THE LAW AND THE ENVIRONMENT IN KENYA

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Atdi Farouk Muslim

A Thesis

submitted in part fulfilment of the degree of

Master of Laws

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Decl ion

1, ABDI FAROUR MUSICIN, do hereby declare that this Thesis is my original work and has not been submitted and is not currently being submitted for a degree in any other University.

Signed	+mabdi
	A. F. Muslim

This Thesis has been submitted for examination with my approval as University Supervisor.

Professor U. U. Uche

Head,

Department of Public Law.

TABLE OF CONTENTS

4	Puga
Declaration	
Acknowledgements	á
Summary	j.V
Table of Cases	viii
Table of Statutes	20
Table of Subsidiary Legislation	xiii
Table of Conventions	xv
Introduction	1
CHAPTER ONE	
DEFINITION OF THE ENVIRONMENT	11
Legal Definition	15
CHAPTER TWO	
IMPORTANCE OF THE ENVIRONMENT TO MAN	20
The Environment in Kenya	
Agriculture	26
Aquatic and Marine Resources	34
Fisheries	40
Forestry	44
Water	47
Government Policy on the Environme	•
About this Thesis	54
	74
CHAPTER THREE	
THE ENVIRONMENT AND THE COMPETING INTERESTS	56

e

	Page
(a) Urbanization and human settlements	61
Human Settlements and the Water	
Resources	68
$_{\mathcal{W}}$ (b) Agriculture and the use of	
Pesticides	74
Pesticides and Water Resources	80
Irrigation and the Water-borne	
Diseases	90
(c) Industrialisation and Pollution	
of Waters	94
Tanneries	98
The Paper Industry	99
- Coffee	101
Sugar Refineries	105
_ The Dairy Industry	107
- Fruit and Vegetable	
Cannaries	108
Heavy Metals	109
(d) Forestry and the Conservation	
of Water	111
(e) Pollution and the Marine	
Environment	121
90 25	4
CHAPTER FOUR	
LEGAL PROTECTION OF THE ENVIRONMENT	132
The Common Law	132
Pollution at Common Law	724

	Page
Persons entitled to sue	136
Unsuitability of the doctrine	
of Riparian Rights	1.37
Nuisance	142
Fublic Nuisance	147 -
Proof of Pollution	1 52
Trespass	153
Damages	154
Injunction	155
Statutory Law and the Protection	
of Water Resources	160 ′
Planning and Administrative	
Institutions	161
Conservation of Water	163/
	and the same of th
Effluents and the Pollution of	
Effluents and the Pollution of Waters	167 ′
	167 ′
Waters	167 ′
Waters Enforcement of Legislation on	167 ´ 173′ 177
Waters Enforcement of Legislation on Water Quality and Conservation	173
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution	173
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution The Control of Pesticides	173 177 186
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution The Control of Pesticides Protection of the Fisheries	173 177 186 197
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution The Control of Pesticides Protection of the Fisheries The Law on the Pollution of the Sea	173 177 186 197
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution The Control of Pesticides Protection of the Fisheries The Law on the Pollution of the Sea Planning and the Exploitation of	173 177 186 197
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution The Control of Pesticides Protection of the Fisheries The Law on the Pollution of the Sea Planning and the Exploitation of the Environment	173 177 186 197 204
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution The Control of Pesticides Protection of the Fisheries The Law on the Pollution of the Sea Planning and the Exploitation of the Environment Planning Authority	173 177 186 197 204 215 218
Waters Enforcement of Legislation on Water Quality and Conservation Land Usage and Control of Pollution The Control of Pesticides Protection of the Fisheries The Law on the Pollution of the Sea Planning and the Exploitation of the Environment Planning Authority Control of Development	173 177 186 197 204 215 218 219

	Page
CHAPTER FIVE	
CRITIQUE: ENVIRONMENTAL LEGISLATION	227
Balance of Interests	228
Doctrine of Recurrence	230
Prescription	230
Public Nuisance	231
Abatement	234
Proof of Injury, award of damages	
and other reliefs	235
Statutory Law	238
Control of Land Usage	238
Legislation on Pesticides and other	
Chemicals	242
Co-ordination of Policy, Adequacy	
and Enforcement of the Law	244
Individual Rights	249.
CHAPTER SIX	
COMPREHENSIVE APPROACHES TO ENVIRONMENTAL	
PROTECTION	256
Enforcement of the Law	~258
Amendments to Statutory Law	259
Improvement of the Planning Law	261
Land Use and Soil Conservation	263
A Better Environment for the Future	257
	268
Footnotes	
Bibliography	

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SUMMARY



Concern for the well-being of the environment is a phenomenon whose history is as old as the history of man himself, and efforts to conserve and preserve various environmental aspects have been undertaken at the various atages of the development of human civilization.

However, it is during the present century, and especially the last three decades, that the environment has been subjected to the most wide-spread impairment, has resulted from pressures and activities generated by the world's rapidly growing population and the rapid development and, sometimes uncontrolled, use of technology. Rivers have been polluted thereby rendering the water unsuitable for many purposes; industrial development has raised wide-ranging damage to the environment with thousands of acreas of vegetation. for instance, simply drying up as has happened in Silesia, Poland's industrial heartland; projects planned for generating greater agricultural activities such as the construction of dams for perennial irrigation have produced unforeseen consequences: habitants suitable for pests have been created thereby aggravating the pest-control problem in many areas of the world where beef is important as a source of protein.

awakened the world community to the need for intensified action at the national and international level to limit and where possible, eliminate impairment of the human environment. At the end of the 1972 Stockhom Conference called by the United Nations to discuss the state of the human environment as well as to seek for means to conserve it, an International body, viz. the United Nations Environment Programme (U.N.E.P.) was set up to serve as an en-going machinery for anticipating and preventing threats to human health and well being poned by impairment of the environment.

In Kenya, the National Environment Secretariate (N.E.S.) was set up to advise the Government on matters related to the well-being of the environment.

Chapter one, of this Thesis, discusses the definition of the Environment with the view to show the importance of such definition in the determination of environmental protection measures. Chapter two deals with the importance of the environment to man in general, and its position as the base upon which the progress and development in particular. Chapter three discusses the various demands, sometimes conflicting, which are made on the environment and the consequences of the conflicts generated by such demands. Chapter four examines the body of law designed

to protect the environment in Kenya and in Chapter five a critical analysis of the Law is undertaken with the view to bring out the shortcoming(s), if any, of the said law as a means of protecting the environment.

Ways and means of strengthening the Law as a machinery for environmental protection are discussed in chapter six.

ABBREVIATIONS

A. C. Appeal Cases (Law Reports)

A. BLE.R. All England Reports

Ch. Chancery Reports.

Ch. D. Chancery Division Reports.

E.A. East African Law Reports.

LR HL. House of Lords Law Reports

K.L.R. Kenya Law Reports

L. T. Law Times Reports

N.R.L.R. Northern Rhodesia Law Reports.

Q.B.(K.B.) Queen's (King's) Bench Division Reports.

S. C. Supreme Court (United States of America).

Z. L. R. Zanzibar Law Reports.

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INTRODUCTION

In recent years, concern for the state of the human environment has assumed international significance. This concern springs from the realization that resources such as water and land are components of the one and the same environment and that impairment of any one of these resources, for instance, water, through misuse or mismanagement is bound to affect not only the use to which this particular resource may be put but may also affect the use to which other resources such as land may be put and this, not only at a local or national level but in most cases at the international level too. This fact is easy to grasp when the problems of water pollution are considered and solutions thereto have to be sought for and applied within the context of an entire watershed basin, since the flow of water in rivers and creeks has no respect for political boundaries but follows constant patterns from surface run-off to progressively larger streams and rivers always in the same direction and with cummulative volumes.

The various inland water bodies, such as rivers, lakes, ground waters etc. are interlinked components of the global hydrological system. As a result of man's activities, these natural water resources are experiencing varying degrees of pollution, with the unassimilated wastes being conveyed to oceans and sea where they cause pollution

in estuaries and coastal waters. The uses of inland waters - domestic industrial, agricultural etc - each require a certain quality so that it becomes necessary to maintain the quality standards for the management of the living resources, inland fisheries and for the provision of water for domestic, agricultural as well as industrial purposes. However, since, as pointed out above, many river and lake basins are shared by more than one country and since nearly all river basins drawn into seas or oceans, the concern about inland water pollution assumes regional and international dimensions.

ocean pollution, the most serious side of it being its harmful effect on the life-giving capacity of the sea, upon which man must increasingly depend. More than half of the world's population depends solely on food from the sea for a supply of essential nutrition and the sea as a potential food source will become more important in the future. The sharply rising world population makes it imperative therefore, that this invaluable food source be preserved and conserved. Covering over seventy per cent of the global area, the sea is still largely unexplored and it is only now that its almost limitless potential is being explored.

World-wide concern over marine oil pollution dates back to the early years of the Twentieth Century although it is only in recent years that international agreements have been achieved. During the 1920's many nations prohibited oil discharges in their ports and shortly afterwards the 1926 International Conference was convened in Washington resulting in the first International Convention relating to Oil Pollution.

Though discussed at both technical and legal levels the convention failed to be ratified by any nation. In 1954 another conference was convened resulting in the International Convention for the Prevention of Pollution of the sea by Oil. 2

Despite the ratification of the 1954 Convention, however, concern over marine pollution has grown steadily in recent years and this could be explained by the fact that although the 1954 Convention was an environmental protective instrument, it failed to take into account the most important aspects of the marine pollution problem in that oil was recognized as a problem only to the extent that it visibly dirtied the waters, fouled beaches so that its impact on the biological productivity of marine ecosystems was largely ignored. Over the years, however, the adverse effects of marine pollution which include damage to marine organisms and ecosystems, to human health through direct contact with polluted water are now being recognized. Many specific effects of marine pollution are probably unknown and the magnitude of those known to be possible is often undetermined.

The first initiative to cramine and discuss the need for continuous development and adoption of the most suitable techniques of resource conservation and utilization at the international level was made by the United Nations Economic and Social Council at its Fourth Session in February-March, 1947 and on 28th March, 1947 the Council adopted the following resolution 132 (v)1:

The Economic and Social Council, Recognizing the importance of the world's natural resources, particularly due to the drain of the war on such resources and their importance to the reconstruction of devested areas and recognizing further the need for continuous development and widespread application of the techniques of resources and conservation and utilization,

Decides to call a United Nations Scientific

Conference on the conservation and utilization
of Resources for the purpose of exchanging
information on techniques in this field, their
economic costs and benefits and their
inter-relationships³.....

Prior to this, many other conferences had been convened to discuss impending threats to, or damage already wrought on, the environment through misuse of the natural resources.

However, these earlier conferences had, in most cases, never attempted a comprehensive assessment of the natural resources and other components of the environment as a single whole. An example of such a conference is the 1926 Washington International Conference on Oil Pollution which was attended by most of the world's maritime nations. The result of the unilinear approach adopted at these conferences was to examine a problem facing the environment in isolation from the other components of the environment without taking into account the extent to which this problem was accentuated or modified by its reaction with the rest of the environment.

A comprehensive approach was adopted at the United Nations Scientific Conference on the Conservation and Utilization of Resources with each of the resources being examined in relation to its use, development and conservation first on its own and then its interaction with other components of the environment looked into.

Since the above conference was held, greater use has been made of the world resources for socio-economic development and this has brought about changes which have, at times resulted in the destruction of the resources which are essential for the survival of man. Rivers have been polluted rendering the water unsuitable for many purposes; industrial development has raised wide-ranging damage to the environment with thousands of acres of vegetation,

for instance, simply drying up as has happened in Silesia, Poland's industrial heartland; 5 sir pollution has destroyed plant life, leading to agricultural and easthetic losses, apart from its health ill-effects. Air pollution has placed real restrictions on the types of vegetation that may be raised in many areas of a country. In New Jersey, (United States), for instance, pollution injury to vegetation has been observed in every county; and damage has been done to at least 36 commercial crops. Planned largely for generating hydroelectric power, the Kariba Dam with an area of 1700 square miles, has been a mixed blessing. Vegetation along the Dam has created habitat attractive to the tsetse fly, aggravating the pest control problem in this area where beef is important as a source of animal protein. Shortly after completion the Dam was invaded by aquatic plants covering more than onetenth of the Dam's surface and thereby interfering with commercial fishing and creating difficulties.

The disastrous consequences of these environmental damages prompted the world community to examine, once again, the problems facing the human environment with a view to establishing mechnisms for an on-going examination of possible threats to the environment and recommend lines of action where damage had already been done.

The question of convening an international conference on the environment was raised by the Economic and Social Council of the United Nations at its 46th Session. In a resolution or the subject £1346 (XLV) 1 the Council underlined the urgent need for intensified action at the national and international level to limit and where possible to eliminate the impairment of the human environment. Endorsing the Council's recommendation, the General Assembly at its 23rd Session decided 1Resolution 2398 (xxiii) to convene a United Nations Conference on the Human Environment, 1972.

The conference was convened as a result of the realization that the problems of the human environment cover virtually all human activities and that these problems can only be resolved on a global scale. Thus, unlike the United Nations Economic and Social Council Resolution [32(iv)] of March, 1947 which had decided that "the Conference be devoted solely to the exchange of ideas and experience on these matters among engineers, resource technicians, economists and other experts in related field", the General Assembly at its 24th Session, resolved that

"It should be the main purpose of the conference to serve as a practical means to encourage and to provide guidelines for action by Governments and international organizations designed to protect and improve the human environment and to remedy and prevent its impairment by means of international co-operation"7 In line with the action-oriented approach adopted during the conference on the Human Environment which was held in 1972 in Stockholm, a United Nations body, viz. the United Nations Environment Programme, was set up and its Governing Council laid down objectives, some of which are produced below, as guidelines for this body:

- i) To anticipate and prevent threats to human health and well-being posed by contamination of food, air or water;
- ii) To detect and prevent serious threats to health of the oceans through controlling both ocean-based and land-based sources of pollution, and to assure the continuing vitality of marine stocks;
- iii) To improve the quality of water for human use, in order that all persons may have access to water of a quality compatible with requirements of human health;
 - iv) To prevent the loss of productive soil through erosion, salination or contamination; to arrest the process of desertification and to restore the productivity of deciccated soil;

Like with the earlier international efforts to tackle environmental problems, concern for the environment in Kenya was always sectorial and uniliear and was normally directed at what was perceived, at a particular time, to be an environmental problem. In 1912, for instance, the Nairobi Sanitary Commission was appointed under the Commission of Enquiry Ordinance, 1912, to inquire into and report inter alia, upon "1. (a) the Sanitation and drainage of the Town-ship of Nairobi and the residential area adjoining the same;

- (b) The Nairobi water supply;
- (c)
- (d) Sanitary and municipal services.8

Later in the 1940's concern was felt in East

Africa as a whole over problems of water pollution arising particularly from processing of coffee and sisal. At many sisal factories the whole of the liquid and solid waste was discharged to rivers without treatment; even where liquid waste alone was discharged serious pollution frequently occured.

As on the international level, it has gradually come to be realized in Kenya that efforts to tackle environmental problems must be integrated and take into account all, or nearly all, or the environmental facets if success is to be achieved. This realization is borne out in the Kenya 1974 - 78 Development where it is stated that "The identification of any deterioration of the environment is often a scientific one and the assessment of its significance and rate of progress certainly is. Moreover, research may be needed to determine the real cause and to suggest the remember. Then the results of these findings must be seen in their relationship to the various activities of the people and Government programmes for development."

Recently, the Kenya Government established

the National Environment Secretariat under the office of the President which will act as the Government environmental watch-dog.

This Thesis will focuse upon the role of Law as a tool for environmental protection in Kenya. However, in order to appreciate the prospects and problems which may stand in the way of the Law as a means for protecting the environment the first three Chapters will discuss the importance of the Environment and its relation to the Kenyan economy, developmental efforts and more significantly the competing demands made upon it. It is after this that an examination of the role of Law will be undertaken.

CHAPTER ONE

DEFINITION OF THE ENVIRCEMET

In the now-standard definition, Ecology is the Science of the relationship between organisms and their environment. The term "Ecology" was coined 100 years ago by the German biologist Earnst Haeckel. The "eco = "from the Greek "oikos" (house) is the same as in "Economics" and according to an old definition what ecologists study is "the economy of animals and plants."

It is thus to Ecology, more than any other branch of Science that attention should be turned in the search for a definition of the "Environment". One such definition has been advanced by Dasmann who has said that in the broad sense the human environment can be defined as:

"..... the surface area of the earth made up of the atmosphere, the oceans, the upper surfaces of the land areas of the continents and islands associated with them and the living things that inhabit this area." 12

It is apparent from the definition above that the human environment is made up of the natural resources of the earth and includes the wonderful climates found the world over, the weather, the land which surround us, the houses man lives in, his food, the water available to him and the many things which have an effect on him.

Apart from its all-embracing characteristic, the other fact worthy of note in relation to the environment is the inter-relatedness of its various components. If a forest is cut and burned, for instance, timber will be the first to be affected, but in time the soil may be damaged and the water relationship altered. Next to be affected will be the stream flow and under ground water supplies and before long fish life in the waters and animal life on the land may be destroyed or changed.

The importance of the ecological definition of the environment given above lies in the fact that Ecology is the scheme involved in the study of organisms in relation to their environment and since it is this relationship which is now running into difficulties, attention chould be turned to Ecology in the search for solutions. In fact, it may be said that had an ecological approach been adopted in many of the projects - industrial as well as agricultural—undertaken in various countries, impairment of the environment would have been minimized or even avoided. An example is the Aswan Dam project which was undertaken to permit the generation of electric power for industrial and domestic use in Egypt, the irrigation of vast areas of land et cetera. However, the planners failed to take into account several important factors.

It was never realized that the year-round irrigation would provide conditions for the snail that carries bilharzia

and that the reduced flow of the Nile and the lessening of the amount of silt it carried before the construction of the Dam, would result in the croding away of the delta lands and the mouth of the river and the salinization of land in the delta area.

Dasmann emphasizes the importance of taking into account the demands of an area's ecology when planning in these words:

"The approach to conservation that holds most hope is an ecological approach, assuming that this takes into account the ecology of man. This does not mean that ecology is a discipline superior to engineering or economics, but only that it insists on a broader scope than has customarily been considered in the older fields. The ecological approach demands that we examine the total environment and its inter-relationships, at least, to the extent that we are able. not content with a narrow view. Each natural area, be it defined as a watershed, a plant community, or in some other terms, is an ecosystem. ît is a physical and biological system with certain potentials and certain limits. The objectives of management should be to develop that area to provide the greatest yield in improved quality of living for mankind."

International bodies involved in financing development projects such as the World Bank, are now adopting ecological assessment of all development proposals before they provide funds for them, a fact pointed out by Mr. Robert McNamara, President of the World Bank, in his address to the United Nations Conference on the Human Environment at Stockholm in 1972:

"Our experience is that environmental protection can be built into development projects as completely and successfully as any other requisite element. Each project processed in the Bank is now reviewed by the Environment office, and a careful in-house study is made of the ecological components. If

the project warrants it, an onsite 'ecological reconnaisance' study is commissioned by the Bank with use of qualified consultants. If more serious problems are uncovered, a still more intensive on-site evaluation is undertaken in order to determine what specialized solutions should be incorporated into the project's specifications." 14

An example of such an ecological evaluation carried out by the World Bank was in the Yagona district of Cameroon where the rice farmers are poor and the Bank's estimate was that their cash income could increase fivefold if only irrigation facilities could be improved. However, a serious environmental hazard had to be reckoned with bilharzia: for it was feared that with 3,000 hectares being irrigated to settle 2,800 families the project might greatly increase the incidence of this illness. To evaluate this problem, the Bank sent a highly qualified expert in the control of the snail-vector to Cameroon. After on-site research, changes were made in the design; provision was made for regular survey of the snail population and appropriate measures to deal with the snail problem proposed. These changes saved the Yagona project from potential ecological risk. 15

In Kenya, ecological studies of the effect are now undertaken before proposed industries are undertaken. Such a study was undertaken before the Pan African Paper Mills Ltd. established their paper making factory, the study being undertaken to establish the ecological effects of the

factory on the ecology of the Middle and Lower Nzoia River in Western Kenya. 16 The river drains an area of 131,000 km. 2, finally flowing through the northern part of the Yala Swamp to enter Lake Victoria. Provision had to be made to avert the pollution of the river on which people in the surrounding area depended for their water supplies as well as prevent the diminution or death of fish in Lake Victoria through a steady in-flow of effluents from the paper factory.

With this brief survey of the Ecological definition of the environment by requiring ecological parameters to be taken into account when planning development projects, attention is now turned to the legal definition, if any, of the environment.

Legal Definition

The source of the Law of Kenya are contained in section 3 of the Judicature Act, 1967, 17 and are as follows:

- 1. The Constitution of Kenya 18
- 2. Legislation which includes:
 - a). Specific Acts of Parliament of the United
 Kingdom, cited in the schedule
 to the Judicature Act.
 - b). Acts of Parliament of Kenya
 - c). Certain Acts of Parliament of India.
- 3. Subsidiary Legislation, and

4. The substance of the common law, the doctrines of equity and the statutes of general application in force in England on the 12th August, 1897 so far as the circumstances of Kenya and its inhabitants permit and subject to such qualifications as those circumstances may make necessary.

The common law of England has been developing for nearly a thousand years and is embodied in the reported decisions of English courts stretching back to the 13th century. This body of law consists of the ancient customs and usages of England which have been recognized and given the force of law.

Section 3 of the Judicature Act follows the wording of the Kenya Order-In-Council of 1921, which first incorporated the substance of English law into Kenya law. This Order-In-Council established the date of reception of English law as 12th August, 1897. By 1897, there existed in England a specific body of rules generally referred to as the doctrines of equity and the substance of the common law and it is to these rules that the Judicature Act refers. These rules are unwritten but were reported in various authoritative records, reports and text-books. The effect of the Judicature Act is to make some of the ancient English Judicial decisions part of the law of Kenya except where a decision has been varied by Kenya statute law.

The term "environment", though subject to an ecological definition, has been used more in popular debate than legal analysis so that the common law lacks a

definition for it, and the farthest the common law has gone in defining it is to state that the torm can "embrace any aspect of the law that concerns land and its use", "land" being extended to include air and water. 19

explain when it is rememberd that the common law developed as a mechanism for orderly resolution of conflicts and was usually brought into operation after there had been a conflict. Someone would then claim that his interest(s) had been violated by someone else, the court's task, then, being to render a decision that would prevent the conflict and all potential conflicts like it - from dicrupting the society.

One of the threshold issues a party suing for injury to his interest is normally to establish is a right (title) to this interest. Now, it has already been noted that the term "environment", as far as Ecology defines it, and the common law can be said to admit of such definition, is made up of the surface area of the earth, the oceans, the appear surfaces of the land areas of the continents and islands and the fresh water associated with them as well as the the living things that inhabit this area. It is conceivable that the common law never had the opportunity to define the term "environment" as such because no one person, and probably not even a group of persons, ever took court action for damage to the environment basing such action

on the claim that he had a right to the environment as such. This line of reasoning is strengthened by the fact that in as far as the components of the environment, capable of being owned are concerned, the law reports abound with actions taken to seek protection for them or to ask for remedy for damage done to them.

Thus the common law has protected a fishery from disturbance, for example, by the discharge of effluent into a river so as to drive away or kill the fish and injure the breeding, such disturbance being treated as an invasion of a legal right. 20

In Lillywhite V. Trimmer 21, the plaintiff sued the defendant who caused the sewage of the town to flow into a wey at a point about a mile above the plaintiff's premises. The plaintiff sought to restrain the defendant from so doing alleging that the water of the river which prior to the construction of the sewage works, was a pure stream, had been rendered totally unfit for agricultural and domestic puposes.

As with the common law, so with the statutory law in Kenya. Nowhere in the body of the law is the term "environment defined. However, various components of the environment are defined for specific as well as general purposes. Thus, the Development and use of land [Planning] Regulations²², define "land" to include "any land and any interest or right or easement in, to or

over land."23

In the United Kingdom, the Town and Country

Planning Act 24 of 1971 creates the office of the secretary

of state for the Environment, charging the said secretary

with the duty of supervision and general policy co-ordination

on the environment. But even this Act does not contain

a definition of the term "environment."

Since this Thesis sets out to examine the role of
Law as a mechanism for environmental protection, which
role can be affected through control of development, it
may be wondered why there should be concern for the lack
of definition of the term "environment". After all, the
definition of the term will not confer title on those
who may want to seek protection for the environment.
However, as in other cases, definition of the term would
provide clarity of what is specifically involved when matters
pertaining to the environment arise, thus avoiding futile
disputes; and although the definition may not be able to
afford complete explanations by itself it will provide
an over all picture of what the law may recognize as the
"environment."

CHAPTER THO

IMPORTANCE OF THE ENVIRONMENT TO MAN

In his early days on earth, man was just one part of the fauna with no greater impact, negative or positive, on the environment than any other specie. Even today, despite his dominance on earth, man still depends on other living things for his survival. The plants on which he depends for his food such as wheat and maize, are formed of soil, air and sunlight; the beef he eats comes from plant protein and carbohydrate needed to feed his lifestock.

Water needed by every living organism, is as important to man. However, to maintain the stability of the water cycle and preserve the soil, vegetation is essential. This vegetation helps evaporation and keeps the soil porous. Forests which accumulate and storewater and in dry periods distribute it to surrounding areas, are just as important in the maintenance of a reliable supply of water.

However, Man's dependence on his environment is demonstrated by what has befallen societies which have failed to protect it from abuse or misuse and their tragic experience is evidence enough of what awaits mankind if the lesson is not learned. In China and India, for instance,

ancient irrigation systems stand abandoned and filled with silt. Indian, two centuries ago had a population of about 60 million and most of its land problems have been created in the past century through deforestration and ploughing and the resulting erosion and sanitation, all stemming from efforts to support such fantastic population growth. In ancient Egypt, the annual spring flood of the Nile watered and fertilized the soil and the crops could be grown for seven months each year, Extensive irrigation systems were established before 2000 B.C. The country was the granary of the Roman Empire and agriculture flourished for nearly 4000 years. 25 But in 1902 a small dam was built at Aswan to prevent the spring flood and permit year-round irrigation and now the soils are deteriorating from salinization and the completion of the Aswen High Dam has raised many other problems.

In Brazil's Amazon basin an agricultural colony was established in the later 1940's at the confluence of the Madeira and Madre de Dios rivers. Rain forests were cut away and the land was tilled, with disatrous consequences. For the soils of the region, rich in iron ocide and alumina are highly subject to a process called laterization, which can quickly turn cleared lands into rocky brushy barrens. The colonists cultivated their fields among blocks of laterite and found the soils they were working compacting to rock in 5 years. 26

The above brief discussion underline the necessity of taking care of the environment, in order to ensure the survival of mankind. This view was expressed by the head of the world body charged with the task of anticipating and preventing threats to the human environment, viz the United Nations Environemnt Programme, when he said that "Man's activities are now reaching the point where quite clearly we are endangering out own presence. We are exposing ourselves to risk even at the present time, as we have seen in some of these specific cases around the world. But in the larger sense we are risking the future of ourselves and all of our children.

"And unless we realize and are willing to make the changes, then the worst things that I have suggested could possibly happen". 27

This necessity to exploit the environment without subjecting it to irreversible damage is now enshrined in the declaration of the United Nations Conference on the Human Environment, states that:

"A point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consquences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes"28

What has been said above in relation to the preservation and conservation of the environment in the world as a whole holds true, too, for Kenya. And in the part of this chapter which follows, an examination will be made of the initimate relationship between the environment and the country's economic and social well-being.

THE ENVIRONMENT IN KENYA

The question of environmental protection has arisen when Kenya, like other developing nations, are grappling with the problems of economic and social development. For some time, now, the question has been posed in terms of industrial pollution thus giving the impression that environmental protection was best left to the industrialized part of the world.

However, Kenya has as much to gain from environmental protection as the developed world though the two groups must view their environmental problems from different perspectives. In Kenya, environmental problems such as poor sanitation, polluted water supplies, inadequate housing are problems brought about and excerbated by poverty and under-development and efforts to protect the environment must reckon with the act that no progress can be made so long as the masses of people in this country are unemployed or live in areas with very few if any, social smenities. This important fact seems to have been recognized by the leader of the countries, facing

massive problems of underdevelopment. Prime Minister Indira Gardhi speaking to the Plenary Meeting of the United Nations Conference on the Human Environment at Stockholm stated that:

"We do not wish to impoverish the environment any further and yet we cannot for a moment forget the grim poverty of a large number of our people. Are not poverty and need the greatest pollutions? For instance, unless we are in a position to provide employment and purchasing power for the daily necessities of the tribal people and those who live in or around our jungles, we cannot prevent them from combing forests for food and livelihood; from poaching and despoiling the vegetation when they themselves feel deprived, how can we urge the preservation of animals? How can we speak to those who live in villages and in slums about keeping the oceans, the rivers and the air clean when their own lives are contaminated at the source?"29.

Such dilemma seems to be facing Kenya's Forest

Department officials. The existence of forests in Kenya is
being threatened by excisions, fire and from the activities
of those people who are engaged in the charcoal - burning
industry. Yet, so many families depend on charcoal burning
industry for their livelihood that the officials find it
difficult to condemn them before alternative employment for
them is found. The dilemma was expressed by a Forest
Department official when he stated that:

"In a number of areas in Kenya where charcoal is burned in abundance, it is actually a source of employment from which many families derive their income. In such areas trees are serving as cash crops. The local usage of charcoal as a source of fuel both in the urban and rural areas is so extensive that it would be most unrealistic simply to condemn the industry without suggesting suitable alternatives."30

And yet, in order to provide adequate shelter, education, health and sanitation for her people, Kenya will heavily depend on the exploitation of her forests, grasslands, farmlands and rivers, so that it is of the greatest importance that these resources are not misused or wasted.

The other reason why Kenya must be concerned with
the protection of her environment is that as economic and
social development proceeds, the country will be faced by
the environmental problems which the developed countries are
having to reckon with now. The more industrialized the
country becomes the more complex the problem of pollution:
pollution of water supplies, pollution of the atmosphere; and
apart from pollution which results from industrialization, it
must be remembered that Man, by his very nature and even in
small communities, pollutes his surroundings so that the larger
and more developed the community the more complex the pollution
problem becomes. It is thus necessary for Kenya to take note
of the mistakes of the developed countries so that she would
be better prepared to avoid or deal with them when they arise.

In the following sections of this chapter, attention will be turned on the environment and its relation to the various sectors of the Kenyan economy with a view to showing how closely related the economy is to the environment and how dependent further progress is to the careful exploitation of the country's resources.

AGRICULTURE

Kenya is an agricultural country with over threequarters of her population deriving their livelihood from
agricultural activities. For many reasons, therefore, the
Government places special importance on the country's rapid
agricultural development. Of major importance is the fact
that a high proportion of the population will continue to
depend on agriculture for their livelihood. Again, agriculture
being such an important component of the economy, rapid
development in this sector has a big role to play in the
growth and expansion of the country's economy. Agricultural
and livestock products are essential in providing the foreign
exchange needed for development. The table below shows the
quantities of exports, valued at K£17.4 million in 1973, over
the years 1968 - 1972. Looking at it one is struck by the
predominance of the agricultural and livestock products.

TABLE 1. CUANTITIES OF PRINCIPAL OVERSEAS EXPORTS 1968-1972

						
ITEM	UNIT	1.968	1969	1970	1971	1972
Coffee	Metric tons	37,596	50,969	53,725	56,426	53,142
Tea .	11	27,500	32,835	35,063	33,508	47,126
	Million Litres	907	929	1,038	1,145	1,129
	Metric Tons	2,168	2,397	1,753	2,676	3,358
Meat	11	7,095	5,938	6,683	7,180	10,208
Sisal	11	41.,896	35,755	44,291	37,713	38,764
Hides & Skins	ŧī	6,989	6,548	5,893	8,271	10,522
Soda Ash	"	112,489	85,938	157,155	149.904	144,717
Cement	1 1	239,027	309,026	343,069	331,689	372,208
Maize(raw)	11	277,525	140,893	84≈	12*	8*
Canned Pine- apples	11	5,279	7,959	7,465	10,805	9,734
Butter & Ghee	.,	1,037	824	656	227	1,979
Beans & Peas	"	17,712	3.0,849	9,583	8 ,0 59	21,268
Cotton(raw) Wool	••	1,688	2,780	5,082	4,606	4,266
Animal Feeds	"	28,410	29,870	21,827	21,566	39,403
Cashew Nuts	11	8,607	9,141	23,174	10.604	15.540

Consisting of amall shipments of "special purpose" Maize.

Table 1. ... cont.

Source:

Economic survey, 1973. Central Bureau of statistics. Ministry of Finance and Planning. Nairobi. p. 58.

1 ...

Like many other countries of the Third World, Kenya is faced with an ever-growing demand for food. More than two years ago, it was estimated that food production would have to increase by more than 5 per cent per annum, not in order to increase the quantity of agricultural exports, but simply to satisfy the extra demand which has accompanied the increase in the country's population. This demand will be even greater in the urban areas where it is expected to increase by more than 10 per cent per annum. 31 However, the demand for many individual foodstuffs will grow out rates above the 5% per annum mentioned above, with the demand for maize growing at about (4%) per cent, demand for fruit, milk. pig, meat, rice and vegetables growing at between 4 and 7 per cent per annum. If the agricultural sector is to cope with this rising demand for food, more intensive methods of cultivation will have to be adopted.

Apart from having to develop and expand to satisfy the demand for food, the agricultural sector has now to develop as an additional source of employment for the country's growing force of the unemployed. The population of the country is expected to increase by 2.3 million people between 1974 and 1973 and this population growth will

necessistate the creation of jobs for more than 800,000 people, apart from jobs needed for those who are already unemployed. Provision of jobs for school leavers is another problems the country will have to reckon with. To tackle the unemployment problem, the Government has set out a programme whose elements include agricultural and rural modernization. This modernization of the agricultural sector is intended to make the rural areas attractive enough to stem the tide of the rural-urban migration.

Agriculture, which to meet the multifaceted demands made up it [i.e. production of food, source of foreign exchange, absorption of a greater number of the unemployed, is projected to grow at the rate of 6.7 per cent between 1974 - 1978,] must be considered within the environmental context within which it takes place for the environment plays a decisive part in determining the extent of development possible.

One of the major environmental constraints to this agricultural development will be the type of soil found in the various parts of the country. In most tropical countries, and Kenya is no exception, the soils are extremely poor. They cannot maintain large reserves of minerals needed for plant growth such as phosphorus, potassium and calcium. In addition, as R.O. Odingo³³ has observed, the soils of the savanna lands of East Africa and very low in humus and rapidly lose it under

cultivated usc.

Continued cultivation of the land which is necessitated by the country's growing population causes the depletion of the nutrient content so much so that a time comes when heavy application of fertilizers becomes necessary before the soil can support any plant growth.

In the high altitude grasslands of Kenya, the soils are better and capable of supporting large densities of population. But even here the soils lack permanence, and leaching, though seasonal, is widespread with most of them being acidic. Elsewhere, clay soils which are mostly alkaline and not easy to work, are common. Under developed ash, lava boulders and shallow stony fils with rock outcrops are also common in various parts of Kenya.

In the earlier days when the population pressure on land was not as great as it is now, crop rotation and shifting cultivation enabled the cultivators to preserve the fertility of the soil. However, with the population growing as fast as it is, cultivators are forced to use all the land they have access to, season after season and where the soils are field crops, the soils are exposed to rain and radiation leading to a progressive decline in soil fertility.

The widespread incidence of soil erosion in the country is evidence of the great pressure which has been

brought to bear on the limited land resources. The problem of erosion is not new and its history goes back to the early period of colonial government in this country. However, the problem has grown to an alarming magnitude and in 1970; Mzee Jomo Kenyatta the President of Kenya warned the country of the consequences of this problem.

"We see all around us the wonders of an age of technology. However, while mankind could flourish without the computers and spaceships, there would be no human survival without the patient skills of primary production.

whether is richly endowed or marginal areas, to protect their land from soil erosion. This erosion can spring from destroying vegetation on slopes and hillsides and its consequences, including flooding, can damage the homes and shambas of people living away.

"After each period of heavy rain it is possible to see our rivers changing colour, as valuable soil is washed from the land and swept away. This is an irretrievable loss to the nation and in the long run could undermine the agricultural development on which the welfare of all our people depend."36

Despite the President's warning and the many vows
by the Ministry of Agriculture to take action, soil erosion
is becoming even worse and more particularly in the parts of the
country where the population density is highest. Murang's
District, one of the densely populated areas, is characterised
by numerous large valleys and steep highland plateaux. The soil,
here, is no longer the red clay it once was; it has been degraded
to loam and coarser soils which are easily eroded. Many farms
in the area have been hit by rill erosion which has reduced the

area of cultivated land and the yield of crops. Land, once under cultivation but now destroyed by erosion has been converted into pasture which, in turn, has been overgrazed laying the land so bare that crosion has even been further enhanced. 37

The other areas of dense population are found within the Lake basin in Western Kenya where most parts show average densities of over 150 persons per square kilometre. In the well-watered parts of Kakamega and Kisii districts, population density is as high as 400 persons per square mile. It is in these densely populated areas that crosion is worst.

It has been estimated that the Mumias and Broderick Falls areas in Western Kenya lose about 173,255 tons a year that is about 324 tons per square mile per year. [0.5. tons per acre per year] 38 one cause of this fantastic loss of soil is poorsoil management in this area where farmers have begun to cultivate on river banks and other portions of the landscape which are susceptible to erosion.

If soil erosion continues there will be a continued degradation of the cultivated land and a consequent loss of revenue. This has been experienced in Murang'a District where the amount of cultivable land has been reduced by erosion and the yield of crops.

Reduction is productivity resulting from soil erosion has given rise to the view that less of crop from

erosion is more serious than from disease because "... when disease is checked a normal plant can be raised, but from soil erosion permanent loss results."40

Rainfall and the availability of water is the other limitation on agricultural development in Kenya. Only 12 per cent of the land area gets adequate rainfall for intensive farming with a further 6 per cent of the land getting marginal rainfall. Now, as Harrison-Church notes:

"It should be obvious that as elsewhere in the tropics, rainfall is the vital element in the climate. Upon its amount [especially its effective-ness], its degree of certainity, its length and how it falls, largely depend on the natural vegetation agriculture and the mode of life and much else in West Africa." 41

Harrison-Church's observation is borne out by the pace agricultural development and the pattern of population concentration in Kenya Regional distribution of population in the Coast Province shows the strong influence of rainfall distribution on agricultural and other economic activities. There is the distinctive coastal fringe of dense settlements extending from south of the Tana River towards the Tanzania border. This belt coincides with the more humid coastal area and carries population densities ranging from 100 to 250 persons square mile.

Other areas of dense population are found in the Lake
Victoria Basin and the Highlands and these are also areas of
the greatest agricultural activity in the country. Agricultural

activity is almost absent in the arid areas of northern Kenya where the inhabitants mostly normads, keep large numbers of cattle, goats and sheep.

From the above discussion it should be clear that
the great and many demands which the country makes upon the
agricultural sector will cause enormous strains on the limited
land resources. It is necessary, therefore, that these
resources be exploited without causing them irreversible
damage since it is on them the country's well-being will
continue to depend.

AQUATIC AND MARINE RESOURCES.

Apart from Lake Victoria, the majority of the Lakes of Kenya occupy the floor of the eastern Rift Valley and include north to south, Lake Rudolf, Hannington, Baringo, Nakurn Elmentaita, Naivasha and Magadi while Lake Jipe lies outside the Rift Valley.

The largest of these lakes is Lakes Rudolf which has a surface area of about 31,000 square miles and situated at an altitude of 1,250 feet. The surrounding country is dry and desolate except along the dry water courses. The water of the Lake is most unpleasant to drink as is very alkaline and is unplatable even after the increase of citric acid which makes it fritz. The only Kenya rivers which flow into it are the Kaliokwel which only carries

heavy rain floods to the Lake and the Keric which becomes "tired" long before it reaches the lake. The Omo river drains a big tract of the southern highland of Ethiopia and carries the greatest amount of fresh water flowing into the lake.

Lake Baringo has a surface area of 48 square miles situated at an altitude of 3150ft. Two rivers came in from the south, the Tigeri and Cl Analsel. The vaters are greenish in colour owing to the vast quantities of a blue-green algae and at the southern and there is a great area of swamps comprising papyrus.

Then there is Lakes Nakuru and Naivasha. Lake Naivasha is fed by the Malewa and the Girbil Rivers. The wee vegation of the lake used to shelter leeches, protozoa and crustacea, whilst cope-pods, cladocera, ostracods and other good fish all flourished.

Kenya's lakes, wildlife and beaches have been attracting growing numbers of visitors enabling the country to earn much needed foreign exchange. In 1968, for instance, tourists spent more than K£15 m. worth of foreign currency in Kenya with net foregin exchange earnings, the tourist industry was expected to provide 40,000 jobs by 1974.46

Economic gains aside, wildlife is in some cases a vital link in the food chain, a fact which comes out clearly

in the case of Leko Amin. The grass plains surrounding

Lake Amin are grazed by night by large numbers of hippopotemuses,
who consume large quantities of grass. The animals spend the
days in the maters of the lake and the surrounding rivers,
leaving their excreta in them. The excreta fertilize the algae
in the lake, the algae and the other growths being eaten by
several species of Tilapia. These fish, more numerous in
this lake than in any other, form the basis of a large continued
fishing yield. Tilapia species are reckored to be the finest
food fish in Africa and rich in protein and are sold over
large areas of Zeire and Uganda.

The example above shows the inter-dependence of the environment the grasslands, rivers and a lake and man - with the large hippopotamuses population being a condition for the productivity of Lake Amin.

Nearer home, this environmental interdependence is illustrated by the River Athi where hippopotamuses are found. These animals who are entirely herbivores and consumes tremendous amounts of reeds and grass come out in the evening and during the hight they graze like cows. During the day time they lie on sandbanks in secluded stretches, half-in and half-out of the water. As a result of the rich algae and other water growths the River Athi contains one of the best known specie of the Tilapia. This Tilapia has been used to stock dams and was placed in lake Naivasha to give sport and to form a forage fish.

gain is lake Nakuru where flamingoes are found all the year round: 1,250,000 have been counted at a time and estimates of more than 2,000,000 have been made several times, this being the largest concentration of flamingoes in the world. 48 Other migrant species at Lake Nakuru breed on the tundra shores of the Arctic Ocean but spend more time annually at lake Nakuru than on their breading grounds. For this reason, therefore, the Lake, as a feeding and wintering area, is essential for their survival.

To most people, the importance of Lake Nakuru lies in the large numbers of flamingoes and countless other birds along the shores which enhance the ecological diversity and scenic beauty of the lake surroundings. But in a wider sense it is on its biological importance that Lake Nakuru should be judged.

From an ecological point of view, it is important to let the wildlife occupy the low rainfall areas which they already do. To introduce animals, such as cattle in these areas in frantic efforts to produce more beef will disturb the delicate ecological balance which has taken thousands of years to evolve. The grazing of livestock are ill-adapted to the available types of ground cover and because of their high water requirements enormous areas of range vegetation may be trampled and destroyed. This would lead to soil erosion, by both water and wind ultimately depleting both surface

and underground water resources.

David Hopecraft spent four years in Kenya comparing game farming and cattle farming in a low rainfall area. The results of his study have yielded far-reaching results and and it has now become clear that an enormouse potential has yet to be realized using wild animals instead of cattle as a range converter and a source of income.

The wild game (gazelle) he studied 1 lived for months on end without water while the cattle had to drink at least twice a day. This involved constant walking back and forth from grazing to water. As a result, the land becomes trancked and trampled and the land round the water hole was totally devastated. The game also yielded higher productivity [loper cent greater carcass weight] than do cattle. Game meat alone could yield a far greater income because of this higher productivity. Indeed Hopecraft notes, the prices of game meat in parts of Africa where it is being sold in equal and in some parts higher than those of beef.

Thus, game cropping will yield not only meat and earn income, but will, more importantly, preserve the environment since the herbivores are adapted to it. On the other hand, to open up the area, now occupied by wildlife, to livestock will eat up the vegation they prefer leaving the rest to dominate the environment. This forced change in the vegetation cover, together with intensive trampling

and tracking of the land will lead to the loss of the top soil through erosion and the land will eventually be ruined.

resources include the extension of human settlements into areas previously left aside for wildlife populations. This phenomenon is most evident in areas just outside wildlife sanctuaries as happened outside the Nairobi National Park. Closed ecosystems such as Lake Naivasha are being polluted by wastes from factories in their vicinity. The Kenya cooperative creameries Ltd. on the Malewa River has been operating for some years now. Wastes from the factories are poured into the river, which then flows carrying its dairy and chemical effluents into the Lake. As a result the water in the Lake is now polluted and the fish population much reduced. 50

A careful balance between the demands of a growing population and the ecological needs of the wildlife and acquatic communities will have to be evolved, therefore if the country is to continue to enjoy the economic scientific as well as aesthetic gains of the above resources.

FISHERIES

With the global population explosion, shortage of animal protein is becoming more acute and it has been estimated that 80% (percent) of the world population has a pronounced deficiency of protein in their diet. 42

Fish represents an important source of animal protein for a big sector of the world population farming 12 per cent of the world animal protein and supplying 50 per cent of the animal protein in the diet of over 1,500 million people.

Kenya enjoys relatively extensive and varied fisheries resources whose exploitation has shown a steady growth as evidenced by the amount and value of fish landed over a number of years. In 1968, for instance, 55,000 tons of fish valued at £1.5.m. were landed, 43 and since then the amount and value of fish has risen as illustrated in the table below:

TABLE T

AREA AND MAIN GROUP	1969		1970		1971		1972		1973	
	Quentity	Value to Fishermen	Quantity -	Value to Fishermen	Quantity	Value to Fishermen	Quantity	Value to Fishermen	Quantity	Value to Fishersen
FRESH WATER FISH	Metric	K£	Metric	K£	Metric	K£	Metric	K£	Metric	K£
Lake Victoria	17,442	802.3	16,400	774.1	14,918	766.7	15,989	841.3	16,797	906
Lake Rudolf	3,753	29.3	4,854	50.6	3,612	51.4	4,090	51.2	4,927	71.8
Lake Baringo	503	9•3	717	12.4	293	9.0	58	2.0	89	3.0
Lake Naivasha ^l	809	33.5	1,150	49.2	484	29-3	117	12.4	62	9.4
Lake Naivasha ²	. 120	8.5	100	7.4	5 5		••			• •
Other Lakes	1,000	40.0	985	35.5	200	7•5	208	10.0	1,188	69.6
Rivers	1,524	84.0	1,524	84.0	1,622	1,08	1,624	80.9	1,835	107.3
Fish Ponds	121	14.4	121	14.4	• • •	••	• •	••	•••	• • •
TOTAL	25,272	1021.3	25,851	1027.6	21,129	943.9	22,086	997.6	24,898	1,167.5

^{1.} Commerical Fish

^{2.} Sport Fishing

^{..} Statistical abstract, 1974. Central Bureau of statistics, Ministry of Finance and Planning p. 143.

TABLE 2 .cont ..

EREA AND MAIN GROUP 1969		1970		1971		1972		1973		
	Quantity	Value to Fishermen	Quantity	Value to Fishermen	Quantity	Value to Fishermen	Quantity 	Value to Fishermen	Quantity	Value to Fishermen
MARINE FISH	Metric	Х£	Metri	c K£	Metric	K£	Metric	K£	Metric	K £
Lamu	1,270	40.9	744	33.2	1,236	110.4	1,219	58.3	1,126	64.9
Malindi	1,200	67.1	442	26.0	9,287	71.3	1,547	70.9	372	42.7
Kilifi	117	7.5	118	8.0	310	22.6	172	17.5	114	13.2
Mtwapa	121	9.0	117	9.0		••		**		••
masadmom	446	54.7	787	77.8	1,847	164.0	2,176	168.0	1,082	170.6
Shimo	227	19.9	322	23.6	335	246.0	471	38.5	211	18.1
Vanga	202	10.4	237	13.2	435	22.3	419	28.2	321	27.3
Others	1,008	61.9	955	60.8	1,369	88.88	1,299	74.4	235	18.0
Sport Fishing	125	10.0	82	6.1	102	7.8	108	7.3	86	10.6
All other areas	1,630	65.0	3,813 I	202.9	••		••		**	
TOTAL	6,396	346.2	7,617	460.8	6,562	511.7	7,411	463.1	3,547	365.4

Source: Statistical abstract, 1974.

Central Bureau of Statistics, Ministry of Finance and Planning. p. 143.

Fish is not part of the traditional diet of most peoples of Kenya. Only half the population eat it as part of their diet mainly from the coastal and the lake Basin areas. It has been estimated that there are only about 3 kilograms of fish available per person per year. This is low compared to the per capital consumption of fish in some neighbouring countries: Uganda 8.8, Zaire 9.8, Egypt 5.2 and even lower when compared to some European countries: Norway 61.3, Denmark 33.0 and United Kingdom 18.8 A greater per capita consumption of fish is essential if the fisheries resources are to be expanded and developed.

The value of fish does not only lie in its being a source of protein in man's diet but also as a source of fish-meal supplying the poultry and cattle-fattening industry with important feed elements. As of now, the country is a net importer of fish primarily in the form of fish-meal.

Fishing is a profitable industry to many people and it is estimated that about 31,000 fishermen will be engaged in fresh water and marine fishing during the 1974 - 1978

Development Plan Period. The fish trade also supports a large number of fish dealers who work in the fresh, dry, salted fish trades. Many other families find employment in service industries such as boat and canoe building, net making, engine repair, transport of fish and fishery products.

With the increased leisure time and improvement in man's welfare, tourism has become an important industry Angling underwater photography, and viewing marine gardens on the Kenya coast have developed as great tourist attractions.

From the brief discussion above it can be seen that the significance of fisheries to Kenya is great and the resource should be conserved, developed and nationally exploited for the benefit of the people of this country.

FORESTRY

Kenya's Forests Estate is very small in comparison with the country's land area. Indigineous forest occupy 1,700,000 hectares, while plantations occupy 122,000 hectares. The Government is to increase this estate by 8,550 hectares in an expanded afforestation programme. 53

At present the forest industry employs a total of about 150,000 people mostly in the rural areas and this is because the industries have to be located in these areas in order to cut down the high transport costs due to the bulkiness of the forest raw materials. The industry has contributed to the growth and expansion of such townships as Elburgon, Londiani, Kikuyu and Webuye which have forestry as their main economic hase. Schools, dispensaries roads and social.

townships have also benefited the neighbouring communities.

The forestry industry has also contributed to the growth of cottage industries thereby opening up additional sources of employment. These cottage industries which are forestry-based include woodcarving, furniture and making tool handles. Thus in addition to providing employment, the cottage industries fetch currency to these areas.

At present, wood exports to countries outside East

Africa are worth about K£400,000 for sawn timber; K£150,000

for char-coal; K£130,000 for mangrove with wood-carving

earning K£330,000.55

However, the environmental importance of forests lies, not in its capacity to earn revenue but more importantly, in the protection it gives to soils from wind and water erosion. Forests, also, trap water from irregular rainfall storing it for long periods at the same time maintaining a regular supply to surrounding areas throughout the year. Forests surrounding river courses are of particular importance because they provide environment in which aquatic organisms depend. An example is the Amazon basin rivers where the various fish species depend on organisms from the surrounding forests.

Through misuse and lack of planning various countries have suffered a serious reducation in their forest estates.

An example is the Phillipines where 50% of the forests have been lost within the last 20 years alone. In Brazil, the immense forests had been reduced by as much as 40% by 1955.56

Destruction of forests in Kenya goes back to the 1890's and early 1900's with the mangrove swamps at the coast being heavily and wastefully exploited for mangrove bark.

Whole swamps were clearfelled, barked and left to rot. Inland forests began to be exploited as the railway line progressed in-land, first for fuel and later for sawn timber. The first sawmill was set up by an Italian mission at Tuso in the East Aberdares about 1902 and was run by water power. By 1903 other small sawmills were started, timber being extracted from Government and forests for the railway and Government purposes.

With the rapid growth of population, there has been widespread excision of gazetted forests in areas experiencing serious land shortage. Over the last ten-years, for instance, about 41,000 ha. of gazetted forests have been excised to settle landless farmers. 58

The other obstacle to the conservation of forests is charcoal-burning, danger being posed by the indiscreiminate felling of thousands of trees. When the Republic of Somalia put a ban on charcoal-burning in that country there was an increased demand for Kenya charcoal in the Persian Gulf. This led to such widespread destruction of forests that the

Government banned its export outside the country. In areas where charcoal is burned, in-digeneous forests have almost disappeared.

Apart from excision of forests for settlement and the felling of forests for charcoal, the forest estate has to reckon with theft of forest produce, illicit grazing and the destruction of forests by the careless use of fire.

The environmental consequences of this multi-faceted invasion of the forest Estate was recognized as far back as the 1950's, the Forest Department pointing out that the destruction of the estate

"..... brings with it the reduction or failture of essential water supplies and also soil erosion. Many vital water catchment areas have been so impaired by over-grazing that they can no longer perform their main function of water conservation"59

By now it should be clear that forests in Kenya should be conserved not only because they are a source of revenue but more importantly, because their destruction will alter the environment that soil erosion and the failube of water supplies will adversely affect such vital sectors of the country's economy as Agriculture.

WATER

Kenya, with 4,000 kms of major rivers and about 13,000 sq.kms. of Lake area, has very limited water sources.

Of the total annual precipitation only 5% goes into run-off, ultimately finding its way into rivers, lakes, swamps and the sea. This low figure is accounted for by such factors as high evaporation and transpiration rates as well as to high ground-water elsorption rates.

Since without water animals and plants cannot survive the availability of water, since the earliest times, has been the key to development and civilization and in fact the availability of water is the most important single controlling factor in determining the growth of population in an area. This is true of the population-density pattern in Kenya where the humid Nyanza, Rift Valley and Central Provinces with good annual rainfall form one of the high density population clusters in the country. In addition the groundwater in these areas is of excellent quality and is suitable for drinking, irrigation, stock-rearing and other industrial purposes. The eastern half of the country and the southern portion of the Rift Valley are characterised by low rainfall and high temperature rates and in these areas the population is sparse. The arid and semi-arid zones of Kenya lying in the north-eastern and north western parts of the country receive very little rain and with such critical water problems the population is also sparse.

The availability of water saves a great deal of time and energy particularly when compared to the drudgery

of having to carry water for the whole family in a container from a distance of one mile or sometimes further. Up to 1970, it was estimated that most rural families spent 3 to 6 hours a day carrying water from a distant stream, pond or well on equivalent of 600,000 - man days per day. This arduous work diverted, as it still does, a great amount of energy away from other activities such as cultivation and animal husbandry.

Water, its availability and quality, is also related to the general health of the people who use it.

A big number of diseases are caused and spread by the use of polluted water necessitating the expenditure of great sums of money in medical care. The possibility of the incidence of such diseases is greatest in the urban areas where, due to the influx of people from the rural areas, the water facilities are unable to cope with the demand.

In connection with agricultural needs, it should be noted that great quantities of water are required for the production of crops. For instance, it requires 50 gallons of water to produce one cob of maize; to produce a ton of wheat the soil requires about 44,000 gallons of water and 1,600 gallons for one pound of steak.

As was noted above, Kenya's water resources are limited and the demands made upon it increase with the country's growing population and human activities. Yet there is no way to increase the production of this vital resource. For this reason, therefore, there is an urgent need for the country to conserve existing supplies, protecting them against deteriotation in quality and dimunution in quantity through wastage.

GOVERNMENT POLICY ON THE ENVIRONMENT

For many years after the establishment of colonial government in Kenya, the Government directed and supervised the exploitation of the environment without a policy as to its conservation, which would take account of the future demand of society. This is illustrated by the heavy wastage to which the forest estate was subjected during the colonial period.

On the Kenya Coast exploitation of forests for poles and Sewn timber for ships and houses had occured on a small scale for a long time before colonial administration was established. Such exploitation did not occasion any lasting damage or substantial diminution of the estate and new trees soon replaced the ones felled. However, all this change with the establishment of colonial administration and thereafter the forests were exploited on a greater scale to meet the demands of railway construction.

Shortly thereafter, in 1908, a 50-year lease was granted to Messrs. Lingham Gragan over 94,944 acrea of forest. The laste gave the grantees cutting rights

opportunity to acquire a 99 year lease over this forest area. The surprising thing is that at the time the lease was granted very little of the forest area had actually been seen, let alone inspected, by a Forest officer! Clearly, therefore, the grantees were free to exploit the forests covered by their lease without paying any attention to conservation principles were observed in the exploitation of the 264,410 forest area which, by 1908, had been alienated to settlers. 62

This lack of forest policy continued until 1957 when the Government, in a white Paper, set out its policy on the Forest Estate. Prior to this, the Forest Department had no written policy but followed what general recommendations were made by visiting experts sent to the colony to advise on Forest matters. The reports made by these experts did not contain direct statements of policy but generally indicated the way they thought best to exploit and conserve the forest estate.

After independence, a new policy, intended to accommodate what the Government termed "circumstances of the Republic" was announced. In principle, the policy was not different from the one announced in 1957. The new one, as the old one had done, emphasized the role the forests played in the maintenance and improvement of climatic and physical conditions;

conservation and regulation of water supplies; preservation of soil and the earning of revenue.

Prior to 1968, and particularly during the colonial times, large forest areas fore under private management. The danger to the part of the forest estate in private hands lay in the fact that the owners of such forests, in order to meet urgent needs for money, might be tempted to engage in excessive exploitation and so destroy the forest vegetation for many years to come and even convert a formerly prosperous forests into waste land or scrub. The 1968 forest policy set out to avert this danger by the cessation of private ownership of forests.

"In principle the Government's view is that the existence of private rights in the forest estate is objectionable. The Government policy is, therefore, firstly to define and limit any existing rights; secondly, to negotiate on just and reasonable basis the eradication of such rights, and thirdly, to allow no such rights to arise." 65

environmental problems for a long period after the establishment of colonial rule in Kenya noted in connection with forests, was also true of such problems as faced the few and small urban communities which had begun to emerge. As eraly as 1912, water in the Nairobi river was seriously polluted, irrigation trenches which drew water from the river receiving all the foul water sewage of the Indian Bazaar, River Road and surrounding District. Medical authorities regarded the water in the river as "admirably conducive to the spread of disease." It is therefore surprising to note that the sewage commission

was "bold" enough to disclaim liability for taking any remedial action: "The latest report of the sewage commission lays down that it is not the duty of a local authority to convert sowage into drinking water turning it into a stream but that such an authority had fulfilled all its obligation to riparian owners further downstream if it discharges its sewage so treated that it will not become a nuisance." 67

However, the growth of population, the introduction of technology and the problems of land use have subjected the environment to stresses which had been minimal during the colonial era. These stresses will be discussed in the next chapter. At this point, suffice it to say that by the 1970's these stresses had grown in magnitude and after careful examination of them, the Government submitted, through its delegation, a "National Report on the Human Environment in Kenya" and was a signatory of the Declaration on the Human Environment which was proclaimed at the conclusion of the United Nations Conference on the Human Environment held in Stockhom in 1972, which recognized, among other things, that "The protection and improvement of the is a major issue which affects the well-being of peoples and economic development throughout the world, it is the urgent desire of the peoples of the whole world and the duty of all Governments"68

The Government of Kenya has incorporated its committment to the preservation and conservation of the environment into the current Development Plan, 1974 - 78

wherein it is stated that "The Government recognizes that the conservation of the environment is becoming increasingly important as the growth of population and the impact of development and technology bear on the capacity of the environment to sustain the use being made of it. The Government will, therefore, increase its conservation activities and, wherever possible restore damaged environments."

About this Thesis

As Dasmann has noted, 70 a circle has no beginning; and so it is with the environment in relation to which it w would be difficult to pin-point any obvious point at which to start discussion of its conservation or management. This is because it is all linked together and closely interwoven. However, it would be impossible to discuss all what goes to make up the environment at the same time. For this reason, therefore, the Thesis will confine itself to the discussion of the water, aquatic and marine resources whose importance, because of their limited supply and their availability being a major contraint on human activities, has been discussed in the preceeding part of this chapter.

However, before an examination of the Law as it relates to the protection of these resources is undertaken the succeeding chapter will discuss the various demands made upon it, the strange these accounts junerate on the quality,

quantity and the suitability of the resources for the many uses to which it is put.

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CHAPTER THEE

THE ENVIRONMENT AND THE COMPETING INTERESTS

the most important being use of water for domestic and municipal puporses. This demand is likely to increase as a result of Kenya's rapidly growing pupilation. Not only has the population been growing but so too has the rate of annual increase grown - from 3.2. percent between 1948 and 1962 to approximately 3.5. per cent in 1974. This is shown in the table below:

Table 1.

YEAR	POPULATION	AVERAGE ANNUAL GROWTH RATE
1948	5,405,966	3.2
1962	8 ,636, 263	3•⁴
1969	10,942,705	3.4
1974	12,934,00	3.5

Source: Kenya Development Plan 1974 - 1978. p. 99

The country's population will continue to grow to between 28 million and 34 million by the year 2,000⁷¹. The enormous demand for water which this population will generate is underlined by the fact that the per capita consumption of water is as high as 220 liters per day in urban areas while that for mural areas is about 13 litres and day. 72

The second need for water is for industrial uses and this need will increase as more industrialization takes places in the country. The rate of growth of manufacturing industries over the period 1964 - 1968, for instance, averaged about 5.7 per cent and an ambitious target of growth rate of 8.9 was expected over the period 1967 - 1974.73

Of the other uses of water, irrigation is one of the most important, firstly, because of the great importance the Government is attaching to the opening up of new lands for agricultural use and, secondly, because of the great quantities of water required for irrigation projects.

The above needs of water will be discussed separately, below, but at this point it is stressed that Kenya's surface water resources are limited and are highly dependent on the amount and regularity of rainfall. In four years out of five, the annual rainfall is less than 750 millilitres in 85 per cent of the country. 74

Along the coast and to the south of the Tana River there is a zone of high rainfall, about 15 to 40 kilometres in width through out the year. In the Eastern and Central Highlands, there are two rain seasons occuring in March-May and October-December, with the highest rainfall being experienced on the slopes of Mt. Kenya and in the Aberdare Range.

Western Kenya has a long reliable rainy season and the area supports a very large population with a density of ever 300 persons per square kilometre in some areas.

The remainder of the country has low rainfall and consequently the population density is also low.

The main rivers in the country radiate from the Central Highlands and the slopes of the mountains and generally drain the eastern half of the country. Tana River, the largest of them drains the eastern slopes of the Aberdare Range. So does the Sabaki [also know as the Galana downstream and as the Athi further upstream towards the source]. Both of these rivers empty into the Indian Ocean. The rivers draining the southern part of the country - the Nzcia, Yala, Sondu and Nyando - empty into Lake Victoria.

The length and annual discharge of these rivers is given into the table below. 75

Table 2.

RIVER	LENGTH (KMS)	MEAN ANNUAL DISCHARGE MILLIONS OF CUBIC METRES
TANA	700	4,700
SABAKI	550	1,000
N.1017.	260	2,000
YALA	180	1,000

The needs and use of water mentioned above can be broken down as follows:-

- 1. Potable water for human consumption
- Potable water for animal consumption
 livestock watering
- 3. Water as life medium for marine flora and fauna.
- 4. Water as a recreational asset (direct, such as swimming; semi direct, such as beating and indirect, such as beauty.
- 5. Water for agricultural use, principally irrigation.
- 6. Water as raw material or coolant in industry.
- 7. Water as power produce in hydro-electric facilities.
- 8. Water as supporting medium for ships and other commercial vessels.
- 9. Water as sink for wastes.

In order for any water body to function adequately in satisfying anyone of the above purposes, it must have a corresponding degree of purity.

The most serious of the problems facing the water resources of Kenya is water pollution. At the present time, the problem is not serious; however, the problems which do exist indicate that matters could become much more serious in the future due to the rapidly growing population, an

expanding industry and a fast urbanization rate. Before examining the various demands upon the water resources and and their contribution to the problem of water pollution, it is necessary to define the term "Pollution".

Pollution can be defined as "any change in the quality of water which renders it unsuitable for its intended use." This definition, of course, begs the question, as a further definition of "intended use" is required. However, any definition of pollution must take into account the indended use, as pollution is not a single term or a single cause nor does it have single cure but a whole family of related effects.

The most obvious form of pollution is what may be termed "mesthetic" pollution caused by floating scum or large solids caught on the sides of the banks of a river or the sides of any other body of water.

The second type of pollution is that caused by the discharge of substances which obsorb the dissolved oxygen from water as they discompose. Municipal wastes fall under this category.

The discharge of organic compounds such as do not occur naturally and which are often reistant to biochemical decomposition is another type of pollution.

These compounds include insercticides, herbicides and other substances which may persist for many miles in a

body of water or even indefinitely. Of this type of pollution, it has been said that "the whole world is now polluted with DDT and virtually no person or animal, including the Eskimo or the Anarctic Penguin is now free of this pollution."

Heat, too, is now classified as a pollutant because the discharge of heated effluents from industries and by electricity-generating stations influences the effects of existing pollution in a body of water. Increased water temperatures reduce the level of dissolved oxygen and this may have adverse effects on the fish life and other aquatic animals and may, in addition, increase the toxity of other pollutants. The toxic effects of substances such as cyanide, for instance, is increased by a rise in the temperature of water.

Detailed discussion of the above forms of pollution together with examples of their occurence in Kenya will be undertaken below together with the activities which generate them.

a) Urbanization and Human Settlements.

Urbanized societies in which a majority of people live crowded together in towns and cities, it has been said, represent a new and fundamental step in man's social evolution. Although cities themselves first appeared some 5,500 years ago, they were small and mainly surrounded by an overwhelming majority of rural people. The urbanized

societies of today, in contrast, not only have urban concentrations of a size never before attained but also have a higher proportion of their populations concentrated in such agglomerations.

As it has been demonstrated in various studies on rubanization, the rate of population and urban growth in East Africa and other regions of the developing world is greater than was experienced by the now developed countries at an equivalent stage in their economic growth. 79 It is even higher than was commonly expected, for in line with experiences elsewhere in Africa, recent census have revealed even more people than were assumed by extrapolations from previous census counts. An even faster rate of growth is recorded for the "urban population" i.e. the total numbers of people in towns with more than 20,000; and faster still has been the increase recorded for the "cities", i.e. those places with 100,000 or more inhabitants - which in East Africa include Nairobi, Kampala - Mengo, Dar-es-Salaam and Morbasa.

It must be noted, however, that urbanization is a recent phenomenon in this part of the world. In Kenya, at the time of the 1948 census, there were only 17 towns i.e. population centres inhabited by 2,000 people or more a total urban population of 276,240 or 5.1 per cent of the national total. 14 years later, i.e. in 1962, the number of towns had doubled and the urban population numbered

670,950; by the time of the 1969 population census, urban population had risen to about 1 million distributed over 48 towns.

The table below shos the annual percentage increase of population in the country's main urban centres during two periods i.e. 1948 - 1952 and 1962 - 1969.

Table 3.

TOWN	1948-1962	1962-1969
Nairobi	6.0	9.7
Hombasa	5•2	6.4
Kisumu	4.0	4.7
Nakuru	5.8	3.0
Thika	11.5	4.0
Eldoret	6.2	-
Kitale	3.6	3.4

Source: National Report on the Human Environment in Kenya
Prepared by the working Committee for the United
Nations Conference on the Human Environment.
p. 12.

On the basis of the present national rate of population growth as well as the growth rates of the urban areas, it has been estaimated that by the year 2,000, kenya will have a rate of our 72 million people living

in urban centres of more than 2,000 inhabitants. Nairobi and Mombasa, if they maintain their present proportion of the total urban population, will have populations of 3 million inhabitants, respectively.

The growth of the urban population, as discussed above has been so rapid that it has been almost impossible to provide adequate helath and social services. An instance of the strain this rapid urbanization has generated is the difficulty of providing adequate accommodation in the major towns - Mombasa and Nairobi. At present, a sizeable portion of Nairobi's population lives in the shanties of Mathare valley and other places. Other residents of the city are packed like sardines in the substandard housing localities of Eastleigh, Old Pumwani, Railways Landlies, Muthurwa, Shauri. Moyo etc. The conditions obtaining in these places pose serious health problems.

The shortfall of about 7,500 urban dwelling units a year has been met by individual families who have squatted on public and private land and where even squatting is not possible, families have doubled up or tripled up with other families. The resulting overcrowding is now even worse, causing serious helath hazards. The Nairobi City Medical Officer of Health, in his 1969 Annual Report, discusses this problem and its consequence - "Despite efforts to provide low cost and other housing shortage of accommodation continues

shanties spring up in even greater numbers than in 1968. This occured mainly in the Eastern side of the City Mathere Valley, Kariobangi and Eastleigh. In the city centre, Wananchi continued to occupy flats that were formerly inhabited by Asians. The result was that illegal lodging houses and unauthorized partitions sprang up in even greater numbers than before. Over-crowding was rampant and the sanitary conditions of the dwellings deteriorated a great deal."

To cope with this housing demand, the Government planned to spend K£53 m. during the 1970 - 1974 Development Plan period. Of that sum, 85 per cent was to be spent on urban housing, with Nairobi, Mombasa, Kisumu and Nakuru receiving the lion's share of this expenditure on housing. In the face of this housing demand, Nairobi planned a programme for over 10,000 housing unites of which more than 7,000 units were scheduled to cost less than K£1,000. Mombasa's requirements of 2,000 a year was to be met half-way-only 1,000 units were to be built during the Plan period. The needs of the other urban centres amounting to 1,000 units were to be supplied by the National Housing Corporation.

The above housing programme was not fully met; more high cost houses were constructed at the expense of

low cost housing. 83 If the tendency of the housing programme to fall short of demand continues, the situation would deteriorate, for as a Member of Parliament has warned; "Unless there was a reversal of Kenya's housing policy now, there would be 2,000,000 improperly housed people in Nairobi alone by the year 2,000.84

Apart from the housing crisis in most urban centres, there is also the inability of the local authorities to provide other social services and an instance of this can be gathered from the 1972 keport of the Education Department (Nairobi). A total of 72,121 children were enrolled in Nairobi City Council's Primary Schools leaving a staggering 9,000 children of school age not attending.

12 new schools were completed and provided an additional 1,650 standard one places in January of that year. Of 68,000 pupils of certificate of primary education only 2064 were placed in Form one of the maintained secondary schools.

In a recent case study of Nairobi presented to an expert study group, the City's Chief Planning Officer says that the estimated annual expenditure will rise to nearly K£30 m. by 1985, against a projected revenue of K£22 m. 86

This officer warned that unless addition resources are found, the City will be unable to provide adequate housing and other services. However, the problem of financing these services faces nearly every local authority in the country and the abolition of graduated personal tax as well as

any lighter. New sources of revenue such as site rates are bound to meet political resistance as they will increase the total tax burden to the individual. And yet, there seems to be no alternative except the impairment of development in the urban centres as well as the deterioration of their inhabitants' welfare

Preccupation with housing problems in urban centres has resulted in neglect of the housing needs of rural areas of the country where the majority of the population live. The Government spelled out its non-involvement in financing rural housing when it stated that "The impetus for the construction of housing in the rural areas must continue to be the people themselves," and all the Government will is "provide funds for research, education and technical advice and assistance ..., 87

In view of the above, the traditional rural houses in the country will continue to be thatched structures in isolated homesteads. Most of these rural houses are based on designs used by the local people for generations. The majority are mudwalled with grass-thatched roofs and though metal roofs are on the increase, most of the rural population will continue to be housed in the traditional low standard housing.

Admittedly, the rapid rate of urbanization and the fast rate of population growth have generated innumerable stresses on the environment. However, as pointed out, in the last chapter, this thesis will concern itself with those interests which make demands on the water resources of this country. Below, therefore, is undertaken an examination of the implication of these varied demands.

Human Settlements and the Water Resources.

The water carriage system of transporting municipal wastes is one of the characteristics of a modern community. However, the waste: carriage function acts in competition with industry and commerce which require large valumes of water for their various processes. If small amounts of water are used or the distance between sources of wastes (home, industries etc.) are great, it will be possible to dispose sewage by permiting it to seep into the ground. However, the capacity of the soil to carry away the wastes is gradually exceeded as the popurdensity increases.

In heavily populated areas, sewage is usually disposed by being discharged into a receiving body of water. The body of water dilutes the pollutants carried in the waste to the point where their pollutants are no longer so concentrated as to cause a nuisance. In the event that the receiving body of water is so small that it cannot provide adequate dilution, treatment of the heaving becomes necessary

in order to remove the pollutants to such a degree that the sewage can be discharged into the body of water without seriously jeopardizing the aquatic environment.

As the population of many of the urban centres grow their sewage facilities, though once adequate are quickly outgrown. Funds for new facilities can be obtained only at the expense of those needed for better schools, roads and other public services. As shown above, the available funds are insufficient for all these needs.

The 150 sewage treatment plants in Kenya are incapable of treating the large quantities of sewage which are generated by the rapidly growing population as well as an expanding industrial sector. In Nairobi, about 10 million gallons secondary treated effluents are discharged daily through the sewage system, which now has to work at near 100 per cent capacity to maintain satisfactory minimum dissolved exgyen levels in the discharge in order to avoid polluting the very small volume of stream flow in the Nairobi River into which the effluent is discharged.

The area on which the city of Nairobi is situated has very limited water resources and the city mainly depends on water brought in by pipelines from sources in the Aberdare Range. The discharge of wastes into the Nairobi River from the Eastleigh and Kariobangi sewage treatment plants has converted this small river into "more or

less an open sewer." In fact, the Ministry of Health has warned that "Pollution has reached a very dangerous level for both people and animals using the Nairobi River and other tributaries passing through the City."

In the "illegal" Settlements such as Mathare

Valley, sanitation facilities are almost absent. Due to

the rocky nature of the site, all pit latrines are

shallow and fill very quickly. With one latrine serving

more than 35 people, poor standards and shelter construction,

the sanitation facilities are potential threat to health.

Since most of these latrines have no lighting, they are

not used after dark; defaccation is in the open

The open drainage channels discharge their wastes (which

include human wastes) into the nearby rivers.

Apart from domestic sewage, industrial effluents are discharged into the Nairobi and Ngong rivers; but this is a subject which will be examined when discussion moves on to the disposal of industrial wastes.

Mombasa discharges about 1,200,000 gallons into
the Indian Ocean. 92 However, it should be noted that not
all of the town's sewage is disposed of in this way because
12 per cent of the town population uses pit latrines while
the disposal of about 3 per cent of the sewage is
uncontrolled. These facts as the significance when it is

rembered that a portion of water supply on Mombasa mainland is by well. Since the pit latrines become saturated after so long and no further soakage is possible, there is the ever-present possibility of pollution of the water supply.

Kisumu's daily sewage discharge is 650,000 gallous all entering into the Kasat River which flows into Lake Victoria from which the Kisumu area gets its water supply. The volume of sewage discharge mentioned above does not include the sewage from the peri-urban areas where pit and bucket latrine are used. The disposal of sewage into the Kasat River not only impairs the quality of the river's water for human consumption but makes the river unsuitable for fish and other aquatic organisms.

Lake Nakuru, the home of about 2 million flamingoes, is the receiving body of water for Nakuru's 767,000 gallons sawage. If the waters and the habitat of the Lake were to be destroyed by pollution resulting from sawage disposed, its unique characteristics as the home for the largest concentration of flamingoes would disappear. The World Wildlife Fund being aware of the possibility of such pollution, donated \$500,000 dolars to the Department of National Parks and this money has made it possible for the Lake Nakuru Park to be extended from its original size of about 14,000 acres to about 50,000 acres. 95

Of the remaining urban centres, some, such as Thika, have treatment plants which are so overloaded and badly managed that the final effluent has a high content of suspended solids and an extremely strong odour. Other urban centres, such as Embu or not sewered at all.

As for the rural area of Kenya, the current , Development Plan makes no mention of any plans to develop sewage disposal systems though strong emphasis is placed on the supply of piped, safe water for human uses. However, the supply of water to these rural areas does not avert the necessity of providing a sewage disposal system. If anything, a steady, safe supply of water in these areas will generate greater quantities of wastes than are generated at present and if no system exists to deal with these wastes, pollution of the local water resources will ensue.

At present, in the absence of sanitation facilities, people in these areas "just go to the woods"; and although their human wastes eventually find their way into bodies of water, their quantity is such that they are broken down without resulting in water pollution.

Bacteria are present in crude sewage in very great numbers and although treatment of the sewage results in their reduction, the number remaining in the fully treated effluent is very great. Most sewage bacteria are harmless, of course; but pathogens may also be present in smaller numbers and they include organisms which give rise to typhoid, dysentery and cholera. As early, as 1919, River Nairobi was found to be infected with typoid and was considered unfit for human consumption. 96

At the request of the Nairobi City Council, the Medical Centre made a stool-survey of over 15 primary school children. The survey which was made in September - October, 1970 showed the following results:

infection with Bilharzia (62%),

roundworm (81%) and

Hookworm (27%).

On the basis of the above information, the Housing Research and Development Unit of the University of Nairobi concluded that although the data does not tell of "the extent of bad health amongst children in Mathare, but can indicate the form it takes and the steps to suggest to alleviate them.

The worms and bad tummies are from dirt and the absence of an efficient system for disposing of human waste." 97

Though the poor systems of waste and sewage disposal have not led to acute water pollution in Kenya, it is noteworthy that almost all the cities and towns in Kenya have developed in locations of limited water resources and as a result they are bound to have pollution problems that may be difficult or expensive to control.

b) Agricultural and the Use of Pesticides.

It has been estimated that nearly 500 million people are hungry in the Third World today and the Director of the United Nations Food and Agriculture Organization (F.A.O) has admitted that the situation is more critical than it has been for a very long time. This food crisis is closely related to the growth of population in the Third World and the World at large. On the global scale, estimates say that the World population of 3,000 million will double in the next 35 years and continue to grow at the rate of 1,000 million people every 8 years. Puring the World Population Conference in Bucharest, Rumania, it was disclosed that 4 million people had perished, in the Sahelian Belt; and according to UNICEF, 500 million children were facing starwation.

Though not experiencing famine conditions, Kenya has accasionally faced shortages of essential foodstuffs such as maize, beans, rice and sugar. In 1971, the demand generated by population growth in general and by the rate of urbanization in particular, called for a growth rate of more than 5 per cent in food production in Kenya. 101 Because of the country's Limited Land resources and because the use of irrigation to increase the acreage of land under cultivation is not a wiable alternative because of the costs involved, increased productivity can only be attained through the use of fertilizers to maintain and

improve soil fertility and the use of posticides to eradicate pests which invade and destroy crops under cultivation.

The table below shows the ever-increasing quantities of fertilizers and pesticides imported into the country over the last 10 years (i.e. 1964 - 1973)

TABLE 4.

ARTICLE	UNIT	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Manufactured Fertilizers:	Metric ton									¥	
Nitrogenous Phosphotic	11	32,172 12,423	47,892 11,884	31,180 17,766	29,265 15,645	32,259 19,421	31,115	50,170 19,331	(2)	54,668 15,420	
Other	11	2,438	2,976	2,956	3,570	5,432	6,574	9,053	13,858	11,917	15,104
Insecticides, fungicides, disinfectants							<u>.</u>				
etc		3,702	4,344	3,051	2,595	3,760	3,717	4,337	4,298	3,934	6,658

Source: Statistical Abstract, 1974. Central Bureau of Statistics. Ministry of Finance and Planning, Nairobi. p. 77.

The quantities of chemical compounds used in Kenya as shown in the table above are only a small reflection of the ever-increasing number of synthetic organic chemicals which have been developed and widely used as pesticides all over the world. These chemicals have proved their values in preserving valuable crops attack by pests and in destroying vectors of communicable disease. Indeed, it can be said, and with some justification, that the vast campaign launched by the World Health Organization for the eradication of malaria, which hy 1968 had achieved a coverage of 79 per cent of the estimated 1733 million people living in areas which were originally malarious, would not have registered such success in the absence of DDT. 102

Some fertilizer Programmes have been introduced in various parts of Kenya, an example being the one in the coast province. Acting on a request from the Kenya Government, a five-year F.A.O. Fertilizer Programme was started and since 1971 a F.A.O. expert has been working in Mombasa where he supervises Fertilizer Programme projects which are designed to improve the network of fertilizer distribution; to teach agricultural staff about the use of fertilizers and other matters related to the use of fertilizers. The programme also involves demonstrations on farms planted with maize, cassava, cotton, sunflower groundnuts, sorghum, coconuts and vegetables. The

programme has had a big impact on the yeld of these crops and it is estimated that productivity could increase 3 to 4 times if the farmers follow the instructions of the agricultural staff on the use of fertilizers.

Fertilizers, Pesticides and their effects on the Environment

one of the chemicals which has been widely used for pest control is the DDT, whose rotency as an insecticide was discovered in 1939. It was used extensively by armies during the second World War and subsequently became popular for insect control. D.D.T., a member of the chemical group (Chlorinated hydrocarbons) which includes aldrin, dieldrin and chlordane is virtually insoluble in water, though it may vaporise from the ground without losing its potency.

D.D.T. in soil or water is ingested and concentrated in small quantities by the smallest animals, from whom it passes along the food chain, until it appears in higher concentrations in fish or other predators, including mammals.

Though the cummulative effect on humans of this chemical is not very well known; scientists treat it with suspicion because it has been shown to attack the liver; causing the liver enzymes to break down the sex hormones. 103 in a study carried out in Nairobi, residues of DDT and dieldrin were detected in the timsues of humans and baboons from various parts of the country. In humans aged 25 to 40 years the total value of DDT residues averaged 4.60 parts

per million; in baboons C.O7 parts per million. 104 In another study, the presence of pesticides of all major classes including polychlorinated biphenyls (PCBs) was established in nearly all samples analysed from natural waters of the Rift Valley area and from samples from some coastal waters. On the basis of this study it was stated that n... pesticides have found their way into many species of wildlife, from the lower forms of life to the highest forms resident in the Rift Valley area of Kenya. It might be stated in passing that even twenty five human milk samples analysed revealed DDT, DDE and PHC levels of O.O6 = 0.91 p.p.m., 105

1

Though there has been no evidence that DDT has adverse side effects on soil micro-organisms which are of major importance in maintaining soil fertility, the chlorinated hydrocarbons do kill soil insects, parasites as well as the predators of pests. The reduction of the pest population deprives the pest predator of its prey and this may lead to a reduction to a level where it is ineffective as a control when the pest population increases again. In this regard, it has been claimed that "... mites, as pests, are a creation of the pesticide industry. Careless over-use of DDT and other pesticides has promoted many of these little insectlike relatives of spiders to pest status by killing the insects that previously preyed on the mites and kept them under control."

The other important side effect of the use of these insecticides is the possibility that the pests build up resistance against these chemicals. This happened in the Canete Valley in Peru where attempts were made to control cotton pests in 1949 DDT and other pesticides were used widely with the effect that cotton yields rose dramatically: from 494 kilograms per hectare in 1954. The farmers were so encouraged by these results that there was even heavier application of the pesticides.

It was first noticed that birds, animal forms such as insect parasites and predators began to disappear and gradually there was a new invasion by the pests, which heavy application of the insecticides, had been intended to control. Yields began to drop in spite of the tremendous amounts of insecticides applied. There is a death of data on this aspect of insecticides use in Kenya; but there is little reason to suggest that the same cannot happen here.

Pesticides and the Water Resources.

Phytoplankton are the primary products responsible for most of the food we take from the marine and fresh water resources so that if photosythesis was reduced to any significant degree in this phtoplankton the amount of life in these resources would also be reduced. The presence of mercury has effect similar to that of DDT and like the chlorinated hydrocarbons it tends to be concentrated in food chains.

The danger of these posticides to our water resources in Kenya was first experienced as early as 1944 when the military and medical authorities sprayed the Kavirondo Gulf (lake victoria) with DDT in a campaign against mosquito. The DDT, apart from eradicating mosquito, also killed a number of insects, many of them beneficial to man. A study was made on the efects of the insecticides on the fishery in the Gulf and results showed 107 that:-

- a) There had been a fish mortality following the spraying of the coastal area of victorial Nyanza.
- b) Aquatic fauna had been markedly reduced in quantity and quality, molluscs and leeches being the only species left undisturbed. Algae on the shore was killed.
- c) Plankton was much reduced both in quality and quantity.

The fish mortality in the Gulf as evidenced by
the result of the above study was such that some people
might have felt that the Government fear on the effect of
the spraying was not justified. To such people, Copley
warned that "... full results from such spraying may not
be visible for months after the event. Some foods
(microscopic in size) may gradually die off and these
being the food of the larger organisms also cause them
to die off and so on in the food chain until the fish

themselves die from starvation and a valuable fishery sadly decline in value. The results do show that before any spraying with DDT is undertaken most careful consideration must be given to other things and not just the killing of a mosquito, in view of the fact that DDT is a most powerful insecticide which is not selective in its action."

The problem of pesticide pollution of water rescurces did not receive much attention after the Kavirondo Guld incident until in March, 1971 when there was a sudden fish die-off in Lake Nakuru.

Lake Nakuru is a closed ecosystem without an outlet and, therefore, sensitive to pollution. Urban sewage, industrial waste and run-off from surrounding agricultural areas constitute a pollution hazard. Some 767,000 gallons of sewage are discharged directly into Lake Nakuru. In addition, there are several industries manufacturing or dealing in a variety of chemicals from agricultural fertility to highly toxic pesticides, detergents, oil and heavy metals.

Approximately 75,000 fish died. The die-off followed a sudden heavy rainfall in the town of Nakuru. Samples of these fish were analysed at the Institute of Chemical Bacteriology and Water Chemistry of the Technical University of Munich and in 1972 the results of this analysis were

published in a report 110 by the Kenya National Parks, from which the following tables are taken.

TABLE 5

Pollutant Levels in Lake Nakuru (Figures in parts per millions)

water	Silts and - Sediment 5.10-670	Algae and organic matter.
06-0.49	5.10-670	3.90 - 855
06-0.49	5.10-670	3.90 - 855
.02-0.05	0.21-2.25	0.36 - 5.88
.01-0.05	0.19-3.02	0.11 - 1.96
.0 -0.062	0-0.004	0.01 - 0.05
07 0 08	0.03-1.49	0.04 - 1.07
•		0 -0.062 0-0.004

As it has been repeatedly pointed out, Kenya's water resources are very limited and this is a major constraint on developmental activities. Yet, these resources which are 50 vital for the welfare of the people are also polluted with pesticides, as shown in the table below.

In Tanzania, 36 people died of pesticide poisoning within the period July 1969 - July 1970 and post-mortems revealed that they had eaten food contaminated by insecticides. This number could have been higher if all the deaths caused by insecticide poisoning had been reported.

TABLE 6 RESIDUES IN WILDLIFE OF LAKE NAKURU CATCHMENT
BASIN.

(Average Figures in parts per million)

					1
SAMPLE	PCB'S	DOT/DDE	внс	TOXAPHERE	OTHERS
Algae (Blue green)	9.82	0.06	0.04	0.01	0.17
Frogs	0.87	0.08	0.02	0.01	0.03
Fish (Tilapia ssp)	0.99	9. 05	0.09	0.02	0.29
Birds - Flamingo	7.12	0.27	0.22	0.01	0.05
	12.10	0.31	0.32	0.01	0.04
Cormorant	19.21	0.35	0.51	0.01	0.07
Pelican	8.10	0.53	0.37	0.02	0.03
Fish Eagle	13.0	0,47	0.58	0.02	0.04
Mammals - Buffalo	-	0.47	0.03	0.01	0.01
Monkey	1.75	0.08	0.02	[- T	0.01
Hyena	5.25	0.11	0.07	•	-
Impala	-	0.05	0.10	-	11-

TABLE:7 RESIDUES OF PESTICIDES FOUND IN THE NATURAL WATERS OF EAST AFRICA

SAMPLE	POLY-CHLORINATED BIPHERYLS (PCB'S)	ORGANOCHLORIDE INSECTICIDES	ORGANO PHOSPHORUS	CARBAMATE INSECTICIDES	LOCATION
RIVERS	0.03 - 0.09	0.06 - 1.7	9 1.8	0 0.1	River Molo
•	0.04 - 3.8	0.01 - 7.0	0 — 1.2	0 0.5	River Njoro
-	0.05 - 5.1	0.02 - 3.3	9 0.8	0 0.1	River Hairobi
LAKES	1.15 - 90.6	1.4 - 7.6	0.6 - 2.9	0 0.2	Lake Naivasha
2	5.1 - 855	1.1 - 15.4	0.4 - 2.4	0 0.5	Lake Nakuru
-	0.9 - 129	0.5 - 6.7	0 1.2	0 0.4	Lake Victoria
COASTAL WATERS	5.0 - 451	0.5 - 2.8	0 0.9	0 0.1	Malindi
	2.9 - 386	0.2 - 3.4	o 1:1	0 0.2	Mombasa

Deaths directly attributed to insecticide poisoning have not been reported in this country though this is, by no means, an indication that such deaths have not occured.

Again, since the residue of these substances have been detected in human tissue, it is only a matter of time before their long-term effects are felt in this country.

Herbicides are also being used in ever-increasing quantities. These chemicals act as substitute for farm machinery and labour in cultivation because of their chemical capacity to kill weeds. Although their direct effect on animal life is little known, these herbicides have a long term impact on animal populations through their eradication of plants on which animals ultimately depend for food. In the past few years, 250 metric tons of herbicides were used as in-puts in agricultural activitities.

Recent studies in the United States of America
(U.S.A.O and Sweden indicate that herbicides may produce
defects in mammals (including humans) and may also kill bird
embroys or induce defective or sterile young.

Apart from herbicides and insecticides, the agricultural sector has been using large quantities of inorganic nitrogenous and phosphatic fertilizers to boost productivity and as a result the waters draining the country's farmlands are rich in nitrogen. In the lakes and rivers into which these

fertilizers are ultimately discharged, they are converted into organic substances as large masses of algae develop. Subsequently, the algae is decomposed and the bacterial decay they undergo consumes exgyen thus reducing the amount of this element which is vital for fish and other animal life.

This process may also occur where sewage is discharged into a body of water. In urban areas, sewage is often dumped into the nearest river on lake. With a growing urban population, the load of sewage in streams, lakes and rivers will exceed the capacity of water to disperse or dilute these nutrient and phosphatic substances in the sewage. The excess nutrients brought into bodies of water by sewage and run-off will create a condition known as Eutrophication i.e. an excessive enrichment by nitrates and phosphates. The large masses of algae mentioned above flourish on this excess initrates and phosphates.

In industrialized countries where eutrophication is widespread, fisheries have been destroyed and marine ecosystems adversely affected. Lake Erie in the United States of America (U.S.A.) and Lake Baikal in the Soviate Union are examples of lakes in which entrophication presents a serious threat to the marine and aquatic ecosystems.

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Controversy has raged over the wisdom of continued use of these chemical substances as agricultral in-puts in

the face of their adverse effects on the environment.

Concern about health hazards from pesticides was first expressed at the 1950 Assembly of the World Health Organization. In subsequent years, greater concern on this subject has been expressed by the World Health Organization, Food and Agriculture Organization, other international and national organizations. However, some persons and even organizations have refused to accept the fact that these substances pose a longterm threat to the environment. Typical of this group is a Kenyan delegate's statement in his lecture delivered to the World Population Conference in Bucharest, Rumania, in which he said,

"The current propaganda campaign against even the judicious use of agricultural chemicals being promoted by fear-provoking and hysterical scholars of ecology is the evidence of their myopic comprehension of only a small chapter of the book of this vast and all-embracing science.

"If at the present stage of our knoledge, agriculture is denied even the controlled use of fertilizers and insecticides because of the unwise legislation being promoted by hysterical and powerful lobbyists who incessantly keep on predicting doom for manking through chemical poisoning, then a good many more of the human beings will perish not by the doubtful and remote chemical poisoning but by the very real and immediate starvation." 113

The claim of this delegate that anybody is opposed to the "controlled", "judicious" use of agricultural chemicals

that these chemicals have been an important factor in promoting increased agricultural productivity. What the ecologists have sought to do is to draw the attention of the public to the long-term ecological effects of excessive use of these chemical substances and examples abound where they have had adverse effects on the ecology. Yet, the Kenyan delegate had the courage to shut his eyes to these examples; to him, such effects were "... doubtful and remote ..."

admits of these long-term ecological effects, a fact which comes out clearly in the address of the Minister for Agriculture to the Seminar on the Efficient and safe use of Pesticides in Agriculture and Public Health held in Nairobi in October, 1974. During his address the Minister admitted that in recent years it had become evident that residues of certain persistent compounds were widely distributed in the environment and in certain situations seems to have produced undesirable side effects. 114

Earlier on, in 1971, at the UNESCO Regional
Seminar on Ecological, Methodology and Conservation In
Tropical Africa held in Nairobi, with the participation
of 12 countries, a unanimous recommendation was adopted
for the setting up of a regional pesticide monitoring
laboratory for Africa, because, as the recommendation stated,

"It is abundantly clear that the accumulation of pesticides in the body tissues of animals (including man) is coming to be recognized as an urgent problem in a number of African countries."115

Irrigation and the Water-borne Disease

is assuming great importance in the country because of the absence of the scope of increasing the cultivated acreage. Apart from this, agriculture is highly vulnerable to the vagaeis of an unreliable rainfall. Food production, in particular, is strongly influenced by the variation in weather. Development of irrigation could bring some stability into the farming industry and could substantially lower the cost of famine relief in dry years.

Most of the large-scale irrigation schemes are managed by the National Irrigation Board (N.I.B.) and includes schemes at Mwea and Hola based on Tana River, Perkerra based on Perkerra River, Ahero and Bunyala. The land and Farm Management Division of the Ministry of agriculture manage the minor irrigation schemes in the arid morthern and eastern part of Kenya.

Two of these large-scale irrigation schemes - Mwea the largest and most successful and Bunyala - are based on rice production. At Hole, cotton is grown with crops of maize, groundnuts and green grains, being also produced. The production of sugar cane is to be started on this scheme. The farmers on these schemes have realized high

incomes as a result: the not average income at Mwea is K Shs. 3,400/= and at Bunyala incomes have been as high as K Shs. 4,000/=. However, there have also been cases of failure on some of the schemes: the farmers on the Perkerra scheme have had to contend with low yields and fluctuating prices receiving for onions. The Ahero scheme has been plagued by disease and consequent low yields.

One of the vital conditions for the irrigation schemes is the availability of water in sufficient quantities and it is this fact, among others, which makes discussion of irrigation schemes relevant in an examination of the demands made upon the water resources of this country.

When water is abstracted from the river, the immediate effect on river quality is nil and the water remaining is of the same quality as that abstracted. But this abstraction may be an entire loss to the river system by evaporation and transpiration and this may increase the effects of any existing pollution. On the other hand, any excess water which drains back to the river will increase its mineral content, in particular the harness and concentration of nitrogen and phosphorus compounds. Thus the water will be of reduced quality for domestic and some industrial processes.

Water development projects intended to bring about increased agricultural productivity may turn

out to be a mixed blessing in terms of the health of the people for whom the projects are undertaken.

Among such projects, are man-made lakes, which it has been noted, facilitate the incidence of malaria and schistomiasis.

Galole, Perkerra, Ahero and Bunyala and Hola. As was noted above, the farmers on these schemes have realized higher increased productivity; but it should also be noted that in the process of raising incomes in these rural areas new environmental problems have been created. Irrigation canals provide: an ideal environment for malarial mosquitoes and the vector snails which transmit bilharzia. In fact, the incidence of bilharzia at the Mwea irrigation scheme has been ascribed to the environmental change brought about by the construction of the irrigation canals.

As a short-term remedy, pesticides may be use to eradicate the malarial mosquitoes and molluscacides to kill bilharzia -carrying snails. However, the use of these chemicals may usher in a new train of environmental problems:

be water may/polluted without necessarily removing the disease from the environment.

The construction of dams may not always have favourable effects on fisheries and in many instances

the imigration routes of fish and in so doing may ruin the fishery. The Tana River which rises in the Aberdare mountains, it has been estimated, has a power potential of about 15,350 million KWL. Already, the potential is being tapped at Kindaruma Dam which has been constructed on the dam. As realy as 1955, it was feared that the construction of this and other dams would lead to the extinction of the eels of Tana River.

In addition, the construction of dams may have adverse effects on the spawning grounds of fish by their flooding. On low water level these spawning may dry up leading to spown mortality and hence the failure of the fishery. This occured at the Roserires reservoir. (Egypt) in 1968 when the water level dropped so low that many fish were killed.

(c) Industrialisation and Pollution of Waters.

As it was pointed out at the beginning of this chapter, industries are among the biggest consumers of water. Further, it was noted that water consumption by industries is lilely to grow as more industrialization takes place in the country. Between 1964 and 1968 industiral growth proceeded at the rate of 5.7 per cent, while this rate was expected to rise to 8.9 per cent between 1967 and 1974. The achievement of this growth rate was based on the expectation that more industries would be started to replace imported goods manufactured outside the country. Apart from this the Government has initiated a Rural Industrial Development Programme which is designed to promote rural economic development and the creation of more jobs through the promotion of labour-intensive small scale industries. Under this programme centres will established through out the country and four such centres are already operating at Nyeri, Kakamega, Machakos and Embu.

The figure below shows the industrial towns in Kenya and their sources of water.

water (mainly from rivers) is used in large quantities by industry for process work, colling purposes, steam raising and water power. As a result, when a site is chosen for a new factory, consideration is given to the quality as well as to the quantity of the water available.

Among the largest industrial consumers of water are the chemical industries, steel plants, textile industries, tanneries, paper and pulp mills and power stations.

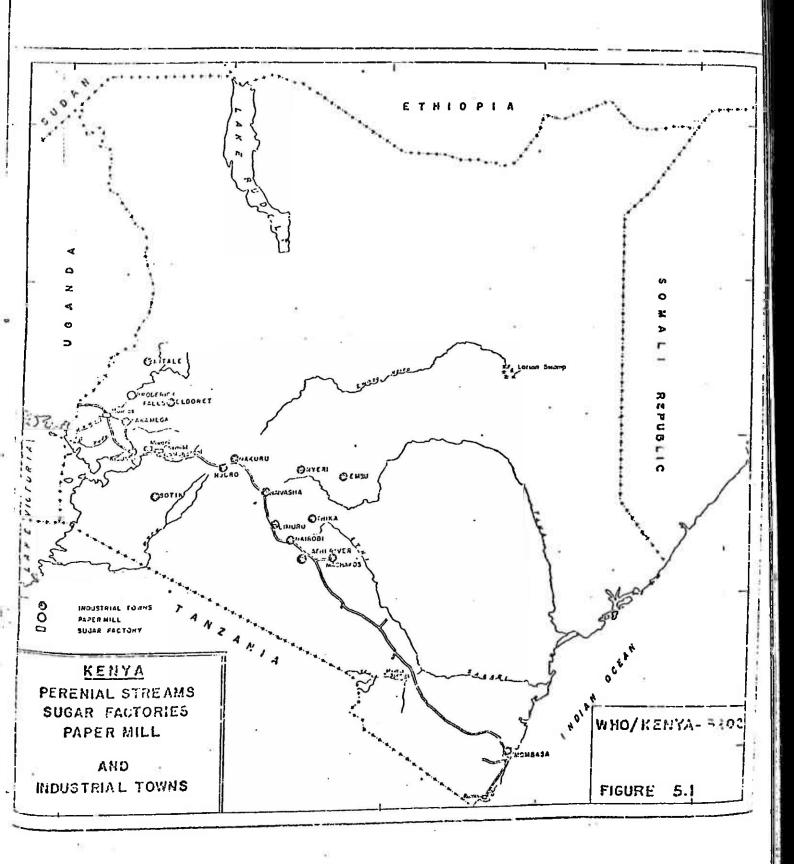
The table below showing the approximate water requirements of several important industries (mainly in the U.S.A.), gives some idea of the tremendous amounts of water used by industry. Most of this water is returned, after treatment, to the rivers and, hence, can be the cause of much pollution.

TABLE: 8

Approximate Water Requirements (Figures given in gallons per unit of material)

INDUSTRY	WATER REUIREMENTS
Steel Paper Wood pulp Tanning Cotton dyeing	50,000 gal / ton. 32,000 gal / ton. 50,000 gal / ton. 8,000 gal / 1,000 lb. hide. 8,000 - 17,000 gal / 1,000 lb. 45,000 gal / 1,000 gal. of Milk.
Milk	47,000

Source: Rudolfs, W., "Industrial wastes, their disposal and treatment." Reinhold publishing corporation New York. 1953.



often present in industrial effuents may interfere directly with the biological balance of the organisms in the river by exerting inhibitory influences on fish and fish food or by upsetting the acological balance of the aquatic environment. The substances may be actually toxic to river organisms without necessarily being harmful to humans. For example, extremely small concentrations of heavy metals and cyanide could be tolerated by human beings while being toxic to fish and aquatic organisms. Similarly, copper is inhibitory to the growth of bacteria and toxic to fish as illustrated by the fish kill in Migori River attributed to drainage from the new-efunct Copper Macalder mine in Nyanza.

Normally, industrial wastes are treated before discharge to public sewers, for reducation in concentration of toxic substances to such a level as not to cause interference with the purification of the mixed demests sewage and industrial sewage. Industries which are too far from a public sewer may have to invest in treatment works so as to cope with the disposal of their own wastes. However, this is an investment which brings no direct profit to the industries concerned, and without some pressure to do so, few industries will invest in such treatment works. This fact is borne out by the observations made by the World Health Organization team which visited several industries in the country: "By and large, today

most industries so situated in Kenya do not provide any form of treatment for their waste water and where treatment works have been built, they are almost invariably overloaded or poorly operated." 123

This failure to carry out pre-treatment at the factory may create conditions which adversely affect the helath of the river and the general public. As matters stand at present, this is a phenomenon which is no longer phypothetical in Kenya, for as the World Health Organization team found "... industries are not managing their wastes very well; ... local water pollution problems and often public health hazards are being produced at most of the places that were visited." 124

An examination of individual industries is undertaken below with a view to showing their contribution to the water pollution in Kenya.

TANNERIES

Several companies in Kenya such as Zimmermann (Taxidermists,) Ltd., and Belleys Tanneries Ltd., both located at Kahawa are engaged in the manufacture of leather. Other tannaries are located at Limuru and Nakuru. The waste from a tannery are heavy and carry large quantities of suspended matter. The suspended matter includes hair, particles of flesh and suspended particles of lime and

calcium carbonate. The waste is inherently putrescible and eventually becomes offensive.

to remove chrome from the tannery waste is so heavily over-loaded that it is proving to be totally ineffective and a serious odour problem has been created as the wastes flow past the Limuru township. In addition, the inefficiency of the plant has resulted in a large fish kill.

A few cases have been reported recorded in other countries where anthrax has been transmitted to bathers through contact with tannery waste discharge into water courses. Isolated instances have also been reported where arsenic which is semetimes used in hair removal, has been present in sufficient amounts to check biological action in streams and sewage treatment plants.

In view of the inefficiency of the treatment facilities at most of the tanneries in this country, there is likelihood of similar cases occuring here.

The Paper Industry:

The three main comapnies engaged in the manufacture of pulp, paper and paperboard are the Kenya Paper Mill Ltd., Transcandia (Mfg) Ltd., and the Pan African Paper Mills Ltd., with their paper mills located at Thika, Nairobi and Webuye respectively.

The paper mill at Webuye is located on the right bank of the Nzoia River and its estimated cutput is 27,000 tons of bleached paper per year. The residue in a Kraft pulp mill includes bark, rejects and knots that can be burned or recovered. Because of the large size of most of the Kraft operations and the correspondingly large water requirements, the effluent from these mills is voluminous and their oxygen demand is of the same strength as that of domestic sewage.

The importance of giving due consideration to treatment of pulp wastes lies in oxygen depletion. However, this is not a serious problem since the internal recirculation of process water and the flow characteristics of the Nzoia River are good.

Toxity of substances in the Kraft process is also a factor worthy of consideration. The substances present in the bulp wastes that are potentially toxic to fish include caustic soda soda ash, resin acids and sulphites. Heavy metals like mercury and cadmium are also used in the Kraft process; these metals are virtually indestructible and find their way into the food chains of plants and animals. However, the Kraft mill does not use mercury in its processes.

Coffee

Coffee is Kenya's principal cash crop and export.

In 1973 marketed coffee production amounted to K£35,777,000. 126

The total area of coffe in Kenya was 80,700 hectares in 1972

of which 26,900 hectares were on large-scale estates and

53,000 hectares on small-scale farms. 127

abstracted from the berries by pulping in which process a machine squeezes the beans out and water is used to separate the pulp from the beans. The beans are then subjected to fermentation under water to remove the perchaent skin from the bean and chemicals such as sodium metabisulphite is sometimes used to bleach the beans.

The fermentation wastes are disposed off into sewage pits and eventually sink into the ground; the wastes from the pulp should be retained in earther reservoirs from which it seeps into the ground while the pulp is retained to be used as manure.

Due to the inefficiency in the disposal of these wastes, the production of coffee has been the source of very large-scale pollution. Coffee pollution is an old problem in this country and as early as 1935 a committee problem in this country and as early as 1935 a committee appointed by the Water Board Of Kenya inverstigated means of disposal of coffee effluents and published an interim

report. 128 Though the proposals made by the committee led to an improvement in the conditions of rivers which had been heavily polluted, the situation steadily got out of control with the expansion in coffee production.

At present, there are more than 520 coffee factories managed by cooperatives and distributed over the country as shown in the Table below:

Table 9.

DISTRICTS	NUMBER OF REGISTERED FACTORIES
	111
Meru	73
Murang'a	
Kisii	66
ar sa má	54
Nyeri	45
Kiambu	44
Kirinyaga	
Machakos	30
	27
Embu	25
Bungoma	12
Kakamega	
South Nyanza	11
	22
Other Districts	
TOTAL	520

Source: The Disposal of Effluents from Coffee Processing Factories and River Pollution. Director of Water Development. Water Development. Winistry of Water Development. February, 1975. p. 5.

Most of these factories are very small and many of them are situated on river banks. At some of these factories, the pulp water from the earthen reservoirs overflows freely into the rivers. In the Central Province of Kenya, the main coffee-growing area, the numerous rivers that flow through the region from the Aberdares remain the main source of water for domestic and all other purposes. These are the rivers that are threatened by pollution from pulp and fermentation wastes as well as large quantities of insecticides used on coffee plantations to keep the coffee free from such diseases as the Coffee Berry Disease.

by the fact that "organic pollution produced in processing the coffee raised on 1 hectare of land is equivalent to that produced by about 3750 people in one day" and the World Health Organization Report concludes that the pollution potential of the untreated wastes from processing coffee all over the country is equivalent to that of population of more than 4.5 million people during harvesting.

Among the most heavily polluted rivers are the following: Matundu, Karura, Gatharini, Kasarini, Riara, Kiu, Kamiti, Makuyu, Kamothai, Ruiru, Theta and Thiriki. Not only does this pollution make the river water unsuitable for demestic purposes, it also makes treatment of the same more expensive. At Chuka water Treatment Plant, the water

Department has had to use many more times the normal quantity of coagulant to get potable water; the Thika water Treatment Plant experienced taste problems due to coffee effluents entering the Chania River.

In view of the fact that there is little piped and treated water in the coffee growing areas, the health of the population in these areas is likely to suffer unless the rivers, on which the majority of the population depends, are protected against pollution.

Sisal

As with coffee, sisal has a long history as a source of river pollution in this country. 130

The waste waters are produced during the separation of fibre from the fleshy part of the leaves by decortication to wash the fibre and to carry away the tow and leaf debris which are discharged through a flume at the head of which additional water is used to assist in the removal of the waste material. The waste water contains high concentration of nitrogen and organic matter and it has been known to burn the surface of crops with which it comes in contact.

In the Fourteen Falls area, 15 miles from Thika, fish has disappeared from the river whose water has turned blue and has burned the foliage it has come in contact with.

It is possible for one to observe the chemical reaction in the water creating bubbles for several miles on the river before it joins waters of the larger Athi River.

Yet, with no other source of water, people in the area have to use water from this polluted river for drinking, washing their clothing and bathing.

Sugar Refineries.

At present, there are five sugar refineries in this country located at Ramisi, near Mombasa, Chemelil, Miwani, Muhoroni and Mumias in the western part of the country.

Sugar refineries, along with fruit and vegetable canneries, are among the industries that produce wastes with an extremely high Biological Oxygen demand. In the sugar refineries large amounts of liquids are produced and these contain various sugars which are leached out from the sugar cane. The discharge of these sugars into a body of water supplies an abundant source of food for bacteria and fungi. The metabollic activities of these organisms in consuming these wastes deplete oxygen resources of the body of water which quickly becomes anaerobic.

Organisms, including fish which require dissolved oxygen are forced out or are killed and the only organisms that remain are the anaerobic bacteria and fungi and the few

invertebrates that are adapted to get their oxygen from the atmosphere. This phenomenon has been experienced in the lower reaches of the Ramisi River into which the sugar refinery at Ramisi discharges its wastes. The river water has turned black and is highly deficient in oxygen.

Apart from depleting oxygen in bodies of water, sugar wastes present another problem: the disposal of molasses. Molasses can be disposed off by being sold in foreign markets; however, this has not been possible because of the shortage of transport facilities which have made it difficult to get the molasses to the coast for shipment to overseas markets. Molasses can also be used to produce alcohol and the Miwani Sugar refinery has been amking use of its molasses for this purpose.

However, production of alcohol is not the best alternative since spent liquor has a high biological oxygen demand. In fact, the Ruaraka River has been polluted with breweries from the brewery plant at Ruaraka.

Molasses can also be used as cattle feed but this is a practice which has not yet become popular in this country.

Faced with the difficulty of disposal of these wastes, the sugar refineries have resorted to what is, in their view, the cheapest solution of all: dumping the molasses

into the nearest river. The result and consequence of such activities was referred to by the Director of the Water Department in his address to the Paris International Conference on Water Pollution, "In Western Kenya there was excessive pollution from two-new sugar factories discharging wastes into rivers used directly for drinking by thousands of people downstream. In one case, the fish population of the receiving water was also destroyed along a 24 km. reach." 131

The Dairy Industry

Dairies are located in Nairobi, Nakuru, Kisumu, Eldoret, Thomson's Falls and Mariakani.

Wastes generated by these dairies include:-

- a). Water used in the refrigeration system for condensing and water for precooling various pasteurised products.
- b). Rinse water and wash water from cans, tank trucks, equipment, product pipelines and floors.
- c). By-products such as buttermilk and in some cases skim milk that cannot be utilized.
- d). Speiled or damaged raw or manufactured products or by-products that cannot be salvaged for other uses.

The dairies at Mariakani and Njoro have lagoons which treat their wastes, sometimes mixed with demestic sewage. The operation of these treatment facilities is not always efficient and in fact the dairy at Eldoret discharges its untreated wastes into the Sosiani River.

Dairy wastes are composed wholly of organic matter, hence, they are capable of exygen depletion at a high rate. In a stream or any other body of water, these wastes are consumed at a very fast rate causing enormous oxygen depletion. Milk wastes also contain nitrogen and phosphorus which are excellent plant nutrients. In disposal through irrigation, the wastes help in the maintenance of the ground cover crop; however, in a stream, the effect is detrimental. Algae and other aquatic plants grow more rapidly and upon dying add odours to the water. These are often difficult to remove by treatment processes preparing water for domestic use.

Fruit and Vegetable Cannaries.

Canneries for the canning and preservation of fruit and vegetables are located at Subukia, Thika, Machakos, Sotik, Naivasha and Nairobi.

The usual high concentration of soluble solids in the canneries' liquid wastes causes rapid microbial growth in the receiving waters. Starches and sugars present in the receiving waters utilized by aerobic types of canning wastes are readily utilized by aerobic types of

micro-organisms. This utilization requires that dissolved oxygen be taken from water. The effect is a depletion of oxygen to a level at which fish life is killed. If utilization of exygen continues, anaerobic decomposition of the waste begins with production of odours, discolouration of the stream and other nuisance conditions. This has occured at Thika where the sewage treatment effluent has a very strong odour caused by pineapple wastes which are discharged by the local cannery.

Although liquid wastes are screened, the suspended solids concentration is normally high especially with vegetable wastes.

Gaseous fermentation of wastes in the body of water forms an unsightly scum blanket which may become a site for fly breeding and odour production.

Heavy metals.

shown that salts of lead, zinc, copper, cadmium and mercury cause death among fish by attacking their respiratory organs. The spaces between the gill filaments become filled with mucus and precipitate of the metal. This prevents the water from reaching the gill filaments and supplying its dissolved oxygen to the organs. The spaces between the gills may become so filled with the precipitate

that movement becomes impossible and the circulation of the blood through the gill capillaries becomes retarded.

Traces of these heavy metals have been found in the cooling water discharged into a tributory of Mwachi Creek from the industrial plant owned by Brollo Kenya Ltd. at Miritini, near Mombasa. The water from this tributary, which is used for domestic consumption was found to be contaminated with zinc, in concetrations exceeding World Health Organization desirable limits. No study was made of the effect of this heavy metal on fish in this particular body of water; neither has a fish been reported. However, a fish kill which was reported in the Migori River has been attributed to drainage from the now-defunct copper Macalder mine in Nyanza.

d). Forestry and the Conservation of Water.

In the previous chapter it was emphasized that conservation and management of the forest estate are designed and should be undertaken to produce not only timber and wood but also water. Apart from this, it was also noted that forests surrounding river courses are highly productive and provide environment for the existence of many aquatic life forms as well as terrestial animals. To illustrate its numerous fish species which feed on organisms on the shorex forests, was mentioned. In this section, the role of forests in the conservation of water will be examined at greater detail.

The total area of reserved forests is 6,670 square miles or 3.03 per cent of the total land area. This is a low per centage in view of the role forests play in the will-being of the country and yet even this low percentage is being reduced further by various human activities.

Unlawful and excessive grazing ranks among the greates threats to the successful conservation of the forest estate in this country. This problem has reached the most alarming proportions in the mountain forests in northern samburu and Maralal. With the control of cattle diseases and the elimination of their natural enemies, the heads of cattle have increased and as a result the pressuer on forests has been growing. Unfortunately, grazing is

accompanied by the firing of grazing in order to produce better fodder. It is this double impact of excessive grazing and regular firing that has destroyed many of the vital water catchment forests in the drier areas of the country. It is very difficult to save what is left of the catchments in such areas and thus to preserve the water supplies without which the human and cattle populations will not exist.

Political pressure exerted by short-sighted political leaders in various parts has been responsible for most of excision of gazetted forests. As the National Report on the Human Environment in Kenya observed, this pressure may be parliamentary or it may be effected through encouraging defiance of the forest legislation and overt settlement within a forest reserve. Forest officers who take action or threaten to do so, are often harassed and even subjected to physical violence. Gazetted forests have many squatters who are felling the valuable forests to plant crops. Mau and Mount Elgon forests are being indiscriminately destroyed, by squatters who claim to have been born there despite the fact that subsequent investigations show that many of these people move in from the surrounding districts when the Timboroa area of Mount Elgon was gazetted as a forest about 5 years ago, there were only 6 people who were known to be living in the area; but today people have moved in in their thousands and they claim to have always lived there. The other problem hindering the conservation of forests is charcoal burning for domestic and export purposes. A few years ago, the Republic of Somalia put a ban on charcoal burning in that country and as a result there was an increase in demand for charcoal in the Persian Gulf. This opened a big market for charcoal traders in Kenya and export of charcoal to the Persian Gulf rose from 2,500 tons in 1967 to 32,000 tons in 1970.

Within the country, charcoal as a source of fuel is used extensively, particularly in the urban centres.

The production of this charcoal is moving farther and farther away from the urban centres due to the fact that the raw materials have been used up in the surrounding areas.

Charcoal used in Nairobi, for instance, is now being imported from as far as Kitui, Embu, Machakos and the Rift Valley.

It is difficult to obtain an approximation of the forest area which is destroyed by this activity because people in the business are nromally not willing to talk about it freely because of the criticism raised against the activity as one of the cases of vegetation destruction. However, it is estimated that about 235,0000 cu.m. of both charcoal and firewood are used annually and the annual sales of charcoal is now estimated at about K£3,000,000/=.136

Fires are another menace to forests in this country which has lost 20,630 hectares of plantation and indigenous forest due to forest fires since independence. Though some

of these fires are accidental, most of them are started by people through malice and carelessness. Honey collectors are also responsible for some of these fires. In 1973 alone, more than 2,600 hectares of forest were burned at a value of more than K£30,000.

Apart from the diminution of the forest estate due to grazing and felling of trees for charcoal or timber, activities which can be controlled by enforcing the relevant provisions of the Law, diminution of this estate can be due to the Government's action through excisions for agriculture and settlements. Over the period 1964 - 1970, an average of 600 ha. has been converted annually to agricultural settlements as a result of official excisions from forest The conversion rate in the same direction reserves. is also high in areas outside gazetted forest reserves. Despite the Government's committment to "... reserve in perpetuity the existing forests and wherever possible add to them •••• "139 further excisions took place so that by 1972 the forest estate had been further reduced by 62,000 hectares. 140

The presence of forest or of any sort of dense vegetation covering the ground prevents the rapid run-off water so that the water sinks, replenishing springs and streams. Experiments carried out in Kericho have shown that the replacement of forest cover by tea estates increase the

stream flow to higher rates than when there was forest cover. This is because the forest is a more efficient and greater user of water. 141

If forests are removed to make room for cultivation most of the water runs off so that less remains to replenish springs. Admittedly, the total yield of water will be higher from absolutely bare ground than from grass or forest. However, this water will run-off very much more rapidly and there will be no flow in streams and springs in the dry season. The result of this process, continued over centuries can be graphically observed in a country such as Ethiopia. Areas originally covered by forest have been replaced by grass and srub around Addis Ababa, Tigre and Eritrea due to agricultural activities which have been carried out in utter disregard of the need to conserve forests. As a result, the springs have dried and the rivers are always dirty.

In Kenya, an example of this can be seen on the Taita Hills where the hillslopes are heavily cultivated at the moment. At the beginning of this century, River Voi was permanent whereas it now dries up in any drought before it reaches Voi and in the rains it brings down quantities of silt in violent floods. Leslie Brown attributes this change to the increase of population on the Taita Hills from 62,000 to 110,000 between 1948 and 1969, resulting in the trebling of the area under cultivation. Of the attempts to desilt the Voi River, Leslie Brown says "one might just

well have echoed the carpenter in Alice in Wonderland who, when asked whether he thought that seven maids with seven mops could sweep away the sand on the sea-shore in six months, replied, with a bitter tear that he doubted it. The right way to desilt the Voi River and restor it to its former status as a permanent clear stream is to re-afforest the Taita Hills, nothing else will achieve it." 142

which has befallen the Voi River, the District Commissioner of the Elgeyo Marakwet District has recently given notice to over 2,500 residents of Lelani Location who have been cutting down trees and cultivating inside Embobut and Kipkarnur forests to move out of the forest areas. The notices were based on the fact that the Embobut and Aror Rivers are dependent on the forests for the supply of water and deforestation would result in a shortage of water in the lower settled areas of the valley.

The destruction of vegetation and forest cover on hills and mountains is though to be one of the causes behind the collapse of the Greek civilization and the same process has been responsible for the development of vast tracts of desert in the Middle East. "Many of today's deserts lie as silent memorials to once glorious civilizations that 2,000 to 3,000 years ago were based on extremely fertile lands supporting important animals and human populations." 143

Unwise cultivation, overgrazing, indiscrimiate cutting of trees for timber can alter the climate of a region extensively. Although fluctuations in weather are largely due to natural causes, the above activities can aggravate the incidence of drought through soil erosion and the disturbance of ecological cycles. And this may be thought that this is a very long-term process, but it is not, as can be seen in the area was covered by thick forests and dense vegation and the streams were abundant and regular. Reduction of the forest area due to caltivation has resulted in a poor sort of pasture and the cultivated area has been atandoned. Most of the best soil has been carried away by run-off and the streams are all dirty and subject to violent floods.

In an article entitled "Acts of man, Not God",

TIME magazine has attributed the five-year drought in the

Sahelian countries of Senegal, Mauritania, Upper Volta, Mali,

Chad and Niger to the indiscriminate cutting down of trees

and other poor land practices. "Because the semi-arid region

is ecologically fragile, mistakes in the use of soil and

water and vegetation are manified. Trees have been cut

down for fuel, savannah grass has been replaced by

seasonal crops and available ground water has been

squandered. Most damaging of all, the inhabitants have

allowed their huge herds of livestock to denude the land

through overgrazing. These practices, combined with the

drought, have killed off the natural vegetation and allowed the Sahara to creep Southwards- in some places by as much as 30 miles a year."

The activities which have led to the grim situation in the Sahelian region are common in Kenya as has been shown in the previous pages of this section. What has happened in the Sahelian region should, therefore, be an eye-opener for this country and unless something is done to stop the destruction of the forest resources, the country faces the propect of seeing its wonderful heritage laid to waste.

Felling of trees may also lead to soil erosion with silt being deposited within river channels thus ruining the habitants of many aquatic biota. On the effects of erosion on the marine environment an official of the East African Marine Fisheris Research Organization has stated, ... "owing to (I believe) the increase in farming and the subsequent de-forestation of many up-country areas the Sabaki River and the Tana River now discharge large quantities of terrestial silt into Kenyan waters. This silt, together with the fertilizers and compounds it almost certainly contains, surely poses a threat to the marine environment."

In view of the wide-ranging consequences of the diminution of forest rescurces, no competing interests or

political pressure should be alloted to engage in activities which reduce these resources and eventually disturb the weather and ecological cycles.

e) Pollution and the Marine Environment.

and concerted attempts to combat it goes back to the first decade after the First World War when the United States of America (U.S.A.) and the League of Nations undertook to obtain international agreements on measures to deal with oil pollution. At that time, oil pollution, especially on the shores of the Atlantic Ocean was considerable. Since then, the rising world economy and the ever-increasing demand for fuels have contributed to a world-wide concern over the pollution problem.

More recently, 300 environmentalists at an international conference called by the United Nations Food and Agriculture Organization assessed the impact of oil pollution on the marine environment. It was shown that the pollution problem is very real and that both national and international action against pollution is most urgently required. The most serious aspect of ocean pollution, participants at the above conference concluded, was its harmful effects on the life-giving capacity of the sea. At the moment, more than half of the world's population depends solely on food from

the sea for a supply of essential nutrition and the importance of the sea as a source of food will increase as the rising world population turn to it for food. 147

the harmful effects of oil pollution have already begun to effect the marine environment and pose a serious threat to fish life in many of the world's seas. Recently, at the conference on pollution of the Mediterranean Sea, the United Nations Food and Agriculture Organization Director-General in-charge of fisheries warned that "After a period of very rapid expansion, fish production from the sea has begun to level off in many parts of the world as readily exploitable resources are becoming difficult to locate. Some of the large resources such as the Scandnavian herring and the Peruvian anchory, have shown a serious decline at least temporarily." Mediterranean fish and marine life is particularly vulnerable since the area is almost an enclosed sea with very limited water exchange with the Atlantic Ocean.

The importance of Kenya's marine environment as a source of fish food, promotion of job opportunities and the base upon which a large portion of the coastal tourist industry is founded, has already been outlined in the previous chapter. The major threats to the continued exploitation of this environment are caused by three types of pollutants:-

- 1. 0il
- 2. Refuse (sewage, garbage, wastes. etc.)
- 3. Hazardous wastes (mainly chemicals).

The expansion of the port facilities at the Mombasa harbour has proceeded at a fast rate since 1967, with 15 deep-water quays in operation. But the anticipated increase in cargo moving through Mombasa has necessitated the construction of additional berths, bringing the total to 17. Inspite of this expansion, the harbour has periodically experienced severe congestion. The congestion experienced by the harbour between December, 1973 and March 1974 led to the imposition of a surcharge of ten percent (10%) for cargo shipped from European ports. 150

The congestion of the harbour arises from the increasing number of ships handled at the port. For instance, the number of ships handled from 1,533 in 1965 to 1,844 in 1971 while the net tonnage increased from 5.2. to 7.3 million tons over the same period. To cope with the increased demands on the port facilities the Kenya Government is currently considering the feasibility of establishing a second harbour capable of handling ocean-going vessels. In the meantime, the harbour authorities have decided to expand the facilities so as to accommodate larger vessels (up to 180) meters in length and 24 metres wide, thus increasing the handling capacity to vessels of up to 15,000 tons)

The table below shows the tonnage of cargo handled at Mombasa and in this respect, special attention should

be directed to the tonnage of petrol and oils so that the potential for oil pollution can be appreciated.

Oil pollution of the sea arises from the following sources:

- Deliberate pumping of oil into the ocean by sea-going vessels.
- 2) Accidental spilling of oil into the ocean by sea going vessels.
- 3) Oil spills due to shipping accidents and casualties.
- 4) Oil spills due to aaccidents or negligence et shore oil installations.
- 5) Oil spills due to accidents or negligence on offshore drilling stations.
- 6) Miscellaneous spillage.

After a cargo of oil is discharged, or fuel tanks are empty the tanks are ballasted with sea-mater. Before a new cargo or new fuel is taken on ,again, the oily ballast water is pumped out into the ocean, tanks are cleared and pumped out continually, until clean. 153

TABLE TRAFFIC HANDLED AT MOMBASA - 1964 - 1973

- 125 -

CARGO (1,000 tons)		1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
EXPORTS	; Dry Cargo	1,108	1,107	1,203	1,264	1,439	1,400	1,515	1,520	1,621	1,913
	Petrol and Oils (in bulk) 563	626	715	878	792	737	849	687	647	676
1	Total	1,671	1,733	1,918	2,142	2,231	2,087	2,252	2,369	2,268	2,589
IMPORTS	Dry Cargo	655	939	1,132	830	931	875	1,058	1,330	1,237	1,175
	Petrol and Oils	1,776	1,872	2,045	2,194	2,346	2,324	2,466	2,638	2,564	2,990
	Total	2,431	2,811	3,177	3,024	3,277	3,199	3,524	3,968	3,801	4,165
TRANS= SHIPMENTS		45	40	17	17	21	22	20	28	30	25
		4,147	4,584	5,112	5,183	5,529	5,30	5,79	6,365	6,099	6,780

Source: Statistical Abstract Central Bureau of Statistics. Ministry of Finance and Planning Nairobi: p. 190. * excluding passengers.

When considering pollution, oil can be divided into "persistent" and "non-persistent". Non-persistent oils include aviation fuels and others which are highly volatile, evaporating quickly leaving little residue.

It is the persistent oils such as diesel and lubricating oils used in most ship engines which cause pollution of the ocean. Once this type of oil is discharged into the sea, it can very quickly spread over a large surface area in a thin film. If has been calculated that it takes only ten minutes for one cubic metre of Middle East crude oil to form a circle 48 metres in diametre. The volatile elements of the oil quickly evaporate after discharge, and the residue tends to form an emulsion with sea-water which is difficult to disperse.

Some oils form waxy lumps which are persistent for a long time; examples of this type of pollution can be seen at the Kilindini harbour. With the expansion of the harbour facilities as well as the contruction of a second port oil pollution will become even more serious. As it is now, the situation is serious enough as an official of the East African marine Fisheries Research Organization has stated "The situation as regards oil pollution is presently quite bad: I estimate that at least 75% of the entire coast-line of Kenya is contaminated by oil to a greater or lesser extent." 155

Another factor which is bound to increase sea pollution along the Kenya coastline is the ever-increasing demand for oil throughout the world with the resulting greater development of international sea-borne carriage of This growing demand has necessitated an increase in the world tanker fleet as well as an expansion of their size. For example, tanker cargoes increased from 440 million tons in 1958 to 1,120 million tons in 1968, an increase of 70 - 100 million tons per year. 156 In this regard Edgar Gold has stated that "There is little doubt that this trend will continue at this or even more accelerated rate over the next 10 years. This means that by 1980 over 2 billion tons of oil cargoes will be carried on the oceans annually." In 1961, the world's tanker fleet contained 2671 vessels with an averaging almost 150,000 tons each were already on order. 158

The danger to Kenya's coastline posed by the increased oil cargoes and tanker traffic arises in two ways. Firstly, as the Persian Gulf states increase their production of oil which is shipped to the western countries, pollution of the Kenyan coastline is also bound to increase since it has been found that the present pollution is due to the oil that is discharged during clearing operations on board tankers en route from the Cape to the Gulf and vice-versa. These operations are normally carried out in international waters outside Kenya's jurisdiction.

Secondly, the ever increasing size of the tankers has limited their maneoeuvering ability and has made them incapable of stopping within a reasonably short distance. 159 This factor has contributed to an increasing number of marine accidents, and it has been estimated that at present, the average annual influx to the ocean from accidental spills throughout the world is probably about 200,000 tons. 160

Oil pollution resulting from marine accidents involving these large tankers can have wide-ranging effects. An instance of this occured in March 1967 when the very large 'Torrey Canyon' grounded off the South-West coast of Cornwall, England. The Torrey Canyon was a tanker of 61,263 gross tons and carrying 119,328 tons of crude oil from the Persian Gulf to Milford Haven in Wales. The ship was 974.5 feet in length, 69 feet in depth and 125.5 feet in breadth.

The result of the Torrey Canyon wreck was the largest single oil spill in marinetime history. It was estimated that over 30,000 tens of crude cil were released.

The spillage spread along the coast of Corrwall, crossed to Normandy and Brittany (France), as far as 225 miles away. 162 The Cornish coast, a vacation spot with highly attractive beaches, became oil-soaked. Sea-birds, by thousands, became entrapped in the oil and died despite the rescue.

despite the rescue effort. Inspite of a major campaign on the oil, using deter agents and everything else that coult be thought of, damage was done.

In view of the present state of oil pollution of the sea on the Kenya coastline, it is regrettable that no research has been conducted on the effects of this pollution on the country's marine environment. Even the 'National Report on the Human Environment in Kenya and does not deal with its ecological effects. However, the impact oil pollution has had in other parts of the world is well-documented. Of the many adverse ecological effects of oil pollution, the most serious is its destructive impact on the ocean's ecology and the complex chain of life. Oil on the surface of the sea is harmful and can damage many organisms.

Apart from oil, the other source of sea-pollution in Kenya is the discharge into the sea of untreated industrial effluents and domestic sewage, especially at Tudor Greek and Port Reitz. This pollution arises because some major industries around Mombasa do not discharge their wastes into the public sewers and sewage is discharged into the ocean at low ebb.

Some of the pollution also arises from activities undertaken hundreds of miles from the Kenyan coastal waters.

An example of this is soil erosion which has increased

as a result of expansion of the agricultural activities and the subsequent de-forestation in many of the up-country areas. As a consequence, the Sabaki and Tana Rivers now discharge large quantities of silt into the Kenyan coastal waters. This silt, together with the fertilizers and chemical compounds it contains pose a threat to the marine environment.

In recent years, fishermen along the coast have found that explosives can bring more fish to the surface than hours of netting. However, the use of explosives cause large scale devastation of the marine environment. Large areas of coral reef, once teeming with marine life, become devoid of life. Apart from the destruction of the coral reef, use of explosives is wrecking that portion of the tourist trade which is based on the watching and photographing of the marine life. People from the polluted waters of Europe and ports of America are willing to pay large sums of money to come and see the teeming life on the coral. However, they will not pay to see the broken reefs on which all life has been destroyed.

The statement of proposals for the increased use and conservation of the environment.embodied in the current Development Plan, takes cognizance of the threats to the marine environment as well as the damage which has already been done to 1t. 164 Taking a serious view of the situation, the Government has come out with a

conservation programme which will be offected immidiately and will include, among others,

- pollution of the sea and shoreline by oil,
 effluents from factories, factory ships
 and municipal waste;
- b). Measures to prevent the use of explosives for fishing.
- c). The restoration and protection of the marine turtle and dugong populations.
- d). Attempts to obtain international agreements and improvements in international low relating to the use of the seas, their products and pollution the marine environment.

CHAPTER FOLE

LEGAL PROTECTION OF THE ENVIRONMENT

It was noted in Chapter One that in as far as the definition of the renvironments is concerned, the common law does not go further than stating that the term embraces any aspect of the law that deals with land and water. 165 The ecological definition, however, is more comprehensive and definee the term as inclusive of the surface atmosphere, the oceans, the upper surfaces of the lend zreas of the continents and belands of the fresh waters associated with them, and the living things that inhabit this area. 166 But it should be noted that while the ecological definition sets out the components of the environment more comprehensively, the two definitions (common law and ecological) are founded on the two woes important components of the environment viz. land and water.

In this Chapter, a discussion of the common law as well as the statutory law of the land in as far as they can be employed to protect the country's water resources will be undertaken.

The Common Law

Under the common law, the owner of land on the banks of a natural watercourse is entitled to what are termed "riparian rights", that is to say, he has the right to have the water of such a watercourse come to him in its natural state in relation to its flow, state, quantity and quality. But as it was pointed out in North Share Railway v. Pion, 167 the land must be in actual contact with the stream either laterally or vertically.

Riparian rights may be exercised by the riperian owner, his lessee or his tenant. In the case, where the puner grants a partion of his land adjoining the river, the grantee becomes a riparien owner possessed of similar rights. Riparian rights attach to the land so that they cannot be granted as easements or reserved when land is sold.

The rights of a ripation comes apply to water flowing in a natural channel upon or below the surface but the channel must be known and defined as apposed to water which equanders itself over an undefined area.

Though riparian rights relate to the natural quality of water, its ebstraction, diversion and obstruction, this chapter will concern itself with the other aspect of these rights, that is to say, the quality and pollution of the water on which riparian rights apply.

These riparian rights apply on private waters which include (a) rain water falling on an individual (riparian) owner's land and such flows of water as arc dispersed over his land without running in defined channels or which case for the greater part of the year;

- (b) spring water which comes out of the earth on a riparian's own land exhausting itself on his land before running into defined channel;
- (c) such ground water as can be trapped by the use of wells or boreholes.

The second class of water is termed "Public Water" and includes water other than private water which runs in defined channels above or underground. Neither the state nor the individual can claim any ownership in this water and all that the latter has is a right of user: no one possesses it, but everyone has a right to use it. The law is: everyone over whose property the public water flows has a right to use it for human and animal consumption but in doing so, an individual must take into account the rights of others.

In the succeeding parts of this Chapter, discussion will first centre on the meaning of Follution, the types of pollution recognized by the Common law and actions which may be taken to control or stop it and the persons who may take such actions. It is after such discussion is completed that the question whether the doctrine of reparish rights apply in Kenya will be examined such examination, it may be argued, should have been undertaken at the beginning of this chapter; however, such undertaking was postponed for two reasons:

- (a) To have done so at the beginning would have prejudiced an objective examination of this dockrine before it's rules are fully analysed;
- (b) Since the ultimate goal of this Thesis is to lay out the ways in which the law may be employed to protect the environment, an examination of common law doctrines which have a bearing on environmental protection is called for whether they apply an this country or not. For it is after such an examination that the usefulness of all or some of the rules under this doctrine can be appreciated and an effort made to incorporate into the country's law what is deemed of assistance in affording protection on to the environment.

Pollution at Common Law.

Polution has been defined as "the addition or doing of something to water which changes the natural qualities of such water," los and Key has defined polution in relation to river water to occur when the water is altered in composition on condition, directly or indirectly as a result of the activities of man so that it is less suitable for any or all of the purposes for which it would be suitable in its natural state". 169

It would be noted that the two definitions above are concerned with any change in the "natural state" of the water and the common law in theory, at least, may prohibit the discharge of any matter that changes this natural state of the water. Thus, in Attorney-General v. Sirmingham Taure and Real District Drainage Board, the addition of sawage to a stream which resulted in the deterioration of the purity and quality of the water at the point where the sawage matter entered the stream emounted to pollution.

It has been recognized under the common law that the disposal of sewage matter which is insufficiently treated into a river may cause pollution of the same. This was the case in <u>Bidder v. Local Roard of Health for Croydon¹⁷</u> where by the direction of a local board of health the sawage of a town had been conveyed to a river and the sawage, not having been fully treated, had so polluted the river as to kill the fish therein. The same state of affairs

are poorly managed or overmarked to such extent that untreated sewage is disposed of by being discharged into the nearest bodies of water. An example of this is found in Kisumu where thousands of gallons of sewage enters into the Kasat River which flows into Lake Victoria, from which the Kisumu area gests its water supply. Not only has this sewage disposal impaired the quality of the river water making it unfit for human consumption but has also made the river unhabitable by fish and other equatic organisms.

The disposal of trade effluents into a body of water may also cause pollution, as was illustrated in the case of <u>Fletcher</u> v <u>Bealey.</u> 172 In this case, the defendants were alkali manufacturers and in the process of manufacturing this alkeli, large quantities of waste were produced. The waste contained considerable amount of sulfur and when heaped up, the waste got hot and liable to ignite if no care were taken. After a large amount of this waste was heaped up, there came from it a certain liquid, greenish in colour and which contained very destructive chemical elements. Similar cases of disposal of trade effluents into rivers occur in Kenya as was discussed in chapter Three. At Limuru, effluents from the tanner have so polluted the body of water into which they are discharged as to cause a large fish kill. In the Fourteen Falls Area near Thika, fish has disappeared from the Chania River whose water has turned blue as a result of disposal into it of effluents from the sisal factories.

In the case of The Pride of Derby and Derbyshire Angling Association Ltd.

end Another v. British Celanese Ltd and Others 173 the action was, in part,

founded on the claim that pollution of river Derwent resulted from the disposal

into this river of heated effluents, containing suspended organic matter,

discharged into the river from the works of a power-generating company. The

damage and danger resulting from the pollution were aggravated by the rise in

temperature of the water caused by the large quantities of heated effluents which

were discharged into the river.

As for fisheries, the owner of a fishery is entitled to damages where the discharge of refuse or effluent into a river drives away or kills fish.

In such a case, it is necessary to prove that the fish-kill occured immediately after a quantity of sewage was discharged into a river on which the fishery is based. Upon proof of such sewage disposal, and in the ebsence of an elternative cause of the fish-kill, the owner of the fishery would be entitled to damages. 174

Now that "pollution" has been defined and instances of pollution under common law given, the next part of the chapter will set out the class of persons entitled to sue in the event of their rights being injured through pollution.

Persons entitled to sue:

Any person, whether a landlord or tenant, whose private right has been injured by pollution can sue and claim damages for such injury. The right to take action is based on the fact that a riparian owner has a right to receive water in its natural state. Such owner can, therefore, take action against the upper riparian owner who is responsible for the pollution of water. In Pennington v. Brinsop Hall Coal Company, the plaintiffs filed the suit praying for an unjunction to restrain the Defendants from polluting a stream on which he depended for water—used in his cotton mill. The plaintiffs alleged that water pumped from the Defendant's colliery into the stream contained sulphuric acid and other deleterious matters and that it corroded iron very rapidly. The effect of this was that the Plaintiffs' boilers and other ports of their machinery was corroded and destroyed by the water from the stream and as a result the plaintiffs were now being forced to spend large sums of money to clean, repair and renew their boilers and machinery.

A reversioner, too, may pray for and obtain an injunction if his resersionary interest is injured.

In the case of a fishery, the person who is entitled to it can obtain an injunction and an sward of demogra where the fishery has been so disturbed, say, by sewage discharge into a river, that fish is killed or driven off

so, too, can a member of an association having rights in a fishery, bring an action to protect the waters on which such fishery is based from pollution.

In the case of a fishery, action may also be brought by a nonriprian owner where such owner has fishery rights in a body of water
which have been disturbed by the discharge, into it, of sewage, trade
effluents or other wastes. In this regerd, it should be noted that
apart from the above cases where a non-riparian owner seeks to protect
his fishery rights, a non-riparian owner, as well as a member of the public
may take action to stop pollution where such pollution amounts to a
public nuisence.

Unsuitability of the doctrine of Riporian rights:

are limited. Most of the rivers have their source in the highland regions which ere hundreds of miles from the Indian Ocean, Lake Victoria and the Rift Valley into which they flow. The rivers flow dwindles progressively so that in the case of the rivers which flow eastwards, only the Tana and the Athi manage to reach the Ocean. The pressure on these limited water increase as the development of the country proceeds.

The riparian doctrins which developed in England, a country with emple supplies of water, operated to protect one farmer against the improper activities of another if his upstream neighbour wrongfully diverted the course of the waters. The rules which developed under this doctrine for the overall purpose of apportioning rights between private individuals in a country with ample supplies of water were bound to produce hardships when applied in a country like Kenya where the supplies of water were limited.

One such hardship is in relation with the use of public water. It has already been stated that neither the State nor any individual can lay any dominium in it and all that an individual has in relation with such water is a right of user. Everyone who has access to it may use such water for enimal and human consumption. Since the right of access determines

who uses the water and since such right is difficult to acquire by the public, the upshot is that the right of user of public waters is limited to those persons whose land bound the river. If this rule of the riparism doctrine were to be rigidly applied in Kenya it would produce a situation whereby the few rivers in the country would be made use of only by those individuals through whose land the rivers flow.

with regard to the primary use of water, i.e. water for human consumption and domestic purposes such as washing of utensils, bathing etc., an upper proprietor can appropriate as much water as he requires for ordinary purposes without taking into consideration the requirements of a lower proprietor even if this should result in the lower proprietor being deprived of all water, the only limitation being that the upper proprietor appropriates the water for primary purposes.

Difficulties of applying the riparian doctrine in Kenya are compounded by the fact that the law is exceedingly vague in relation with the secondary use of water. The rule is that every owner along the stream has the right to have the water reach him in such a state that he may use it for his secondary purposes (i.e. use of water for irrigation, industrial or other purposes). This rule may lead to a stalemate when it is applied in a country where the quantity of water is small in comparison with the demands made upon it. As every proprietor is bound by the same rule, the end result would be that where there is a shortage of water for all requirements, all the proprietors would have to abate their use of such water. But the rule does not set out the principle on which the abatement would be made, and this is bound to produce difficulties where the uses are not comparable. If X claims water from the irrigation of his crops and Y claims the same water for industrial purposes, the absence of a basis on which the above two uses of water are to be abated would create problems.

In addition, those who were the first in making use of the water have no superior claim against those who make use of the same water at a later period or even against those who do not use the water at all, for as wisdow

has noted the use of such water by a riperian owner ".... is independent of the actual user of the water and riparian owner may begin to exercise the right when he will." In effect, this means a riparian corner may retain his reparian rights for all time though he may never make use of them.

Further, the doctrine does not provide a method for defining the rights of proprietors along the river. If a lower proprietor feels that his rights have been infringed by an upper proprietor, all he can do is bring a suit against him, but that will only settle the matter between these two proprietors so that the same uncertainty will remain as regards all the other proprietors.

The Tanganyika water Legislation Committee which was appointed in 1956 to examine the provisions and administration of the country's water lews together with matters incidental thereto noted the unsuitability of this doctrine for countries with limited water resources and its report states that "The Common Law doctrine riparian rights, recognized in varying degrees in many countries having ample supplies and constant regimes, is unsuitable for admission in a semi-arid country with varying water regimes".

It is significant that even the earliest pieces of legislation seem to have recognized the above fact and consequently the exercise of the riparian rights has always been restricted. In Bowker v. Secretary of State 177 the Plaintiff brought action against the Secretary of State for the damage caused by the defendant's servants entering on his land and constructing a dam and a ditch, thereby draining a swamp. The Defendants claimed damages against the Plaintiff for wrongfully cutting and removing such a dam. The determination of this suit hinged on the question: who had the right to use water in the Lower Kedong river for irrigation purposes? On this issue, Berth J., held that *.....the Lower Kedong River is a river within the meaning of s.3 of the Crown Lands Ordinance of 1902 and all rights to

the water of the Lower Kedong are vested in the Crown and would so vest if the whole length of such river were within the Plaintiff's boundaries. It is clear that the Legislature intended to prevent riparian holders acquiring rights which otherwise they might have acquired." 178

In the later case of <u>Jewal v. Singh</u>, Pickering J., took a different view of s.3 of the Crown Lands Ordinance. In his opinion this section was merely declaratory of the common law. However, the difference in the judgements of the two judges was more apparent than real since even Pickering J., recognized only two rights of the riperian owner which had been left unaltered by the Ordinance. These were the rights of the riparian owner to have a stream flow from his land without obstruction and his right to use the power derivable from such stream.

It was pointed out in chapter two that agricultural and industrial development as well as the growth of population in the country have increased the demands made upon the existing water resources. The allocation of these resources has brought many problems, with increasing competition among water users for a scence resource leading to a wide variety of disputes. In the course of tackling similar problems, governments in other countries have at times found it necessary to curtail or control traditional use of water and to acquire land compulsorily for headworks and distribution systems. In its study entitled "Guidelines for the Drafting of Water Codes - general principles and legislative examples", the United Nations Economic Commission for Asia and the Far East have sought to explain why it may be necessary for a Government to regulate the use and distribution of water resources and the commission's explanation is also true of Government intervention in this country. The study states:

"Many Governments rather than leaving such disputes to be settled between partial through litigation have chosen to intervene to prevent disputes arising. From the point of view of the orderly end planned development and utilization of resources, the establishment of individual rights by a process of injury, contention and judicial resolution is wasteful. In seeking for an alternative, many countries have decided in favour of some degree of governmental supervision through a system of regulation of rights or admini-

With the enactment of the Crown Lends Ordinance of 1915, 180 limitations were placed on the extent of the riparian rights which an individual could claim:

- shall not unless otherwise expressly therein confer any right to the water of any spring, or river, lake or stream, other than to such water as may be required for domestic purposes upon the land sold, lessed or occupied under the licence.
- provided no person shall dam any spring, river or stream or divert any spring, river, stream or lake on any land sold or leased or occupied under this Ordinance or any Ordinance repealed by this Ordinance or any unalienated Crown Land except with the consent of the prescribed officer or any person authorized by him in writing.....

Reading sections 75 and 152 above together it will be seen that the only common law rights which remained to an owner were complete rights to private water of wells and boreholes using underground percolating water rights to private water of springs for domestic purposes only and rights to public water for ordinary purposes provided that no demaing and diverting takes place.

The effect of the Crown Lands Ordinance was to protect the water resources from abuse and waste through the exercise of riparian rights. The riparian rights which were retained viz., over water from wells and boreholes could not prejudice the orderly and equitable use of the water resources because such waters were small in quantity. It is the lakes, rivers and streams which were of importance and these the Ordinance protected.

Uncertainty as to the ownership and control of water has since been removed, first by the water Ordinance of 1929 which declared that:

"The water of every body of water is hereby declared to be the property of the Crown and its control is hereby vested in the Governor-in-Council on bahalf of the Crown, subject to the provisions of this Ordinance" 181

Though the Ordinance has since been repealed, the law remains the same with the present water Act's declaration that:

"The water of every body of water under or upon any land is vested in the Government" 182

Under the above Act riparian rights have been abolished by the requirement of a parmit for all uses of water - for domestic, industrial, municipal, agricultural purposes. However, the Government waived the necessity of a parmit in three cases where the amount of water sued was likely to be small. These cases are 103

- (a) When water is abstracted for domestic purposes if such abstraction is made without the employment of works;
- (b) When the works for the development of underground water are not situated within 100 yards of any body of surface water
- (c) when water is stored in a dam or abstracted therefrom a dam which has not been declared to be a weter-course.

The riparian rights over wells and boreholes, which rights had been left intact by the Crown Lands Ordinance were now abolished by the imposition of state control over the construction of wells and dems and use of water therefrom. The end result is that riparian rights are exerciseble only over water in springs situated wholly within an individual's land.

With the almost total abolision of riperian rights doctrine, the other common law doctrines which may be used for the protection of water against pollution are Nuisance and Traspass and it is to these two that discussion now turns.

NUISANCE

Nuisance has been defined as any "unlawful interference with a person's use or enjoyment of land, or of some right over or in connection with it." 185

A nuisance may be either a public nuisance or a private nuisance but the logal basis of each is different: a private muisance is a civil wrong based on the interference with a property right, while a public nuisance is a crime involving interference with the rights of the Community at large, and which may give rise to a tort action that can be maintained by a private individual.

As a cause of action for the abatement of an invasion of the environment, nuisence is not new, as evidenced by the decision in 1661 wherein it was found that the odour from the in William Aldred's case, 186 defendant's hogsty was a nuisance. It is of the essence of a public nuisance that it affects an interest of the general public as opposed to that of only a few individuals and us it was held in Attorney-General v. P.Y.A. Querries, a public nuisance " is one which is so widespread in

its range and so indiscriminate in its effect that it would not be reasonable to expect one person to take proceedings to put a stop to it as distinct from the community at large."187

However, while a public nuisance is considered an injury to the public, the Lew does recognize the right of an individual plaintiff to bring a tort action for a public nuisance. In such a case, the plaintiff must show that he has suffered special damage over and above the ordinary damage caused to the public at large. Thus, when a polluter injures an entire community it is difficult for any single individual or small group of individuals to prove that they have been injured differently in kind rather than in degree from the injury to the rest of the community. Such proof as is required from an individual who seeks a remedy for a public nuisance was given by the plaintiff in Benjamin v. Storr. 188 which was a case of pollution amounting to a public nuisance. The plaintiff kept a coffee house and the defendants carried on the business of auctioneers in a narrow street. One of two entrances to the defendant's premises was situate in such street and was 6 feet distent from the plaintiff's coffee house. The defendants, in the exercise of their business daily brought to and

fro sometime kept standing in the street, horses, and vans close to the door of the plaintiff. The vans obstructed the light and air of the plaintiff's coffee house, causing him to burn gas daily and the hourses caused offensive smells by reason of which the plaintiff lost some of his customers.

The plaintiff had to establish three things: first, that the injury he suffered was a particular injury, it not being enough to show that he suffered as anyone else; secondly, that the injury was direct and not merely consequential and, thirdly, that the injury was substantial and not momentary or everescent.

The court came to the conclusion that the plaintiff had established the three requirements above: he had been deprived of light and air and he had been compelled to burn gas at considerable expense in addition to being subjected to unwholesome odours.

As for pollution, a person has at common law no right to pollute water so that in a polluted state it passes to the land of another person who has a right to receive the water, for it is a natural right to have water flow to one's property unpolluted and in its natural state not only in quality but also in temperature, 189 and a landowner may not use his land so as to be a nuisance to his neighbour.

The main country's water resources include sewage discharges into the bodies of water, industrial effluents, insecticides, fertilizers etc.

Examples of such pollution are found at Nakuru where Lake Nakuru is the receiving body of water of the town's daily 767,000 gallons of sewage. And as was pointed out earlier nearly all bodies are now contaminated with insecticides; industries have also been discharging their wastes into rivers in ever-increasing quantities thereby killing fish and rendering the water unfit for human consumption. The question arises: can an individual bring an action of private nuisance to easte or stop the further pollution of the water resources?

To sustain an action of nuisance, there must be interference with the use or enjoyment of lend or some right over or in connection with it such interference deucing damage to the plaintiff. However, such interference would not be difficult to establish since the persons most likely to take action in the event of water pollution are those persons who live on the land through or over which the rivers pass or on which the particular body of water is situated. Such persons depend on the water from the lakes, rivers and streams for domestic and other purposes and as was pointed out earlier in Chapter Two such persons are the majority in the country. As was laid down in Jones v. Llengust Urben District Council, 190 a riparian owner on the banks of a natural stream whather ha is or is not the owner of any part of the bed of the stream, is entitled to the flow of the water past his land, in its natural state of purity undeteriorated by noxious matter discharged into it by others.

Though the doctrine of riparian rights does not apply in this country, this is not to say that the people over whose land rivers pass or other bodies of water are situated have no other right in the water. In fact the rights of water of those persons who abstract for domestic purposes from particular bodies of water have been given recognition by section 30 of the Registered Land Act which provides that:

"Unless the contrary is expressed in the register, all registered land shall be subject to such of the following overriding interests as may from time to time being subsist and affect the same without their being noted on the register -

- (a) rights of way, rights of water and profits subsisting at the time of first registration under this Act;
- (b) natural rights of light, air, water and support."

It has been noted that the requirement of a permit for most of the uses of water has abolished the riparian rights to the extent that these rights cannot now be exercised. However, s. 48(1) of the Water act 192 retains one of the main principles of the riparien dectring, via.

that the right of the enjoyment of a natural street of water on the surface belong to the proprietor of the edjoining lands as a natural incident to the right of the soll itself. The above section provides that:

"When issuing a permit, the water Apportionment Board shall specify as far as practicable the particular portion of any land to which the permit is to be appurtenant, and such permit shall thereupon, save, as harein provided, be appurtenant to such portion of land..... and such permit shall pass with any demise, devise, alienation, transfer or other disposition thereof, whether by operation of law or otherwise."

In view of the recognition of the right of water in the above statute, an individual would be able to satisfy the first condition in the maintenance of an action of private nuisance: proof of interference with the use on enjoyment of land or some right over, in or in connection with it, causing damage to such an individual.

The other main essential of private nuisance is that the interference must be with the enjoyment of land since private nuisance is "confined to injuries to property, whether to essements such as the obstruction of light or of rights of way or the diversion of the water-courses, or the withdrawal of support from a house or other kinds of property, as by noise, noxious vapours, smoke or the like..... In all such cases the plaintiff in order to maintain an action must show some title to the thing to which the nuisance is alleged to be. 193

Though it is not possible to show a title to the water for which an individual seeks protection since the ownership of water of every body of water is vested in the Government, such an individual would at least be able to establish a right to such water, such right being recognized by the Repistered Land Act and the establishment of such a right should be enough to sustain an action of prigate nuisance.

Damage, the other element which must be established in an action of private noisance, will be discussed below after discussion of public nuisance has been completed.

PUBLIC NUISANCE

Public nuisance developed historically as a cetch-all criminal offence which allowed the government to prevent interference with the rights of the community. 194

Interest of the community as opposed to that of only a few individuals. As Law, C.J. pointed out in R. v. Mwanza, 195 "Public nuisance are such inconvenient or troublesome offences as annoy the whole community in general and not marely some particular person," so that where the evidence only shows that it is only one person who is inconvenienced this would not amount to a public nuisance. 196

In Kenya, several statutes make a public nuisance a statutory crime. One of these statutes, viz. the Public Health Act¹⁹⁷ enumerates acts and conditions which are public nuisances and they include:

or other receptable for water, whether public or private, the water of which is used or is likely to be used by man for drinking or domestic purposes or in connection with any dairy or milkshop or in connection with the manufacture or preparation of any article of food intended for human consumption which is in the opinion of the Medical Officer of Health polluted or otherwise liable to render any such water injurious or dangerous to health."

Pollution of water which couses annoyance, discomfort or injury to the community is thus a public nuisance and can be dealth with as a crime.

Where pollution emounts to public nuisance it may also be the subject of civil proceedints. In this connection it must be remembered that subject to the exception contained in s. 61 of the Civil Procedure Act, 198 all civil proceedings in respect of public nuisances must be brought with the sanction of the Attorney-General. The above section provides:

- "(1) In the case of a public nuisance the Attorney-General or two more persons having the consent in writing of the Attorney-General may institute a suit though no special damage has been caused for a declaration and injunction or for such other relief as may be appropriate in the circumstances of the case;
- (2) Nothing in this section shall be deemed to limit or otherwise affect any right of suit which may exist independently of its provisions."

Subsection (2) above anticipates such actions as may be brought up by local authorities under the Public Health Act and by authorized persons under the Water Act against persons who pilute water.

The advantage on action based on public nuisance has over one bessed on private nuisance is this: an action for public nuisance arising out of water pollute can be brought by any person, whether or not he depends on such water. 199 This rule should enable those persons interested in protecting water against pollution to take action where such pollution occurs in areas of the country in which they cannot establish a right in the water affected.

Since provisions prohibiting nuisances exist in various statutes one would expect that persons and bodies including local authorities, empowered to enforce these provisions would do so where water is polluted. Now, as was shown in the previous chapter most, if not all, water in this country is polluted and there is hardly any occasion on which the statutory provisions regarding pollution have been enforced. In view of this failure to take action, it may be wondered whether the existence of penalty against polluters is a bar to an action initiated by an individual to stop or prevent pollution.

The general rule is that where an Ant creates an offence and provides a remedy, the only remedy is that provided by the statute. Such was the nature of the objection raised in <u>Fraser</u> v. <u>Fear</u>, ²⁰⁰ in which the lessee of a duelling house and premises and of certain rights of fishing attached

to the demisized premises sued the occupiers of a mill on the stream in which the fishing rights were enjoyed. The plaintiff alleged that certain works at the mill obstructed the free passage of Salmon to and from the sea end destroyed large numbers of young fish.

An objection was taken that an action for damages for the injury to the fishery and for an injunction restraining continuance of the acta complained of would not lie in view of the penalties imposed by a. 53 of the Salmon Fishery Act, 1873.

Dismissing this objection, Fatrwall L.J. (at p. 429) said that:

"The real question is whether the rights intended to be protected by the statute were thos of the public or of any other persons also who may suffer from its breach. If it be the latter, it is well settled that the breach of such statutory duty is a tortious act, entitling the sufferer to special damages so in every case where a statute enacts or prohibits a thing for the benefit of a person, he shall have a remedy upon the same statute for the thing enacted for his advantage or for the recompense of a wrong done to him contrary to the said law."

The acts compained of were a breach of s.53 of the Semon Fishery Act, 1873 and resulted in the destruction of some young fish, such destruction prejudicially affected the plaintiff's fishery. Concluding his judgement Fairwwell L.J. seid:

"In my opinion, it follows that the plaintiff is entitled to an injunction to restrain the continued breach of the statutory requirements."

In rejecting an objection similar to the one above, Eva J., delivering his judgement in Attorney-General v. Premier Line Ltd 201 stated:

"The public is concerned in seeing Acts of Parliament are obeyed and if those who are acting in breach of them persist in so doing, notwithstanding the infliction of punishment prescribed by the Act, the public at large is sufficiently

interested in the dispute to werrant the Attorney-General intervening for the purpose of asserting public rights and if he does so the general rule no longer operates: the dispute is no longer between individuals, it is one between the public and a small section of the public refusing to abide by the law of the land.

The principles laid down in the above cases should be of considerable assistance to those individuals who may want to take action against persons or enterprises which are responsible for the pollution of water in their areas. However, in areas where a river is being polluted by several persons or enterprises as is the case with River Nairoti which is polluted by the discharge into it of affluents and sewage, the award of demages against one or some of the polluters may not be a satisfactory since this leaves the other polluters, who were not parties to the action, to continue with their activities which pollute the river. In order to have the pollution stopped, an action may have to be taken against all the polluters in order to cut down the cost of separate suits. 202

Proof of pollution, a subject which will be discussed below, required technical resources which are neither easily nor cheaply available to most of the individuals who may want to take action to stop the pollution of the bodies of water on which they depend. In view of this, it would appear that the best and relatively cheap way to proceed would be for an individual to take court action to compell a local authority or other body responsible for ensuring the potability of water in his area to perform the duties imposed upon them by statute. An example of such a duty is the one imposed upon local authorities by s. 129 of the Public Health Act which provides that:

e.129 "It shall be the duty of every local authority to take all lawful and reasonably practical measures -

(a) for proventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or

domestic purposes (whether such supply is derived from sources within or bayond its district); and
(h) for purifying any such supply which has become so poiluted; and of take measures (including, if at law) against any person so polluting any such supply or polluting any stream so as to be a nuisance or danger to health".

An individual may thus ask the court to issue an order of mandamus' against a local authority concerned requiring it to perform the duty as prayed by the plaintiff. In suite in which orders of mandamus are prayed, questions arise as to whether the relevant statute has conferred power or discretion or has imposed a duty. The general rule is that if a power or discretion, as distinct from a duty, exists than the prerogative order of mandamus will not be granted by court.

In considering this question the use of the word "may" as distinguished from the word "shall", though not conclusive, may be of considerable assistance to the Court. Reading s.129 of the Public Health Act above, the conclusion that the enactment sought to impose a duty upon the local authority is irresistible not only because of the use of the imperative word "shall" but also because there is nothing in the provisions relating to the abatement of nuisance which suggests otherwise.

An individual who is adversely affected by the failure of a local authority to prevent pollution of water or to purify any such supply which has become so polluted can therefore, bring an action against such local authority, for, as Vaughan Williams L.J. stated in Groves v. Wimborne, 203 "It cannot be doubted that where a statute pravides for the performance by certain persons of a particular duty and someone belonging to a class of persons for whose benefit and protection the statute imposes

the duty is injured by the failure to perform it, prime facis, and if there be nothing to the contrary, an action by the person as injured will lie against the person who has so failed to perform the duty."

The same principle was stated in <u>Yosuf Mutenda</u> v. <u>Zakelive Mugnyissoka</u> 204

Where it was held that "in cases where there is a duty of public or quasi-public nature or a duty imposed by statute, in the fulfilment of which some other person has an interest, the court has jurisdiction to grent a mandamus to compel the performance of such duty."

PROOF OF POLLUTION

It was noted, above, that under common less pollution is the addition on doing of something to water which changes the natural quality of such water. In the case where pollution arises from the presence of solids such as rubbish, manure, or even sawage, proof of such pollution is not difficult and all that the plaintiff needs to prove is that the offender is responsible for the presence in the water, of such solids. In Kenya, this type of pollution is associated with such industries as do discharge solid effluents into bodies of water, for instance the particles of heir, discharged by the tanneries and molesses from the sugar refineries.

The most serious source of pollution, however, is the discharge into water of liquid effluents. Liquids from coffee processing fectories contain large amounts of chemicals used in the processes; waste waters from the decortication of sisal contain high concertrations of nitrogen and organic matter. This type of pollution, as was shown in Chapter Three is responsible not only for microbial growth which to dimunition of oxygen in bodies of water but is also responsible for the deterioration of water quality to such an extent that it becomes unsuitable for human consumption.

Proof of this type of pollution is established by samples of the offencing officent teing triang of samples of the polluted water at selected points for analysis. The findings are given in evidence by the analysis. In cases where pollution has caused fish

mortality, specimen of the dying or freshly dead fish are exemined and results given in evidence to supplement the findings of the analysis of the polluted water.

In the case of pollution arising out of the discharge of heated effluents into water, for instance, the discharge of heated condenser water into a river, a series of temperature readings are given in evidence. Along with the temperature readings, technical evidence on the fatal or ill-effects of heated water on equatic life should be given.

Samples of the water which is allegedly polluted should be taken at different points of a stream or river: at the point where the polluting matter or effluent enters the water; at points above and below the point of discharge. This is done in order to show that pollution is not being caused upstream and that the discharge is causing pollution downstream. In the event that the source of pollution is far removed in distance from the affected point, it is necessary to prove a direct link between the source and the pollution at the said point. This can be done by taking samples of water at several points along the river.

TRESPASS

Trespass consists of an unjustifiable interference with the possession of land and the interference usually consists of an unauthorized entry upon the soil.

In order to maintain an action in trespass, the plaintiff needs to prove that he is either in actual possession of the land or that he has a right to possession at the time of the tresspass. As was pointed out in <u>Khatibu bin Mamadi v. Issaji Nurbhai</u>, 205 the plaintiff need not be necessarily the owner of the property so that a tenant whose possession of the land has been disturbed may maintain an action for damages against the intruder.

The distinction between trespess and nuisance lies in the fact that trespess is an invasion of the right to exclusive possession of land, a direct invasion; while nuisance is an invesion of the right to use and enjoy land, an indirect interference.

Local authorities and bodies or person who manage sawage works which are so badly managed or over-worked that untreated sawage enters into rivers can be sued for trespass under the rule stated in Janes v. Llangust Urban District Council: 200 any one who turns or allows faecal or other matter collected by him or under his control to escape into a river in such a manner or under such conditions that it is carried, whether by current or wind on to his neighbours land is, on the principle of Rylands v. Fletcher guilty of a trespass."

Proof of damages in a suit of trespass presents fewer problems since no actual damages need be shown for the right to be free from trespass is absolute. However, if no actual damages are shown the recovery will be limited to minimal money damages since, as was stated in <u>Visram</u>

* Karsan v. Bhatt²⁰³ *....the person injured must receive such sum of money as would reasonably be said to put him in as good, but neither better nor worse, a position as he was immediately before the wrong was committed.*

Assuming that a party has succeeded in establishing the pollution of water in which he has a right, the question as to the assessment and quantum of damages and other reliefs open to him are then dealt with. This subject is dealt with below.

DAMAGES

As a general rule, it is not necessary to prove the actual damages suffered in the case of water pollution. It is sufficient for him to show that his right to have the water flow to him in its natural state has been interfered with. This principle was laid down in Jones v. Llanrwst Urben District Council where it was stated: " a riparian owner on the banks of a natural stream whether he is or is not the owner

of any part of the bed of the stream is entitled to the flow of the water past his land, in its natural state of purity, undeteriorated by noxique matter discharged into it by others. Anyone so fouling the water infringes a right of property of the riparian owner, who can maintain an action against the infringer without proving actual damage and obtain an injunction to prevent the continuance of the injury".

The same principle applies when an action is brought by the Attorney-General where a public right is infringed. In Attorney-General v.

Shrewbury (Kinceland) Bridge Co. 210, the defendant company acted in such a way as to interfere with a public right of way and with a towing path and also drove piles into the bed of river Severn in a manner calculated to impede naviation on the river. The Attorney-General thereupon filed an information against the company at the relation of the coplaintiffs. It did not appear that there had been interference with any private right and the question, therefore, was whether the Attorney-General had or hadn't any right to interfere in such a case without showing some substantial injury to the public. The court took the view that the Attorney-General was justified in interfering, though there was no evidence of public injury.

However, where no substantial damage suffered by the plaintiff is proved, the action having only been brought to stop the plaintiff is right being infringed, all the plaintiff can obtain are nominal damages. But in suitable cases, damages would be awarded even when they have not been specifically claimed.

INJUNCTION

The superiority of injunctions over the other remedies in cases where the environment has been impaired was recognized nearly a century ago and, cozers-Hardy Q.C. (as he then was), eppearing for the plaintiffs

in <u>fletcher</u> v. <u>Bearley</u> sequed that the court would entertain actions of the nature of injunctions quie timet more readily in cases of water pollution and that sort of injury then in other cases because the injury is irreparable and pecuniary damages are no damages. More recently Arnold W. Reitze, Jr. has stated that "since the award of monetary damages is not a satisfactory remedy for environmental torts, the equity court's power to enjoin the nuisance should be exercised." 212

It was recognized at common law that a man was entitled to protection against unlawful disturbance of his rights and against vexatious litigation and remedies in this respect were given by certain "write of prevention" 213

In this way a plaintiff could secure himself against a future apprehended loss. This much can also , as Oluyede 214 points out, be deduced from the case of Attorney-General v. Block. 215

An injunction is an equitable remedy subject to the discretion of the court and the principles upon which the court acts in granting or refusing injunctions apply to injunctions in respect of water pollution actions. Little help can be derived, however, from the East African case—law on the use of injunctions to protect public rights. "It does seem that there are no cases in East Africa yet, dealing with situations where an individual has sought an injunction where an element of public right as opposed to individual right was involved."

An injunction will be granted to restrain the continuence of a nuisance where the injury caused by the nuisance is substantial or in the case where though the damage done is slight the nuisance is a continuing or recurring one.

The availability of other remedies to a litigant, for example, damages, makes the court reluctant to grant an injunction against the party sued; however, in the case of water pollution the court will and should over look this fact so as to avert the necessity of bringing a series of actions

if no injunction were granted, especially when the acts complained of are recurrent or continuous as are most discharges of industrial effluents and sewage.

Apart from the prayer of injunction where the injury has already occured, an injunction may be granted to restrain the commission of a prospective nuisance. In order to obtain such an injunction, it is necessary to show a strong case of probability that the apprehended injury will in fact arise.

In <u>Fletcher</u> v. <u>Bearlay</u>, a firm of paper manufacturers applied for an injunction to restrain a firm of chemical manufacturers from sending alkali refuse which contained considerable amounts of sulphur into the river upon which the works of both parties were situate, that of the defendant being higher up the valley, so as to pollute the water and render it unfit for plaintiff's use. It was not alleged that there had been any pollution but only that if the defendants continued to act as they had been doing, pollution would ensue.

Since the view is held by this author that an injunction to restrain a prospective act likely to lead to pollution of water is a move suitable remedy than others and since the judgement in the above case laid down the principles on which the Court acts in granting or refusing to grant such an injunction, leave is taken to set out the decision in great detail below. Delivering the decision of the court, Pearson L.J. stated:

It is not correct to say that if the plaintiff has not sustained or cannot prove that he has sustained, substantial damage, this court will not give relief because, of course, if it could be proved that the plaintiff was certainly about to sustain very substantial damages by what the defendant was doing and there was no doubt about it, this Court would at once stop the defendant and would not wait until the substantial damage had been sustained. But in nuisance of this kind, it is known by experience that unless substantial damage has actually

will be sustained and, therefore, with reference to this particular description of nuisence it becomes practically correct to lay down the principle that, unless substantial damage is proved to have been sustained this Court will not interfere. There must, if no damage is proved, be proof of imminent danger and there must be proof that the damage will be, if it comes, substantial — I should almost say irreperable because to my mind, if the damage is not proved to be so imminent that no one can doubt that if their remedy is delayed, the damage will be suffered, I think it must be shown that if the damage does occur at any time, it will come in such a way and under such circumstances that it will be impossible for the plaintiff to protect himself against it if relief is denied on a quia timet bill.

"But in this present case, the defendants do not intend that any amount of this liquid should get into the river and inasmuch as it is perfectly possible and practicable to prevent the liquid from getting into the river, I cannot think that at the present moment the evidence is sufficient on this point to justify the Court interfering."

As it must have become clear from the decision above, it is not sufficient merely to allege that the proposed acts will have an illegal result as against the plaintiff without putting before the court sufficient evidence to enable it to judge that question, for it was stated in another case "...as to injunctions which are called injunctions quis timet it is essential to show that what the defendant is about to do must have that effect - not may but must." 217

The necessity of proving the imminence of the apprehended pollution may not be easy in this country except in cases where the amount and quality of the polluting discharge is known. In cases of industrial

effluent, the amount of the discharge may vary according to the volume of production in the particular enterprise at various periods; its effect on the quality of the water which it is discharged will depend on the volume of the water and the climate obtaining at that particular time; the amount of water ebstracted, this tending to enhance the pollution of the water left. However, where the amount of the polluting discharge, say sewage, is known or can be calculated with a great degree of certainty and where the characteristics of the body of water are stable and the effects of the previous discharges known, an injunction, by prohibiting the acts in question, should go a long way in averting the future pollution of this country's water resources.

Having examined the common law doctrines and their role in protecting the water resources of this country, the next part of the chapter discusses the protection provided to these resources under the statutory law.

STATUTORY LAW AND THE PROTECTION OF WATER RESOURCES

In Kerya, there is no general environmental legislation, the lew relating to the environment being contained in a variety of statutes. This is true, too, of the legislation designed to regulate the use, development and conservation of the country's water resources.

In this part, the main emphasis will be laid on the discussion of the legislation which relates directly to the use, development and conservation of the water resources. However, since other resources. such as forests, and human activities such as agriculture have a great bearing on the well-being of the water resources, legislation which regulates the exploitation of resources such as forests and human activities such as agriculture will also be examined. Discussion of the water legislation will be confined to its application on the surface water resources. The exclusion of the ground water resources in the discussion is based on the fact that these resources have not been exploited to any significant extent except in the drier, low potential areas of northern and eastern Kenya so that these ground water resources do not feature prominently in the country's development plane to provide water for its inhabitants. And although the increasing development in the country as well as the growth of population have been responsible for the derignation of the quality of the surface water resources, human activities have not resulted in any appreciable degeneration in the quality of the ground water resources. For these reasons and because the surface water resources which are crucial to the development of the country are the ones under the greatest strains and thus subject to the resultant impairment, discussion, in this part will be confined to the law relating to the protection of the surface water resources.

Planning and Administrative Institutions

The body charged with the overall responsibility for the planning and development of the country's water resources is the Water Resources Authority which is established under s.19 of the Water Act. 218 Its duties, among others is to investigate the water resources of Kenya and to advise and make recommendations to the Minister regarding the improvement, preservation, conservation and utilization and apportionment of such resources. 219

Planning for water development and the handling of pollution problems can be undertaken within the context of an entire watershed basin. This is because the flow of water in rivers and other bodies of water has no respect for political or administrative boundaries, but follows a constant pattern from surface run-off to progressively larger waterways, always in the same direction. In recognition of this fact, the Water Resources Authority is required to divide the country into catchment areas, which areas it may from time to time subdivide or amend. 220 In pursuance of this, the Water (Catchment Board) Rules have divided the country into six catchment board areas, namely:

- (a) The Tana River cetchment Board, covering the River Tana and the surrounding catchment areas;
- (b) The Rift Valley Catchment Board, encompassing the Rift Valley drainage system;
- (c) The Athi River Catchment Board, for the Athi River watershed area;
- (d) The Northern Eweso Nyiro Catchment Board for the area drained by the Ewaso Nyiro River.
- (e) Two Catchment Boards for the Lake Victoria basin namely, the Lake Victoria (North) Catchment Esard and, Lake Victoria

(South) Catchment Hoard.

The duties of the above catchment boards is to advise the Water Apportionment Board, in respect of their areas, on ²²²

- (a) the apportionment and use of existing and potential water supplies, and
- (b) the adjustment, cancellation or alteration of any licence, sanction or permit.

In each province is established a Regional Water Committee appointed by the Minister for the purposes of 223

- (a) advising the Minister on Water conservation, development and policy in their provinces.
- (b) submitting to the Water Resources Authority recommendations on water development in their provinces:
- (c) considering proposals for water projects from local authorities and advising the Water Resources Authority on such project proposals:

Subordinate to the Water Resources Authority and, charged with the responsibility of issuing permits, licences and sanctions and generally for the purpose of apportioning water resources is the Water Apportionment Board established under s.25(1) of the Water Act. In practice, the Water Apportionment Board exercises the Minister's powers under s.4 of the Act whereby "The control of every body of water shall be exercised by the Minister...." and s.5the right to use every body of water is vested in the Minister."

The Board meets each month and is extremely active in carrying out its functions which are mainly concerned with the issue, variation and revocation of water permits.

CONSERVATION OF WATER

water has already been discussed. It was pointed out that the pressure on forests by cattle and such human activities as the felling of trees for charcoal-burning or the clearing of forest areas for human settlements is a thing which destroys not only the forests, but soon or later, the livelihood of the cattle and those who live by them, for if such activities are effective in destroying the forests, they dry up the water supplies on which the cattle and human population depend.

To guard against such destruction, the Minister for Water Devalopment is empowered to take measures to protect the forested catchment areas. S.14 of the Water Act provides:

Where the Minister, after consultation with, or on the advice of the Water Resources Authority is satisfied that special measures are necessary for the protection of the Water resources in or derived from any area, he may declare such area or any part thereof to be a catchment area and may, by order require, regulate or prohibit the doing by any person in such protected area of any act which he considers necessary for the protection of the water supply obtained therefrom, and any person so ordered who fails to comply with the provision of such order shall be quilty of an offence and liable to a fine not exceeding ten thousand shillings.

The control of every body of water is exercised in accordance with s.4 of the Act and the right to use water of every body of water is, under s.5, vested in the Minister. Thus, by the exercise of this right the Minister can regulate and control the use of water taking into account the need for conserving this resource. The definition of every body of water is wide enough to embrace all manner of water

This power of the Water Apportionment Board to declare whether the water in question falls within the definition of the term "body of water" coupled with the right of control of the use of water by the Minister is the first of the control devises contained in the Act and which may be used for the purpose of water conservation.

The other control device is the requirement that a permit is required for nearly all the uses of water. Such uses of water as do require a permit include the following -

- (a) the provision of water for municipalities, townships, villages and communities (s.35 (b)).
- (b) the use of water for steem raising on railways
- (c) the provision of water for the irrigation of land, not exceeding 2 acres, used for orchards, gardens, nurseries and land-farming operations (s.35(c))
- (d) the industrial use of water, including mining, the washing and treating of coffee, vegetation fibre or other agricultural or

mineral produce (s.35(d)),

- (e) the employment of water for the development of power(s.35(e)),
- (f) the provision of water for the irrigation of land exceeding 2 acres in extent. (s.35(f),
- (g) the provision of water for any other purpose approved by the Water Apportionment Board (s.35(g).

Applications for water permits must contain such particulars as would enable the Water Apportionment Scard to decide whether the grant of the permit applied for would in any way prejudice the right of others to use the water. The application must contain information, for example, on whether the water applied for would be used for any purpose or in any process that will foul it or that will increase its burden of silt or gravel or whether the use of the water would be injurious directly or indirectly to public health, to stock, to fish or to crops or gardens irrigated with such water. If the use of the water would cause any of the adverse effects referred to above, the applicant is required to state what steps are proposed to render the effluent and the residue innocuous and pure before returning it to the stream. 226

The uses of water which do not require a permit are set out in s.38 and include:

- (a) the abstraction or use of water for domestic purposes by any person having access to a body of water if such abstraction is carried out without the use of works;
- (b) the development of groundwater when the works for such development are not situated within 100 yards of any body of surface water;
- (c) the storage of water in a dam, channel or depression which has been declared not to be a watercourse under s.31 of the water day.

Apportionment gives priority to the domestic use of water and the Board may reserve such part of the flow of a body of water so is required for domestic purposes. 227 And, if after the grant of a permit, and because of grought, natural changes or increased demand or other cause the obstraction or use of water causes a shortage of water for domestic purposes or any other purposes which in the opinion of the Board should have priority, the Board may vary or revise the permit so as to ensure adequate supply of water for domestic or other use which the Board has given priority.

The purpose for which the water is to be used is specified in the permit, as is the part of land on which it is to be used. This ensures that the water is not used except for the purpose or purposes specified in the permit. Thus, a permit issued for irrigation of part of a landholding may not be used for the remainder of the holding or for, say, a factory built on the land.

In addition, the grantee of a licence or permit exercises his right to divert, abstract, use or store water in accordance with the conditions of his licence or permit as regards the quantity of water or proportion of the discharge of the body of water concerned. To ensure compliance with the conditions set out in the permit or licence, the Water Apportionment Board may prescribe in the permit or licence that the permit holder or licence is required to construct and maintain controlling or measuring devices such as weirs flumes, sluice gates and valves to ensure that only the quantity of water authorized is abstracted or used. 229

Failure to observe the conditions set out in the permit or licence for instance, conditions as to the quantity of water to be used or ebstracted, the quality of effluent or waste returned into the body of water may lead to the cacellation of such permit or licence. 230

To summarize this part of the Chapter which has dwelt on the means available under the Water Act, for the conservation of water resources, the main powers available for this purpose include:-

- (a) The power of the Minister to declare an area to be a catchment area;
- (b) the power of the Water Apportionment Board to declare the water in question to be "a body of water" for the purpose of the Water Act and thereby bring such water within the provisions of the Act;
- (c) The requirement of a permit for most uses of Water thus making it possible for conditions as to quantity of water used and quality of effluent returned to a body water to be imposed; (d) the construction of controlling and measuring devices to restrict the quantity of water to that specified in the licence or permit.

Effluents and the Pollution of Waters

Effluents from Industrial processes and sawage from sawage works have contributed to widespread pollution of this country's water resources. However, the most dangerous level of pollution has been reached obly in where industrial concerns and the municipality sawage works discharge effluents and sawage directly into River Nairobi and its tributaries. Elsewhere the level of pollution is low, reflecting the absence of dense concentration of industry. However, a single industrial concern in an area can so pollute the water as to make it unsafe for human consumption and the watering of livestock. One example is the Graderick Falls Paper Mills in Western Kenya. If toxity of its effluents was not restricted, the discharge into River Nzoia of the industrial effluents from the Mills could render the water dangerous for consumption by the large population of becam beings and paimals who are dependent on the River. Another recent example is the water of Kerio River in Kerio Valley, which water has been rendered unsafe for human and animal consumption due to the

discharge into it of effluents from the Fluorspar Factory. The water has been found by the Government Chemist to contain fluoride in quantities which render it dangerous from human consumption. 231 Yet, for lack of an alternative source of water people and animals in the area continue to use the water from the River. 232

Effluents from coffee factories have also caused deterioration of water quality in the coffee growing areas.

Maintenance of Water quality as well as the protection of fish life and aquatic plants is achieved through the requirement that permission must be obtained before an effluent is to be discharged into a body of water. Standards which lay down the maximum concentration in the effluent are presently made part of the agreement when the Water Apportionment Board issue a permit for the use of water. These standards are made as part of the regulations which the Minister has power to make under s.182 of the Water Act.

One of the fundamental problems in formulating standards for effluent control is the leck of full understanding relating to specific pollutants and their detrimental effects. The work is further complicated by the fact that usually a multitude of waste sources make their various contributions which intermix or decay at various rates. This problem is confronting those persons charged with the setting of standards as admitted by the Head of the Water Quality and Pollution Control Section of Kanya's Ministry of Water Development - "In Kenya standards are normally based on the literature from work done on rainbow trout. This is not completely satisfactory since although this species has been found to be sensitive to most poisons, it is an introduced species in Kanya with limited distribution and it would have seen advantageous if more information was available on

indigeneous species. Similarly, data on toxity on invertebrates is extrapolated from work on exotic species 233

In setting the standards, factors such as river velocities, bed characteristics, and water depths are taken into account. These factors exert their influence on the affluents discharged into bodies of water. Dilution occurs and this has the effect of reducing the toxity of the effluent; temperature of the water is a relevant factor since high temperatures have the effect of promoting a more rapid rate of decay for quick acting poisons and other chemicals. At high temperatures, the amount of oxygen that can be dissolved is also lower.

Samples collected from unpolluted streams in central and Western Kenya over a range of flow conditions have indicated that most streams in the high-land humid are as can be classified as clean. In contrast, samples from areas outside the Central Province and Western Kenya show the occurence of natural organic pollution especially in the Rift Valley; analysis of these samples indicate a high iron content.

Since the characteristics of the rivers and those of the surrounding areas vary so widely, it has been found unrealistic to set a national standard for effluents discharged into these rivers and other bodies of water. In Nairobi, for example, it is unrealistic to assume that pollution will not occur. All that the standard for the Nairobi River and other fishless rivers can set out to achieve is purity of the water to such degree that it can be used for cooling and other industrial uses and that it is also suitable for partical body contact in such recreational activities as fishing and boating.

In areas of the country where the rivers only flow during the est seasons standards will vary according to the crops being grown in the areas at the same time taking into account the salt tolerances of the plant and public health considerations. For industrial effluents, the standards

will very to take into account the toxity of substances in such effluents, and they will need to be high where the affluents contain poisons which are discharged into a closed body of water.

These standards are then incorporated into the water permits as conditions so that failure to comply with them may result in the pencellation of the water permit by the Water Apportionment Board.

In addition, any effluent discharged or returned into a body of water from where it was taken, must be of such purity as satisfies the Water Apportionment Board. 235 And in no case shall such effluent contain matter paisaneus or injurious to public health, to livestock or to crops; neither shall the effluent contain more silt, gravel or houlders than is normally carried by the body of water from which it is taken.

The Water (General) Rules also contain provisions regulating the use of water for the pulping, hulling and washing of coffee:

- (a) The effluent from such pulping, hulling or washing must be screened in such a way that no coffee berries are returned to any body of water;
- (b) The residue from the acreening must be removed daily to such place as the Water Apportionment Board approves so that there shall be no risk of such residue being washed into a body of water;
- (c) The effluent from the first and second washings of the coffee shall be diverted into seepage pits end such pita must be so maintained that no direct flow from the seepage pits into any body of water.

In addition to the above provisions which cover the discharge of effluents from coffee processing works, the Water (General) Rules contain in Rule 75, a provision general and wide enough to regulate the discharge of effluents and other matter from any other activity. This Rule provides:

"The Water Apportionment Board shall have authority to determine whether or not any sawdust, tailings, gravel refuse, sewage or effluent from any works or any other material or substance of any kind being put or proposed to be put into any body of water or watercourse is prejudicial or will prejudice the beneficial use for any purpose of the water of such body of water or watercourse or is impending or interfering or may impede or interfere with the natural flow of any body of water...."

If the Water Apportionment Board comes to the conclusion that such matter as set out above is prejudicial to the use of such water or impedes or interferes with the flow of such water, the Rule above empowers the Board to "order any person not to put any such thing into or adjacent to such body of water or watercourse and, further, may order the removal of any such matter from, or from any site adjacent to, any body of water or watercourse any person who refuses to obey such order shell be guilty of an offence.

Since most uses of water are only allowed under a permit in which conditions as to the type and quality of effluent to be discharged into body of water have been incorporated and, further, since the discharge of effluents or other matter contrary to these conditions may result in the cancellation of the permit, the powers of the Water Apportionment Board contained in the Water (General) Rules are really additional. They are additional in the sense that they cover the same matter and confer the same power on the Board as have been provided for in s.99(a) of the Water Act. However, these additional powers is that the Board can elect to act under the Rules to require the doing or abstention from doing certain acts, when it is not in the interest of the person concerned or the country itself to cancel the permit under s.99(a) of the Water Act.

Apparently, the Spord has exercised its powers under the Rulec in the many of the instances when industrial works have an discharged their effluents as to pollute the water rendering it unfit for human and animal consumption. If this were not the case, a lot many industries would already

have lost their water permits.

Development of Water Resources:

The country's growing population, accompanied by the increase in agricultural and economic activities are bound to generate bigger demands for water in the future. It is, therefore, the duty of the Water Resources Authority to prepare estimates of future water supply requirements, 237 and to formulate proposals for meeting the existing as well as the country's future water supply requirements.

Some of the proposals made by the Water Resources Authority may involve the undertaking of schemes by the Government for the provision of water. On receiving advice from the Water Resources Authority or the need for such scheme, the Minister may publish a notice in the Gazette setting out the land required for the development of such scheme. The Minister may then acquire such land in order to facilitate the development or improvement of water as envisaged in the scheme and such acquisition of land shall be deemed to be an acquisition for a public purpose under the Land Acquisition Act. 240

Apart from acquiring land, the Minister may construct and maintain works on any land, if he deems such work necessary for 241

- (a) the protection of the source or course of any body of water;
- (b) the conservation of water.

The numer of the land on which such works are constructed is entitled to compensation for any adverse effects on the land, caused by such works. In assessing the amount of such compensation regard shall be had to the benefit or betterment which has accrued to such land by the construction of such works.

Acquisition of lend for the development or conservation of water resources may be initiated by a water undertaker. Such water under-taker applies to the Minister who consults the Water Resources Authority on the

application. Upon being satisfied that such acquisition is desirable, the Minister may take the necessary steps to secure the acquisition of the land in accordance with the law relating to the compulsory acquisition of land for public purposes. 243

The Minister may also declare an area to be a protected catchment area upon being satisfied that such declaration is necessary in order to protect a catchment area from which the water supply of a water undertaker is obtained. Within such protected area, the Minister may require, regulate or prohibit the doing within such an area of any act which may be necessary for the protection of such area or for the protection of the water supply derived therefrom.

Enforcement of Legislation on Water Quality and Conservation.

The establishment of the Water Quality and Pollution Control section, since 1972, has enabled the Ministry of Water Development to undertake the scientific and technical work necessary for the successful prosecutions of the contraventions of the Water Act and the regulations and rules made thereunder. This work involves the collection and analysis of water samples when pollution is suspected or alleged to have occured. Such analysis are made in order to establish whether or not the samples in question contain polluting matter.

The section has established three pollution monitoring river surveys on the Nairobi River, Nzoia River and Laka Makuru. The survey based on the Nairobi River is being undertaken to collect data to enable the section to work out standards for effluent discharge into the river and its tributaries. The Nzoia River survey was started to assess the impact of the Pan African Paper Mill effluents on the quality of the river water. In addition, the survey is examining the effects of soil conservation measures

in the river's conservation area. The sampling of Lake Nakuru covers all the tributaries of the Lake and semage works of effluents from the municipality of Nakuru entering the Lake. In 1973 alone, 1471 tests were made from 164 samples taken from the Nairobi River, Nzoia River and Lake Nakuru surveys. 245

The section also undertook water treatment pilot studies as well as ground and surface water analysis.

The Pollution Control Officer is stationed in Nairobi in the Head Office of the Ministry of Water Development. His stationing in Nairobi is obviously an obstacle to the efficient execution of his duties since in the event that pollution occurs in an area he must be able to get to the site immediately so that smales, especially of organic compounds, can be analysed within the shortest time possible.

However, this problem is likely to be solved during the 1974-78 development plan period during which K£175,000 is to be spent for establishing and running area laboratories based on the country's catchment areas. The laboratories will be manned by five Area Pollution Control Officers aided by supporting staff.

In their work of detecting pollution, these officers will be assisted by Water Bailiffs who are appointed under Rule 61 of the Water (general) Rules. Persons who perform the duties and have the powers of Water Bailiff are:

- (a) any person holding the post of Water Sailiff;
- (b) any officer of the Ministry of Water Development authorized to act as Water Bailiff by the Water Apportionment Board.
- (c) persons, other than those of the Ministry of Water Development, appointed by the Chairman of the Water Apportionment Soard by notice in the Gazette.

The evidence of pollution which is collected by the pollution control officer(s) or water bailiff(s) is passed on to the Minister, or the Water Resources Authority or the Water Apportionment Board, any of whom may institute and maintain proceedings in court against the person alleged to pollute the water. When the offence is of a trivial nature or, if the Minister, the Water Resources Authority or the Water Apportionment Board is of the opinion that the justice of the case would be met by the recovery of a money payment, a civil action can be taken against the person alleged to have polluted the water.

A water undertaker who has made regulations for the purpose of protecting the water against pollution is under an obligation to enforce the regulations he has made. 248 In the event that such water undertaker fails to do so, he may be ordered by the Minister to take such action as shall specify in such order. 249

Apert from the persons and institutions above, local authorities have the responsibility to take all lawful, necessary and practicable measures to prevent the pollution of water supplies in their areas. This responsibility pertains to the supply which the public, within the authority's area, has a right to use and does use for drinking or other domestic purposes. Where pollution of such water supply has occured, the local authority is under a statutory duty to purify it. The measures which the local authority is required to take to protect their water supplies against pollution include proceedings at law and such measures are to be taken against any person so polluting a supply of water or polluting a stream so as to create a nuisance or danger to health.

Apart from the above statutory duty imposed upon the local authorities, the Minister may impose on such authorities the duty of enforcing rules in respect of defined areas prohibiting or regulating the grection of dwellings,

sanitary conveniences, stables, cattle sheds, pig styes, dipping tanks, factories or any other works likely to entail the risk of pollution of water supply in their areas. The above rules may also prohibit or regulate the deposit in the vicinity of, or in any place draining into any such supply, of any manure, filth or noxious or offensive matter.

5.130(2) provides that Rules made under this section shall be made with due regard to the interests of agriculture or any other industries. Presumably, the intention here is to provide against the making of rules so strict in their provisions that it becomes almost impossible for industries to dispose of their wastes into bodies of water without contravening such rules. However, the possibility that such rules will make it impossible for industries to so dispose of their wastes is remote since the industries abstract water and discharge effluents in accordance with the conditions in their water permits, which conditions it will be remembered contain quality standards for the effluents determined by the Water Apportionment Board, which Board in imposing the conditions takes into consideration the interests of the water supplies and the need to protect them against pollution.

If the standards discussed in this part of the chapter are effectively enforced and, further, if contraventions of these standards as well as the other provisions of the Water Act, the Public Health Act and the provisions of any other written law relating to the use, conservation and pollution of the country's water resources are prosecuted, the problems facing the water resources would be reduced to the minimum, if not eradicated altogether. The current pollution of water and the other problems the water resources, would therefore, suggest the presence of some shortcoming in the Law as it obtains at the moment or the lack of enforcement of such Law. Whether this is the case or whether other factors are responsible for the problems facing the water resources will form the subject of discussion in the next chapter.

Land Usage and the Control of Pollution

In the discussion of the pressures on land which have been generated by the growing demand for more food in the previous Chapter, it was seen that land previously uninhabited or uncultivated is now being opened up for agriculture. Although this Thesis does not set out to examine land usage in particular, it becomes necessary to discuss the implications of land usage on the quality of the country's water resources.

The ancient practice of shifting cultivation among the Africa peoples of Kenya allowed the soil to recover and replenish, the vegetation to grow on land previously cultivated and the ecological balance to be maintained. But with an increasing population pressure on land, it is not possible to continue this practice any longer and the land is tilled year in year out with all the consequences which befall a "flogged" soil.

Added to this, is the improper cultivation of steep slopes. In 1968 there was a deterioration in soil conservation in parts of Elgayo Marakwet and Baringo and the Agriculture Department found it increasingly difficult to control steep and hillside cultivation. A deterioration of the same nature was noted in Masailand especially along the Mbagathi River. 253

Apart from silting rivers and streams, soil erosion is affecting the exploitation of the hydro-electric potential of the River Tana. With most trees cut down on the hillsides, the soil is left bare, erosion takes place, the eroded soil being washed down the river and eventually reaches the power stations at Kamburu and Kindaruma where silting becomes a stumbling block to the production of electricity.

In addition, the marine environment is being threatened by the discharge into the sea of silt carried by the Sabaki and Tana Rivers.

The foregoing makes it clear that measures designed to protect the water resources against pollution should encompass control and super

vision of the land usage practices, a fact which was recognized by the Tanganyika Water Legislation Committee and by the Economic Commission For Asia and the Far East which stated that:

Certain ancillary powers to undertake or control acts on land are essential to proper water management. Thus, action may be necessary to protect the bed and banks of rivers to prevent erosion or pollutive acts on adjacent land, to undertake emergency acts on land or even compulsorily to acquire land" 255

Since poor agricultural methods as well as the invasion of the forest estate have eventually contributed to widespread scil erosion, discussion will now be centred on the two statutes, viz. the Agriculture Act²⁵⁵ and the Forest Act, 257 which have hitherto been employed to bring about an improvement in the farming methods as well as conserve the forest estate.

The provisions of the law which regulate measures to conserve the soil are mainly contained in the Agriculture Act. Whenever the Minister thinks it necessary or expedient to do so in order to conserve the soil or to prevent the adverse effects of soil erosion, s.48 of this Act gives him power, with the concurrence of the Central Agricultural Board, to make rules to prohibit, regulate or control.

- (a) the breaking or clearing of land for the purpose of cultivation,
- (b) the grazing or watering of livestock
- (c) the firing, clearing or destruction of vegetation.

The Minister makes such rules whenever they are necessary to preserve the soil on ridges or slopes or in valleys or for the protection of the land against erosion or the deposition of sand, stones, or gravel on such land; in addition, the Minister may make rules for the preservation of the soil and its fertility.

The objective of securing the preservation of the scil and its fertility may also be achieved by the Minister exercising power to make rules under s. 46 (b). Such rules may require, regulate or control, among other things,

- (a) the afforestation or re-afforestation of land;
- (b) the drainage of land including the construction of contour banks, terraces etc.
- (c) controlling or prohibiting the use of land for any agricultural purpose including the depasturing of stock.

Apart from the rules made under s.48 which are, in most cases, of general application over the whole country or a region of the same, soil preservation measures can be effected against an individual or group of individuals through Land Preservation Orders. s.50(2) of the Agriculture Act provides:

"A land preservation order may be made against the owner or occupier of land, or against both the owner and occupier either at the same time or at different times."

The power to make land preservation orders makes it possible to take into account the peculiarities of a piece of land under cultivation on which it is intended to preserve soil and its fertility. The Orders are designed to require a farmer whose activities have contributed to a deterioration of soil fertility to undertake measures which will preserve such fertility. Power to make these orders is exercised both by the Director of Agriculture 258 and the Minister of Agriculture.

Apart from the above orders, the Minister may make Land Development Orders requiring the owner of land or occupier of such land to undertake or adopt such system of management or ferming practices as, in the Minister's opinion, may lead to the proper development of the land in respect of which the land development order is made.

In addition to the rules and regulations on soil conservation which may be made by the Minister, regulations on soil conservation may be made by the District Agricultural Committees which are established for each district under s.22(1) of the Agriculture Act. The functions of these Committees are, among others, to exercise such powers and to perform such duties as may be stipulated under the Act establishing the Committees or any other written law. Under s.48(2) of the Agriculture Act the District Agricultural Committees have powers to make regulations applicable to their areas on matters similar to which the Minister may make rules.

The Agriculture (Basic Land Usage) Rules, 1965, 268 made by the Minister of Agriculture under the Agriculture Act apply to all land in Kenya except plots of land not more than two acres used for residential purposes in municipalities and townships and land used for recreational purposes.

The above Rules are designed to protect land with a slope of over 12 per cent, protection of water courses and protection of land against erosion. To this end, Rule 6 of the above Rules make it an offence for any person to cultivate, destroy the soil or cut down any vegetation or depasture any livestock on any land lying within six feet of a watercourse or where the watercourse is more than 6 feet wide, within a distance equal to the width of that watercourse to a maximum of 100 feet. Such activities can only be carried out, within the distance specified in the rule, with the prior permission of an authorized officer who, before granting such permission, will ensure that enough care and effective measures will be taken to avert erosion of the soil which may eventually enter the watercourse. Rule 7(2) requires the owner of land to ensure that the flow of water on his land shall not cause any soil thereof.

Though the Agriculture (Basic Land Usage) Rules, 1965 apply to all land in Kenya recognition is given to the fact that conditions in various parts of the country differ so widely that separate provisions may be

necessary to cover such conditions. Rule 11, therefore, states that,
"A district agricultural committee make regulations relating to agriculture and land usage under these Rules in respect of the district of which it is established." Acting under this Rule, a district agricultural Committee may make regulations to cover any conditions peculiar to its area of jurisdiction.

Most District Agricultural Committees and local authorities have made regulations and by-laws to regulate and control use of land for agriculture in a bid to preserve and conserve the soil. But soil erosion does not arise out of bad farming practices only; everstocking may be the other cause and in fact this was the earliest cause of erosion noted especially in what was formerly known as the "Ukamba Reserve" now divided into Kitui and Machakos districts. At the moment overstocking continues to be a major cause of erosion in practically all the provinces. 261

Erosion arising out of overstocking and overgrazing can be dealt with under the provisions of the Crop Production and Livestock Act. ²⁶² If no rules have been made under s.4 of the above Act, s.4(A) empowers local authorities, subject to the approval of the Minister responsible for animal husbandry, to make by-laws:

- (a) prohibiting the keeping of cattle or the grazing of the same on any agricultural land;
- (b) regulating the numbers and kinds of livestock which may be kept on any such land; and
- (c) providing for the compulsory reduction of the numbers of livestock in any such area.

The Crop Production and Livestock (Cattle) Rules 1959^{263} apply in some locations of Machakos district where the problem of overstocking has been most serious since the earliest days. These Rules empower the Distinct Commission 264 to order any parson grazing any cattle, sheep or

goate to remove them to any other part of the location where he is satisfied that the area on which the cattle, sheep or goats graze is not capable of supporting them.

Under the Crop Production Livestock (Livestock and Controlled Areas) Rules, 265 the Minister has power to appoint a committee for each area to which these Rules apply. The areas to which the rules apply include the Beringo District, West Pokot District, Maralal, that part of Nanyuki District which comprises the Mukogando Forest Reserve and the Mukogando Special Reserve, the Taita District, that part of Nakuru which comprises the portion of the Lembus Forest Reserve, Forest Reserves and special Reserves established under s.4 of the Forest Act, 265 and most parts of the North Eastern Province.

In the above areas, no person may depasture any livestock except under a valid permit issued by the committee 267 and such committee has power to specify in the permit the number and type of livestock which may be depestured and may impose any other condition in respect of grazing as to it seems fit.

The Minister and the local authorities are responsible for enforcing the rules and regulations and by-laws which they have made in respect of soil conservation. In addition, the Land Division of the Ministry of Agriculture is responsible for enforcing the soil conservation rules throughout the country. Through its Soil Conservation Services, the Division also undertakes soil conservation work such as terracing and such other work as rural road building, bush clearing and dam construction.

Normally, a farmer applies to the soil conservations services unit and, in return for a small fee, the unit moves in and does the work requested. Alternatively, the extension staff of the Department of Agriculture may, after a visit to an area, advise the soil conservation

services unit to undertake soil conservation work in such an area.

In Chapter Two, the role of forests in the conservation of water was discussed and in Chapter Three an attempt was made to show the consequences of vegetation destruction in general and of indistriminate felling of trees and of the dimunition of the forest estate in particular. Because this part of the Chapter centres on water pollution by the discharge of silt into bodies of water, it would be pertinent to discuss the legal provisions on the preservation and conservation of the forest estate, since the dimunition of this estate is a contributory factor in the increase of soil erosion and the consequent pollution of water.

Under the Forest Act, there are various ways in which forests can be preserved or protected:

- (a) The Minister may declare any area to be a forest area
- (b) Acting Under s.5(1) the Minister may declare any forest area or any part thereof to be a demarcated forest.

The Act prohibits certain acts within the bounds of a forest area or a demarcated forest. These acts are laid down in s.8(1) of the Act and include:

- (a) the felling, cutting, burning or removing any forest produce;
- (b) the erection of buildings or cattle enclosure
- (c) setting fire to any grass or undergrowth or any forest produce
- (d) depasturing of cattle
- (e) clearing, cultivating or breaking up land for cultivation.

Apart from declaring any area to be a forest area or demarcated forest, the Minister may also declare a forest area or demarcated forest area or any part thereof to be a nature reserve for the purpose of preserving the natural amenities thereof and the flora and fauna thereia. The Minister has declared several nature reserves including the Kisere Nature Reserve, comprising of any area of about 1165 acres, 11 miles north-east of Kakamega township. 269

Inspite of the provisions of the Forest Act as well as the Rules made thereunder, 270 the forest estate has continued to diminish in size.

Some of the factors responsible for this state of affairs can be can be dealt with by enforcing the Forest Act and the rules made there— with the section include grazing in forest areas or demarcated forests, felling or cutting down trees, erection of buildings. However, where political pressure is used to settle people in the forest areas or demarcated forests, those responsible for enforcing the Act find that they cannot take action against those who contravene the Act:

"Political pressure has tended to hamper efforts by the Department and even by the Administration Police to evict illegal squatters in forest reserves" 271

This political pressure has led to widespread excision of forest, such excisions being carried out under s.4(1)(c) of the Forest Act which provides:

"The Minister may, from time to time, by proclemation in the Gazette declare the boundaries of any forest area and from time to time alter such boundaries."

Though quite legal, the excisions of the forest areas produce just as bed long-term effects on water resources of this country as are the consequences produced by felling of trees, destruction of vegetation by illeral equatters in the forest areas. Rether than give in to political pressure, the Government should be firm in its protection of the forest

estate since in the long-run, it is this estate which will sustain the other resources, such as water, on which those who now wish to destroy or diminish the forest estate will depend.

The Control of Pesticides

As was shown in the previous Chepter, increasing quantities of pesticides and other chemical substances have been used the world over in an effort to raise food crops sufficient to meet the demand for food from the world's ever growing population. The same is true of Kenya.

Apart from pesticides, herbicides are also being used in everincreasing quantities. These chemicals act as substitutes for farm mechinery and labour because of their chemical capacity to kill weeds. In
addition, the agricultural sector has been using large quantities of
inorganic nitrogenous and phosphatic fertilizers to boost productivity.

waters draining farm-lands on which fertilizers have been applied end up in rivers and lakes where the fertilizers are ultimately converted into organic substances as large masses of algae develop. Eventually, the algae is decomposed and, during the bacterial decay they undergo, oxygen, vital for fish and other animal life, is consumed. Because the dimunition of exygen due to the decay of the fertilizers is a process beyond most people's direct and physical perception, and because this is a phenomenon which has as yet not occured on any large scale in this country, not much attention has been given to this aspect of the use of chemical substances in the agricultural sector.

However, the uncontrolled use of pesticides has at various periods aroused the concern of many persons, as happened in 1944 when there was a fish-die off in the Kavirondo Gulf, in Lake Victoria, due to the D.D.T. spray on the Gulf waters in a campaign against mosquitoes. The fish-kill in Lake Nakuru in 1971 strengthened the view that control is necessary to guard against consequences of the indiscriminate use of pesticides and other chemical substances.

Various Acts of Parliament are in force and in one way or the other they are all designed to control the use, manufacture of pesticides, fertilizers and other chemical substances.

Under the Food, Drugs and Chemical substances Act, ²⁷² "Chemical Substance" is defined to include, among others, germicides, pesticides and insecticides. ²⁷³ This Act is designed to prevent the adulteration of food, drugs and chemical substances and in so doing ensure that the pesticides and insecticides offered for sale satisfy the standards set down as to the quality, composition and safety of the substance in question.

The Act establishes the Public Health (Standards) Board²⁷⁴ whose function is to advice the Minister on the administration and enforcement of the Act. The membership of the Board is drawn from the various sectors of the society whose interest may be affected by the regulations which may be made to control the manufacture, sale and use of the substances. Public health interests are represented by the Director of Medical Services who is the Chairman of the Board²⁷⁵ and his depty who is the Chief Health Inspector, while the Government interests are represented by four members appointed to represent the Government. Since the regulation of these substances affect the interest of those who manufacture them, provision is made to facilitate the representation of their interests on the Board.

To this end, a person with special knowledge of the food-packing industries as well as a nominee of the Pharmaceutical society of Kenya sit on the Board.

The local authorities as well as the National Assembly are represented by one member each.

To protect the consumer against deception as regards the character, quality, composition and safety of the chemical substances he purchases, regulations setting standards for these substances are made under the Act. 278 Gree standards have been prescribed, the labelling, packaging, selling and advertising of these substances must comply with the said standards, a

failure to do so being made on offence under the Act. 279

The water resources of this country which are used for human consumption, as well as for the preparation of food, are protected against contamination by s.24 of the Act which provides that:

"Any person who uses or disposes of any chemical substances in a manner likely to cause contamination of food or water for human consumption or in a manner liable to be injurious or dangerous to the health of any person shall be guilty of an offence."

Contamination of water in various parts of the country was shown in the previous Chapter, where in the case of the Central Province large quantities of insecticides used to eradicate the coffee Berry Disease end up in rivers and streams on whose water the bigger part of the population depend. Pesticide residues have also been found in the waters of rivers and lakes all over the country. Except in a few instances in a few instances in other countries it has not been possible to link any disease to the use of pesticides in this country and for this reason, the question arises as to whether s.24 is sufficient protection against unwise use of pesticides.

In answering the question posed above, it is necessary to realize that s.24 consists of two limbs: the first limb provides against the use or disposal of a chemical substance in a manner likely to cause contamination of food for water for human consumption; the second limb makes provision against the use or disposal of a chemical substance in a manner liable to be injurious or dangerous to the health of any person. With the above provisions in mind, it is possible to see that the mere possibility that food or water will be contaminated is provided against.

Where water analysis has been carried and such analysis shows the presence of pesticide or insecticide residues in food or water, therefore, prosecution of persons responsible for the presence of such residues should be able to succeed. In cases, where tests show that such residues may actually be injurious or dangerous to health prosecution of those

responsible for the presence of such residues should also succeed since the injury or danger to health need not have actually occurred, because in the words of the Act, all that needs to be proved is that such residues are "liable" to be injurious or dangerous to the health of any persons
....." (9.24).

The preparation, preservation, conveyence and sale of the chemical substances must be done under conditions which ensure that they will not be contaminated, with dirt or filth or any other foreign manner which renders the same injuries or dangerous to health. 280

To protect the consumer and the general public against injury or denger to health arising out of the use or disposal of pesticides and insecticides, the Minister, after consultation with Public Health (standards) Board, may make regulations to regulate:

- (a) the labelling, packing and sale of chemical substances; 291
- (b) the size and dimensions of the packages of these substances; 292
- (c) the standard of composition, strength and quality of chemical substances; 283
- (d) the importation or exportation of the chemical substances. 284

Where a substance has been declared to be a "poisonous substance" under s.5 of the use of Poisonous Substances Act, 285 provision may be made by regulations under that Act to protect persons against the risk of poisoning by the said poisonous substance arising from its use, storage, transport sale and disposal. 286

Stricter control can be imposed on the use and disposal of poisonous substances under the provisions of the Use of Poisonous Substances Act than can be imposed on the use of Chemical substances under the Food, Drugs and Chemical Substances Act. Under the former Act, regulations may provide for:

- (a) the imposition of restrictions or conditions as to the purposes for which, the circumstances in which or the methods by which poisonous substances may be used; 287
- (b) the imposition of restrictions on the concentration of poisoncus substances used and on the period which must alapse between the treatment of any crop, food or land and the subsequent . handling of such food, crop or land;
- (c) requiring the provision, in good order, of protective clothing and equipment and other things needed for protecting person's clothing and equipment from contamination by poisonous substances.

To guard against the possibility that the persons who may have to use these poisonous substances are not knowlegeable on how to use them in such a way that they do not injure or endanger their own health or that of others, regulations may be made under the Act requiring the training and instruction of such persons in the use of the equipment employed in the application of the poisonous substances to land or crops or crops or food. 288 Along with this, regulations may be made requiring the provision, in good order, of facilities for first-aid treatment so that in the event that injury occurs, the person or persons so injured can be given treatment immediately pending medical examination and further treatment later on.

Some of the residues which have been found in food and water resources in this country may have come from drugs or poisons such as are used in horticultural and agricultural activities. Control of the trade in such drugs or poisonous substances to ensure that food and water resources are not contaminated by same can be exercised through the Pharmacy and Poisons Act. 289

A person carrying on business in mining, agricultural or horticultural accessories may apply to the Phermacy and Poisons Spand for a license to sell such poisons as may be specified in his license on grant of such

licence. 250 After the grant of the licence, the grantee may sell Part I poisons to, among others, any parsons or institutions and to any persons who:

- (a) possesses the prescription of a duly qualified medical practitioner, dentist or veterinary surgeon;
- (b) a person who the seller knows to be a person to whom the poison may probably be sold.

Where the poison is brought by the person by whom it is to be used, the seller is required to make an entry in the Poisons Book indicating information including the name, address of the purchaser, the name and quality of the poison sold and the purpose for which it is required by the purchaser.

Similar information is required to be entered where the person is sold, not to the person who requires it but to his agent or servant 292

These provisions are designed to restrict the dealing in poisons to the class of persons who can be relied upon to deal with same without causing danger to themselves or to others. And to restrict the manner of dealing with the poisons which may be needed in their profession, Rule 8(2) of the Pharmacy and Poisons Rules 293 made under s.44 of the Act provides that:

"A person licenced to deal in poisons for agricultural, horticultural and mining purposes shall not sell:

(a) any poison, other then ammonia, hydrochloric acid, nitric acid, potassium quadroxalate and sulphuric acid except in a closed container as closed by the manufacturer or other person from whom the poison was obtained.

Thus the seller is duty-bound to ensure that all poisons he sells, other than those named in the rule above, are securely bottled, posing no danger to substances or persons who may come into contact with them.

Further provisions on this subject are contained in Rule 12 which provides that poisons for sale, consignment or transport must be contained in a container impervious to the poison and sufficiently strong to prayent

leakage arising from risks of handling and transport.

The Pharmacy and Poisons Act ²⁹⁴ requires that the container (of the poison sold) must be labelled to show:

- (a) the name of the poison
- (b) the proportion of the poison in a preparation where such poison is used as an ingredient;
- (c) the word "Poison" or other indicator of the character of the article.

Where the poison is to be sold in liquid form in bottles of a capacity of more than 120 fluid ounces, the bottle must be labelled with the words "NOT TO BE TAKEN". 295

Chemical substances such as organic chlorines are widely used in the country's livestock industry for the eradication of animal diseases. An analysis of a breakdown on the type of dips used per annum showed percentage usage as: 2% arsenicals, 1% 9HC's, 80% organic chlorines and 17% organo-phosphates. 296

An example of water contermination arising out of the use of these organic chlorines is documented in a suty od a river which serves as a source of water for human consumption as well as a source of fish protein for a population of about 30,000 people. The study showed that there were high levels of these organic chlorines in the rive's water.

Under the Cattle Cleansing Act, ²⁹⁸, standards may be prescribed to regulate the type, composition and composition of the chemical substances used in the livestock industry to guard against the sale and use of such substances being injurious to health. Once the standards have been prescribed it becomes unlawful for any person to sell or offer for sale as an effective tick-destroying agent any article or fluid which does not conform to the standards prescribed under the Act. ²⁹⁹ So, too, the Act prohibits the use of any solution for the cleaning of any cattle if on analysis the solution fails to conform to the standard prescribed for an effective tick-destroying agent. 300

To facilitate the analysis of the articles used in the cleening of cattle so as to ensure compliance with the prescribed standards, the Act empowers the Director of Veterinary Services to appoint suitable persons to act as analysists. 301

At present the Department of Veterinary Services collects information on pesticide residued in meat, milk and milk products.

Samples on dairy products are taken by Messrs. Nestle in cooperation with the Veterinary Department and analysed outside Kenya. 302 The Scientific Research Division of the Ministry of Agriculture is also to set up a pesticide residue unit which will monitor posticide residues in crops offered for sale in the various expert markets. The Water Quality and Pollution Control section of the Ministry of Water Development will, by the middle of 1976, undertake the monitoring of posticide residues in water and aquatic food chains. 303

The Government Chemist also analyses samples of foodstuffs for pesticide residues when requested to do so. Similar work is done by the Kenya National Parks, though in this case analysis is confined to pesticide residues in Lakes Naivasha, Nakuru and Bogoria (formerly, Hannington) which lakes are surrounded by farmlands on which pesticides and chemicals are used in the agircultural and livestock industries.

The International Centre of Insect Physiology and Ecology (ICPE) which has been opened in Nairobi will undertake the study of new methods for selective control of insects such as the tse-tse fly, termites, army-worms, ticks and mosquitoes. The studies to be undertaken by the Centre will also help to determine the long term effects of biocides and other chemical substances 304

The Fertilizers and Animal Foodstuffs Act³⁰⁵ is designed to regulate the importation, manufacture and sale of agricultural fertilizers, animal food-stuffs and other substances of mnimal origin intended for the manufacture of such fertilizers and foodstuffs. Since the substances used in the manufacture of such fertilizers and animal food-stuffs may contain

fertilizers or animal foodstuffs which contain bone or any other substance derived from an animal carcass unless the person importing the said fertilizer or animal foodstuffs has first submitted to the Director of Veterinary Services a certificate signed by a person designated by the Minister certifying that such bone or substance has been effectively and completely sterilized.

To ensure that the provisions of this Act are complied with the Minister may make rules prescribing among others

- (a) Standards of composition, efficacy, fineness and purity of fertilizers and animal food-stuffs;
- (b) the prohibition of certain substances in fertilizers or animal foodstuffs.

Analysts appointed by the Minister may take and analyse samples of fertilizers and animal foodstuffs which are offered for sale in the country in order to ensure compliance with the provisions of this Act. 308 Inspectors may enter any premises, place or vehicle and inspect any fertilizer or animal foodstuffs and may thereafter take samples of such fertilizers or animal foodstuffs for analysis. 309

African basis was first made with the enactment, by the Presidents of the three member states of the East African Community, of the East African Community of the East African Community of the East African Control of Pesticides Act. Though the Act has not been passed by the national Parliaments of the member states and, therefore, of no force in any of the three states, its enactment does indicate the awareness of the Governments in the region that it is necessary to work in close co-operation to evert the danger posed by the uncontrolled use of pesticides in one of

the states leading to injury to the rest of the states.

Centralized regulation of the importation, manufacture, distribution and use of pasticides is to be achieved through the East African Pest Control Organization which is established under 9.3 of the Act. Among the functions of the Organizations are: 311

- (a) to regulate the importation, manufacture, distribution, labelling, marking, identification and use of pesticides;
- (b) to approve and register pesticides and to prescribe standards of quality in respect of these pesticides, and
- (c) to advise the Governments of the Partner States and any person who so desires on the manufacture of pesticides and their suitability for use.

Unlike the Food, Drugs and Chemical Substances Act which provides that "pesticide" is a chemical substance 312 without going on to define what a "pesticide"is, the East African Control of Pesticides Act provides a fuller definition of the term. Under this Act, 313 "pesticide" is defined to mean any matter or substance used or intended to be used:

- (a) for the control of weeds, pests and diseases in plants;
- (b) for the control of external vectors of veterinary or medical diseases and the external parasites of man or domestic animals;
- (c) for the protection of any food intended for human or animal consumption.

This definition is wide enough to encompass the herbicides, fungicides, insecticides, molluscides, defoliants, and other chemical substances used as pesticides in the East African States.

The Act requires that any pesticide for sale should:

- (a) be registered with the East African Pesticides Control Organization 1
- (b) bear on the container its name and percentage of its active chemical ingredient;
- (c) bear a description of the precaution to be taken on its use and the words "Approved by the East African Pasticides Control Organia

zation;³¹⁶

(d) bear on its container the name and address of the person firm or company which menufactured or compounded it. 317

It is an offence to distribute or sell any pesticide which does not conform with the requirements of the Act or any regulations made thereunder. $^{318}\,$

when the Control of Pesticides Act is finally passed by the Parliaments of the Partner States, it will be possible to institute more efficient control and regulation of the use of pesticides since, under this Act, it will be possible to centralize the control of pesticides and chemical substances used in the agricultural and livestock industries. As it is now, and more particularly in Kenya, there is a proliferation of legislation, persons and institutions charged with the task of regulating the use of these substances with all the consequent overlap of powers and administrative difficulties.

The importance of fisheries as a source of enimal protein as well as employment has already been outlined. Fisheries, too, is an important aspect of the country's tourism industry, with angling, underwater photography, marine-viewing serving as great tourist attractions especially on the Kenya Coast.

However, the continued exploitation of this resource is threatened by various human activities, chief of which are the discharge into bodies of water of industrial effluents and sewage matter. Water draining the country's farmlands contain pesticides and chemical residues and these eventually find their way into the waters on which the fisheries are based, therefore causing injury to this valuable resource.

The principal legislation which provides for the development and the regulation of the fish industry is the Fish Industry Act. 319 Among other things, the Act empowers the Minister to make regulations prescribing the manner in which fish shall be caught and determining the times and seasons at which the catching of fish shall begin and case. 320

The regulation of the manner in which fish are caught is an important factor in the protection of the fisheries since some of them may not be developed enough to sustain large-scale exploitation and any attempt to do so may lead to a dimunition or even destruction of the Fishery. This is the case with the fisheries based on numerous rivers in the country. Desirous of protecting the fishery based on River Tana in the two districts of Lamu and Tana River, the Minister of Tourism and Wildlife has exercised the powers conferred by s.7 of the Fish Industry to make the Fish Industry (Tana River and Lamu District (Protection)) Regulations, 1975. Regulation 2 of these regulations provide that:

*No person shall kill or take fish in

- (a) any frame water, lake or river in the Tana River District; or
- (b) any fresh water leke in the Witu Division of Lamu except by

by means of a fishing rod or pole to which is attached a line or thread with one heak or lure incorporating a hook fastened at the end of the line".

It will be apparent that the intention of the regulation above is to prevent the use of large-scale fishing methods such as nets and other devices which many diminish or destroy the fishery; however, by allowing the use of fishing rods the Regulations do permit fishing such as is done for sport or for fish for domestic consumption. Similar protection is given to the fishery along prescribed sections of the River Athi and its tributaries by the Fish Protection (Athi River and Thika River) Rules. These rules prohibit the killing or taking of fish in the Athi River at any point between its source and its junction with the Tsavo River by netting, trapping or by the use of poison or explosives. Similar methods of killing fish or taking same are prohibited in the Thika River at any point between its source and its junction with the Tana River.

Commercial fishing is mainly concentrated in the fresh water lakes and of the territorial waters of the country. But even in these lakes the means by which fish is caught must be controlled otherwise the fishery may be depleted or destroyed altogether. The main threat to the fisheries in these lakes is over-fishing. This has occured in several lakes but to date, study of this phenomenon has only been documented in relation with Lake Victoria. In this Lake, "Tilapia yields have declined, not because fishes have become 'net-shy' but because stocks have been reduced to dangerously low level. This is shown by the fact that changes in fishing result in the predicted changes in yield". 325

Decline of the tilapia yields mentioned above has occured as a result of the reduction of mash sizes of the gill nets used in fishing. This fact as well as its long-term consequences, was mentioned in a letter to the

author from the fisheries biologist working for the East African Freshwater Fisheries Research Organization (EAFFRO). In his letter the fisheries biologist states that "Mesh sizes of gill net have declined over the years until immature fishes are captured prior to spawning which maintains the population. As a parable, if many of the young Kenyans — say 1 to 10 years old were continually removed from the population, the ultimate outcome is obvious. It is difficult to impossible for the average fishermen who depend on fishing as a livelihood to comprehend and understand this". 326

The regulation of the type and size of the nets used in fishing in Lake Victoria is exercised under the fish Protection (Lake Victoria) Rules, 1966. These rules prohibit the use of mosquito nets in Lake Victoria without a valid permit and such permit is issued by a fisheries officer. The rules also prohibit the use of any set net (i.e. a net which is placed into position in the water with the object of fish swimming into it and becoming entangled in it and which is in that position for an appreciable period of time) The mesh measurement of which is less than four inches and whose length is greater than 30 meshes. 329

Various studies of fishing methods in the Lake have indicated that the use of nets the mesh measurement of which is less than 4 inches is likely to lead to a decline in the fishery. "Reduction of mesh-size reduces the sizes of the fish caught and, by removing breeding stock, impairs recruiment. The 3½ inch nets indeed catch some individuals before maturity! The freely permitted use of small-meshed nets is a gross management. A similar catastrophic decline in both total catch and catch per net of T. Variabilis in a well-studied area from almost 1.4 per cent in 1962 to less than 0.8 per net in 1967 and the earlier history of exploitation of this species recounted elsewhere (fryer, 1961; Fryer & Iles 1972) is further evitable."

Provisions similar to the ones in force in Lake Naivasha through the Fish Industry (Lake Naivasha) Regulations 1971. 331

Apart from the regulation of the use and size of fishing nets provisions exist which regulate the number of people who may undertake commercial or sport-fishing. Regulation 7 of the Fish Industry (Lake Naivasha) Regulations require possession of a fisherman's licence issued by the Director of Fisheries for commercial and sport-fishing. The Director of Fisheries or any officer authorized by him in issuing permits take into account the well-being of the fisheries and depend on this issue or refuse to issue a licence.

Further protection of the country's fisheries is undertaken through the fish Protection (Regulation of Fishing Craft, Sea Fisheries) Rules, 332 which regulate the number and type of vessels used in fishing. These rules apply to the whole of Kenya and her territorial waters. Rule 4 provides that no person shall use for fishing any boat the owner of which engages in fishing unless such boat is registered with a fisheries officer or District Commissioner of the area. The interests of the fisheries are a paramount factor as is indicated by the provisions of Rule 8 which provides that:

"Any fisheries officer or District Commissioner may, if he considers it in the interests of the conservation of fish so to do, refuse to register any boat or change of ownership as aforesaid or cancel the registration of any boat....." The rules also give power to various officers to require any person in possession of a boat to produce the Certificate or certified copy of certificate of registration of the book during any of the occasional checks undertaken to ensure compliance with the provisions which regulate the use of crafts and vessels.

Birds, their nests and animal life in and around rivers and lakes are protected against consternation and any other disturbance which may destroy nests, bird aggs or force the birds and animals to migrate through the provisions of the Lakes and Rivers Act 333 which regulates dredging and the

use of stream vessels on certain lakes and rivers. At present, the Act applies to Lake Naivasha 334 and to rivers 335

The Act empowers the Minister to make rules:

- (a) regulating the use of stream vessels and vessels of any other description on the rivers and lakes to which the Act applies
- (b) regulating the traffic on the said lake and rivers;
- (c) regulating any other activity when such regulation is necessary for protecting the bird or animal life on the said lake or rivers.

viz The Lekes and Rivers (Regulation of Boats on Lake Naivasha) Rules. 336 Rule 7(1) of the above rules limits the speed of steam vessels plying on Lake Naivasha to 15 miles per hour and with careful regard to the existing circumstances and conditions in the particular lake. It is an offence for a vessel to ply at such speed that damage is thereby done to nests, birds, piers, wharfs and shore works or consternation is caused amongst birds or animals on or in the Lake. A steam vessel fitted with silencing apparatus must be controlled in such a manner that the silencing apparatus does not create noise and the exhaust gases are expelled below the surface of the water, 337

However, when it becomes necessary for vessels to ply at speeds greater than 15 miles per hour in the performance of police or other public duties, the Minister may exempt such vessels from the provisions of rule 7(1) and Rule 7(2).

At the coast, the use of high explosives to increase catches is a serious menace to the development of the inshore fisheries as well as to all marine life. Apart from the express prohibition of the use of these explosives in relation with the fisheries of the Athl and Thika Rivers in the Fish Protection (Athi River and Thika) Rules, 338 the Trout Act 339

prohibits the use of explosives, electrical devices or poison for the purpose of killing, stunning or disabling trout or for the purpose of rendering trout more easy to catch. 240

Rule 77 of the Water (General) Rules 341 which have been made under s.182 of the Water Act, prohibit the deposit into any body of water of any sawdust, vegetation, mineral refuse, the effluent from a sheep or cattle dip, factory premises or works, sewage or any other matter which is harmful to the fish, fish life or fish food contained in such body of water.

A fish or an assistant fish warden is given power under Rule 78(1) of the above Rules to order any person not to deposit into or adjacent to a body of water any of the substances mentioned in Rule 77 above or any other thing which is harmful to the fish, fish life or fish food in such body of water. In the event that the harmful substance has been deposited into such body of water, the fish or assistant fish warden may order the person who so deposited the substance to remove it.

To facilitate the enforcement of these Rules, a fish warden or an assistant fish warden or any person authorized by a fish warden may enter any premises or land the $\frac{for}{purpose}$ of:

- (a) inspecting bodies of water to detect possible contravention of these Rules;
- (b) collecting samples of fish or thing being deposited into the body of water. In the event that the Rules have been contravened the fish warden or an assistant fish warden or any person authorized by a fish warden may interfere summarily to prevent further deposit into the body of water of the substance which is harmful to fish, fish life or fish food.

A person who proposes to construct any factory or works where efficient will be deposited into or adjacent to a body of water or its tributary, and if such effluent is likely to be harmful to fish, fish life

epproved by, the Mater Apportionment Board, plans showing the methods which such parson intends to employ to render such effluent innocuous. This Rule enables the Water Apportionment Board to ensure that methods employed in rendering effluents innocuous by factories are efficient enough to avert harm being done to the fisheries.

The legislative provisions designed to protect the country's fisheries discussed above provide against all or nearly all activities which may lead to a decline or destruction of the fisheries. Yet, the fisheries continue to contend with these activities in most parts of the country. Whether this is the result of any shortcoming in the provisions or lack of enforcement of such provisions will be the subject of examination in the next chapter.

The Law on the Pollution of the Sea

Kenya, like all other states whose boundaries are bounded by see or ocean, exercises sovereignty over a belt of see adjacent to her coastline. The width of this see over which Kenya exercises sovereignty has been settled by the provisions of the Territorial Waters Act 343 which provides:

"s.2(1) Except as provided in sub-section (4) of this section, the breadth of the territorial waters of the Republic of Kenya shall be 12 nautical miles."

The above Act does not contain provisions on measures to combat pollution of the territorial weters and there is nothing, in its provisions, to suggest that it was intended to deal with this problem. Nevertheless. its importance lies in the fact that by providing a width of the sea on which the Republic of Kenya has sovereignty, the Act enables the laws of the land to be enforced within this territorial water. The laws which may be relevant in dealing with pollution in the territorial waters include the Penal Code 344 and the Public Health Act which prohibit activities which amount to public nuisances. Pollution of the sea may be dealt with as a public nuisance especially when it endagers the life of human beings, as happened in Japan in 1953. In that year a case was discovered in Japan involving a peculiar disease among the people living along Minamate Bay, Kyusha. The victims of the disease, henceforth known as "Minamata Disease" suffered blindness, stupor, convulsion and mental impairment and their children were often infected with the disease from birth. The cause of those infirmities was conclusively identified - consumption of foods obtained from the bay which was polluted by mercury. In other circumstances and areas, diseases such as hepatitis, stomach and mental disorders have been conclusively associated with sea pollution.

In addition, regulations and be more to control activities which might lead to sea pollution and passing ships can be required to comply

with such regulations with the exception of f_0 reign and state ships. Among activities to be controlled could be the following:

- (a) ships off-loading oil cargoes;
- (b) clearing activities of tanks.

To date, there has been no prosecution for pollution under the provisions of the Penal Code or the Public Health Act. This is due not only to the fact that sea pollution is a recent phenomenon in this country but, more importantly, due to the lack of appreciation, on the part of Public Health Authorities who have not been known to be enthusiastic over the enforcement of the Public Health Act, anyway, that pollution of the sea can be dealt with as a public nuisance.

Provisions on sea pollution are contained in the Merchant Shipping Act³⁴⁶ which imposes "aulified" absolute and stricts liability for pollution damage within 100 miles from the coast of Kenya. The Act provides:

"s.309(1) if any oil or oily mixture is discharged from

- (a) any ship into a harbour or into the sea within 100 miles from the coast of Kenya; or
- (b) any Kenya ship into sea within 100 miles of any land, the owner or master shall be guilty of an offence and liable to a fine not exceeding ten thousand shillings."

The provisions of this Act are intended to deal with the pollution not only arising within Kenya's territorial waters, but also pollution which arises far out in the high seas. The damage caused by pollution which occurs beyond the territorial waters is rapidly affecting the country's beaches and, therefore, such important activities as tourism on which the development of the country depends.

The absolute and strict liability imposed on the owner or master of a ship found to be guilty of pollution by s.309(1) above is qualified by

- s.273(2) of the Merchant shipping Act which defines the liability of the owner of the ship for the damage done by the pollution and where such damage has occured without the actual fault or privity of such owner. Where such damage is caused by an act or omission of any person whether on board the ship or not, or in the navigation or management of the ship, in the loading carriage or discharge of its cargo, the liability of the ship's owner for damages will be determined as follows:
 - (a) in respect of loss of life, or personal injury, damage or loss to property, the limit of the liability will be an aggregate amount equivalent to 3,100 gold francs for each ton of that ship's tonnage;
 - (b) in respect of loss or damage to property or infringement of any rights, an aggregate amount equivalent to 1,000 gold francs for each of that ship's tonnage.

However, payment of money damages or fine can not be an adequate remedy when it is remembered that the damage done may take time before its extent is or can be determined. And where marine life is destroyed by pollution, payment of fines however big can never restore such marine life. In recognition of this fact, the Merchant Shipping Act contains provisions which seek to avert the occurence of marine accidents which may cause pollution of the sea. To this end, s.210(1) provides:

"All owners and masters of ships and sea planes and other craft when on or in close proximity to the water shall obey the collison regulations and shall not carry or exhibit any other signals than such are required by regulations under this Part".

If any damage to property arises from the non-observance of the collision regulations, the damage shall be deemed to have been caused by the wilful default of the person in charge of the ship, see plane or other craft unless it is shown that the circumstances of the case made a departure from the collision regulations necessary — 348

To ensure that the ships or see planes or other see crafts do not cause pollution due to their faulty construction, s.197 of the Act empowers the Minister to make regulations respecting the following:

- (a) construction of machinery;
- (b) the testing of equipment
- (c) the testing of equipment and the class and quantity of various types of equipment to be carried in any vessel.

The period within which a conviction for an offence under the Act may be obtained or damages recovered is set out in s.287 which provides:

"....neither a conviction for an offence nor an order for payment of money shall be made under this Act in proceedings instituted in Kanya unless those proceedings are commenced within one year after the commission of the offence or after the cause of complaint arises, as the case may be."

The provisions of the Merchant Shipping Act, some of which have been discussed above, are comprehensive enough to deal with pollution of the country's territorial waters. However, these provisions have been rendered ineffective by the state of the law which governs the high seas, a subject which will be discussed below.

The law on the high seas has its foundation in the rule that the high seas are not open to acquisition by occupation on the part of states individually or collectively. This rule is now embodied in Article 2 of the Convention on the High Seas, 349 which provide:

The high seas, being open to all nations, no state may validly purperty to subject any part of them to its sovereignty. Freedom of the high seas is exercised under the conditions laid down by these articles and by the other rules of international law. It comprises inter alia, both for coastal and non-coastal states, of

- (1) Freedom of navigation
- (2) Freedom of fishing
- (3) Freedom to lay submarines cables and pipelines.
- (4) Freedom to fly over the high seas.

These freedoms, and others are recognized by the general principles of international law, shall be exercised by all states with reasonable regard to the interests of other states in their exercise of the high seas."

Provisions of Article 24 of the Convention, however, while not limiting the freedom of the high seas embodied in Article 2, above, does qualify this freedom to the extent that it requires every state party to the Convention to take measures to control pollution of the sea by the discharge of oil. This Article, viz Article 24, states:

"Every state shall draw up regulations to prevent pollution of the seas by the discharge of oil from ships or pipelines or resulting from the exploitation and exploration of the sea bed and its subsoil, taking account of existing treaty provisions on the subject."

Notwithstanding the provisions of the Convention or the High Seas
Article 24, pollution of the seas has proceeded unabated and this has been
attributed to the entirety of the law governing the high seas.

The unsatisfactory nature of some aspects of this law particularly Article 2 of the above Convention, so it has been argued, cannot be justified:

"Until now the freedom of the high seas has in practice been interpreted as including the Freedom to discharge or sink in the sea materials or substances of all kinds, in the absence of any special treaty obligations to the contrary. I am doubtful whether this interpretation of the freedom of the high seas can still be upheld today. The principle of the freedom of the high seas was developed for the purpose of naviation and fishing; at the time of its development one could start from the assumption that these traditional uses would leave the sea unaffected in its substance and quality. But uses of the sea which according to modern scientific knowledge might bring about injurious changes in the nature of the water and in the organic and inorganic processes occuring in the water transgress the limits of the presupposed harmless common use of the waters of the sea and are, therefore, no longer covered by the right of freedom of the sees. Uses of this kind may be probiblited unless, in the concerts case under consideration, they can be shown to be harmless." 350

At present, therefore, marine pollution can only be dealt with either through multilateral treaties in which the contracting parties undertake to prohibit their ship and national discharging oil in high seas in general or in specified zones or by extending the jurisdiction of the coastal state to a zone off its territorial waters.

As for multi-lateral efforts to deal with marine pollution the

1954 Convention for the Prevent of Pollution of the See by oil, as amended in 19

1962, requires each state party to the Convention to prevent the discharge
by its ships of oil or oily mixtures in certain prohibited zones. Under
this convention, it is the flag-state of the ship which has the power to
impose criminal sanctions in respect of any infringement of the regulations
made by the flag-state. The standard set out in the 1954 Convention
prohibits discharges of oil or oily mixtures which contain one hundred
parts of oil for every million parts of mixtures.

The 1969 Convention relating to Intervention on the High Seas In Cases of Oil Pollution Casualties sets out to deal with pollution of the high seas as occured during the Torrey Canyon wreck in 1967. The Convention allows coastal states to intervene anywhere on the high seas following a maritime casualty which may result in a release of oil that may cause harmful consequences. For the first time the coastal state is given a limited power to employ coercive measures against foreign ships on the high seas. However, the measures must be proportionate to the damage to be eliminated.

Another Convention bearing on the efforts to combat marine pollution is the 1969 Convention On Civil Liability for Oil Pollution Damage. 352

This Convention introduces strict liability, in private law, of the ship owner for the damage caused by the accident at sea in which his ship was involved; this liability can be enforced before the Courts of the Courts.

State. Silefly, the Convention provides that:

- (a) tankers which discharge oil are liable to private claims end to claims by states for damage caused on the territory of the coastal state;
- (b) The owner of a ship carrying more than 2,000 tons of oil in bulk as cargo is required to maintain insurance or other financial security in an amount equal to the limit of his liability. This is designed to ensure that any vessel owner subject to the convention has adaquate assets to meet his potential.
- (c) each party to the Convention must ensure that vessels flying their flags have certificates attesting that financial responsibility has been established before permitting them.

This Convention makes the owner of any ship carrying oil strictly liable for any pollution cuased by oil escaping or being discharged. The owner has to prove in each case if there is a specific exception to his liability such as if the pollution was caused by grave natural disaster or third party negligence. Unless the owner was guilty of actual fault he can limit his liability to a fixed rate for each ton of the ship's gross tonnage, with a maximum liability of \$14,000,000 for each incident.

Despite the above Conventions, dissatisfaction has been voiced by many states over the slow development of protective and preventive provisions in international law in respect of sea pollution. Unwilling to let their marine environment be damaged while awaiting international solution to this problem, some coastal states have taken unilateral action to protect their environmental interests.

Although no state may exercise sovereignty over the high seas, international law recognizes that it may become necessary for a coastal state to exercise particle in some times of the high seas for purposes. To this end, Article 24, Paragraph (1) of the Convention on the territorial sea states;

"In a zone of the high seas continuous to its territorial sea, the coastal state may exercise the control necessary to:

- (a) prevent infringement of its customs, fiscal, immigration or sanitary regulations within its territory or territorial sea;
- (b) punish infringement of the above regulations committed within its territory or territorial sea."

Whether the provisions of the above paragraph of Article 24 can be said to recognize measures against pollution of the sea has not been settled end it is significant that nations like Canada have proceeded on other rules of international other than the above Article and, Brownlie, writing on pollution measures under the above paragraph states that:

"The exclusion of this type of claim may be implicity in the fact that states have approached the major problem, oil pollution, by means of multilateral conventions." 353

However, McDougal and Eurke have argued that it is incorrect for any one to claim that Paragraph (1), Article 24 of the Convention on Territorial Sea exhausts the types of purposes of zones over which a state exercises control can be claimed:

"The proposed limitation of permissible purposes for contiguous zones because of the reference to customs, fiscal, sanitation and immigration", is certainly no accurate summary of the purposes for which states have in the past demanded, and been accorded, an occasional exclusive competence in contiguous waters. Their mutual demands and reciprocal defences——have extended, as we have seen, to important common iterests in relation to security and power, as well as to other forms of wealth protection. With developing technology and expanding enlightment, new uses of the oceans, portending also new benefits and harms unique to perticular states boardering on the oceans, would appear certain to emerge." 354

In addition, it has been argued that, the freedom of the high seas does not involve a licence to pollute the merine environment and the shores of the other states on the basis that states are barred from taking preventive, protective measures against polluting activities on the high seas.

"Such a view runs counter to the fundamental principle of international law laid down in the Trail Smelter Arbitration more then 30 years ago. The tribunal in that case declared that 'under the principles of international law....no state has the right to use or to permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the proprties or personal therein when the case is of serious consequence and the injury is established by clear and convincing evidence. Many of the precedents cited in this case related to water pollution controversies and it is not unreasonable to assume that what the Tribunal had to say about pollution by fumes is equally applicable to water pollution.

If a state is forbidden to use its own territory, where it enjoys full sovereignty in such a manner as to cause injury to another state, it would be only good law and good logic for this same principle to apply even forcefully to areas not under its sovereignty or exclusive authority, such as the high seas 355

It is on the kind of arguments above that some states have taken unilateral action to protect the high seas contiguous to their territorial waters. One such state is Canada which, in 1970, passed the Arctic Waters Pollution Prevention Act. 356 This Act is designed to preclude the passage of ships likely to pollute the environment. Commercially-owned ships intending to enter waters of the Canadian Arctic will be required to meet

design, construction and navigational standards. The zone of the Artic Ocean over which such standards may be applied extend up to 100 miles off shore. Most of the provisions of the Canadian Act are similar to the Kenya's Merchant Shipping Act which, as it has been noted, also applies to a width of 100 miles of offshore waters. Like with this Kenya act it is provided in the Canadian Act that regulations may be made to control construction, competence of the ship's crew etc.

Canada has also argued that injury to her environment poses a threat to her security, thus justifying the unilateral action the country is taking. The right to environment the environmental intergrity, corresponds to the right to territorial integrity so that the principle of self-defence permits the state so threatened to take the reasonable preventive measures to protect the environment.

"Security" is here given the broad interpretation noted by McDaugal and Burke:

"In terms of impacts on its total value position - that is, security most broadly conceived - coastal states commonly and realistically perceive that acts beyond the territorial sea may have harmful effects" 358

In addition to Conventions on Pollution, a number of funds have been established to reimburse the clean-up costs of national governments. One of these is known as the "Tanker Owners Voluntarily Agreement Concerning Liability of Oil Pollution" (TOVALOP). The scheme is based on private, voluntary participation of tanker owners and provides limits of liability of \$100 per gross registered ton up to a maximum of \$10 million Liability is based upon a presumption of negligence.

Another international voluntary agreement has recently come into force. It is called "Contract Regard on Interim Supplement to Tanker Liability for Oil Pollution! ³⁶⁰ The agreement provides for the payment of claims upto \$30 million to persons suffering damage resulting from oil pollution. The fund is financed by levies against the oil companies

invalved. To bring the fund into operation 50 per cent of the world's receipt for crude oil must be represented by parties to the agreement. The actual amount of compensation payable under this agreement is the amount of damage incurred up to \$30 million, less the amount payable under TOVALOP to a government, less the expenditure entitled to be made by the owner for removal of oil under TOVALOP, and less owner's liability under the laws of the location where the spill occured.

Though Kenya can deal with pollution under the Merchant Shipping Act, her efforts will not bear fruit unless the international aspects of pollution are dealt with through international efforts. It is imperative, therefore, that Kenya and other developing countries participate in the efforts which are being made to combat pollution through international efforts.

Planning and the Expluitation of the Environment:

Impairment of the environment stems either from the fast growth of the population or from the undisciplined application of technology without due consideration being given to the adverse effects such application may have on the environment. Lack of control over land use and the exploitation of other natural resources may also lead to environmental impairment. These factors manifest themselves in different regions of the world depending on the characteristics of the particular region. In the densely populated regions of the world such as South-east Asia the size and growth of population is the main factor in the consideration of environmental quality. Lack of control over technology, in countries with slowly growing population such as Sweden, predominates among the factors which lead to the declining quality of the environment. Dasmann explains how any or all of the three factors above may lead to an environmental crisis:

"Population, technology or land use contribute to environmental crisis through the ways in which they interact with the human environment through placing undue pressure on certain of its systems or functions or through interferring in one way or another with its ecological processes." 361

However, it may be possible to avoid some of these crisic if a system of planning is instituted to influence the growth of population, the application of technology, land use and the exploitation of the natural resources in such a way that one or all of them do not disrupt the ecological scheme and functioning of the environment. If such planning is not instituted, crisis must eventually arise. The construction of the Aswan Dan on the Nile River is a good example of crisis which have occured as a result of the disruption of the scheme and functioning of the environment.

In bailding the day, pararation of great susatities of electric transmission of lands which would be permitted by

the construction of the dam were the predominant factors taken into account. No thought was given to the fact that the year-round irrigation would create suitable conditions for the snail that carries bilharzia; neither was account taken of the fact that the dam would reduce the flow of the Nile River so that the absence of the silt it once carried would result in an eroding away of the dealta lands, the possibility that the Mediterraneas fisheries, once fertilized by the silt load in the Nile flow, would decline was not entertained. The result of the failure to take into account the above possible consequences has now been realized: the incidence of bilharzia has increased; land previously productive has been salinized; and the delta lands as well as the mouth of the river have shown signs of repid erosion.

Planning the use of land and other natural resources in Kenya, a country with a high population growth rate and a severely limited area of arable land, is a necessity. Failure to institute planning will only lead to the deterioration of land quality and other natural resources. This eventuality was recognized by the working committee for the United Nations Conference on the Human Environment, 1972, whose Report states:

its natural resources Kenya has reached a water-shed. On the one side is the accelerating decline of fertility and yields from many types of resources, on the other side a salvaging of every resource and its fullest development for the benefit of all the people - the knowledge and the technology to succeed ar to a great extent already available. If present trends continue, we can expect an increasing national bill for famine relief; a steady decline in the options open to us in developing resources not as yet fully utilized such as wildlife, domestic livestock, scenic attractions and the harnesding of water supplies; land use conflicts exercated by unplanned population pressure from a nation expecting a piece of land for everyone; deteriorating quality and quantities of water.

and the total destruction of many delicate and valuable accessment. Temporarily in some areas' yields will continue to rise with improved crop varieties and the increased application of fertilizers and pesticides but even as they do so, the nation's capital in the resources of the land will be shrinking."

The importance of planning has long been recognized by the Government and in 1965 overall planning was incorporated into the Government's developmental policy:

The discipline of planning is not something to be accepted lightly or shrugged off as unnecessary. If planning itself is not to be a wasta of resources, discipline is not simply something that the Government imposes on the private sector. It is also a discipline that the Government imposes on itself at every level and in every Ministry. With planning no Ministry if free to act as an undisciplined, unrestricted entrepreneur promoting funds and projects to maximize the status of the Ministry. Instead, all must accept the discipline and join in maximising the resources available for development, determining the best use for these resources and ensuring that resources are in fact used as planned." 363

The legislative basis for planning in Kenya is contained in the Land Planning Act, ³⁶⁴ the Town Planning Act, ³⁶⁵ and Grade I and Grade II Building Bylaws ³⁶⁶ and the Local Government Regulations. ³⁶⁷ The above legislation is mainly designed to control the physical planning of human settlements and is not concerned with the wider environmental questions. However, since the planning authorities prepare regional as well as national plans for development of human settlements, their work has an important bearing upon the well-being of the environment and the discussion below is

of physical planning for protecting the environment. Discussion will be centred on the examination of the Rend Planning Act and the Town Planning Act, leaving out the other legislation since the latter is mainly concerned with the details of implementing the plans prepared under the former two pieces of legislation. That is to say, legislation such as the Grade I and Grade II Buildings Bylaws contain provisions on matters such as the size of the buildings, materials to be used in constructing such buildings etc. And while such details have a bearing on the quality of the environment, the view is held that it is to the Lend Planning Act and the Town Planning Act that attention must be centred since it is under these two Acts that plans are prepared so that under the said Acts it is possible to incorporate conditions to safeguard environmental interests.

Planning Authority

Authorities charged with the responsibility of planning for the development of their areas are set out in the Development and Use of Land (Planning) Regulations, 1961, ³⁶⁸ these regulations being subsidiary legislation made under s.2 of Land Planning Act.

A local authority may be constituted by the Minister as the Interim Plenning Authority for the area under its jurisdiction 369 and such local authority may then, after consultation with, and with the agreement of, the Minister, prepare town plans or area plans and submit them to the Minister for approval. 370 An "area plan" means the plan of an area of lend to which the Regulations apply while a "town plan" means a plan for an area or part of such area of a municipality, township or trading centre within the administrative jurisdiction of country administration to which the Regulations apply. 371

The area and town plans to be submitted to the Minister must contain maps and other descriptive matter such as is necessary to illustrate the appropriate planning proposals for the area. In particular the plans must show what existing development there is in the area, as well as proposed

roads, density zones and the areas in which sub-division is permitted. 372

The details required to be included in the plan assist in showing the manner in which land shall be used, the stages by which specified development may be carried out and of land which is likely to be acquired. Thus, the plans act to give the general framework for promoting and controlling development by giving a broad outline over a wide area to indicate the general relationship between the main purposes for which land may be allocated.

The Minister may himself prepare a town plan or area plan in respect of unalienated Government land and generally for an area for which no such plans have been approved. 373

In the event that the Commissioner of Lands has approved a plan under s.23 or s.24 of the Town Planning Act relating to land to which the Reculations apply, such plan shall be deemed to be plan approved by the Minister for the purpose of the Regulations. 374

In all cases, except where otherwise required by the Minister, a local authority must ensure that owners of lend affected by the plans prepared by such local authority have notice of the plan as well as the particulars and proposals contained in such plans, before submitting the plans to the Minister for his approval. Similar notice must be given when the plant has received the Minister's approval and the notice must name places at which the approved plans may be inspected. These notices are intended to secure maximum public cooperation and approval for the purpose of a development plant is above all to reflect the wishes of the people living within the area.

Control of Development

An understanding of what, under the Kenya planning law, constitutes development is crucial to the discussion of the scope of control which may be imposed on development and the means and way by which such control may be imposed. The Development and the of Land (Planning) Regulations, 1961, action the definition of what does or does not constitute "development". In the words

of the Regulations, "development" means: 375

- (a) the making of any material change in the use or density of any building or land or the subdivision of any land which, for the purposes of these Regulations shall be termed class A development; and
- (b) the erection of such buildings or works and the carrying out of such building operations, as the Minister may, from time to time, determine, which for the purposes of these Regulations shall be termed class 8 development.

On the face of it, the above definition may give the impression that its scope is wide enough to encompass all manner to activities which may have a bearing on the well-being of the environment. This impression is created by the fact that many uses of land can be soid to fall under the Regulations. Now, since it is mainly the change in the use and density of land which have brought about environment impairment, the impression is forstered that such detrimental activities can be controlled by the exercise of powers which regulate "development."

However, the true scope of what constitutes development under the Kenyan lew is gathered when attention is turned to the proviso of the definition of "development". This provisor contains activities which, for the purposes of the planning law, is not deemed to constitute "development". These activities include:

- (a) the subdivision of agricultural land into plots of 2D acres or more where no change of use is involved;
- (b) the use of land for the purposes of agriculture or forestry or the use of buildings occupied with land so used;
- (c) the carrying out by a competent authority of any works required for the construction maintenance or improvement of a road where such works are carried out on land within the road reserve;

(d) the carrying out by a local authority or statutory undertaker of works for the purposes of inspecting, repairing or renewing any sewers, mains, pipes, cables.

With the exclusion of agriculture and forestry from the definition of development", a range of activities which fall within the definition of "agriculture" such as breeding and keeping of livestock and the use of land as grazing land are left out of the jurisdiction of planning authorities.

However, such activities cannot be said to be outside the scope of all planning since they can be regulated and controlled through the provisions of the Agriculture Act.

The devices available for the control of development, including the requirement of consent, the imposition of conditions, will now be discussed.

Requirement of Consent.

The Regulations provide that no development shall be carried out before consent is obtained from the interim planning authority having jurisdiction, over the area within which it is intended to carry out the said development. 376

A person requiring consent for development makes an appplication to the interim planning authority for the area in which the land concerned is situated 377 and where no such authority exists the application is made to the Central Authority. 378 Upon receiving the application, the Central Authority refers the application to the local authority in the area or to the Land Control Board, 380 if the consent sought is for change of use of egricultural land where the plot of land concerned exceeds 20 acres or for the subdivision of agricultural land into plots of less than 20 acres where the plot concerned exceeds 20 acres. In the case of an application in respect of land sithin 3 miles of an adjacent municipality, to that local authority.

Interim Planning Authority are bound by the provisions of any relevant area or town plans which have already received approval. This provision is intended to avoid a situation arising where the plans approved by these two bodies find themselves in conflict with plans which already have received the approval of the Minister. In addition, the Central Authority and the Interim Planning Authority are required to have regard to the health, amenities and convenience generally. It is, therefore, for these planning authorities to take a long-term view of the effect of their giving consent to the application(s) before them.

Under Regulation 12(1), the central Authority may refer an application before it to all or any authorities in the country as it may think fit. The Authority may do this when such reference is, in its opinion, necessary for the establishment of an overall planning approach. In considering the application, the Central Authority is required to have regard to the comments received from the authorities to whom the application was circulated.

It has been noted that applications, in which consent is sought for change of use of agricultural land where the plot of land concerned exceeds 20 acres or the consent sought is for the sub-division of land into plots of less than 20 acres, ere refered to the Land Control Board for the area in wich the land to be divided is situated. In considering such applications, the Land Control Board is bound by the provisions of the Land Control Act in respect of "controlled transactions", subsdivision of land being such a transaction. 382 s.9(1)(b) of the above Act provides:

*In deciding whether to grant or refuse consent in respect of a controlled transaction, a land control board shall act on the principle that consent sucht generally to be refused where:

- (i) the person to whom the land to be disposed of -
- (a) is unlikely to farm the land well or to develop it adequately; or
- (b) is unlikely to be able to use the land profitably for the intended purpose cwing to its nature."

Acting on the above priciple, the Land Control Soard shall be able to slow down the degeneration of land resources which has resulted from subdivision and fragmentation of farmlands. This subdivision has not, except in a few cases, benefitted the country in any way and has actually been responsible for much of the soil erosion in the country, a fact noted by the working committee on the Human Environment:

"In spite of the consolidation programme there still remains a tendency for re-gragmentation with its frequent proneness to lowr the standard of farming. and today senior agricultural officers concerned by the soil losses ocurring in parts of Kenya can talk of a "very serious problem" and "more should be done to save the soil." 383

Regulation 11(2) of the Development and Use of Land (Planning)
Regulations, 1961 contain provisions which may be used to improve the
human environment in the area in which development is intended to be carried
out and more so in the urban areas. The above Regulation requires that
an application show the land which the applicant intends to surrender
for public purposes. Now, public purpose is defined to mean any non-profit
making purpose which may be declared by the Minister to be a public
purpose and includes 384

- (a) educational, medical and religious purposes;
- (b) public open spaces and car parks
- (c) Government and local government purposes.

Orban areas in Yangs are bearing increasingly important as hower for an ever-growing percentage of the country's population. One of the problems facing these urban areas is the provision of land for basic and

adequate living space, the provision of water, sanitation, sewage and transport. In considering applications, therefore, the planning authorities should make use of the provisions of Rule 11(2) to ensure that sufficient land is set aside by every developer so that the future requirements of the urban areas are not frustrated or impossible to meet.

(ii) Conditions of Development

In granting consent to a planning application, conditions may be imposed requiring certain things to be done or prohibiting others, in relation to the land or building. The conditions may, for instance, require the applicant to comply with the building regulations in relation with a particular matter such as avoidance of acts likely to create a nuisance. In particular, the planning authority must ensure that sufficient land for public purposes, as set out in Regulation 11(a) is provided.

In the event that insufficient land is provided, the application should disapprove the application except when the applicant is willing to provide additional land.

Most of the buildings in this country's urban areas were put up by private developers and public agencies who, in the past, bought land and raised houses for various reasons. The consequences of their activities have manifested themselves in traffic strangles, overcrowded schools, office and shopping centre – all creating communities which lack beauty or order. This is the result of thousands of small, separate decisions made with no relation to one another.

The power to impose development conditions should, therefore, be u utilized to streamline the development being carried out in each area as well as bring a national harmony in the developmental activities carried out over the country as a whole.

Enforcement of planning control

The bodies charged with the task of ensuring that the development being carried out in their areas comply with the provisions of the Development and Use of Land (Planning) Regulations, 1961, are the Central Authority, the interim planning authority and the local authority. 385

It is an offence for any person to carry out development without consent of the relevant authority and on conviction the person who has carried out such development is liable to a fine not exceeding five thousand shillings or to imprisonment for a term not exceeding six months or to both such fine and imprisonment.

When it comes to the notice of the planning authorities that some without development in their area has been carried out/their consent or if conditions subject to which consent to develop granted have not been complied with, the planning authority concerned serves an "enforcement order" on the owner or occupier of the land. The enforcement order must be served within 5 years of the development being carried out. This order may, among other things:

- (a) set out the steps to be taken by the person on whom it is served, in order to restore the land to the condition was carried out; the time within which such steps are to be taken will normally be set out in the order.
- (b) require compliance with the condition which the owner or occupier of the land has failed to observe. 387

In addition, the enforcement notice may require the demolition or alteration of any buildings or marks, the discontinuance of any use of land or the carrying out of buildings or other operations.

The enforcement notice takes effect ofter period specified therein, which period shall not be less than 28 days after service of the notice.

The notice does not take effect if it has been appealed against until such appeal has been determined and in the event that the appeal is allowed, the notice ceases to have effect. 389

Appeals by a person aggriaved by the enforcement notice is determined by the Minister whose decision is final, and which decision, in the words of the Regulations "shall not be questioned in any court." 390

If the steps required to be taken by the enforcement notice are not taken within the time specified therein or within any extended period the authority may allow, the authority may recover the expenses incurred by it from the person concerned. Such recovery of the expenses is independent of, and does not prejudice, any other penalties which may be imposed on action taken under the Regulations. 391

A person entitled to appeal under Regulation 27(4) but fails to do so, loses the right to dispute the validity of any action taken by the authority under the provisions of Regulations 28(1) upon any grounds that could have been raised in such appeal.

The above provious can be and should be employed as a device to control development not only through the imposition of penalties provided for, but by requiring, through the enforcement notice, the doing of such acts as are practicable to streamline the development that has taken place without the necessary consent or the development that has been carried of without compliance with the conditions imposed.

CHAPTER FIVE

CRITIQUE: ENVIRONMENTAL LEGISLATION

V.J. Yonacone tells of the 1968 spring alumni of a prestigious law school, who claim emong their numbers many justices of the united states supreme court, which held a re-union. The intellectual theme for that re-union weekend was "Law and the Urban Crisis." Five prominent legal educators were invited to address the alumni on this urgent question, but just as the proceedings were about to begin, a group of black law students, together with members of the City's Black Coalition, entered the auditorium and began to address themselves to the all-white speakers on the platform and the all-white alumni audience.

"You just dont understand the problem at all," they said.

"The problem is not LAW and urban CRISIS; <u>lew is the CRISIS.</u>"

Yonacone cites the above incident before he draws the conclusion to his article entitled "Environment and the Lew". 392 In his conclusion, Yonacone states:

"And now when we look to the law for ensuers to many of our social and environmental problems we find that the law itself is the cause of many of those problems. It is 'the law' that permits environmental degradation".

Yonacone's conclusion was reached after an examination of the law relating to the protection of the environment. Without anticipating the conclusion to be reached by this Thesis and without being prejudiced by yonacone's views, en attempt will be made to undertake a critical analysis of the Kenya Law as discussed in the previous with the view to establish what shortcomings, if any, there may be in this law.

Much of the discussion will be based on the English case law and the Kenya statutory law since there is a dearth of local case law on matters pertaining to environmental protection. And even the small case-law that

exists, does not relate to the central question treated in this Thesis viz. the protection of this country's water resources; most of it is based on the infringement of common law rights giving rise to nuisance actions. 393

while it is arguable that this dearth of local case law is evidence of the unsuitability of the Common Law and Statutory Laws of this country, as environmental protection, the view is held that such an argument is unsupportable. The suitability or otherwise of the country's body of law can only be determined if actions based on this body of law ever want to court. It has been noted that the awareness of the need to protect the environment is a new phanomenon in this country and the persons or organisations interested in the well-being of the environment have not taken their claims to court. And if that has not been done the explanation should be sought elsewhere, unless, of course, the argument is put forward that some aspects of the law militate against actions being instituted in court. But even then such aspects of the law must be shown to exist through a critical analysis.

It will be the objective of this chapter to examine whether there are any shortcoming in the law relating to environmental protection in this country. Discussion will first concentrate on the common law doctrines discussed in the previous chapter before moving on to examine the provisions of the statutory law.

Balance of Interests

An action on nuisance can only be brought by persons whose property rights have been invaded. In addition, the invasion of the property rights in question must be substantial. If the particular conduct in question involved a physical effect on land, the showing of a substantial interference is not difficult to prove. But if the interference involves aesthetics, inconvenience or some other subjective annoyance, the showing of a substantial interference is more difficult to prove. In these cases, the interpretation of what constitutes a "aubstantial" invasion is based

upon the values within the community of what constitutes the use of property in a normal menner. In <u>Robinson</u> v. <u>Kilvert</u>, ³⁹⁴ a complaint was made by the tenant of the ground floor of a building that the tenant of the basement was making the basement so warm that the brown paper which he kept on the ground floor suffered demage. The plaintiff lost the case, the court holding that: "... a man who carries on an exceptionally delicate trade cannot complain because it is injured by his beighbour doing something lawful on his property, if it is something which would not injure anything but an exceptionally delicate trade "³⁹⁵ Thus, interference with either an idiosyncrasy or hypersensitive plaintiff or with unusual property does not amount to substantial interference.

The requirement of substantial interference is related to the balancing of interests carried out by the court in a private nuisance action. In delivering his decision in Watt v. Jamieson, 396 Lord President Cooper set out what factors should be considered in the process of achieving a balance between the numerous interests that may be involved:

"The balance in all such cases has to be held between the freedom of a proprietor not to inflict material loss or inconvenience or an adjoining property; and in every case, the answer depends on considerations of fact and degree. I cannot accept the extreme view that in order to make a relevant case of nuisance it is always necessary for the pursuer to aver that the type of user complained of was itself non-natural, unreasonable and unusual. Especially when (as in this case) the so-called 'locality' principle applies, it must be accepted that a certain amount of inconvenience, annoyance, disturbance and even demage must be accepted as the price the pursuer pays for staying where he does in a city tenement."

The 'balance of interiots' test is the one on which most plaintiffs lose their actions and Reltze sees the apparent weakness of this test in

the fact that "The powerful polluter will never be stopped unless he injures an equally large economic interest." 397

Doctrine of Recourence

While the balance of interests test is the one on which many actions may be lost, the requirement of recurrence or continuence may create some problems in some instances. In actions on nuisance, relief will normally be granted if the nuisance is temporary and occasional and where injury which has to be proved must be "of a substantial scent." 398

However, the fact that act complained of was a temporary nature cannot defeat the plaintiff's claim if the said act while temporary did constitute a state of affairs which led to the injury, the subject-matter of the action. This aspect of the law was illustrated in Stone v. Solton where the plaintiff, while standing on the highway was injured by a cricket ball hit from the defendant's ground. In the court of Appeal, Somervell L.J. stated that the real gist of the alleged nuisance was not the isolated act of hitting the ball into the highway but the organizing and carrying on of a game on property adjacent to a highway, so that the public right of passage was rendered dangerous; the fact that balls reached the highway only occasionally was evidence that no dangerous state of affairs existed. 399

Prescription

A right to pollute a watercourse may be claimed by long use anjoyed by the claiment without interruption for more than 20 years and "If the right has been enjoyed for 40 years it is deemed to be absolute and indefeasible."

This prescriptive right has been singled out as one of the weak points in the common law of nuisance as it relates to environmental protection:

"Since the nuisance theory is a property concept, the individual creating the nuisance may obtain a prescriptive right to continue his nuisance if he has been carrying out the activity for the period necessary to accuire a prescriptive right. Thus, pollution carried

out for a long period of time may give a legal right to continue such actions." 491

However, before the above observation by Reitze is even considered, it must be remembered that prescription can only be claimed for something that can have a lawful origin at common law; moreover, prescription cannot be claimed where it would be in contravention of a statutory prohibition i.e. a claim to pollute by sawage or trade effluent a watercourse to which the water Act, the Public Health Act, the Lakes and Rivers Act apply; nor can a prescriptive right be claimed so as to create a public nuisance or in such a manner and to such an extent as to be injurious to health.

Therefore, the fact that prescription can be claimed, should not stand in the way of the country's effort to protect the water resources against pollution since such prescription would be so restricted that it would not prejudice the well-being of the water resources.

Public Nuisance.

A public nuisance, it was pointed out in Chapter Three, is any conduct or state of affairs which affects the well-being of the community as opposed to that of only a few individuals. Pollution of water in streams and rivers in Kenya is an example of state of affairs which affects the well-being of the community which may be dependent on such streams or rivers for water for domestic and other purposes. River Chania in Thika is such a river, a river which the people in the area depend for water. Yet, the water is heavily polluted with sisal wastes and high concentrations of detergents.

The state of affairs in this river has been existing for a long period of time and yet no action has been taken. The Civil Procedure Act empowers the Attorney-General to institute suits when conduct gives rise to a public nuisance. The Water Act and Public Health Act also contain provisions providing for action to be taken in the case of public nuisance.

Yet, no action has been taken in this regard either. No explanation has been given for this lack of enforcement of the lew and the only hypothesis which can be advanced is that the authorities concerned are wary of prosecuting industries responsible for such pollution in view of the fact that these industries create employment for the people in the area and earn foreign exchange for the country.

However, while public nuisance is considered an injury to the public, the law does recognize the right of the individual to bring an ection for a public nuisance. In such case, the individual must show that he suffered special damage over and above the ordinary damage caused to the public at large. He must show that not only he has been injured but that his injury is different in kind, rather than in degree from that of the public. Thus, in an action of water pollution it would be difficult for an individual to prove that they have been injured differently in kind rather than in degree from injury to the rest of the community.

Apart from the difficulty of establishing special injury as stated above, there is a general unwillingness, even fear, by the people to take action against enterprises and activities which have brought development to their area. This factor was ably discussed in an article entitled "Environmental Crisis Looms as Coffee Pulp Pllutes Rivers" which was published in a local newspaper:

MA crisis is looming in the coffee producing areas of Central Kenya as a result of the flow of wastage from coffee pulping factories into the rivers.

"Coffee is a controversial subject in the area - its criticism is

almost taboo - as it is the crop that has transformed the region

from subsistence economy to a prosperous money - earning community" 402

(Emphasis mine)

In recognition of these factors - i.e. the difficulty of establishing special injury by the individual as well as the reluctance or fear of taking action against the polluters, the public authorities should take the lead and presecute the offenders and by so doing protect the country's water resources.

ABATEMENT

A person who sustains domage from a private nuisance is entitled to abate or remove it. Thus, a person may enter upon another's land and ebate a nuisance of filth provided the abate is urgently necessary. A private individual may also abate a public nuisance so long as he does so peacefully and on the grounds that it does him a special injury beyond that suffered by the public.

It is, firstly, this necessity of proving special injury which will stand in the way of the individual who sets out to abate a nuisance, for, as pointed out in the discussion of public nuisance above, it would be difficult for an individual to establish special injury in cases of water pollution.

That spart, there remains the difficulty of the means the individual would employ to abate the nuisance. If water is being polluted by wastes from a factory, how does the individual abate this nuisance except by requiring the factory to cease its activities altogether? And the question then arises whether the individual can actually and successfully pit himself against the parties running the factory. In most, if not all, cases the individual is in such a weak position vis a vis the persons who have an interest in the factory that he does not stand a chance of stopping the pollution of the water in question.

In addition, the right of the individual to abate a nuisance is not one which is favourably regarded by the courts as is evident in the decisions of the court. In the words of Lord Hale

"But because this many times occasions tumults and disorders, the best way to reform public nuisance is by ordinary courts of justice." 403 Again in <u>Colchester Corporation</u> v. <u>Brooke</u>, Lord Denmann C.J. in delivering the decision of the Court said:

"A public nuisance becomes a private one to him who is specially and in some particular way inconvenienced thereby as in the case of a gate across a highway wheich prevents a traveller from passing, and which he may therefore throw down; but ordinary remedy for a public nuisance is itself public, that of indictment; and each individual who is only injured as one of the public cap no more proceed to ebate it than he can bring an action? 404

For the reasons above, the individual is thrown back to public authorities in order to get relief but it has been noted that the authorities concerned do not seem enthusiastic over the prosecution of those who create these public nuisance. This, therefore, makes the right of abatement of little assistance to those who consider themselves and their interests injured by these nuisances.

Proof of injury, award of damages and other reliefs.

Assuming that an individual has aurmounted the difficulty which stand in his way when instituting an action, he would still need to prove the damage he has suffered and he would still need to relate this damage to the state of affairs complained of.

Now, the proof of pollution is a technical task requiring scientific work. Samples of the polluted water have to be collected and analysed; the analysis would have to be carried out in a laboratory equipped to undertake such a task. In practical terms, therefore, it is only the Government Chemist and other bodies which have the facilties required for such work which can undertake such analysis. An individual desirous of instituting a nuisance action would be greatly handicapped unless the public authorities came to his aid and as we have seen not much hope can be entertained in this direction.

In cases where demage is epprehended, the individual would find himself at even a greater disadventage.

As a rule, an injunction will be granted to restrain the continuance of a nuisance where the injury done is substantial or where however slight the damage may be, the nuisance is a continuing or recurring one so that it would give a series of actions if no injunction were granted.

However, in cases of injury to the environment in general and water pollution in particular, one is interested in averting the occurence of the conduct which might cause such injury or pollution. In Chapter Three it was shown that the indiscriminate felling trees is dimunishing the forest estate and the dimunition of the estate in turn leads to a dimunition of the water resources. However, this is a long-term phenomenon as is the long-term effect of uncontrolled use of pesticides. In actions intended to eafeguard the environment against the long term effects of such activities, it is not likely that the court will grant an injunction against such activities. In such an action the court will require that it be proved that substantial damage has actually been sustained because "unless substantial damage is proved to have been sustained, this court will not interfere" 405

Evidence of environmental damage to the excessive use of pesticides is a phenomenon which has not been well-established in Kenya. In countries like Canada, research work in Ontario has established that DDT is almost certainly the cause of an alarming decline in the successful reproduction of lake trout. In addition, "There is now overwhelming evidence that DDT in fish, the prime food of the Bald Eagle, is the single reason for the rapid decline in the numbers of this species, which is now virtually sterile in eastern North America. In addition, many other kinds of birds now lay eggs which cannot hatch."

Yet, the court may refuse to accept such evidence from Canada on the grounds that local conditions being different from what they are in Canada, such eventuality is not a certainty in this country. This lack of certainty

would be fatal to the action because in actions in which injunctions are sought to avert an apprehended injury "....1t is essential to show that what the defendant is about to do must have that effect - not may but must." 407

It is clear by now that it would be an uphill task to get an injunction to restrain many of the activities which eventually occasion irreperable injury to the environment. Evidence of certainty of injury in the broader environmental injury cases, for instance, harm brought about by the use of pesticides and pollution of the sea, would be hard to come by and injunctions would not, therefore be granted.

Law of Nuisance and the Environment

The view is held, after examining the law of nuisance above, that this common law doctrine would be of little assistance to the efforts of environmental because of some of its essential principles e.g. the requirement of special injury in public nuisance, necessity of establishing the imminence, almost certainty, of harm, etc.

In addition, the scope of this doctrine does not admit of the wide ranging interests involved in environmental protection. It is a doctrine which developed to protect definite property interests and property rights and if such interests and rights desire the protection of this doctrine definite injury must be established.

Yet, attempts to protect the environment must be put in motion long before the damage has been done. And such attempts must embrace a wide range of activities if they are going to be effective at all. They must seek to protect forests, restrain use of chemicals unless proper control is ensured, ensure that the land is used taking into account the interests of the environment as a whole. This must be done, because, in the final analysis it is these seemingly unrelated activities which lead to environmental degeneration.

STATUTORY LAW

Unlike the doctrine of common discussed annve, nemely the doctrine of nuisance, statutory law covers nearly all the aspects of environmental protection and if it was effectively enforced, environmental damage would be reduced to a minimum. The provisions of the Water Act and the rules and regulations made thereunder, for exemple, are wide enough to cover all activities which might pollute the water resources. The lack of enforcement of these provisions has contributed to the worsening situation in regard with Water pollution.

However, the degeneration of the water resources can not be reduced or stopped merely by enforcing the above Act. Other aspects of the environment, such as land, forests atc. have a great bearing on the well-being of these water resources so that it becomes necessary to examine provisions of the statutory law which regulate these aspects of the environment. And here the problem may lie not only in the lack of enforcement but also to shortcomings in the law regulating these aspects.

Control of Land Usage

It has been said that ".... the law of land tenure reform which has led to individualization of tenure has not paid sufficient attention to the problem of ensuring that the land is then used productively." 408 Lack of sufficient staff and political factors have been advanced as militating against the application of the Agriculture Act to all agricultural land in the country" 409

The Agriculture Act which is the principal legislation empowers the minister to make regulations imposing development conditions upon any land to be specified in a development order requiring the person named in such order to undertake a development programme on the land. The development programme consists of the adoption of such system of management on farming as the Central Agriculture Board may consider necessary for the proper development of the land for agricultural purposes. The order may require an owner or occupier to submit a programme of development to the District Agricultural

Board, for approval upon receiving the district board's approval the programme has to receive the approval of the Provincial Agricultural Board and finally it has to receive the aproval of the Central Agricultural Board.

The shortcoming in the issue and enforcement of these development orders lies in the time-consuming process involved. The process takes such a long time that years may pass before the final approval is obstained. And while this process is being gone through the former practically does what he wants.

Before and immediately after independence farms, especially in the large-scale farming areas, were surveyed and planned before passing on to a new owner. Drainage control soil conservation, rotation of crops and afforestation were all set down in the farm plan. However, land has of late been changing hands so fast, the large farms are just subdivided regardless of the existing soil conservation works.

Under the agriculture (Basic Land Usage) Rules the Director of Agriculture or the Provincial Agriculture Officer or the District Agricultural Committee may issue an order requiring the owner cultivating land on any slope exceeding 12 per cent to construct works or carry out repairs necessary for the protection of such land against erosion. Orawing guidance from this Rule, and as a matter of policy, cultivation of land with a slope exceeding 15 per cent has been discouraged or completely prohibited.

It is exiomatic, of course, that the efficacy of legal provisions is determined by the conditions in the area or sector of society where those provisions are to be applied. The above Land Usage Rules apply to all land in Kenya except to plots of not more than 2 acres used for residential purposes in municipalities and townships. In Central Province, for example, soil conservation remains a problem especially in the middle zone of the

province where almost every inch of the land is cultivated. In this and other areas of the Province, there has been a tendency to cultivate all land without leaving any grass strips to check erosion. Rather than rigidly enforce the Rules, a different approach is called for, as was admitted by the Department itself:

*Although the policy is that land over 15 per cent should not be cultivated it is not logical to think that this can be put into practice due to the shortage of land. 413

In hilly countries of South East Asia farming has been successfully carried out on the slopes by the adoption of suitable farming methods. Similar methods shall be adopted here and these would satisfy the present land-hunger as well as protect the land against erosion. As they are, the Basic Land Usage Rules have failed to stop farming on the slopes and thus ineffective as a protection of the land against erosion.

The Soil Conservation Unit of the Ministry of the Agriculture is supposed to undertake conservation works in the rural areas and on large farms. The weakness of this Unit lies in the fact that it has no power to exercise discretion in the type of work it carries on a farmer's land. When a farmer applies for it to come on to his land and construct a dam, the service cannot, even when convinced that the works requested, has no conservation value, refuse to undertake such works. An example is the construction of dams, an activity in wich the Unit is heavily involved in. It has been found out that the construction of dams increases the capacity to carry more livestock, and the increased livestock in turn, increases the potential for the incidence of widespread soil erosion.

Another factor which stands in the way of successful soil conservation effort is the power which the Agriculture Act confers on the extension staff

This power has aroused feelings against the extension workers from the earliest days of agriculture. Since the extension workers are the means through which the Government reaches the farmers in all its efforts to improve the quality and quantity of crops produced, it is feared by these workers that their relationship with the farmers would be compromised if they were the same people to enforce the soil conservation regulations. This factor was noted in the International Labour Organization Report "Employment, Income and Equality, a strategy for increasing productive employment in Kenya in its chapter on Agriculture where it stated: "Most of these practices are covered by legislation, but the laws tend not to be enforced for understandable reasons: the extension services of the Minister of Agriculture regard these functions as being incompatible with their teaching and advisory functions and avoid taking action." 414

Apart from these short-comings in the Act, there are other factors which militate against the effectiveness of the Act as a soil preservation machinery. One of these factors is the fact that in the past greater attention has been paid to the large-scale progressive farmers with the consequent neglect of the small-scale farmer who may be the one in greater need of advice and assistance in the implementation of soil conservation measures.

Another factor is the quality of the staff employed in the extensive service generally and the soil conservation services unit in particular. The extension staff has mostly been made up of individuals who were recruited into the Department of Agriculture, during the colonial period, not on the strength of any qualifications they possessed but rather because of their support for and enthusiasm in the soil conservation measures which at that period were generally unpopular. The Minister of Agriculture is aware of this fact and attempts have been made to rectify the situation. 416

The enforcement of the soil conservation regulations do not enjoy the support of the local political leaders in the areas affected by

erosion who, the ILO Report suggested, "... do not want to jeopardize their chance of re-election being too severe on their constituents." 417

The unwillingness of the local political leaders to assist the extension staff in enforcing the soil conservation regulation is one of the major hindrance to the enforcement of the regulations and unless the local leaders appreciate the necessity of these regulations, little, in the way of soil conservation, would be achieved.

Legislation on Pasticides and Other Chemicals

The work of Cabeda has shown that most of the natural waters in this country are contaminated with pesticides and other chemical residues. This contamination of the water resources is on the increase with the current heavy use of pesticides and other chemicals in the agricultural and livestock industries. While the long-term effects of these chemicals on the environment is being researched, their short-term effects have already been realized. Sample of crops destined for export and livestock products have now to be analysed in order to detect residues of chemicals or pesticides.

The chemicals have also been responsible for several deaths in the country. In 1969, for instance, 16 cases of death due to perathion poisoning were reported.

The legislation which regulates the manufacture sale, use and other matters related to posticides, poisons and other chemical substances was discussed in the previous chapter and attention will now be directed to the inadequacies of this legislation.

Provisions governing the information which should be given on the lebels of the packages used for pesticides constitute an important part of pesticide legislation. Under the Food, Drugs and Chemical Substances Act, the Minister after consultation with the Public Health (Standards) Board may make regulations in respect of lebelling. 420 To date, no regulations

have been made under this Act. This is an unfortunate omission on the part of the authorities concerned since the majority of the users of these chemical substances may not fully appreciate the toxity of these substances and their misuse may occasion death or other serious long-term environmental consequences.

The Pharmacy and Poisons Act requires that the container of any poison sold should show on the label, the word "Poison" or other indication of the character of the article. Where the poison is to be sold in liquid form in bottles of a capacity of more than 120 fluid ounces, the bottle must be labelled with the words "NOT TO BE TAKEN". The view is held that this information is not adequate, as pointed out below.

The regulations under the above two Acts should require the labels to include information which goes beyond the directions for use and should centain a description of the symptoms of poisoning, the antidotes, if any, and the advice on the treatment to be applied. Like in the Plant Protection Law of the Federal Republic of Germany, 421 the regulations should require that the information shown on the containers used for plant and crop protection should include the nature and quality of active ingredients, the method and time of application, the quantity to be applied, the hazards associated with the use of pesticide and the time that must be allowed to elapse between treatment and harvesting. This last requirement is of importance in ensuring that agricultural products do not contain harmful residues.

Special hazards are obviously associated with the serial application of pesticides and for this reason regulations should be made to regulate this activity on the large forms. The regulations should require the organizer of the earial application to provide washing decontamination end first-aid facilities, as well as for the marking of the area to be treated. The regulations should also specify the meximum permissible wind velocities for serial application. In fact, the use of Poisonous Substances

Act anticipates such regulations and its provisions should have been made use of to make them. 422

Legislation on the transport of pesticides exist in a number of countries although this may merely take the form, as in Denmark, of provisions laying down that no pesticide may be transported in such a way as to come in contact with foodstuffs and that all necessary safety precautions must be taken during transport. 423 The Minister has power to make such regulations under s.28(1)(e) of the Food, Drugs and Chemical Substances Act for, inter alia, the conveying of food and chemical substances. No such regulations have been made. Regulations should have been made to require that no food should be transported in the same truck with damaged packages containing a poisonous substance may be delivered until the foodstuff has been examined for possible contemination. In additions, the regulations should have been made specifying the precautions to be taken in destroying or ... disposing of containers or packages that have been used for pesticides; such regulations should also have been laid down the minimum distances from sources of water, likely to be used for human or livestock consumption, at which pesticide aprying may be carried out.

In a paper prepared by the Environmental Committee of the Ministry of Agriculture it was agreed that the interests of agricultural industry are so wide-ranging—and important that little has been done to restrict the use of all but the most dangerous agricultural chemicals. However, it is sheer short-sightedness to let these interests outweigh the necessity for care and control of the use of these substances, for, if the environment were to be extensively impaired through the use of these pesticides and chemical substances, agriculture itself would lose the base on which it stands at present.

Co-ordination of Policy, Adequecy and Enforcement of the Lew

The importance of planning the exploitation of the environment has already been discussed. It now remains to examine the efficiency of the planning process as it is presently carried out in the country.

Planning is carried out by the Physical Planning Department of the

Ministry of Lands and Settlement. The Department undertakes planning activities of the whole country and prepares development plans for each of the provinces as well as the urban centres. These plans are mainly concerned with providing a national framework for the location of capital investments and the location of trading centres.

The planning legislation, especially the Development and Use of Land (Plenning) Regulations, 1961, however, leave out many activities which if left unplanned could have edverse effects on the environment. The Regulations leave out agriculture and forestry in their definition of "development", emphasis being laid on roads, buildings etc. Granted, the construction of roads and the erection of buildings do have long-term effects on the environment. But so do agriculture and forestry, especially when it is remembered that agriculture includes the keeping of livestock, and such exclusion of these activities, as Hopecraft's work has demonstrated, may cause environmental damage. "Basically, the approach adopted is wrong because it ignores fundamental ecological principles governing the relationship between life and the environment. Animals have been introduced which are not biologically well-suited to the climate, the vegetation, the moisture level, the diseases and other aspects of the environment of East Africa. Since the grazing habits of these (livestock) animals are ill adapted to the available types of ground cover and because of their high water requirements enormous areas of range vegetation are being trampled and destroyed. Soil erosion by both water and wind speeds up the process, ultimately depleting both surface and underground water resources. The delicate ecological balance which nature has built over thousands of years is distrupted."425

The view that the Development and use of Land (Planning) Regulations, 1961, are deficient is strengthened by the fact that Regulation 15 which provides matters the Planning authority should take into account when

considering applications to carry out development, does include environmental interests emong these matters. Granted, Regulation 15(1)(b) provides that the authority shell "have regard to the health, amenities, and convenience of the community generally and the proper planning and density of development and use of land in the area. Though on the face of it the provision is wide enough and thus capable of embracing any and all activities which bear on the environment, it is rendered ineffective by two factors. The first of them is the narrow interpretation and definition of the term "development" and the preoccupation of the department with buildings, roads etc. without any necessary concern for the long-term of other activities on the environment.

The other factor which restricts the use to which Regulation 15(1)(b) could be put, is the absence of a land use policy in the whole country so that planning authorities have to determine what is the best land use for different areas. With no land policy to guide them, the work of these authorities has a great potential for environmental mismanagement. Realizing this shortcoming, the Government intends to establish a Land Use Committee to advise on the most appropriate use of land where there are conflict of interests between alternative uses such as agriculture, forestry, wildlife and tourism. 426

As a result of lack of a land policy, Ministries and departments have been in competition with each other over land use in many parts of the country: "In Kenya today we have reached a situation where land use interests such as agriculture, tourism, ranching, wildlife management, forestry, and water conservation - each of them valid and nationally productive usages of land - are in some instances in competition and often in conflict over large areas of the country. Not only are various arms of the Government in disagree ment or confusion on these issues but this is compounded by the demands of the landless and the burgeoning population which are haphazardly realized

in the absence of clear policies. 427

The conflicts mentioned above often lead to stalemates in the implementation of the plans made by the physical Planning Department and the Ministries and department, as a result make their own adhoc plans: "Nevertheless, planning performance is not all satisfactory. Even now, many ad hoc decisions in the string of development continue to be made without reference to the nominated service centres set down in the Development Plan. Educational and trading facilities are still provided in an unco-ordinated and sporadic manner and land use inside towns has sometimes been at variance with the approved town plan or is unauthorized and unorganized. A28 Nothing is likely to do more harm to the environment than these ad hoc plans and decisions for inherent in such ad hoc plans is the inability to provide for long-term effects to the activities carried out on the environment.

The fragmental approach which has been shown to prevail in the planning process, is also reflected in the enforcement of the law on various environmental matters. The provisions is a good example: s.181 of the Water Act empowers the Minister, the Water Resources Authority and the Water Apportionment Board to prosecute any person polluting the water. The Penal Code makes it a demeanour for any person to corrupt or foul the water of any public spring or reservoir, so as to render it less fit for the purpose of which it is ordinarily used. The duty to prosecute such acts as do corrupt or foul the water rests on the Public Prosecutor.

Under the Public Health Act, the duty to protect water against pollution rests on the local authorities. Responsibility of protecting the water resources under the Food, Drugs and chemical substances Act is placed on yet another person viz an "authorized officer". In this Act such officer means a medical officer of health, a health inspector or any qualified person authorized in writing by a local authority. 431

The multiplicity of persons and agencies charged with the duty of enforcing provisions designed to protect the water resources has given rise to a situation in which so many powers are confered on so many persons and agencies that in the end none of them enforces the legislation concerned. This fact is aptly summed up by the S.H.O. Report on Kenya's water Legislation: "The study reveals that most of the problems encountered arise from a poor level of implementation and enforcement of the law, rather than any serious deficiencies in it. In fact formal enforcement action is practically unknown and the study did not reveal a single prosecution under relevant laws in the last decade.

The reasons for this low level of enforcement are many, but may be summarized as follows:

- (i) The division of responsibility among so many agencies between which cooperation is not always good. At best this makes for procedural difficulties and at worst to lack of interest.
- (ii) the number of laws involved which may be difficult to understand and correlate, particularly by the subordinate officials concerned.
- (iii) Lack of experience of enforcement procedures by officiels and lack of case law. 432

Since the persons concerned do not seem to be enthusiastic over the enforcement of the legislation covering many environmental aspects, environmental protection may have to depend on the initiative of the individual to institute proceedings or make presentations whereever environmental degradation is threatened. In the last part of this Chapter, therefore, an examination of the Law will be made with the view to establish what right(a), if any, does the individual have to take action to protect the environment.

Individual Rights and the Environment: 3

In the United States of America, as well as in many Western European countries individuals have formed citizen groups though they can exert pressure on their Government to take care of the environment. Some of the groups have grown out of the measure of protection various governments were giving to the environment. In some countries there has been a feeling that governmental activities, themselves, were endangering the environment. An example of this occured in the United States of America (U.S.A.) in 1956 with the construction of the Glen Canyon Dam. As the construction of the dam went forward, it was realized that no measures were taken to provide any sort of physical protection against flooding the Rainbow Bridge National Monument. In 1962, therefore, a suit was taken against the secretary of the Interior by three conservation organisations and one individual to require the secretary to prevent closure of the diversion tunnel until edequate protective measures were taken. 433

Another factor which has led to the growth of citizen groups is the feeling that the Government is not doing all it can, or should do, to protect the environment. In 1860, for example, Denmark was a nesting place for 10,000 mating pairs of white stocks. By 1970 the number had plummeted to, at most 60 pairs – all on the Jutland peninsula except for one pair in an exhibit called "What Man Does To Nature" at Copenhagen University's Zoological Museum. The two specimens, like the examples of five other "seriously endangered" bird species in Denmark, were staffed! Another 10-20 bird species are on the Gwindling list. The museum curator in charge of the exhibit said this wes "symptomatic of ecological change of woodlands as well as of increasing general pollution." 434

In Kenya, voluntary organizations have been active in the sphere of wildlife protection and societies like the East African Wildlife Society,

Wildlife Clubs, and the World Wildlife Fund have been in existence for a long time now. However, in constrast to the environmental movements in the United States of America and elsewhere, who have sought legal protection for the environment in court proceedings, the wildlife movement in Kenya has confined its activities to labbying for the protection of wildlife and the contribution of funds for research and other activities. In 1973, for example, the World Wildlife Fund donated 500,000 dollars to buy land around Lake Nekuru so as to make it possible for the Lake Nekuru National Park to be extended.

Discussion below, however, will centre on an examination of whether the individual acting alone, or in concert with others, has any enforceable rights in relation with the environment.

In an original lawsuit instituted by an individual or citizen group, the existence of a legal right is a threshold issue and it must be resolved before the question of locus standi can be determined. For example, if there exists a legal right against a particular department or Ministry to have a prescribed environmental aspect or component, it would seem that the right must exist in favour of the general public since by its very nature, the environment and its various components are not legally the property of any citizen or organization anymore than they are the property of every citizen.

In this respect, the growth of court actions by citizen groups in the United States of America have arisen as a result of legislative provision when impose upon an agency such as a roads department or water development authority the duty of taking into consideration aesthetic, scenic, fish and wildlife and other interests in planning and implementing its work. An example of such legislative provision is found in the amended

Federal Aid Highway Act of 1966:

"It is hereby declared to be the national policy that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges and historic sites. The secretary shall not approve any program or project which requires the use of any publicly owned land from a public park, recreation area or wildlife and waterfowl of national, state or local significance as determined by the officials having jurisdiction thereof unless (i) there is no feesible and prudent alternative to the use of such land, and (ii) such programme includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge or historic site resulting from such use." 436

The above provisions like many others in the United States have generated among many segments of the interested public expectations that the Law is at long last being employed to protect the environment. More importantly, such provisions are viewed as creating individual rights in the environment. The provisions of the Federal Highway Act and other legislation are viewed as creating duties upon the affected and correlative rights in the general public. If these rights and duties do exist, moreover, it is thought that they ought to be enforceable in a court of law.

The question now is whether the statutory laws of this country do recognize the existence of similar rights. As was pointed out earlier, there is no unitary environmental legislation in the country and matters pertaining to the protection and exploitation of the environment are dealt with by individual statutes dealing with particular aspects of the environment.

ment. The Water Act deals with the water resources and the right in, and use of, water is vested in the Minister, the forest resources are regulated by the Forest Act. These Acts do not of any inference of the existence of individual rights in these pesources.

The making of representations has often been used to lobby for environmental protection. Regulation 9(1) of the Development and Use of Land (Planning) Regulations, 1961 437 provides that: except where otherwise required by the Minister, a local authority shall, before submitting any plans to the Minister for his approval, take such steps as may be necessary to acquaint the owners of any land affected by such plans and particulars with the proposals contained therein, and the local authority, when submitting such plans and particulars to the Minister for approval, shall certify that such steps have been taken and shall submit to the Minister any comments or objections made by such landowners.

Under the above regulations, however, the only persons who may make representations or objections are those whose lands are "affected by such plans and particulars". Thus, an individual or citizen group wishing to protect land against the adverse effects likely to arise from the implementation of a plan do not have the right to make objections or comments so long as they are not owners of land affected by such plans.

Out even the comments and objections which may be made by owners of land affected are not binding on the local authority or the Minister.

Regulation 15(1) of the Act provides that the Central Authority, or an interim planning authority:

shall when considering a planning application -

(b) have regard to the health, amenities and convenience of the community generally and the proper planning and density of development and use of land in the area."

This is the mearest the above Regulations come to the imposition of duties on the planning authority to take into account environmental interests. In some cases it may be possible for an interested party to show that the intended development does not pass this test and that if carried out such development would prejudice the use of the remaining land in the area.

However, all the authority is required to do is "to have regard to"
the above matters and if it has actually taken account of these matters,
their decision on the application will not be open to attack even if the
interested party is of the view that the decision prejudices the wellbeing of the environment.

In the event that the consent is granted, and it is felt that the development so permitted will prejudice the well-being of the environment, the question arises: who has the right to appeal against the grant of such consent? Certainly, not the applicant who has now received the consent he sought. The land of other owners in the area may be adversely affected by the grant of consent to undertake development. However, there is no provision in the Regulations permitting such land owners to appeal against the grant of consent.

The Development and Use of Land (Planning) Regulations, 1961, the right to appeal is only granted to a person whose application for consent has been turned down, and in this regard it is significant that Regulation 21(1) which makes provision for appeals to the Minister starts with the words "An Applicant of" Thus, it would seem that the owner of adjacent land does not have the right to appeal against the grant of consent.

An individual or group of individual whose interest is founded on their desire to protect the environment against herm erising out of develop-

ment proposals which have received consent, is in even a weaker position. Not only does he lack the statutory right to make representations, but he cannot point to a legal right which has being infringed.

The desire to protect the environment and the realization that
the government may actually permit activities detrimental to the environment outpouring of feeling in many countries that there is a constitutional
right to a decent environment, and if there is none, there should be one.

In the United States of America it has been ergued that the Ninth
Amendment can be used to protect the environment. This Amendment of the
Constitution states: The enumeration in the Constitution, of certain rights
shall not be construed to deny or disparage others retained by the People."

In Kenya, where the individual statutory rights on which he can base his claim for environmental protection, the provisions of the Constitution would go a long way to enable an individual to institute proceedings. However, the question arises: does the Constitution guarantee a decent environment?

In this respect, the Constitution states the entitlement of "every person in Kenya.... to the fundamental rights and freedoms of the individual, that is to say, the right, whatever his race, tribe, place of origin or residence or other local connections, political opinion, colour, creed or sex, but subject to respect for the rights and freedom of others and for public interest, each of the following, namely (a) life, liberty, security of the person and the protection of the law." 438

However, it is submitted that it is unlikely that the courts in this country would accept the argument that above constitutional provisions guarantee a decent environment. Firstly, the few constitutional cases which have been decided by this country's courts have dealt with issues quite unrelated to the question of environmental protection. They have mainly been on questions of freedom of the individual from unlawful argest, detention etc. 439 And in cases where the protection of life and health is the issue.

the court would normally direct attention to those acta and circumstances which directly and immediately threaten such life and health. The constitutional right is here ggared towards the protection of life itself: no one is to be deprived of it intentionally save in execution of a sentance of a court in respect of a criminal offence.

Secondly, the absence of laws which impose a duty on the authorities concerned to take account environmental interest would weaken the argument that the constitution does guarantee a decent environment.

The law with respect to the right of the individual to seek protection for the environment, can now be summed up as follows:

- (a) The right of ownership and control of most of the country's resources is invariably invested in the Minister.
- (b) None of the statutes impose the relevant authorities to take environmental interests into account.
- (c) Except for the owner of land whose such land is affected by a plan made by a planning authority, no other person may make objections or comments on such plans.
- (d) The individual may take court action to compel a local authority or any other relevant authority to perform their statutory duty of protecting the water resources.

In the light of the state of the country's law, and in view of the continuing exploitation of the environment, a new approach to environmental protection is called for in this country. And this will be the subject of discussion in the next chapter.

CHAPTER SIX

COMPREHENSIVE APPROACHES TO ENVIRONMENTAL PROTECTION

The nature of environmental is complex and closely with many other aspects of the society. And although pollution of water resources has been the main subject of discussion in this Thesis, this is not to suggest that the country does not face other problems related to her environment. Air pollution, for instance, is an environmental problem rapidly reaching higher dimensions. At present, this air pollution has not reached the very high levels compared with the situation in many industrialized countries. However, it may not take a long time before the situation becomes more ecute. In fact, it has already been noted that "... in some areas, especially in Neirobi, the extent of air pollution from industrial vapours and particulate matter has reached the observable level where it is readily seen without the aid of instrument."

The importance of wildlife to the maintenence of a health environment was discussed in Chapter Two and it was also pointed out that poaching and uncontrolled hunting of wildlife destroys an aspect of nature's biology and thereby distort the life cycle and the human environment. This is a phenomenon which is accelerating fast in this country with 12,000 elephants destroyed each year. And taking Game Department accounts that Kenya has 130,000 elephants, this means that at this rate the species will be exterminated by 1986. This should not sound like an exaggeration because authoritative facts and figures are evailable showing that some rare species of the zebra family, such as the Quagga and the Sonteguagga have been wiped out of existence. There is also evidence to show that at least 5,000 Zebra in the Athi-Kajiedo area were poached in a space of six months.

The population of lesser flamingoes at Lake Nakuru has dropped

remarkably to the point that it is beginning to worry conservationists.

Of a million lesser flamingoes that have always been in this lake, less than 7,000 are now remaining. 443 Up to now, nobody seems to know why the number is decreasing gradually but it is thought that the recent prolonged drought may have been a chief contributory factor. It is reckoned that the blue-green algae on which the flamingoes feed, are now found in smaller quantities and as such cannot support the usual large population of flamingoes. Their decrease may have been caused by insufficient rainfall. Lack of additional fresh water into the lake could have upset chemical and physical characteristics, thus making it difficult for the blue-green algee to multiply at the normal rate.

Rain-water which collects in Menengai Crater travels underneath and comes out into the Lake. It is feared that the decrease of fresh water may have been caused in part or wholly by reckless cutting down of Mau, Cherangari, Nandi and Kekamega forests for charcoel.

The above are some of environmental problems for which solutions must soon be found. The measures taken to solve these problems should not be looked upon separately but as part of a comprehensive solution since, as has been shown before, the well-being or otherwise of one aspect of the environment has a great bearing upon and is reflected on the well-being or otherwise of the other aspects of the environment.

In this Chapter, it is proposed to examine and suggest ways in which the water resources can be effectively protected against pollution slways bearing in mind, of course, that the suggestions put forward would not be effective unless other aspects of the environment are also protected. In addition, the chapter will discuss the ways in which effective control on the use of pesticides and other chemicals should be undertaken, the problem of soil erosion can be dealth with and, lastly, the improvement

of the planning process.

Enforcement of the Law

It was pointed in the previous chapter that the law in relation with water pollution is not enforced. Thus, the one contributory fact in respect of the deteriorating water quality is the poor level of implementation and enforcement rather than any serious deficiencies in the law itself.

One reason for this lack of enforcement, it was pointed out, is the division of responsibilities among so many agencies, with the end result that the responsibilities are never discharged. As it is now, the provisions of the Water Act, Public Health Act, the Penal Code, the Food, Drugs and Chemical substances place the responsibility of protecting water against pollution on the Minister, the Water Resources Authority, the Water Apportionment Board, the Water baillifs, fish wardens, local authorities, medical officers of health, the Attorney-General, the Director of Medical Services, the Director of Agriculture etc.

Management of the country's water resources should be based on the catchment areas into which the country has already been divided. Water supplies will be more easily provided and the re-use of water throughout the catchment area will become possible. The enforcement of the law should be the responsibility of the catchment boards. Since these boards will also be charged with the task of administering the water laws in their areas. This will enable the boards to relate enforcement activities to their management and administrative policies.

with the appointment of Area Pollution Control Officers to serve in the catchment areas, it would be possible to carry out the enforcement activities more effectively. To assist in the carrying out of their work the number of water baillifs will have to be increased and placed under the various Pollution Control Officers.

Aided and backed by the Water Apportishment Soard these catchment boards should be more eggressive in enforcing the water pollution requlations. To date, the Water Apportionment Soard, though having the power to revoke the water given to industries has been lax in exercising this power against those industries which have discharged effluents into bodies of water.

For the pollution control officers and water baillifs to be more efficient in enforcing the Water Act, they should be so trained that they understand the text of the water legislation as well as the reasons for it. They must also have a sound knowledge of the extent and limit of their powers and the procedures that could lead to successful prosecution.

Amendments to Statutory Law

The manufacture, distribution, sale and use of chemical substances in this country is regulated under a multiplicity of Acts: Food, Drugs and Chemical substances Act, Use of Poisonous Substances Act, Pharmacy and Poisons Act, Fertilizers and Animal Foodstuffs Act and the Cattle Cleansing Act. And each of the Act empoowers the Minister to make rules and regulations for such matters as labelling, quality and composition of the chemical substances in question.

Since the Acts relate to different activities - e.g. agriculture, medical services, veterinary services - there is a great possibility that the rules and regulations, though relating to the same chemical substance, will lay down very different standards. An example: under s.2 of the Food, Drugs and chemical substances Act, a "chemical substance" is defined as "any substance or mixture of substances prepared, sold or represented for use as -

- (a) a germicide:
- (b) an antiseptic;
- (c) a disinfectant;
- (d) a pesticide

- (f) a rodenticide;
- (g) a vermicide; or
- (h) a detergent."

Now, some of the above substances are poisons and their sale and use may therefore fall under the provisions of the Pharmacy and Poisons Acta. Further, some of them may also be used in the cleansing of cattle in which case they will come under the Cattle Cleaning Act. Standards for use, sale, quality composition atc of the substances which fall under the Food, Drugs and Chemical Substances Act are normally set by the Public Health (Standards) Goard; for those substances which fall under the Pharmacy and Poisons Act standards are set up by the Pharmacy and Poisons Board, while for those substances used in the livestock industry the standards are set by the Director of Veterinary Services.

In the same manner, the enforcement of the Acts and regulations made thereunder, though in some instances covering the same chemical substances, is dvided among several bodies and persons. This division of powers and reponsibilities creates administrative and enforcement difficulties and conflicts, sometimes, within the same Ministry. The Director of Agriculture and the Director of Veterinary Services, though in the same Ministry, exercise powers on chemical substances under different Acts: the former under the Food, Drugs and Chemical Substances Act; the later under the Cattle Cleansing Act. Each of these two officials may set down different standards on the same substances.

Granted, the officials may try and co-ordinate policy and standards covering different substances. However, the chances that the agreed common policy will actually be followed are slim, because each of the officials is spurred on by different interests.

The consequences of such division of powers and responsibilities has often led to the non-enforcement of the Acts and regulations made thereunder

and to emergence of conflicting policies.

The lew in regard to chemical substances should be emended to provide for the establishment of one single body which will be responsible for the administration of the lew on these substances. This would make for economy in the deployment of the scarce man-power skilled enough to police the country and enforce the lew; it would also make the easy standar-disation of regulations on such matters as quality, composition, safety precoutions etc.

Improvement of the Planning Law

The importance of proper planning in the exploitation of the environment has been repeatedly pointed out and the deficiencies relating to the country's planning law were discussed in the previous Chapter.

Industrial advances and the growth of population are bound to generate greater pressure on land in future. With an accelerated of urbanisation there will also be an increased demand for recreational land in the form of woodlands and parks. All these factors call for a more comprehensive approach consisting of landscape analyses so that all parts of the country can be valued on the basis of their qualities for different human activities.

To facilitate the necessary comprehensive planning process the first step should be amendment of the Land Planning Act, setting out in the amended Act, the objectives of planning in this country. The objectives of the amended Act could run as follows:

- "(i) This Act shall be designed to protect the nature and landscape values of Kenya and to afford to the population the widest possible opportunity to enjoy these values.
- (ii) The powers conferred by this Act shall be applied in particular:
- (a) to preserve and care for large landscape areas and other areas which by reason of their ecological end acenic value or situation are of essential importance.

(b) to preserve and care for areas, flora and fauna, as well as geological formations, whose preservation is of essential interest for scientific educational or historical reasons.

To carry out planning activities efficiently, there will be need to establish regional planning committees which will carry out periodical surveys of land in their areas to determine its ecology and the suitability of the region for different activities. To assist the overall planning authority in evaluating applications for development, the regional planning committees will prepare landscape charts based on their surveys. The charts will also provide information on scenic elements which are both valuable and vulnerable and which demand particularly intensive protection such as stretches of the coastal waters, fresh water bodies and forest areas.

It was pointed out in the previous chapter that when a local authority prepares an area plan, it is required, under Regulation 9(1) of the Development and Use of Land (Planning) Regulations, 1961, to publish such plan so that the owners of land affected by such plan can make comments or objections. In addition, it was noted that the only person who can make an appeal in respect of application for consent is the applicant whose application has been rejected. The inadequacy of this regulation was also discussed in the previous chapter.

The Land Planning Act should be so emended that when an application for consent to carry out development, notice of such application is published in the Gazette and in one or more of the newspapers circulating in the locality. At the same time, the owners or occupiers of land in the area should be informed by mail.

To the meetings or inquiries held to consider applications for consent, should be invited the following:

- (a) The applicant for consent;
- (b) Owners or occupiers of land in the area;
- (c) The regional Planning Committee; and

(d) Any other person or organisation who have requested to be invited to the meeting or inquiry.

The amendments should also include the right of appeal by individuals and interested organisations in the event that consent for development is granted.

that representations can be made in cases of applications for water permits. Since the knowledge of facts about discharges is a first prerequisite to any exercise of individual rights, whether common lew or statutory, the amendments of the Water Act should provide for information on proposed discharges into bodies of water to be made available to persons in the area who depend on the body of water for their supply of water as well as anybody else who may request such information.

Such an amendment will enable representations to be made to the relevant water authorities to exercise their powers of variation or revocation.

Another aspect of the Water Act which calls for amendment is the one in relation with prosecution for water pollution. Under the existing legislation, prosecutions can only be made by persons and authorities specified in the legislation. However, there are a number of persons who may suffer considerable loss of pleasure or recreational apportunity when rivers but who have no interest in the legal sense which would give them locus stand in any proceedings. The right to bring prosecutions should be extended to include such persons as well as those persons in the area who are interested in the well-being of the body of water in question.

Land Use and Soil Conservation:

Attempts to deal with the problem of soil conservation must be undertaken along with conservation, preservation and management of the other natural resources which together make up the country's total environment. To deal with soil conservation is not only artificial but will be

defeatist right from the baginning for the environment is all linked together and tightly interwoven, apart from the fact that soil erosion arises out of other activities.

The control of erosion on the national level should include such measures as reservation of forest areas, preservation of vegetation on watersheds, protection of stream banks and, where possible, reduction of livestock and human population. The measures proposed above should include the re-organisation of the soil conservation services unit of the Ministry of Agriculture.

The Unit should be the only body responsible for implementing soil conservation measures and it should cease being a revenue-earning unit so that it can tackle erosion on its own initiative without waiting, as it now does, for farmers to ask it to undertake conservation works. To enable the re-organised unit to do its more efficiently, it should have its own field officers who visit areas under their jurisdiction and then report directly to the Unit. As it is now, the Unit has to wait until the extension staff report to it.

The soil conservation Unit should also be given discretion to determine the nature of the work they undertake if the construction of a dam is bound to lead to more erosion by enabling a farmer to keep more livestock than the land's carrying capacity, for example, the Unit should have the power to refuse to construct such a dam.

In case a dam is built, the Unit should regulate such matters as the routes which livestocks will follow when trekking to the dam or borehole. This would minimize the impairment of lend by cattle trampling all over it.

A national committee on soil erosion should be established composed of Soil Conservation Services Unit officials, agricultural officers and

members of the Forest Department. This would enable members to get to know what steps are being taken to deal with this problem in other parts of the country and should also help the adoption of a common approach on soil conservation. Under the present set up, officers of the soil conservation services are often ignorant of the work their counterparts in various parts of the country.

The Soil conservation Services field officers should doncentrate on soil conservation, leaving the work of advising farmers to the extension staff of the Ministry of Agriculture. This would remove the stigma of compulsion from the extension staff allowing it to concentrate entirely on advising farmers.

In the previous Chapter, it was pointed that the enforcement of the Agriculture (Besic Land Usage) Rules 1965, in relation with the prohibition of cultivation of steep slopes has not been successful due to the shortage of cultivable land in many parts of the country. Since the enformement of some of these Rules has proved most difficult, continued cultivation of steep slopes must be accepted and alternative methods of dealing with resulting erosion.

Now, it is well known that planting trees in windbreaks is an effective way of controlling wind-erosion. So, is strip cropping a system under which crops are planted in contour strips across the hillsides whose width downhill is not sufficient is not sufficient to permit run-off water to gather any great force. Again, some crops protect the soil more effectively than others by reason of their close spacing or good foliage cover; examples are sugar cane and small millets.

It is suggested, therefore, that the Regulations or by-laws should detail out the type of crop to be planted and the system under which the crops is to be grown. For exemple, to mitigate the effect of erosion permitting crops, the regulations or by-laws should require some degree

of mixed cropping with beans or groundhuis.

In areas where intensive agriculture is undertaken the regulations or by-laws should require the farmers to undertake bench-terracing.

Pasture erosion is normally caused by over-stocking and results from the excessive grazing and trampling to baring of patches in the pastures which are then liable to erosion by run-off. Since local over-stocking frequently occurs round water supplies one of the solutions should be an increase in the number of water supplies by the construction of dama, reservoirs or boreholes. An alternative, where practicable, is to keep the stop, during the rainy seasons when pools of water are present in many places, away from the permanent water-supplies so that congestion round these is limited to the dry season. Absolute prohibition is a nagative policy, less speedy and effective, than re-opening for short periods before each rainy season to heavy grazing which scatters the seed and adds manure.

After all is said and done, it remains to implement and enforce these regulations, by-lews and rules. It has already been noted that agricultural officials are reluctant to enforce these regulations regarding them as being prejudicial of their teaching, while elected leaders do not want to jeopardize their political future by being severe on their constituents. If soil erosion accelerates because the officers concerned are reluctant to enforce conservation measures, the country will be faced by wide-ranging problems: the use of many bodies of water for industry and human consumption will be prejudiced, irrigation ditches may be filled with sediment and need frequent cleaning while aquatic biota may be ruined.

However, with the re-organisation of the Soil Conservation Services
Unit, the appointment of its own officers and the establishment of a national
committee on soil conservation, it should be possible to obtain a better

level of enforcement of soil conservation regulations.

A Better Environment for the Future:

The maintenance of a healthy environment is closely related to the continued exploitation of the country's natural resources and the well-being of its peoples. This was the subject of discussion in Chapter One.

The legal protection conferred on the environment was discussed in Chapter Four while proposed changes in the law were discussed in this chapter.

The drive to protect the country's environment should start with the enforcement of the current law while steps are being teken to implement the proposed changes.

However, lesting protection to the environment will only be achieved when the public becomes conscious of the importance of this environment. By educating the public about the necessity to preserve this environment, a greater circle of society will be involved in the current search for measures to ensure a better and more healthy surroundings both for the present and future generations.

This consciousness of the importance of the environment should be acquired in life as early as possible. Environmental education and pollution should be firmly implanted in the curricula of basic and higher education in the country. Elementary schools should be encouraged to supplement inschool environmental education with excursions to conservation areas, forestry and zoological and related points of interests. In addition, schools should be encouraged to form conservation societies wildlife clubs etc. through which students environmental interests can be cultivated and developed.

"in large part this process of checking deterioration will depend on the establishment of effective programmes of public information through all available media, aimed at developing an increased level of environmental consciousness among the people".

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