.

Table 7.1: Location values for the study areas

Location	Location values
Mombasa island/Nyali/ Shanzu/Bamburi	5,009,746
Malindi Beach	2,765,290
Shelly Beach	2,303,420
Watamu Beach	2,271,763
Diani Beach	2,297,587
Kikambala/Kanamai, Kijipwa	1,823,374
Mtwapa	1,[illegible],447
Galu Kinondo	1,258,56[illegible]
Msambweni	1,[illegible]49,045
Shimoni	1,092,914
Kilifi	1,012,102
Tiwi	859,060
Gazi	[illegible]10,667
[illegible]	708,419
Lamu	[illegible]49,759
Yungi/Wasini/Funzi islands	[illegible]03,621

Source: Data collected by the author

NB These zones were the areas within which all the 331 properties used for the study were located.

The LOC variable now incorporates the following variables: use of fronting water and its intensity, and the level of mosquito infestation in an area. In terms of location aspects, however, it does not necessarily mean that, for instance, Diani Beach (2,297,587) is more than five (5) times a better location than Yungi island. The relative importance of each location should be measured against a nearby location which has almost similar features. Thus it would improper for example, to relate a property in Lamu (649,759) to one in Mombasa (5,009,746). Each region forms a submarket of its own and it, therefore, follows that the relative importance/difference of location for properties [illegible] in two nearby regions is [illegible]

[illegible]

3. Size of the property (SIZE)

[illegible] determines the [illegible] of use of a property and is reflected in the [illegible] or value of the plot. All other [illegible], the larger the plot the higher will [illegible] value. Size is given in acres.

4. Distance from the shoreline (DISH)

This factor is said to be the most important determinant of the value of waterfront property. This seemed to be the consensus among all the people interviewed during the research work. The nearer the property is to the ocean water, the more value it commands. Distance has been measured in metres, from the end of the shoreline to the front boundary of the property, as seen in Figure 7.1.

Measurements from the shoreline to each of the 331 plots [illegible] it has been [illegible] the study to measure actual distance from the shoreline, rather than accept distance in terms of the common notation of 1st row, upto 4th row from the water. This is because the latter categorization is quite arbitrary in the study area e.g in some places 1st row covers all properties within 1 km. of the shoreline, in other areas 1st row is determined by the first road from the shoreline.

5. Possibility of a view of the ocean (VIEW)

Some buyers consider it important to have a view of the ocean waters from their property, even if the subject property is not on the waterfront. The view of the ocean waters gives a unique scenery enjoyable to the eyes of most people and, therefore, it enhances the value of the property. This variable was taken to be a dummy; those properties affording a view of the ocean will score a weight of 1, and those properties not having a view of the ocean will carry a weight of 0.

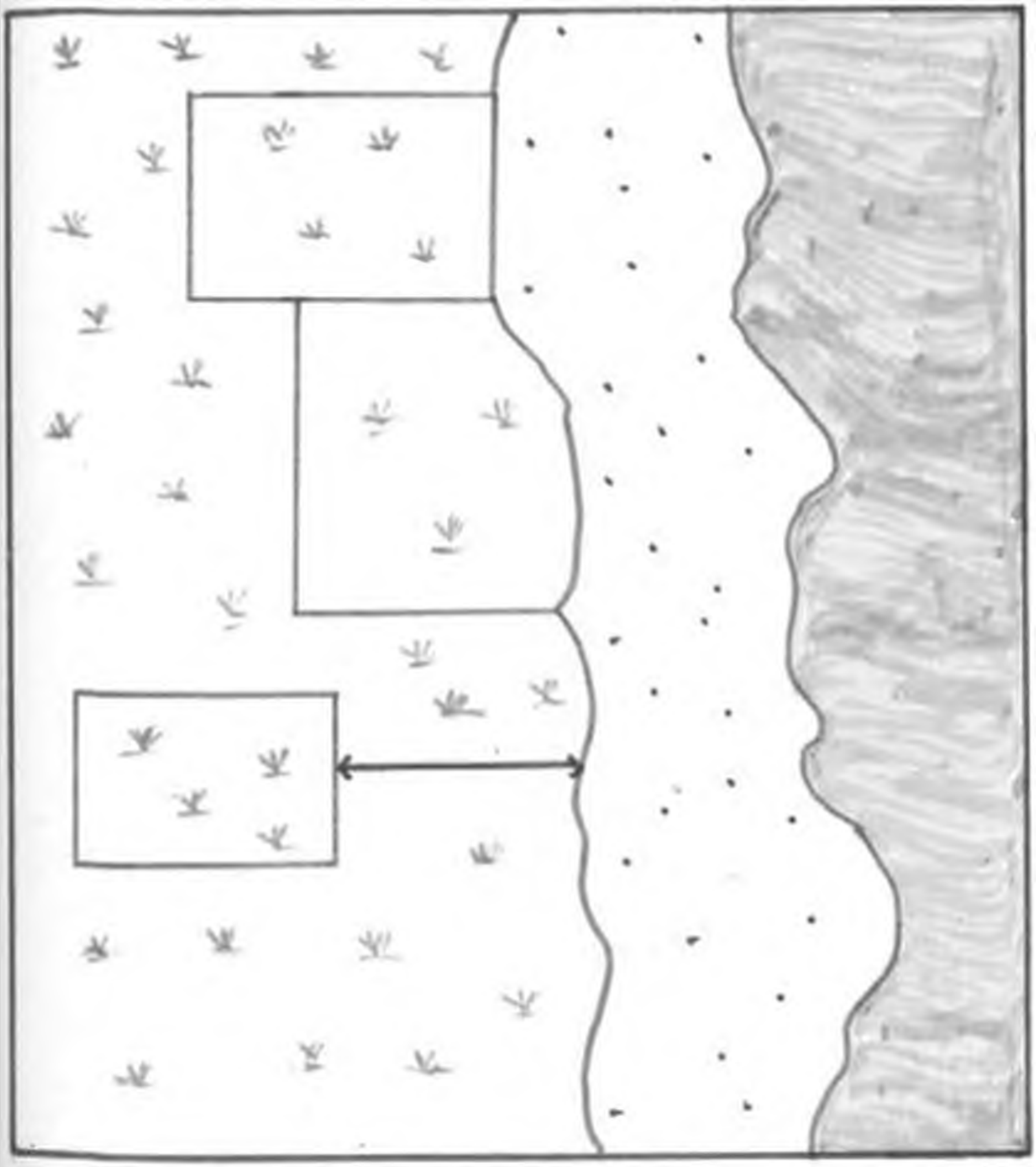


FIG 7.1. MEASUREMENT OF DISTANCE OF PROPERTY FROM THE SHORELINE

6. **Size of the water frontage (AQUA).**

The location of a property along the waterfront alone does not necessarily make it absolutely desirable. An important consideration is the size of the area the property fronts the ocean. This area determines the width of the property which can be used by the fronting property. This variable is given in terms of metres, and it does not apply to plots beyond the first row, whose 'frontage' will be given as 0 metres.

7. **Depth of fronting water (DRPT)**

Although not mentioned or taken seriously by most waterfront property dealers, depth is a consideration because it determines the capacity of a harbour, the amount and level of water sports that can be done and the availability of fish stocks and marine products. Some fishing grounds in deep-water areas e.g Shimoni reef are the most densely-populated with fish, while some deep-water areas can only be used for docking. Depth is given in metres. Properties beyond the first row are also affected by the depth of the water for they can use the water so long as access is provided. The use of the water is not restricted to those on the fronting lands only.

8. **Availability of beach (BEACH)**

Some buyers of waterfront property are interested in the type of beach because the beach determines the types of uses for the property and/ or its fronting waters. Although most beaches in the study area are composed of white or brown sands, there are some which are rocky, and others which are muddy. BEACH is a dummy variable, such that plots with beaches will score 1, those without will score 0.

9. **Proximity to established tourist facility (DIST)**

The proximity to an established facility affects the value of a waterfront property, especially for those whose major uses are tourist-oriented. This is so because first, nearness to an established tourist facility makes it easier to connect or extend services and infrastructure to the subject property, if these are missing. Secondly, visitors or tourists who may not be served or accommodated, or who may miss something in the established facility, will most likely go to the nearest alternative for whatever they require. Tourist facilities include post offices, diving clubs, bureau de changes etc. This variable is given in terms of distance from that facility in metres.

10. **Availability of public access to the fronting beach**

and water(ACCESS)

There are some places along the Kenyan coastline where access to the beach is not granted, especially to those owning or occupying the land beyond the front row. In these places, therefore, people in the second row and beyond do not have access to the beautiful beach sands and the water. Values in such areas would, therefore, be low in those affected zones. This variable is a dummy, designated 1 for those places where accessibility is allowed, and value 0 for those areas where public access is not provided

11. Availability or non availability of water sports (SPORTS)

A number of areas along the coastline of Kenya are popular for a variety of water-related sports which attract many people, both local and foreign. Water sports are increasing in importance and, therefore, have an effect on property values. This factor was taken as a dummy; where available, the value was 1, and where the sports were not offered, the property scored 0. The sports include yatching, scuba diving, wind surfing, fishing competitions, boat racing etc.

12. Value of fish and other marine products from that locality(FISH)

Some areas would be preferred because of the amounts of fish and marine products available from the fronting waters. This is important especially for those who would like to construct hotels and cottages aimed at visitors who like these products. Shimoni reef in the south coast, for example, is famous for fish and prawns, while Shanzu is known for deep-sea fishing. To compute this variable, statistics on the quantity and value of fish and other marine products were obtained from the Fisheries Department for each locality for every month of the years from 1985 to 1990. The value of these products is given in KShs per year for each area. And in order to bring these values to the present, capitalisation was done on the obtained figures as was done for the variable VALUE.

13. Topography of the plot (TOPO)

This variable is important in that, where the topography is naturally flat, the amount of expenses required to develop the land is relatively less than where the land is on a cliff or a swampy area. Areas of flat topography had a score of 2, while areas with rugged, hilly, cliffy or swampy topography had a score of 1. It naturally follows that plots with flat topography are more favourable than those with other types of topographies.

14. **Width of the beach area (AREA)**

The space of the beach area fronting a property determines the level of recreation, the amount of logging of mangrove poles and, generally, the type of use of the property. Beaches which are very wide attract many uses, while narrow beaches attract less. The width of the beach area is given in metres, measured from the shoreline to the lowest tide level. Properties in the second row and beyond have no beach area, hence they scored 0 for this variable.

15. Distance from a major town (TOWN)

This is a minor factor, especially where all facilities and services are available, and shopping centres or small trading centres can provide the needs of the residents. But when a locality is very far from such facilities, this factor becomes significant. The major towns which have been identified in the study area are Mombasa, Kilifi, Lamu, and Malindi, and the distance was given in kilometres.

16. **Tourist season in which the plot changed hands (SEAS)**

During the fieldwork, it was discovered that waterfront properties along the coastline of Kenya are very much influenced by the seasons of tourist trade. During the peak tourist season (January to March) transactions in waterfront properties increase, and the prices paid for these those transactions are equally higher. During the lowest tourist season (April to July) the opposite occurs. The next peak season is from August to December every year. There may be more tourism activity in August and September in one year, but in the next year the action would be from October to December. That is why these months have been grouped together to take care of the fluctuations. Transactions recorded for this study were given in terms of the actual dates, months and years the properties were sold in. Transactions that took place between the months of January and March in every year were rated at weight 3, those which took place between August and December were weighted at 2, and those transactions which were done between April and July of every year were rated at 1.

17. Volume of tourist trade in the locality (TOUR)

This variable was presented in terms of the number of hotel bed-nights occupied in each quarter of every year in the Kenyan coastal belt. The researcher collected those bed-night occupancies which corresponded with the times in which the study properties changed hands. Hotel bed-nights occupied measure the number of tourists who use the beds in tourist hotels overnight. By knowing the number of hotel bed nights occupied by visitors in a given region, we can safely assume that what the visitors spend will be reflected by their numbers. Since it has not been possible to know exactly how much money tourists spend in each region they visit, their shear numbers should offer a representation of their tourism volume. The information required to compute this variable was collected from the Kenya Economic Survey, and the Statistical Abstracts, which are government publications, and from the Mombasa tourist guides. The value of TOUR was also brought to the present value just like the other variables.

18. Motivation or reason for the exchange of the property(MOTV)

Although not very easy to identify, the reason for someone to transfer his property has a large contribution to the final price of the property. Most sellers and buyers would not want to reveal the reasons behind the property deals. And because of this, it was not easy to compute this variable. There are many types of reasons for exchanging waterfront properties, ranging from those which involve one of the parties to those which involve the participation of both parties. All these reasons or motivations have an influence on the final price of the subject property. Examples of reasons unearthed during the fieldwork include the following:

a) prices are now high enough to get huge profits over the previous prices;

b) because everybody else is selling (why should I not also sell?);

c) one has enough other properties elsewhere, has planned nothing to develop this land;

d) plot is very remote, far away from developed and settled areas;

e) to offset personal loans and other financial problems e.g family commitments such as weddings, funerals, school fees etc. (forced sale);

f) owing to its features and the location, the property is appealing for certain developments;

g) to put up development, to meet the demand for services offered by such developments e.g hotels, restaurants,shops, offices etc.;

h) for speculation, to buy today, wait for 'good' prices and then resell the property;

i) just to own a waterfront property, because everybody else is rushing for them, why should I not? ; and

j) to take advantage of ignorance of the sellers.

It can be seen how diverse the reasons can be. In order to simplify the [illegible] for our MRA, the study only considered whether the motivations or reasons were forced or voluntary. The [illegible] of a property engineered by force will be assumed to lead to a lower value than one from a voluntary transaction. Therefore, properties sold through voluntary reasons by either party scored a weight of 2 and those from forceful persuasion [illegible].

[illegible] the fieldwork [illegible] all the variables found to be relevant [illegible] of [illegible] properties and [illegible]. Although some may appear [illegible] have a small portion to contribute [illegible] the property. It will be noticed that [illegible] of the original observed variables were [illegible] the other variables, leaving us with [illegible] as follows:
[illegible] and seventeen independent variables which are

X1 = LOC
X2 = SIZE
X3 = DIST
X4 = VIEW (dummy)
X5 = AQUA
X6 = DEPT
X7 = BEACH (dummy)

X8 - FRONT
X9 - ACCESS (dummy)
X10 - SPORTS (dummy)
X11 - FISH
X12 = TOPO
X13 = AREA
X14 - TOWN
X15 - SEAS
X16 - TOUR
X17 - MOTV

Out of these four ([illegible]) dummy variables, [illegible] [illegible] (BEACH). Dummy variables are used [illegible] relationships between variables which cannot be measured in terms of relative values or scale. These dummy variables do not cause regression estimators to lose any of their desirable properties ([illegible], [illegible]). The main weakness of these variables is that their change is not continuous and therefore a graph cannot be drawn to illustrate gradient for the change.

All the 331 properties inspected were vacant plots within the vicinity of the Indian Ocean or its [illegible]. This bias towards vacant plots was found to be more theoretically correct than having to select both vacant and developed plots for, the valuation methods to be employed would be different for these two types of property. A list showing all the 331 cases and their characteristics (variables) is shown in Appendix 1 and a sample of the inspection sheets used to collect all the information is shown in Appendix 2. The main items of relevance in multiple regression output are explained here:

(a) The Regression Coefficient: This represents the contribution made to price or predicted value of one unit of the relevant variable. For each additional unit of one variable we would expect an increase or decrease in the price or value of property. It is sometimes referred to as the constant.

(b) Residuals: These are the differences between the theoretical price calculated, using the analysis results, for each observation, and the actual or observed prices (Cooper, 1984:96). Residuals give the difference between observed value and the value predicted by the model. They can draw attention to the existence of properties which have substantially different characteristics to the majority of the data and would, therefore, need to be scrutinized further. If the model is appropriate for the data, the observed residuals should have similar characteristics to the predicted ones.

(c) Correlation coefficients: These measure the degree of relationships between independent variables and the dependent variable, and also amongst independent variables themselves. Degrees of correlation range from no correlation to perfect correlation, either negative or positive. Correlation will be perfectly positive if an increase in one variable is accompanied by a corresponding increase in the other variable. And perfectly negative correlation implies that as one variable increases, the other reduces in the same magnitude. The numerical value of the correlation coefficient ranges from -1 to 1. The closer to one (1), the more the two variables are correlated, or are measuring the same thing. When this happens, one of the two variables may be safely dropped (Smith, 1979:251). However, although the correlation coefficient is one of the most widely used statistical measures, it is also one of the most abused (Gupta, 1987:218), in the sense that users sometimes overlook the fact that correlation measures nothing but the strength of linear relationships and that it does not necessarily imply a relationship. Furthermore, correlation does not necessarily mean that a cause and effect relationship occurs between the variables. The [illegible] may have occurred due to pure chance, (although this [illegible] in the current [illegible]) especially in small samples or both the correlated variables may be influenced by one or more other variables. That means, it is a mathematical outcome which depending on Type I or II error does not necessarily establish causality.

(d) Measures of goodness of fit: The goodness of fit measures provide information about the power of the regression model to predict required values. These are relative measures which provide information about the percent of total variance in the dependent variable that is explained by the estimated regression model

e) One of the most widely preferred of these is the coefficient of multiple determination, R^2. This measures the proportion of variance in the dependent variable that is explained by variation in the independent variables. That means, it identifies factors which may account for the variation in the dependent variable. R^2 is given in the formula:

$$R^2 = \frac{\text{Regression (explained) sum of squares}}{\text{total sum of squares}}$$

and its range of possible numerical values ranges from 1 to 0. If the relationship between explained and total variance were perfect the value of R^2 would be 1, meaning that the independent variables completely account for variation in the dependent variable, so that knowledge of X values allows the prediction of Y values (dependent variable) without error. In fact the closer the value of R^2 is to 1, the better the fit. When R^2 = 0, the independent variables account for no variation in the dependent variable, so that knowledge of X values would be useless in predicting Y values.

Normally, whenever an additional variable is added to the regression model, the sum of squared residual variance necessarily decreases. Therefore, the total value of R increases whenever a new variable is added to the equation no matter what its relevance (Brown, 1974:573). Because of this behaviour, the R^2 is always rather high and is not a completely satisfactory measure of goodness of fit. Rather, the R^2 amounts more to a mathematical necessity rather than a causal explanation for the dependent variable, and the researcher must consider the theoretical considerations on the relationships between the dependent and independent variables (Syagga, 1985:295).

ii) <u>The adjusted coefficient of multiple determination, $\bar{R}^2$</u> is a better relative measure of goodness of fit ([illegible]; Brown, 1974:514). The adjusted $\bar{R}^2$ corrects R^2 for the degrees of freedom lost as more independent variables are added to the regression equation. The formula for adjusted R^2 is:

$$\bar{R}^2 = 1 - \frac{(1-R^2)(n-1)}{(n-k-1)}$$

where n = total number of observations

k = number of independent variables

$\bar{R}$ = adjusted R

The result is that as a new independent variable is added to the equation, the value of $\bar{R}^2$ does not necessarily increase; in fact, it can decrease if the new variable does not reduce the sum of squared residuals sufficiently to offset the degree of freedom. The equation with the largest R^2 yields the least residual variance, and is, therefore, the best to be used in predicting Y.

iii) R square change

This measures the increase in R^2 when another variable enters the regression equation. As the next variable enters the equation, there is a change in R^2, either positive or negative. Where a large change in R square is recorded upon entrance of a variable, then that variable's contribution to the predicting power of the equation is very significant. In reality, the large R square change means that the particular independent variable is able to explain the dependent variable more than the other independent variables in the equation. However, a large R square change "does not indicate what proportion of the unexplained variation this increase constitutes" (Norusis, 1988: B220). It merely tells us the contribution and importance of that variable.

(e) There are also absolute measures of goodness of fit of the regression equation.

Standard error of the estimate, S_e is the most widely used of all absolute measures. It allows the calculation of a likely error range if the results are for prediction of prices. The standard error of estimate is scaled in the same units as the dependent variable and is the standard deviation of the residuals. This measure provides information on the size of the residuals or errors generated by the regression model. In about two thirds of the cases, the actual value of the dependent variable will be within one standard error of the estimated value. The formula for the standard error of the estimate adjusted for degrees of freedom is:

$$S_e = \frac{(Y_i - Y_{\hat{i}})^2}{n-k-1}$$

where Y_i = observed value of Y

$Y_{\hat{i}}$ = estimated value of Y

n = number of observations

k = number of degrees of freedom

The properties of this measure are such that the regression equation which has the smallest standard error of the estimate also has the highest R^2.

(f) T-value: Also called student t, is calculated from the standard error and is used to establish whether or not each variable is making a significant contribution to the total calculation of the dependent variable. Its formula is:

$$t = \frac{X - U}{s/\sqrt{n}}$$

The value of the obtained t from this formula is then compared with the calculated or critical t at the appropriate significance level in the t-tables. If t (calculated) is larger than critical t, the null hypothesis, which ought to have been formulated, is rejected. The numerical value of t varies from negative infinity to positive infinity.

The use of t in regression tests has been contested by some people. Brown, for instance, argues that t should not be used as a test of significance because when collinearity exists between the independent variables the effect is to increase the size of the standard errors of the estimated regression coefficients so that the coefficients are not individually statistically significant, while the joint effect of the variables is still highly statistically significant. Therefore, if multicollinearity exists, it is possible that using the t ratio, we could exclude variables that should be included (1974:575). Others, like Gupta (1987), Lapin (1987) and Hamburg (1983) have suggested that the t test produces best results only when the sample size is equal to or less than 30.

(g) The F test: This is a distribution test defined in terms of the ratio of the variance of two normally distributed populations. The F distribution depends on the degrees of freedom for the numerator and for the denominator. F is given by:

$$F = \frac{\text{Between treatment variance}}{\text{Within treatment variance}}$$

F is a continuous random variable that ranges from zero to infinity, and it cannot take a negative value. It is applied just like t test, to test whether there is a significant relationship between the independent variables and the dependent variable, in form of a null hypothesis, and an alternative hypothesis at appropriate confidence intervals. Depending on the framing of the hypothesis, if the calculated F (e.g. from computer printout) is larger than the tabulated F (from F-statistical tables), then the null hypothesis is rejected or accepted

(h) Standardized Residuals: The standardized partial slope estimate, or beta weight, indicates the standard deviation of change in Y associated with 1 standard deviation of change in X, when the other independent variables are held constant. The beta weight corrects the unstandardized partial slope by the ratio of the standardized deviation of the independent variable to the standard deviation of the dependent variables. The beta weight can be used to evaluate the relative importance of the independent variables in determining the dependent variable. Each of these statistics is going to be referred to whenever it comes out in the data analysis below

i) Standardised residuals scatterplot

In regression analysis, the population sample must meet assumptions of linearity and minimise any prediction error terms. The most obvious assumption is that there should be a linear relationship between the dependent variable and the independent variables in the population sample. To determine violation of regression assumptions, we plot the standardised residuals (the unexplained components of the individual total deviations) against the predicted values. If the assumptions of linearity and homogeneity of variance are met, there should be no relationship between the predicted and residual values, hence no observable patterns in the scatterplots. Where the assumptions have been met, the residuals would be randomly distributed in a band about the horizontal straight line through 0 (Norusis,1988:B207). It should be emphasized that such a scatterplot does not indicate that all the assumptions have been met; rather, the plot indicates that the assumptions have not been violated (Daniel,1988:341).

Analysing the data as per the computer printout was done in seven steps as follows:

1. Correlation analysis for all the independent variables against the dependent variable,

VALUE.

2. Conventional MRA on all the 331 study cases.
3. Forward Selection Regression on all the 331 study cases.
4. Backward Elimination Regression on all the 331 study cases.
5. Stepwise Regression on all the 331 study cases.
6. Stepwise Regression on the properties located in each district i.e 165 properties from Kwale District, 89 properties from Kilifi and Lamu Districts, and 77 properties located in Mombasa District.
7. Rank Transformation Regression (RTR) on all the 331 cases.

Through such analysis, it is hoped that one can exhaust all the relevant MRA procedures, and also, be able to compare the different results. Selection of the best predictive model can then be done with justification. Each output was analysed according to, but not necessarily following, the order of regression items of analysis described above.

Step 1: Correlation Analysis

The correlation printout indicated that 12 independent variables were positively correlated with the dependent variable, leaving only 5 variables with [illegible]

Table [illegible] [illegible] coefficients between [illegible] variables and the dependent [illegible]

Dependent variable: Value of property per acre			
Independent variable			Correlation coefficient
[illegible]	=	LOC	0.066
[illegible]	=	SIZE	0.568
[illegible]	=	[illegible]	-0.148
[illegible]	=	VIEW	0.100
[illegible]	=	AQUA	0.390
[illegible]	=	[illegible]	-0.034
[illegible]	=	[illegible]	0.251
[illegible]	=	[illegible]	-0.033
[illegible]	=	[illegible]	0.050
[illegible]	=	[illegible]	[illegible]
[illegible]	=	[illegible]	0.052
[illegible]	=	[illegible]TO	0.104
[illegible]	=	[illegible]	0.290
[illegible]	=	[illegible]	0.026
[illegible]	=	[illegible]	[illegible]
[illegible]	=	[illegible]	[illegible]
X_{17}	=	MOTV	0.032

Source: Data analysis by the author.

The strongest degree of correlation is between X_2 (size of property) and the dependent variable, value of property, at 0.568. This means that, many times a property is either to be sold or bought, prospective sellers and buyers would first consider its size. Other factors held constant, the bigger the size, the higher [illegible] price [illegible] likely to be. But this need not always be the case. The high correlation coefficient only means that there is a strong relationship. Sometimes, buyers can purchase even the smallest of properties as long as it is available on the waterfront. There are also many examples of large-sized properties which do not command higher prices.

Next in strength of relationship is the size of water frontage (AQUA), whose coefficient is 0.390. The variable with the weakest relationship with value is the season in which the property changed hands (-0.004). It would, therefore, appear that value of a plot may not be so much influenced by the time of the year when it is sold. The strongest negative correlation is between the dependent variable and ... i.e distance from the shoreline (DISH), whose coefficient is -0.148. This implies that the farther one moves from the shoreline, the lower the price obtainable for a waterfront plot.

It will be observed from the correlation printout that all the eight variables which have rather strong relationships with the dependent variable are site-oriented characteristics of property. These are SIZE, AQUA, AREA, BEACH, VIEW, DISH, SPORTS and TOPO. This implies that the value of waterfront properties is influenced more by the factors directly on those properties than by non site-oriented factors. However, there appears to be very weak relationships between the dependent variable and most of the independent variables. Out of the seventeen independent variables, only SIZE has a correlation coefficient of more than 0.5. This may imply that values of waterfront properties are influenced by a combination of many factors acting together.

However, the resultant correlation coefficients are contrary to those relationships obtained during interviews with people in the real estate market and their users. For example, those factors which were said to be of less relevance in influencing property value prior to the study turned out to be the more important from the correlation analysis. Furthermore, the theoretical expectations were that the distance from the water (X_1) was to have the strongest correlation with the dependent variable. But X3 (Dish) has a correlation coefficient of -0.148 only. Table 7.3 compares the ranking of the strength of correlation between those obtained during fieldwork (earlier referred to as factors influencing value of waterfront properties) and those obtained from MRA.

Table 7.3: Correlation ranks from fieldwork and from MRA

Ranking	Independent variables order from fieldwork	Independent variable order from MRA
1	Dish	Size
2	Sports	Aqua
3	Loc	Area
4	Fish	Beach
5	Tour	View
6	Climate*	Dish
7	Serv	Sports
8	Aces	Topo
9.	User	Tour
10	Topo	Town
11	Size	Access
12	Beach	Loc
13	Proxt	Fish
14	Beautiful scenery*	Proxt
15	Distance from end of tarmac	Dept
16	Dept	Motv
17	Town	Seas

* Are variables which were dropped from the case

studies

Source: Fieldwork and Multiple Regression Analysis

Between the variables themselves relationships are not uncommon. The highest level of collinearity was found between the availability of a beach (BEACH) and the width of the beach area (AREA) at 0.884. The others are between:

BEACH and AQUA at	0.652
BEACH and DISH at	-0.630
DISH and AREA at	-0.561
LOC and SPORTS at	0.494
LOC and FISH at	0.844
LOC and TOWN at	-0.601
LOC and TOUR at	0.716
AREA and AQUA at	0.509
TOUR and FISH at	0.632

The strong relationship between the type of beach and its width is hardly surprising; sandy beaches are quite wide as opposed to rocky and muddy beaches. It would appear that those plots with sandy beaches had wider beaches. Similarly, the strong correlation between AREA and DISH is understandable, the farther away a plot is located from the shoreline, in fact it bears no beach area at all. And some particular locations along the coastline are very popular for water sports e.g. Diani, Nyali, Shanzu, Kikambala, etc. while others do not offer water sports e.g. Kilifi north beach, Gazi, Vanga, etc. Some localities are rich in fish products while others are deficient, and this explains the strong correlation between FISH and LOC. Most of the preferred locations harvest large quantities of fish eg, Nyali, Shimoni and Watamu. Similarly, 'good' locations also attract large numbers of tourists, hence the strong degree of correlation between LOC and TOUR. The relatively strong negative correlation between LOC and TOWN confirms the fact that areas situated farther away from nearest major towns are likely to have inferior characteristics such as services and infrastructure.

However, some of the correlation coefficients between the independent variables are more of mathematical figures than practical realities. For instance, the strong positive correlation between BEACH and AQUA (0.652) tends to imply that the type of beach is dependent on the size of the water frontage, which in actual fact is not the case. And the strong negative correlation between BEACH and DISH (-0.630) is also not convincing. The availability of a beach is not a function of the distance from the shoreline, even if a plot is very near, that does not mean the plot will have a beach. What the given relationship indicates is the availability or non-availability of a beach, because plots far away from the first row do not have any beaches. The strong correlation between DISH and BEACH confirms Stewart's assertion that virtually any measure of correlation applied to relationships between the explanatory variables will take a value which is somewhat different from zero (1976:101).

Step 2: Using Conventional MRA on all the 331 study cases

This analysis was done to show results of all the factors influencing value when applied together in a block. After all the independent variables were entered, the results came out as follows:

Multiple R	=	0.700
R square	=	0.491
Adjusted R square	=	0.460
Standard error	=	9053115.4591
F	=	16.6139

A look at the R^2 values shows that 49.1% of the original variation from the dependent variable is explained; all variables are significant at less than 1 in 1000 chance. Since all variables were entered at the same time together, one of the ways to isolate those with the highest significance in influencing the dependent variable is through their respective beta weights. Using beta weights, the most important variables influencing value of property in descending order are: SIZE, AREA, FISH, TOUR, TOWN, SPORTS, SEAS, and VIEW. Table 7.4 shows the respective beta weights for each independent variable.

Table 7.4 Beta weights for all independent variables using CMRA

VARIABLE	BETA WEIGHT
SIZE	0.57501
AREA	0.16756
FISH	-0.14758
TOUR	0.14755
TOWN	-0.12375
SPORTS	0.12063
SEAS	-0.11693
VIEW	0.11675
LOC	0.10721
AQUA	0.09260
ACCESS	0.04414
TOPO	0.03273
TEACH	0.01791
DEPT	0.01307
PROXT	0.008642
DISH	-0.008509
MOTV	0.0029345

Source: Data analysis by the author.

The plot of standard residuals indicates that the data meets the linearity assumptions well.

**** PLOT OF RESIDUALS HERE****

Step 3: Forward Selection Regression on all 331 study cases

Using this technique, the results obtained were as follows;

Multiple R	=	0.68
R square	=	0.4624
Adjusted R square	=	0.454
Standard error	=	9114324.5407
F	=	55.55360

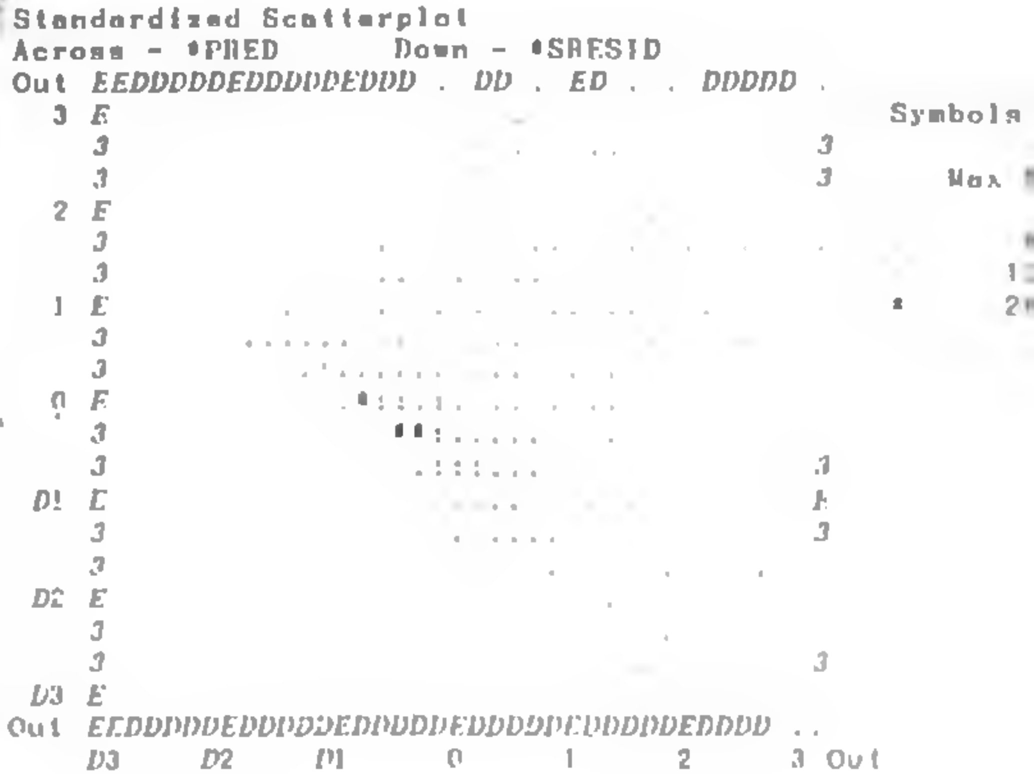


Fig. 7.2 Standardized scatter plot for CMRA

About 46% of the original variation from the dependent variable is explained by this method. After removing each incoming independent variable from the equation, the Forward Selection procedure considers the following five (5 no.) variables to be the most important ones in determining the value of waterfront property: SIZE, AREA, LOC, SPORTS and VIEW. The R square and adjusted R square are slightly lower than those obtained by CMRA. The lower R square obtained by Forward Selection Regression (0.4624) shows that the rest of the twelve (12 no.) variables which have been dropped account for only 0.0286 (2.86%) addition to the variation of the dependent variable.

A scatterplot of the standardized residuals indicates no violation of regression assumptions.****scatterplot here***

The advantage of Forward Selection Regression is that it appears to first rank the variables with the highest correlation with the dependent variable before entering them. The result is to have only those variables thought to be the most important in determining the dependent variable. The main drawback of the technique, however, is that it suggests that the other remaining independent variables are not important in predicting the dependent variable, which may not be true.

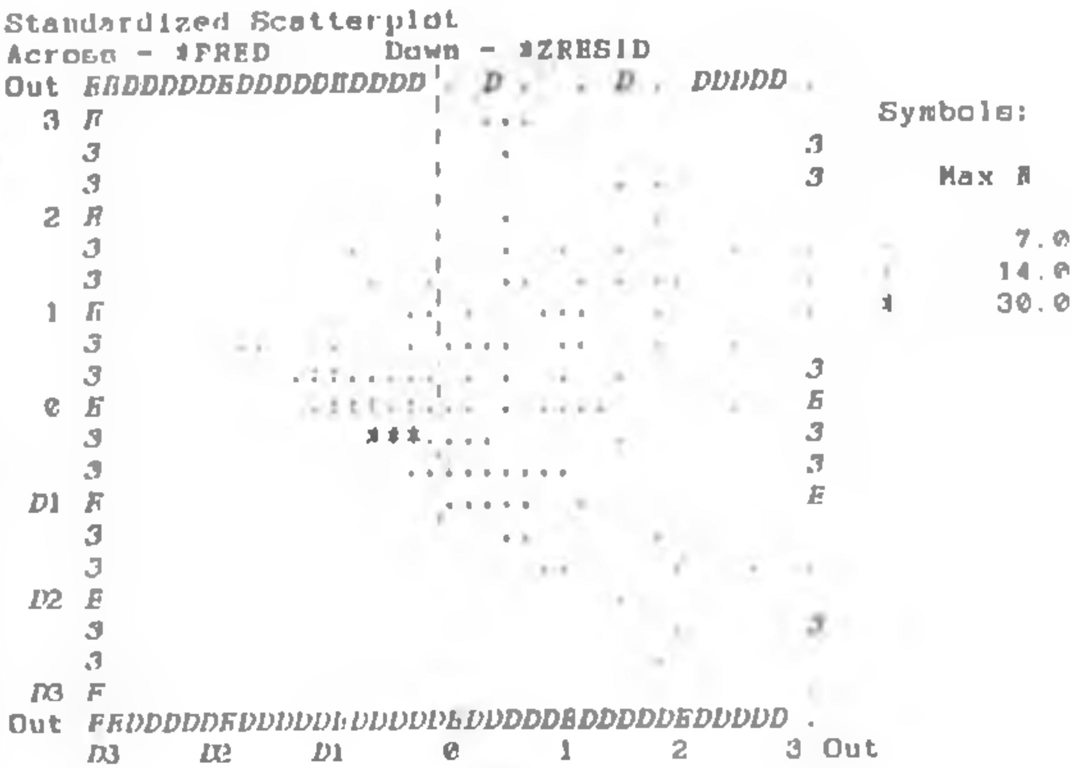


Fig. 7.3 Standardized scatter plot for FSR

Step 4 : Backward Elimination Regression on all 331 study cases

From the Backward Elimination analysis, the results obtained were:

Multiple R	=	0.68686
R square	=	0.47177
Adjusted R square	=	0.46193
Standard Error	=	9048177.5338
F	=	47.93

About 47% of the original variation from VALUE is now explained by this technique, which gives a slightly higher figure than that obtained by Forward Selection Regression. The variables in the resultant equation, which are the most important in predicting value are: SIZE, TOWN, VIEW, [illegible], TOUR and AREA. Subtracting the R square of 0.4717[illegible] from the CHPA figure of 0.491 leaves a difference of 0.019[illegible] ([illegible]), being the variation accounted for by the remainder eleven (11 no.) variables. A scatterplot of residuals is given below.

Step 5 : Stepwise Regression Analysis on all 331 study cases .

Using SRA, it was [illegible] that the results obtained by this procedure were the same as those obtained from forward selection regression. Similarly, the most important

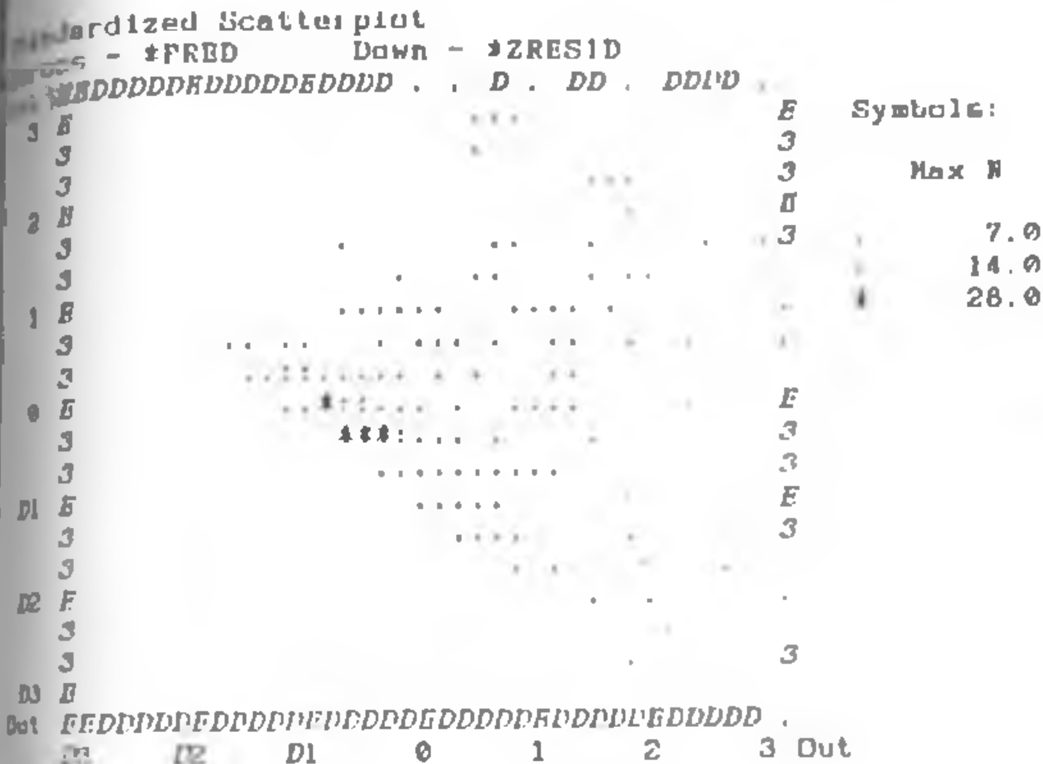


Fig. 7.4 Standardized scatter plot for BER

independent variables influencing value were SIZE, AREA, LOC, SPORTS and VIEW. The scatterplot of residuals is also the same.

Step 6 :Stepwise Regression on properties found in each district

Having found out that stepwise regression is a combination of the other two techniques, the same technique (i.e stepwise regression) was attempted on all properties found in each of the districts in the study area. It was felt that by analysing the entire 331 properties enmass, it would be tantamount to mixing different properties in similar markets, or mixing different markets altogether. To overcome this, and to see how the results would be, the properties under study were separated into their respective districts of locality. This would ensure that each district remained a separate market from the properties in the other districts. The rationale was that properties in Kwale District, for instance,would exhibit different market characteristics from the properties in Mombasa District, or those in Lamu District.

The separation of the properties according to districts found along the coastline of Kenya resulted in the following numbers:

77 cases were found in Mombasa District

89 cases were found in Kilifi and Lamu Districts, and

165 cases were found in Kwale District.

Note that Kilifi and Lamu properties were lumped together because these two districts exhibit the same market characteristics for waterfront properties. The table below shows results of the analysis described above.

Table 7:5 Stepwise Regression results per district in the study area.

District	Multiple R	R^2	Adjusted R^2	Variables in the equation
Mombasa	0.71951	0.51770	0.48373	AQUA,TOWN, SIZE,DEPT,TOPO
Kilifi	0.68476	0.46890	0.43651	SIZE,TOUR,VIEW, SEAS,DEPT
Kwale	0.73009	0.53303	0.51815	SIZE,SPORTS,AREA, VIEW,TOWN

Source: Data analysis by the author.

It can be seen that the stepwise regression for Kwale District produced an equation which accounted for 53.3%

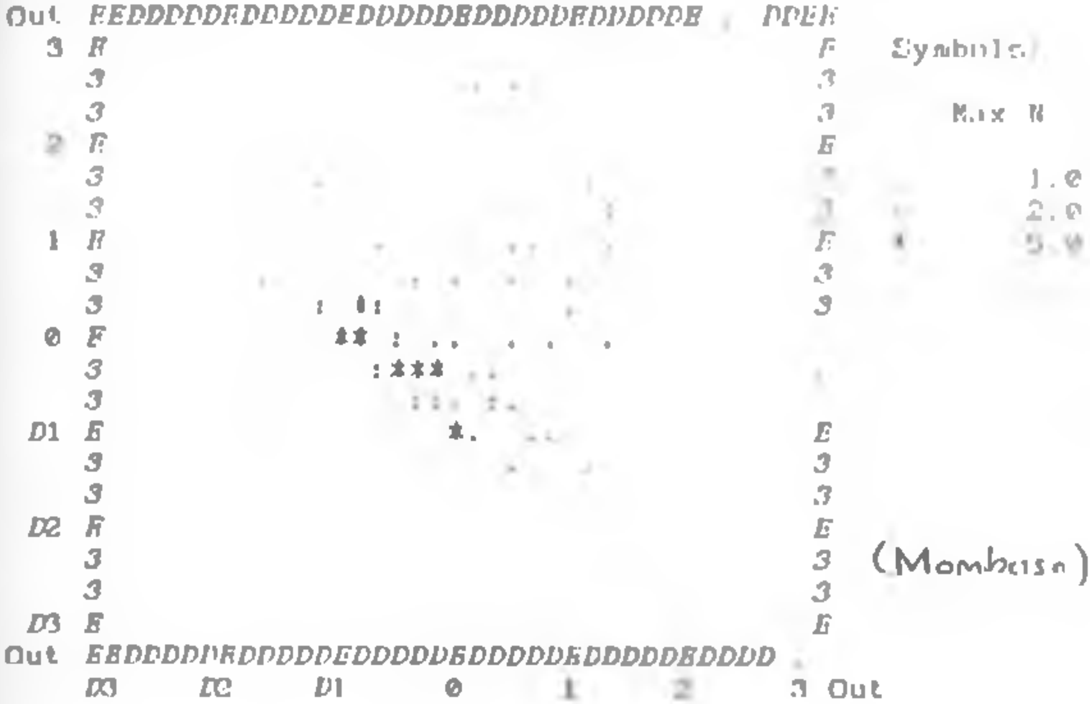
of the variation in waterfront sales, the highest R square obtained so far. Next is that of Mombasa District at 51.8%, and the last is Kilifi District with R square of 46.9%. In all the three zones, the variable SIZE was retained as one of the most important influencing variables, but the other constituent variables were different. Variables DEPT and VIEW appeared in two of the zones, an indication that they are also very significant determinants of value. Scatterplots of the standardized residuals for all the three districts are shown below.

One of the notable features in these three analyses is that variable LOC did not come out in any one of them as an important influencing variable. This is mainly because the separation of the zones was done in terms of localities, such that the LOC variable automatically lost its place. All the properties for each zone were considered to have the same locality features.

Step 7: Rank Transformation Regression on all the 331 study cases

After all the other regression procedures were applied on the collected information, Rank Transformation Regression (RTR) was also attempted on the same information. This technique was fairly described earlier in this Chapter. It will be recalled that its main difficulty is in the

Standardized Scatterplot   Selected Cases
Across - *PRED   Down - *ZRESID



(Mombasa)

(Kilifi)

(Kwale)

Fig 7.5 Standardized Scatterplots for all SRADs

way the ranking of the variables should be done.

As required by the method, the 331 study cases were ranked from smallest to largest in terms of the value of each property in Kenya shillings. There were 199 ranks, from the smallest (case no.71 with KShs.11,424) to the largest (case no. 52 with KShs 74,231,500). Quite a number of properties tied in their ranks, hence the resultant 199 ranks, instead of 331.

Ranking of independent variables, however, was not as straightforward as was with the cases. The overriding principle was to rank the variables in terms of their importance in influencing the dependent variable with as little subjectivity as possible. Many other similar works done previously have been unable to reduce the element of subjectivity in ranking independent variables, thereby leading to questionable valuations (See, for example, the reviews on the works of Wiltshaw, Salivin, and Fraser and Blackwell, amongst others earlier in this Chapter). The ranking of independent variables from the least important to the most important was done using four criteria namely :

1. ranks according to correlation coefficients of each independent variable with the dependent variable,
2. ranks according to the beta weights of each variable,

3. ranks according to the frequency of importance of each variable as it occurs in every regression method used i.e from CMRA to SRAD,
4. ranks according to the contribution of each variable to the R square change in every regression method used in the analysis.

For each variable, an average rank was obtained to represent that variable in the regression methods.
The ranks from the four criteria were totalled and averaged. The variable with the lowest average score was the highest in rank, while the one with the highest average score was the lowest in rank. Table 7.6 below shows how the final variable ranking was achieved.

TABLE 7.6: COMPUTATION OF VARIABLE RANKS

	VARIABLE	CORRELATION COEFFICIENT RANKS	BETA WEIGHT RANKS	FREQUENCY OF IMPORTANCE	R^2 CHANGE RANKS	SCORE	FINAL RANKING
1.	SIZE	1	1	1	1	1	1
2.	AREA	3	2	3	2	2.5	2
3.	TOWN	10	5	4	7	6.5	6
4.	TOUR	9	4	5	3	5.25	4
5.	SPORTS	7	6	3	4	5	3
6.	SEAS	17	7	6	8	9.5	9
7.	TOPO	8	12	7	11	9.5	9
8.	BEACH	4	13	8	14	9.75	10
9.	FISH	13	3	7	12	8.75	7
10.	MOTV	16	17	12	17	15.5	15
11.	ACCESS	11	11	9	13	11	11
12.	DEPT	15	14	6	10	11.25	12
13.	DISH	6	16	10	16	12	13
14.	PROXT	14	15	11	15	13.75	14
15.	AQUA	2	10	7	6	6.25	5
16.	VIEW	5	8	2	5	5	3
17.	LOC	12	9	6	9	9	8

From the table, it can be seen that there were 15 ranks for the variables, the lowest in rank being MOTV, and the highest being SIZE. Two variables, VIEW and SPORTS tied at rank 3, and SEAS and TOPO tied at rank 9.

After ranking both the 331 study cases and 17 independent variables, Conventional Multiple Regression Analysis (CMRA), FSR, BER and SRA were applied on the data to produce rank transformation regression results as follows:

TABLE 7.7: RESULTS:RANK TRANSFORMATION REGRESSION

REGRESSION MODEL	MULTIPLE R	R SQUARE	ADJUSTED R SQUARE	VARIABLES IN ORDER OF IMPORTANCE
CMRA	0.7155	0.51194	0.51168	SIZE, TOUR, AREA, SPORTS, VIEW, TOWN, FISH, LOC, ACCESS, SEAS, AQUA, MOTV, TOPO, BEACH, DEPT, etc.
SRA	0.71546	0.51188	0.51165	SIZE, FISH, LOC, SEAS, TOUR, SPORTS, AREA, VIEW, TOWN, BEACH, ACCESS, AQUA, TOPO, MOTV, DEPT.
BER	0.71546	0.51188	0.51165	SIZE, FISH, LOC, SEAS, TOUR, SPORTS, AREA, VIEW, TOWN, BEACH, ACCESS, AQUA, TOPO, MOTV, DEPT.
FSR	0.71546	0.51188	0.51165	SIZE, FISH, LOC, SEAS, TOUR, SPORTS, AREA, VIEW, TOWN, BEACH, ACCESS, AQUA, TOPO, MOTV, DEPT.

Below is the standardized plot for all the versions of RTR. Only one is shown because all the four versions produced the same scatter plot.

```
Standardized Scatterplot
Across - *PRED       Down - *ZRESID
Out  EEDDDDDEDDDDDEDDDDDEDDDDDE . DDEDDDDDEE
  3  E                 .                    E   Symbols:
     3                  .         .         3
     3                    ..                3      Max N
  2  E                                    . E
     3                          . .         3          319.0
     3          .         .  .  .           3   :      638.0
  1  E    .     ..    . .  .   .  . .       E   *     1277.0
     3      ...      ::  :.   . .      .
     3          :*::  .*.. . ..  .          :
  0  E         .*****.. :: .. .       .
     3           .***.*.. . ..   .          3
     3            :***:...                  3
 D1  E              .**.. . .               E
     3                 .::                  3
     3                    ..  .   .         3
 D2  E                        ..       .    E
     3                         .            3
     3                                      3
 D3  E                                 ..   E
Out  EEDDDDDEDDDDDEDDDDDEDDDDDEDDDDDEDD . EE
     D3    D2    D1     0     1     2     3 Out
```

Fig. 7.6 Standardized scatter plot for all the RTR versions.

In three of the four versions of RTR, two variables were dropped from the equations, namely DISH and PROXT. The exception was CMRA. In the earlier ranking, these two variables occupied two of the last three lowest ranks. The lowest RTR -ranked variable, MOTV, was still accepted as an integral part of the valuation equation. Two other variables, DISH and PROXT were eliminated from the equations, and were, therefore, not required for the valuations. This is hardly surprising, given that the two variables did not appear in any of the other regression models analysed earlier.

In terms of their predicting powers, all the four techniques of MIP produced the same R square, Multiple R and almost the same Adjusted R square. Despite prior ranking of the variables, the computer printout indicated that the emergent orders of importance of the independent variables did not remain the same as earlier done. Only [illegible] occupied its pre-rank position at the top of the pack, with TOUR and SPORTS featuring within the first six important variables in all the models. Variables AQUA and AREA, pre-ranked fifth and second respectively, did not feature amongst the first six techniques BER, SRA and FSR.

This chapter has discussed the factors responsible for values of waterfront properties, their analysis using various regression techniques, and their results. These results have exposed different aspects of waterfront properties, their influencing variables and their behaviour. The next chapter attempts to select the best possible regression model(s) which can be recommended for valuing waterfront property.

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CHAPTER EIGHT

SELECTING THE 'BEST' REGRESSION MODEL

INTRODUCTION

The main purpose of this study was to formulate a valuation model(s) which can be used to value waterfront property. The said model is expected to be realistic in its approach, better in predicting value, and one which can offer better reasoning behind waterfront property values than the prevailing methods.

The Process of Choosing the 'Best' Model

In order to choose the 'best' regression method out of all those which were tried in the previous chapter, comparative analysis of these models was done in terms of:

a) R square

b) Adjusted R square

These two can measure the predictive power of the regression equations. In reality, they are almost similar, and either of them can suffice.

c) Variables found in the resultant equations, mainly to determine which factors are the most useful in the Valuation.

d) R square change for each variable in the regression equations.

e) Beta weights for each variable in the regression equations.

These two indicators, R square change and beta weights, can be used to determine the relative importance of each of the variables in predicting the values of waterfront property. Each of these tests were explained in Chapter 7.

f) Mean Squared Error for each regression equation, which is defined as the mean of the squared difference between actual prices and estimated prices (Neter,1985:426). The formula is

$$MSE = \frac{SSE}{(r-1)c}$$

where: SSE is the sum of squared errors,

r is the number of observations, and

c is the number of columns in the variance analysis

Alternatively, the formula can be given as

$$MSE = \frac{SSE}{n-p}$$

where SSE is the sum of squared errors

p is the number of parameters

n is the number of observations.

The two formulae give the same result and, in any case, the MSE is always calculated automatically by the computer.

g) The C_p criterion or Mallow's C_p statistic, which is based on the normalised [illegible] total error of estimation. This is given by the formula

$$C_p = \frac{SSE}{S^2} + 2(k-1) - n$$

where S^2 is the sample estimator
k is the number of parameters
n is the number of observations (Milton and Arnold, 1986:428)

Alternatively, the formula may be written as

$$C_p = \frac{SSE_p}{MSE(X_1 \ldots X_{p-1})} [illegible]$$

where SSE_p is the error sum of squares for the fitted subset regression model with p parameters (i.e with p-1 predictor variables).

When the C_p values for all possible regression models (say, FTP, CHRA etc. in our case) are plotted against p, those models with very little bias will tend to fall near the line $C_p = p$ (Neter [illegible], 1985:426). Any model(s) with [illegible] will fall slightly higher above this line. In essence, therefore, the use of the C_p criterion seeks to identify subsets of x variables for which the C_p value is small, and for which the C_p value is near p. Accordingly, sets of x variables with small C_p values have a small total mean squared error, and when the C_p [illegible] also near p, the bias of the regression model is small (Neter, 1985:427).

These two criteria, C_p and MSE were used in this study to determine the 'best'model of prediction. The most ideal model for such purposes should have a small C_p value, a small MSE and a large R square. One of these two requirements may not be attained by the model, and in such a case, the valuer has to use his reasoning to choose the best predictive model. Indeed, Milton and Arnold have lamented that "Since it is almost too much to ask that one model have all of these properties, the experimenter must use his own judgement to select the model" (1986:429)

h) The coefficient of variation (CV), whose formula is given as $CV = \frac{S}{\bar{X}}$

where S is the standard deviation,

and X is the arithmetic mean, is a relative measure of dispersion as differentiated from the standard deviation.

In situations of having data with large magnitudes, like in this study, a relative measure such as the CV is necessary for comparison purposes. This coefficient is expressed in percentage terms. A lower CV (percentage) indicates that the prediction method used displays relatively less variation than a method having a higher CV value (Hamburg, 1983:44)

The main regression techniques in question are:

1. Conventional Multiple Regression Analysis (CMRA)
2. Forward Selection Regression (FSR)
3. Backward Elimination Regression (BER)
4. Stepwise Regression Analysis (SRA)
5. Stepwise Regression Analysis per District (SRAD)
6. Rank Transformation Regression (RTR)

A summary table showing all the regression models used in this study and the tests mentioned above is given below. We now have all the possible regression models which have been tested in this study, and we also have some of the relevant model-testing criteria applicable to the study cases. There were in total eleven (11 no.) different regression models against eight (8 no.) testing criteria. In order to obtain a fair judgement on the best predictive model to be used in waterfront valuation, the analysis was done in two ways: firstly, on the influencing variables, and secondly, on the predictive powers of the models.

TABLE 8.1: REGRESSION MODELS AND THE TESTS OF SIGNIFICANCE USED

METHOD	R^2	VARIABLES IN EQUATION	R^2 CHANGE	BETA WEIGHTS	MSE	C_p	CV
OMRA	0.491	SIZE	N/A	0.575	1361^{12}	-277	149%
		AREA		0.168			
		FISH		-0.148			
		TOUR		0.148			
		TOWN		-0.124			
		SPORTS		0.121			
		SEAS		0.117			
		VIEW		0.117			
		etc.					
FSR	0.462	SIZE	0.3246	0.608	4614^{12}	-302	102%
		AREA	0.0644	0.223			
		LOC	0.0474	0.137			
		SPORTS	0.0116	0.149			
		VIEW	0.0144	0.126			
SRA	"	"	"	"	"	"	104%
BER	0.472	SIZE	N/A	0.605	3924^{12}	-299.7	103%
		TOWN		-0.097			
		VIEW		0.129			
		SPORTS		0.139			
		TOUR		0.109			
		AREA		0.225			

METHOD	R^2	VARIABLES IN EQUATION	R^2 CHANGE	BETA WEIGHTS	MSE	C_p	CV
SRAD Kwale	0.533	SIZE	0.4137	0.622	2305^{12}	-310.5	99%
		SPORTS	0.0338	0.229			
		AREA	0.0523	0.219			
		VIEW	0.212	0.144			
		TOWN	0.0120	-0.119			
Mombasa	0.518	AQUA	0.3432	0.594	1607^{12}	-313	189%
		TOWN	0.0643	-0.313			
		SIZE	0.0396	0.320			
		DEPT	0.0320	0.240			
		TOPO	0.0386	0.205			
Kilifi	0.469	SIZE	0.2945	0.638	971^{12}	-315	130%
		TOUR	0.0778	0.230			
		VIEW	0.0363	0.186			
		SEAS	0.0309	-0.182			
		DEPT	0.0294	-0.174			
RTR OMRA	0.512	SIZE	0.3439	0.630	2097^{17}	2472.7	79%
		FISH	0.0039	-0.303			

METHOD	R^2	VARIABLES IN EQUATION	R^2 CHANGE	BETA WEIGHTS	MSE	C_p	CV
FSR	0.512	SEAS	0.0175	-0.161	2358[17]	2472.3	79%
		TOUR	0.0536	0.150			
BER	*	SPORTS	0.0173	0.120	*	*	*
		VIEW	0.0155	0.112			
		TOWN	0.0036	-0.091			
SRA	*	BEACH	0.0008	0.090	*	*	*
		AREA	0.0428	0.116			
		ACCESS	0.0035	etc.			
		AQUA	0.0020				
		MOTV	0.0008				
		DEPT	0.0006				
		TOPO	0.0009				

3) Analysis of Influencing Independent Variables

There were seventeen (17 no.) independent variables which were found to affect waterfront properties in the study area. These variables were combined in different ways in order to find out their influencing behaviours. One variable may be found to be important in one regression model, but in another model, the same variable may turn out be of less significance. Four (4 no.) criteria were used to gauge the importance of each variable in all the eleven regression models. In each model, all the variables were ranked in order of importance using the four criteria namely: correlation coefficient, beta weight, frequency of occurring as one of the most important variable in a model, and the R square charge. Ranking from all the models were averaged, and the same was done for each criteria. Appendix 3 shows how the calculations were done. These calculations were intended to reduce the amount of subjectivity in choosing influencing variables. The table below gives the average rank scores and hence the final ranking for each variable.

TABLE 8.2: OVERALL RANKING OF INDEPENDENT VARIABLES IN ORDER OF IMPORTANCE

VARIABLE NAME	CORR. COEF	BETA WEIGHT	FREQ. OF IMPORTANCE RANK	R^2 CHANGE RANK	AVERAGE SCORE	FINAL RANKING
SIZE	1	1	1	1	1	1
AREA	3	3	3	2	2.75	2
TOUR	9	3	5	2	4.75	3
VIEW	5	8	2	4	4.75	3
SPORTS	7	6	3	3	4.75	3
AQUA	2	9	7	7	6.25	4
TOWN	10	7	4	6	6.75	5
LOC	12	6	6	6	7.5	6
FISH	13	2	7	8	7.5	6
BEACH	4	10	8	11	8.25	7
SEAS	17	5	6	5	8.25	7
TOPO	8	11	7	9	8.75	8
ACCESS	11	9	9	9	9.5	9
DISH	6	14	10	13	10.75	10
DEPT	15	12	6	10	10.75	10
FRONT	14	14	11	13	13	11
MOTV	16	13	12	12	13.25	12

SOURCE: Data analysis by the author.

From this survey, the most important variable which influences values of waterfront lands is **SIZE** of the property. The larger the size or acreage, the higher the value. This factor came out first in all the tests of significance. The others, in order of importance are **AREA** (width of the beach area), **VIEW** (of the ocean waters from a particular property) and **TOUR** (volume of tourist trade in a locality). These two variables were of equal importance. They were followed by **AQUA** (size of water frontage), **TOWN** (distance from a major town), **LOC** (location) and **FISH** (value of fish and other marine animals in a locality) and so on. The least important variables were **DISH**, **PROXT** and **MOTV**. It is worth noting that **DISH**,(distance of a property from the shoreline) had been mentioned by many respondents as the most important factor affecting values of waterfront property.
It can be see that the most important variables are a combination of both site-oriented and non-site-oriented factors. This means that valuers have to survey and study both the particular property they are appraising, together with all the relevant accompanying factors in the locality, region or town.

b) Choosing the 'best' predictive regression model

Similar steps which were used to determine the most important variables were followed in selecting the 'best' model. There were eleven models tested in the study, three of which were used per locality. These were the stepwise regression analysis done in terms of the three districts, namely, SRAD,(Kwale), SRAD (Mombasa) and SRAD (Kilifi). Recommendations or other aspects on any of these models should apply to the other two.

Four other models were variations under the Rank Transformation Regression technique, variations of which were done in terms of conventional multiple regression, backward elimination regression, forward selection regression and stepwise regression analysis. Unlike with the first group of three models discussed earlier, each of the models under RTR can stand on its own ie, recommendations or analysis for one model need not be applicable to the others.

Against the eleven models, four criteria were used to choose the best amongst them. The aim was to reduce as much as possible any subjectivity in selecting the 'best' model. And the main reason for insisting on reducing subjectivity is that many valuers have tended to propose certain methods of valuation basically on personal judgements, in most cases without any scientific or objective backing. Care should be taken, however, to avoid situations where the valuer will be blindly forced to recommend a poor method simply because it has been proved 'good' scientifically. Indeed, some of the valuation methods proposed may be scientifically sound but practically weak and mainly of academic interest only. However, as much as we try to reduce subjectivity in valuation, we cannot completely do without it.

The field of valuation is one which entails personal study by the individual valuer to offer an assessment of the market forces and the resultant value. It is an area which does not necessarily limit the mind and abilities of the valuer to all sets of traditions and calculations. It is for such reasons that variations in property values done by two or more valuers are the rule rather than the exception. Indeed the valuer will always be required to operate in an atmosphere of uncertainty, to study the past behaviour of the property market and evaluate these behaviours in monetary terms. An open mind free from any pre-set conventions is necessary in such practices. To this, Bird adds:

> One would have thought that such a climate would induce and promote flexibility of thought and pliability of action. Contrary to that presumption, there is substantial adherence to dogmatism, the use of formulae and to functional practice.... Rarely if ever, is the validity of formulae or conventions put to question - more

often there is a stern defence of old traditions. How can an exercise in subjective judgement be performed by the use of objective criteria? (1974:110).

The four criteria used to select the best model(s) are the R Square (R^2), Mean Square Error (MSE), C_p criterion (C_p) and the Coefficient of Variation (CV). Common statistical knowledge asserts that, for instance, the model with the highest R^2, or one with the lowest CV, MSE or C_p should be taken to be the best of all. Given the number of models and the testing criteria, some models may score highly in some criteria and poorly in other criteria. While averaging the criteria may be ideal, a lot of caution has to be exercised so as to balance this scientific selection with reasonable valuer's judgement.

It is not possible to have a model which has all these criteria to its advantage. For example, the model with the highest R square is SRAD (KWL) ie stepwise regression analysis per district, for Kwale District. But the model with the lowest MSE is SRAD (KIL). Similarly, CMRA model has the smallest C_p criterion value, whereas the lowest coefficient of variation was scored by the RTR models. Table 8.3 below shows an average rank criteria analysis to determine, at least scientifically, the best regression model.

TABLE 8.3: SUMMARY OF SELECTION CRITERIA FOR THE ANALYSED MODELS

MODEL NAME	R SQUARE RANK	MSE RANK	CP VALUE RANK	CV RANK	AVERAGE SCORE	FINAL RANKING
CMRA	4	2	1	7	3.5	2
FSR	7	8	3	3	5.25	7
SRA	7	8	3	5	5.75	8
BER	5	7	2	4	4.5	5
SRAD (KML)	1	5	4	2	3	1
SRAD (MSA)	2	3	5	8	4.5	5
SRAD (KIL)	6	1	6	6	4.75	6
RTR (CMRA)	3	4	8	1	4	3
RTR (FSR)	3	6	7	1	4.25	4
RTR (SRA)	3	6	7	1	4.25	4
RTR (BER)	3	6	7	1	4.25	4

SOURCE: Data analysis by the author.

Using the ranking of the selection criteria from the above table, it can be seen that the 'best' model is SRAD(KWL) i.e Stepwise Regression Analysis for Kwale District, simply because of the lowest average rank it scored. The model has the highest R square and a very low coefficient of variation. Next in importance is CMRA i.e Conventional Multiple Regression Analysis as applied to all study cases. This model satisfies the criteria of having low levels of MSE and C_p values, despite it having a slightly lower R square and, obviously, a high coefficient of variation. The least important model, perhaps not the 'worst', is stepwise regression analysis as applied purely to all the 331 study cases. The next 'worst' model is forward selection regression (FSR) which, despite impressively low scores in C_p and CV tests, performed poorly as far as the other criteria are concerned.

Before analysing each model's strengths and weaknesses vis-a-vis the test criteria, it is worth to note an emerging pattern in the performance of the regression models. It can be seen from the table above that, apart from model SRAD(KWL), all those models which eliminated some of the 'less important' variables from their equations performed poorly. These models occupy the last four places in the hierarchy of performance. The models being referred to are BER, SRAD(MSA), SRAD(KIL), FSR and SRA. In contrast, all those models which, either did not eliminate any variable from their final equations, or they eliminated very few variables, performed very well. These models include all the RTR versions and CMRA. Each model was appraised individually to determine its usefulness in valuing waterfront property.

Model Rank 1: Stepwise Regression Analysis in terms of Kwale District (SRAD(KWL)

This model used stepwise regression analysis for Kwale District, one of the areas in the study area, to come up with only five variables required for waterfront property valuation. It has the highest R square (53.38) and a relatively low coefficient of variation (33%). However, this model cannot be recommended for use because of the following:

i) Its characteristics only apply to one district; when it is applied to the other regions, the results are no longer the same. If all the other district models produced similar results, we would recommend its use.

ii) It eliminates all except five variables, which are the only ones required to value waterfront property. This is unrealistic because value is a function of all the variables, however insignificant some of them may be.

One major advantage of this model, and indeed also for the other two district models (SRAD(USA) and SRAD(KIL), is that each locality is analysed separately as an identified sub-market. The reasoning behind this is that properties in one district or region need not necessarily exhibit the same characteristics as those properties found in another region. A valuer appraising property in three different locations, for example, would have to look for separate sets of information for each. This makes comparison of results very difficult.

Model Rank 2: Conventional Multiple Regression Analysis (CMRA)

This model is straightforward, simple and made use of all the variables in it. It had the lowest C_p criterion value and a low MSE value, and an R square of 49.1%, which was not far below the highest (53.3%). The model gave the factors influencing value in their order of importance, not throwing out any of them. Its main weakness is that it produced a relatively high coefficient of variation, and this could be due to the fact that the valuer had to gather a lot of information on each and every factor. Given those characteristics, the CMRA model could be recommended for use in valuing waterfront property

Model Rank 3: Rank Transformation Regression in terms of Conventional Multiple Regression Analysis (RTR(CMRA)

The model had a relatively high R square, a low MSE value and in fact the lowest C_p value. Like CMRA above, it is simple and straightforward, and considered all the variables influencing value in its analysis. The main weaknesses of this model, and all the other RTR models, is how to rank the factors in their order of importance before applying them in the valuation. Despite using scientific techniques of ranking eg. looking at the R^2 change for each variable, there is no guarantee that in each valuation, the valuer can eliminate subjectivity in ranking the variables. Apart from this demerit, the RTR (CMRA) model can be utilised in valuing waterfront lands.

Models Rank 4: All the other three RTR models

These models exhibited identical characteristics and results. They had the lowest coefficient of variation of 79% which means that their predicted values deviate the least from the observed values. They also have a relatively high R square. The main disadvantage of these models, as outlined in RTR (CMRA) above, is the problem of ranking the variables. The other demerit is the fact that the models dropped two independent variables which they did not consider to be important (PROXT and DISH) and this is against appraisal theory. Owing to these weaknesses, these methods may not be well suited to be used in appraising waterfront property.

Models Rank 5: Backward Elimination Regression (BER) and Stepwise Regression Analysis for Mombasa District (SRAD(MSA)

The two models had contrasting characteristics and it is only in their average rank scores where they were similar. BER drew its strength from having a very low C_p value (-299.7) while SRAD (MSA)'s main strong point was its relatively high R square of 51.8%. Both models suffer from the same problem of eliminating some "less important" variables. Together with the reasons against regionally- based valuation methods, these two models may not be very useful in valuing waterfront lands.

Model Rank 6: Stepwise Regression for Kilifi District, Model Rank 7: Forward Selection Regression, and Model Rank 8: Stepwise Regression Analysis

All these models carry the same weaknesses and strengths already outlined for their respective associated models. These models, therefore, stand little chance of being useful in the valuation of waterfront property.

Out of all the eleven models, only two of them stood out to be useful, namely: Conventional Multiple Regression Analysis (CMRA) and Rank Transformation Regression applying conventional multiple regression analysis (RTR(CMRA). Both models ranked the variables either

before (for RTR(CMRA) or during the appraisal (for CMRA). Both models satisfied regression criteria: they selected critical value indicators for the specific property type in an area; they assigned weights or relative importance to each of the variables; and the equations they produced from comparable property can be used to calculate the value of other property, both sold and unsold (Cronan, Epley and Perry, 1986:21).
Regression analysis theory suggests that the 'best' regression model to be used in prediction should have a high or large R square, a small C_p value, a small MSE value and the lowest C.V value (See, for instance, the works of Milton and Arnold, 1986; Fraser and Blackwell, 1988; and Cronan, Epley and Perry, 1986).

The three authors, Cronan, Epley and Perry used MSE and R square as the main determinants of the 'best' model. Using this for the two models in our study, it was found that model CMRA had a slightly lower R square (49.1%) than RTR (CMRA), but CMRA had a much smaller MSE value (1361) than the other model (2097). In this respect, therefore, CMRA seems to have an edge over RTR (CMRA).

The R square of 49.1% obtained by CMRA may appear rather low, but the results do not mean that the analysis is improper. In traditional regression analysis, most explanations of causation between independent and dependent variables range from 80 to 98 or 99% or thereabouts (Syagga, 1985; Brown, 1974; Schott and White, 1977, etc). Many of the researches that achieve 90% explanations and above rely on smaller sample sizes and may have one or no dummy variables. In this study, the sample size was moderately large (331 observations) and there were four dummy variables out of a total of 17 independent variables.

Fraser and Blackwell (1988:197) relied on the coefficient of determination (COD) to determine the 'best' model, and in principle, a low COD results into a low MSE. Using this decision rule in our case, CMRA had a lower MSE value than PTR (CMRA). The other two researchers, Milton and Arnold, advocated that the best model ought to have a small MSE value, a small C_p value and a large R square, "... but if forced to rate them in order of importance, we would rely on ... C_p and MSE in that order" (1986:429). Applying their rule to the two models, it can be seen that CMRA maintained an edge over RTR (CMRA), with lower values of both C_p and MSE criteria. In addition, there were the problems of ranking variables in model RTR (CMRA) because few criteria exist for the valuer to use in ranking them. Then there is the issue of omitting some less important variables from its final equation. These attributes make CMRA a better method of prediction than RTR (CMRA) and is, therefore, recommended as the 'best' model from this study, which can be used in valuing waterfront properties.

A look at the order of importance of the independent variables in CMRA shows that this order was not very different from the one obtained in the final ranking of the variables, as shown below.

Table 8.4: Comparison of variable ranks between CMRA and all the other methods.

CMRA Variable Ranking		Overall (all methods) Variable Ranking	
1.	SIZE	1.	SIZE
2.	AREA	2.	AREA
3.	FISH	3.	VIEW, SPORTS, TOUR
4.	TOUR	4.	AQUA
5.	TOWN	5.	TOWN
6.	SPORTS	6.	FISH, LOC
7.	SEAS	7.	SEAS, BEACH
8.	VIEW	8.	TOPO
9.	LOC	9.	ACCESS
10.	AQUA	10.	DEPT, DISH
11.	ACCESS	11.	PROXT
12.	TOPO	12.	MOTV
13.	BEACH		
14.	DEPT		
15.	PROXT		
16.	DISH		
17.	MOTV		

Source: Data analysis by the author.

If we were to take rank 6 to constitute the top important variables, we will find that all the first six variables in CMRA are also there in the first six in the overall ranking. Similarly, the last six variables in importance in the CMRA model are also contained in the last six ranks in the overall ranking. This shows that model CMRA is consistent with the scientific ranking of the variables, without having to disregard any of the variables. Given that the sophistication of a method does not guarantee effectiveness, and the fact that the simpler the method, the better it is to implement, there are enough reasons to justify the recommendation of CMRA. Berenson and Levine (1986:770) have emphasized the application of the principle of parsimony in such situations as the one obtainable in this study, that "... where two or more models appear to adequately fit the data, then a ... method for model selection is based on the principle of parsimony ie the researcher should select the simplest model that gets the job done adequately".

The equation for the CMRA model is:

$$Y = -9,071,922.6 + 76618.4X + 12.9X + 3,529,480X_3 + 847308.2X - 2003.8X_1 - 2,945,826.3X + 1018574.9X - 9425.8X + 4,225,138.7X_1 + 132.3X + 3,031,509X + 70,456.6X - 76,096.7X + 14,920.4X - 0.09842X + 0.897X + 445,716.2X_2.$$

The next chapter will summarise the findings of this study, conclude on the most important aspects of the findings and give appropriate recommendations.

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CHAPTER NINE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

At the onset of this study it was the objective of the study:

i) to evaluate the present methods used in valuing waterfront properties along the Kenyan coastline

ii) to propose better and alternative methods, or better tools in the methods used in the valuation of waterfront properties.

Against this background was the hypothesis that the prevailing methods used in the valuation of waterfront properties were inadequate and inappropriate, thereby causing extreme values or prices of the said properties.

It was further asserted that once the values and potentialities of the waterfront properties could be estimated with precision, their subsequent exploitation and development would be more rational. Proper methods of valuation were, therefore, considered to be the prerequisites holding down the future of the largely unexploited coastal resources. The tourism sector, on which most of the coastline people rely on for their livelihood would be enhanced to the benefit of both the local people and the national economy.

Findings

The findings, conclusions and reccommendations of this study can be approached in two dimensions:-

a) according to the nature of waterfront properties and

b) in terms of the methods of valuation, which is the more important aspect for the purposes of this study.

This categorization is essential because valuation involves properties any way, and concentrating on the methods alone would be likened to the farmer who is only interested in the fruit but not the parent tree.

(a) i) Waterfront properties in the coastline of Kenya are used for various types of land uses ranging from residences to vacant plots. A large section of the coastline is in some places underdeveloped or undeveloped. There are also other associated resources both intangibles and tangibles e.g. marine life, minerals, building materials etc.

ii) The tourist industry is a major user of the waterfront lands along the Kenyan coastline. As the tourist industry expands, more areas are drawn towards it and this has cumulative effect on other nearby properties. The expansion of tourism has seen more utilization of waterfront lands in the Lamu archipelago, Watamu Bay, Kikambala area, Diani, Galu Kinondo, Msambweni and Shimoni areas.

iii) Majority of the coastal properties are owned by people who are not indigenous to the area; either absentee landlords, Europeans or upcountry Kenyans. The partial participation of the indigenous coastal people in the waterfront real estate market is due to the long history of occupation by Portuguese, Arabs and the colonialists, who, especially the Arabs, forced the local people away from the coastline. It is also because of the poor levels of incomes that the people have, poor community organization and lack of leadership. Some of these reasons have led many local people to sell their waterfront lands at throw away prices.

iv) Although the waterfront real estate market has been there for a long time, and is very active, there are no specialized agents in the business. Thus waterfront lands are traded alongside non-waterfront lands by a variety of businessmen and agents.

v) The low and high seasons of tourism trade have a major direct effect only on the rental of developed properties along the water front. Depending on the season in question, rental units will be affected most, with owners having to resort to "special offers" or "local resident rates" during the low tourist seasons. The high season lasts from January to March, with a second one from August to December. Real estate values are indirectly affected, most property are purchased on the hope of preparing developments for the next high tourist season.

vi) In general, all along the coastline, prices and values of waterfront lands have been rising steadily over the years. The greatest increase occurred after 1986 when an increase in the number of tourists visiting the area swelled

(b) In terms of the methods of valuing waterfront properties, there are a number of notable findings.

i) It was found that the most prevalent method used in valuing waterfront properties in the study area is the Market or Comparison method. This method is used irrespective of the factors or variables which are thought to be important in determining the values of waterfront properties. The method is so much entrenched in the minds and practices of the people involved in the waterfront property market that mentioning another alternative method meets with outright disbelief. As a result, some waterfront properties are sold "on the table", so long as the seller or agent knows the prevailing market values in the areas in which the properties are located. Similarly, valuations are carried out "in the office", the only instrument used being [illegible] market price guidelines, a topographical or cadastral map of the area concerned and the name of the owner.

(i) Although the Market or Comparison Method was found to be the one mostly used in the study area, it would only consider the importance of the influencing variables in extreme cases, i.e. properties which exhibited peculiar characteristics. For example, properties located in swampy marshlands with mangrove trees, properties located on or very near the harbours or ports and a few properties which happened to have limestone quarries within them. In such instances, a lot of consideration would [illegible] before the

Comparison Method is finally used. In essence, therefore, there is a small degree of accounting for the final value, but this degree is very small, compared to the number of transactions which take place.

iii) The other methods of valuation generally in use were found to be alien in the study area. The Income Approach, for instance, and the Cost or Contractor's Method were rarely applied in the waterfront valuations. They would only be applied in developed properties, [illegible] when [illegible] properties were changing hands, or if they have to be redeveloped, extended or renovated. Sometimes the methods would be used for book purposes, and even then, some aspects of the Comparison Method would always come into play. In rare cases, the Income and Cost Approaches would be used in valuing vacant waterfront properties where such properties have already identified their highest and best uses, perhaps with all the future and expected levels of incomes and profits.

iv) Speculation [illegible] the study area plays a key role in determining the values of waterfront properties. Quite a large number of properties are bought and then deliberately left vacant, waiting to be resold once the prices go up. Fortunately, the "waiting" is normally very short, perhaps a year or two or at most, three. But the rise in prices is so high within such short times that one cannot comprehend it in valuation terms.

v) There are some attributes of waterfront properties, and within their markets, which are very difficult to quantify, although the participants in the market agree that these attributes are essential in the valuations. Attributes such as scenic view, and beauty, future or highest and best use, quality of the land and water, actual locations, the ocean climate and its daily changes, speculation, smell of the marine waters and their sands, and the influence of tides and waves are examples.

vi) The valuation of waterfront properties is influenced by both site-oriented characteristics i.e. those directly found on the particular property, e.g. size of the property, view, location, availability of beach, and non-site-oriented characteristics. The weakness with most of the regression models used in this study, and that of the prevailing Market or Comparison Method is the strict adherence to valuing using only site-characteristics. Although non-site characteristics are difficult to identify and measure, they are absolutely necessary in relating the value of the property to the market.

vii) Contrary to the pre-study beliefs of the researcher and the traditional knowledge of sellers and agents in waterfront property transactions, some of the variables have very little to do with the values of waterfront properties. Variable X_1 (DISH), the distance of a property from the shoreline, for example, had one of the lowest relationship with the dependent variable. The only variables which lived upto the pre-study expectations of being very significant in influencing the final values are variables SIZE, LOC and FISH.

viii) The best multiple regression analysis "final" model i.e Conventional Multiple Regression Analysis, would only account for 49.1% of the original variation in the values of waterfront properties per acre. That means, using this model for predicting or valuing a property, we would be able to determine with certainty only 49.1% of the true value of that property. The rest of the 50.9% is not accounted for by this "final" model. Reasons have been given to support such a range of prediction as being satisfactory. The regression analysis could not take account of some of the most important influencing variables, such as speculation and scenic beauty, which are difficult to quantify.

ix) The most important variable in determining the value of waterfront properties is SIZE of the property(X[illegible]). This variable was found to be the most important in all the models. The other most important variables to be considered in waterfront valuations in descending order are AREA (X[illegible]), VIEW (X[illegible]), SPORTS (X[illegible]), TOUR (X[illegible]), etc. AQUA (X[illegible] TOWN(X14), FISH (X11) and LOC (X1). The least important variables, which , however, should not be ignored are MOTV (X17), PROXT (X8), DISH (X3) and DEPT (X6).

x) Rank Transformation Regression, despite its justifiable appeal of ranking variables before valuing the property, was found to be wanting in the manner of ranking the variables. A lot of supporting data is required to enable the valuer to rank property- influencing variables each time he is required to value a property. Such data may either be unavailable, or may be expensive to assemble. Subjectivity on the part of the valuer is, therefore, difficult to check using Rank Transformation Regression.

Conclusions: Waterfront Properties

i) The waterfront property market is not coordinated with the tourism industry such that the use, exchange and conservation of the properties and resources in the coastal area are poorly executed.

ii) Local and indigenous people who stay along the coastline are branded squatters on land they have lived on for centuries. Their only hope of clinging to these lands is the central government. The lack of organization, awareness, low incomes, poor leadership and a distaste of the cooperative movement in buying these coastline lands are responsible for the present predicament.

iii) Many dealers in real property do not find it profitable to specialise in waterfront properties in the coast of Kenya. It is concluded here that there are potential fortunes to be reaped from specialising in waterfront properties. The risk element should be overcome by the large number of water front lands which change hands everyday.

iv) The prices and values of waterfront lands are largely determined by market forces, although the market considers factors such as availability of views to the ocean waters, type of beach, the location and amount of infrastructure and services provided in that area, or on the particular property. Rarely do sellers, buyers or agents consider the whole array of factors which were advanced in the study.

v) Except for very few areas along the coastline, the larger parts of the coastline are not polluted with dirty or waste materials. There are some beaches which appear polluted during low tides, but they are cleaned up by the next tide. The wastes that are brought to the beach in such instances are a normal feature on the beaches, and their disappearance later in the day is similarly normal. Such areas include Lamu and Kiamboni, the Malindi Beach, South coast beaches and parts of Mombasa Island. The only polluted waters are those off Kipevu on the Mombasa west coast, which was polluted by the infamous July 87 oil spill in the port of Kilindini

<u>Conclusions: Methods of Valuation</u>

i) The 'best' final multiple regression method in our analysis accounted for 49.1% of the original variation of the dependent variable. Such a moderate power of model prediction is quite satisfactory considering that most of the computations were done scientifically, and hence reduced the subjectivity of the values. This proves that Conventional Multiple Regression Analysis is "..the most useful statistical technique available to the valuer" and that "its results are capable of being tested to establish a level of reliability or confidence " unmatched by any other technique (Cooper,1984:86). Multiple regression analysis, according to Smith, provides the appraiser with the ability to test the real estate market objectively; to determine which variables or factors are influencing prices paid for the comparable sales collected, and how much weight to place on each (1979:248). The function of valuation is to analyse property and be able to advise on the best or highest value of that property. It has become clear to valuers that most clients are not really asking for a value estimate in a valuation report. Rather, they are requesting market research, analysis and documentation to support the price they have negotiated for, or the capital expenditure they have planned for. The idea is not just for the valuer to offer a mathematical figure of price. Conventional multiple regression analysis, as used in this study, provided all these ingredients.

ii) Ranking of variables in valuation may produce better results using statistical regression methods. But in addition to being tedious, subjective and arbitrary to valuers, ranking of variables during valuations is, perhaps, unnecessary, and difficult to impress on clients whose purpose is to be shown a figure of value and the reasons behind it. And variable ranking has the tendency to introduce bias in property analysis, which is suicidal in any valuation job. Analysis is an attempt to find out what factors were responsible for the market values realised in past transactions. Although analysis cannot prove with precision what happened in the past, it can be used, with proper records and mathematical analysis, to give reasonably accurate estimates of today's market values. By attempting ranks on all the influencing variables, the valuer creates a new problem where none existed.

iii) All the stepwise regression analysis models were found to be defective, especially in respect of excluding the less important variables. While it is theoretically possible to break down the causal factors of a property, seldom does the market impute values to each component separately. And although sellers or buyers would consider some factors in their pricing, they finally suggest a value which considers all the factors together. Furthermore, those components which appear less significant in the final build-up of property value may be left out, so that only the very important causal factors are presented. In reality, the property is located on one place and all these factors have some bearing on it. Lack of consideration of any one of them, however small its contribution to the final value, implies that the valuer only measures a portion of the real value of the property. In addition, one variable may be found to be insignificant in the valuation of one property but it may be important in other properties.

iv) In the valuation of waterfront properties no single factors solely responsible for property values; the process has to combine a number of other factors to arrive at a consensus to be included in the valuation method. The only variable found to be of the highest contribution to values of waterfront properties in the study area is SIZE. However, it should not be taken for granted that all previously known important variables will feature in the same magnitude in every valuation.

According to findings from the study area, the use of the Market Comparison Approach has something to do with undervaluation and overvaluation of waterfront properties, hence the corresponding under-utilization or underdevelopment of large parts of the coastline properties. It is the method which is mostly used in the area, and it appears that the method does not properly take into account some important factors in the valuation of waterfront lands. What became evident is that similar properties in similar locations had extreme values using the ordinary Market Approach, e.g. Kshs 1,537,879/= between case Nos.47 and 58, and Kshs.1,683,33[illegible]/= between case Nos.202 and 233. The proposed method, Conventional Multiple Regression Analysis (CMRA), in addition to being analytically a better alternative, has a higher potential of reducing the extremities in values. This is proved by the fact that a lot of scientific reasoning and calculations were used in the method's build-up. Instead of relying solely on comparables, CMRA attempts to value a property using comparables, site-oriented characteristics and non site-oriented characteristics. This objective approach has a higher probability of attaining better and more realistic values than those obtained by the Market Approach. The study hypothesis has in effect been partly proved right. It is the conclusion of this study that the larger blame (for the under- and over-valuation of properties) lies with the method of valuation employed i.e the Market Comparison Approach. Other factors responsible for the extremities in values of similar property in the study area included the presence of difficult-to-measure variables, such as scenic beauty, intensity of use of the property, type of beach, speculation etc.

vi) Although Conventional Multiple Regression Analysis has been seen to be a good alternative to the

Comparison Method, the former cannot completely function without employing some form of comparison in some of its steps. This shows that the Comparison Method still provides the basis for the application of any other methods of valuation. In whatever situation, a comparison of one aspect of the property being valued must be made with a similar aspect of an already valued property. While the CMRA method provides the scientific analysis of the property variables, the Comparison Method provides the basis of market value. The combination ought to reduce the over-reliance on the ordinary Comparable Method, in which, unfortunately, many valuers use the results of the analysis of past transactions almost religiously as an indication of future value. Over-strict worship of the Comparable Method per se results in inadequate attention being paid to the fact that investors, buyers and clients have different tastes and purposes for their valuations.

Recommendations

The findings of this study and the ensuing conclusions have offered a number of issues for thought. From these, there are a few recommendations which can be made.

i) The 'best' multiple stepwise regression methodology proposed in this study (CMRA) has been conducted through the use of the modern computer. However, valuers should continue to have the final say in the method of valuation and the resultant value of the property. As Lambert says, valuers will never be replaced by the computer because "the more things change the more they remain the same, (because) although there have been many changes in the valuation profession (including new methods) the analysis will still remain with the (human) valuer" (1988:28).

The tools used in valuation may change, but the format of the analysis and the interpretation of the values should traditionally be the work of the valuer. Valuers are suppliers of a service and they must supply what is required in the market, otherwise they will be forced out of their business by those who can offer the market requirements.

ii) CMRA should be used in the valuation of property, especially because it can scientifically measure and analyse factors affecting property value, and can rank these factors in their order of importance. This is essential when the valuer wants to attach some significance to a particular variable. Instead of the valuer ranking the important variables, the valuation method ought to do that on its own. CMRA may be particularly useful when valuing properties whose attributes are easily quantifiable and measurable.

iii) Perhaps the biggest problem with many valuations is not the equipment employed, the method of valuation used or the way the method is used, but the way the results are reported. Admittedly, most valuation reports do not answer why the value is as given, what the current market trends are, and other relevant information. In addition, few give reasons for their recommendation apart from many being far from investigative. Many clients require valuation reports which contain the information which will help them to make sound and rational business decisions.

It is recommended that all valuation reports, not only those of waterfront properties, should devote more focus on the analysis of the market, the reasons for the current situation and the possible information useful to clients. Most valuation reports are short of reasoning, although they are lengthy "with a great amount of material which may be collected by clerks, (contain) no valuation information and just have a three or four line statement of value" (Millington, 1988:50).

Valuers should explain as much of the market and circumstances leading to their values as possible. They should remember that the valuer does not make the market, but researches and investigates market activity and then translates market thinking in the valuation analysis of a report. Valuers must, therefore, use techniques known to market participants, and not techniques used only by valuers. After all, as Beckett says "appraisers are not market participants; they are more like commentators. They report market attitudes and behaviour; they do not create them" (1988:52).

Areas for Further Research

1. A methodology for ranking variables in their order of importance in affecting value of property, without a high degree of subjectivity.
2. A scientific and quantifiable way of measuring the 'location' factor in valuation, to be used in regression valuation techniques.
3. Application of the Income or Investment Method of valuation to vacant waterfront lands, with all the possibilities of most probable uses and alternative uses.
4. The application of Factor Analysis in valuing waterfront lands.

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APPENDIX 1: A List of the 331 Study Cases

Case No.	Location	Year	Case No.	Location	Year
1	Msambweni	1989	51	Tiwi	1990
2	"	1985	52	Shanzu	1985
3	Tiwi	1987	53	"	1989
4	Pungu Fuel	"	54	Nyali	1988
5	Diani	1988	55	Bamburi	1989
6	"	1989	56	"	1987
7	"	1988	57	Nyali	1988
8	Tiwi	1986	58	"	"
9	"	1987	59	Bamburi	1987
10	Diani	1986	60	Diani	1989
11	"	"	61	Galu Kinondo	1989
12	"	"	62	"	"
13	"	1985	63	"	1988
14	"	1986	64	"	1989
15	"	1988	65	"	"
16	Mtondia	1990	66	"	1988
17	Shelly Beach	1988	67	"	1989
18	Diani	1987	68	"	1990
19	Galu Kinondo	1989	69	"	1989
20	"	1988	70	Funzi Island	"
21	Diani	"	71		1990
22	Galu Kinondo	"	72	Diani	1989
23	Diani	"	73	"	"
24	"	"	74	"	1987
25	Galu Kinondo	1987	75	"	"
26	Diani	"	76	"	1986
27	Galu Kinondo	1988	77	"	"
28	"	1986	78	"	1987
29	"	"	79	"	1988
30	"	1988	80	"	1986
31	Diani	1990	81	Galu Kinondo	1987
32	Shanzu	"	82	"	"
33	Galu Kinondo	1986	83	"	"
34	Tiwi	1989	84	Diani	1988
35	Watamu A	1990	85	"	1989
36	Bamburi	1990	86	"	1988
37	Malindi	1987	87	Tiwi	1990
38	Galu Kinondo	1989	88	Kikambala	"
39	Shimoni	1985	89	Watamu B	-
40	Diani	1987	90	Shanzu	"
41	Tiwi	1986	91	Yungi Island	"
42	Diani	"	92	Watamu B	"
43	Nyali	1987	93	"	"
44	"	1986	94	Shelly Beach	"
45	"	1987	95	Watamu B	"
46	Shanzu	1989	96	Shanzu	"
47	Nyali	1988	97	Diani	"
48	"	"	98	Watamu A	"
49	Kijipwa	1989	99	Tiwi	"
50	Galu Kinondo	1988	100	Msambweni	"

Case No.	Location	Year	Case No.	Location	Year
101	Galu Kinondo	1990	152	Galu Kinondo	1989
102	Diani	"	153	Diani	"
103	Kanamai	"	154	"	"
104	"	"	155	Tiwi	1990
105	Kikambala	"	156	"	1989
106	Mtwapa	"	157	Waa	1990
107	Galu Kinondo	1989	158	Kikambala	"
108	Kikambala	"	159	"	"
109	Shanzu	"	160	Nyali	"
110	Watamu A	"	161	Kibambamahe	"
111	Bamburi	"	162	Malindi	"
112	Diani	"	163	Shanzu	"
113	"	"	164	Kijipwa	"
114	"	1990	165	Shanzu	"
115	Shanzu	1989	166	Galu Kinondo	"
116	Mtwapa	1987	167	Gazi	"
117	Kikambala	"	168	Kikambala	1988
118	"	"	169	Tezo-Roka	"
119	Diani	"	170	Galu Kinondo	"
120	Tiwi	"	171	"	"
121	Nyali	1985	172	Shanzu	"
122	Diani	"	173	Kilifi	"
123	Mikindani	"	174	Nyali	"
124	Mtwapa	"	175	Kikambala	"
125	Malindi	"	176	Shimoni	1990
126	Tiwi	"	177	Gazi	"
127	"	1986	178	Diani	1989
128	Mombasa	"	179	"	1990
129	Mtondia	"	180	Tiwi	"
130	Galu Kinondo	"	181	Kikambala	"
131	Diani	"	182	Galu Kinondo	"
132	Watamu	"	183	Msambweni	"
133	Mtwapa	"	184	Kikambala	"
134	Shimoni	"	185	Waa	"
135	Kijipwa	1989	186	Diani	"
136	Malindi	"	187	Galu Kinondo	"
137	Kikambala	1990	188	"	"
138	Shelly Beach	"	189	Kikambala	1990
139	Nyali	"	190	Galu Kinondo	"
140	"	"	191	Wasini Island	"
141	Kilifi Town	"	192	Funzi Island	1989
142	Kikambala	"	193	Nyali	"
143	Diani	"	194	"	"
144	Tudor Creek	"	195	Kikambala	"
145	Diani	1989	196	Mtwapa	"
146	Galu Kinondo	1986	197	"	"
147	Nyali	1989	198	"	"
148	Galu Kinondo	1985	199	Wasini Island	"
149	"	1989	200	Diani	"
150	Msambweni	1986	201	Kikambala	1989
151	Galu Kinondo	1989	202	Kanamai	"

Case No.	Location	Year	Case No.	Location	Year
203	Galu Kinondo	1989	254	Kilifi	1988
204	Kikambala	"	255	Wasini Island	"
205	Port Reitz	"	256	Kikambala	"
206	Shelly Beach	"	257	Wasini Island	"
207	Nyali	"	258	Galu Kinondo	"
208	Lamu	"	259	Funzi Island	"
209	"	"	260	Tiwi	"
210	Nyali	"	261	Nyali	"
211	Kikambala	"	262	Diani	"
212	Funzi Island	"	263	Galu Kinondo	1990
213	Shimoni	"	264	"	1985
214	Funzi	"	265	"	"
215	"	"	266	Tiwi	1990
216	Waa	"	267	Galu Kinondo	"
217	Tudor	"	268	Kikambala	"
218	Watamu B	"	269	Galu Kinondo	1989
219	Yungi Island	"	270	Tiwi	1990
220	Malindi	"	271	Nyali	"
221	Wasini Island	1989	272	Diani	"
222	Shimoni	"	273	Kilifi	"
223	Mishomoroni	"	274	Shelly Beach	"
224	Malindi	"	275	Kilifi	1987
225	Pungu Fuel	"	276	"	"
226	Bamburi	"	277	Shelly Beach	1985
227	Galu Kinondo	"	278	Nyali	1990
228	English Point	"	279	Mikindani	1985
229	Nyali	"	280	Msambweni	1989
230	Watamu B	"	281	Shelly Beach	1989
231	Diani	"	282	Kilifi North	"
232	Tiwi	"	283	Shelly Beach	"
233	Kanamai	"	284	Tudor	1990
234	Yungi Island	"	285	Kilifi	"
235	Shimoni	"	286	Malindi	"
236	Mwandoni	"	287	Mtwapa	1989
237	Galu Kinondo	"	288	Kikambala	"
238	Shanzu	"	289	Watamu B	"
239	Mtwapa	"	290	"	"
240	"	1988	291	Kikambala	"
241	Msambweni	"	292	Kijipwa	"
242	Malindi	"	293	Mtwapa	"
243	Shimoni	"	294	Diani	"
244	"	"	295	"	"
245	Kikambala	"	296	Nyali	"
246	Galu Kinondo	"	297	Shelly Beach	"
247	Kanamai	"	298	Mtwapa	"
248	Tiwi	"	299	Nyali	"
249	Kikambala	"	300	Tudor	"
250	Shelly Beach	"	301	Shanzu	"
251	Kikambala	"	302	Mtwapa	"
252	Watamu A	"	303	Kikambala	1990
253	Shanzu	1990	304	Tiwi	"

Case No.	Location	Year
305	Nyali	1990
306	Bamburi	"
307	Galu Kinondo	"
308	Kijipwa	"
309	Kilifi	"
310	Diani	1986
311	Nyali	1987
312	"	1988
313	"	"
314	"	1985
315	Diani	1988
316	Shanzu	"
317	"	1988
318	Nyali	"
319	Kilifi	1987
320	Kikambala	1990
321	"	"
322	Gazi	"
323	Galu Kinondo	"
324	"	"
325	Shelly Beach	"
326	Shanzu	"
327	Shelly Beach	"
328	"	1988
329	Mida Creek	"
330	Galu Kinondo	1987
331	Nyali	1989

APPENDIX 2: A Sample of an Inspection Sheet Used to Collect Field Information

1. Parcel No...
2. Date when sold or bought ....
3. Location ....
4. Size ....
5. Distance from shoreline/water ....
6. Ocean view ....
7. Size of water frontage ....
8. Depth of fronting water ....
9. Type of beach ....
10. Nearest important facility ....
11. Distance from that facility ....
12. Public access to beach ....
13. Infrastructure and services ....
14. Minimum distance from high tidal influence ....
15. Current use of fronting water ....
16. Length of time between high and low tides ....
17. Duration of low tides ....
18. Duration of high tides ....
19. Scenic beauty estimate ....
20. Volume of tourist trade ....
21. Value of fish and other marine products ....
22. Availability of water sports ....
23. Topography ....
24. Tourist season ....
25. Consumer price index/rate of inflation ....
26. Distance to shopping complexes ....
27. Reasons for sale/buying of property ....

APPENDIX 3: VARIABLE RANKS

	VARIABLE	CORRELATION RANK	BETA WEIGHT RANK	FREQUENCY IMPORTANCE RANK	R^2 CHANGE RANK	AVERAGE SCORE/4	FINAL RANKIN
1.	SIZE	1	1	1	1	1	1
2.	AREA	3	3	3	2	2.75	2
3.	DEPT	15	12	6	10	10.75	10
4.	TOWN	10	7	4	6	6.75	5
5.	TOUR	9	3	5	2	4.75	3
6.	ACCESS	11	9	9	9	9.5	9
7.	BEACH	4	10	8	11	8.25	7
8.	DISH	6	14	10	13	10.75	10
9.	PROXT	14	14	11	13	13	11
10.	AQUA	2	9	7	7	6.25	4
11.	LOC	12	6	6	6	7.5	6
12.	VIEW	5	8	2	4	4.75	3
13.	MOTV	16	13	12	12	13.25	12
14.	FISH	13	2	7	8	7.5	6
15.	TOPO	8	11	7	9	8.75	8
16.	SEAS	17	5	6	5	8.25	7
17.	SPORTS	7	6	3	3	4.75	3