ESM 106
ENVIRONMENTAL RESOURCE MANAGEMENT

NATIONAL OPEN UNIVERSITY OF NIGERIA

COURSE GUIDE

ESM 106
ESM ENVIRONMENTAL RESOURCES MANAGEMENT

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Contents **Page**

Introduction

ESM 106: Environmental Resources Management in Nigeria is a one year, two credit first level course. It will be available to all students to take towards the core module of their B.Sc (Hons) in environmental Studies/Management. It will also be appropriate as an "one-off' course for anyone wants to be acquainted with the Nigerian Environment or/and does not intend to complete the NOUN qualification.

The course will be designed to content twenty units, which involves fundamental concepts and issues on the Environmental Resources Management in Nigeria, how to control and manage our resources. The material has be designed to assist students in Nigerian by using examples from our local communities mostly. The intention of this course therefore is to help the learner to be more familiar with the Resources Management.

There are no compulsory prerequisites for this course, although basic prior knowledge in geography, biology and chemistry is very important in assisting the learner through this course.

This Course Guide tells you in brief what the course is about, what course materials you will be using and how you can work your way through these materials. It gave suggestions on some general guideline for the amount time you are likely to spend on each unit of the course in order to complete it successfully. It also gives you some guidance on your tutor-marked assignments. Detailed information on tutor-marked assignments is found in a separate booklet.

What you will learn in this course

The basic aim of Environmental Resources Management is to acquaint learners with the basic concepts of planning, management, human resource management for the enhancement of environmental resources management in Nigeria. During this course, you will learn about planning, management, human resource and natural resources in Nigerian environment. Some common environmental resources in Nigeria such as water, air, mineral resources, land and several others will be discussed in this course.

The course will give you general overview of the process of planning, principles of planning and management of resources including human to conserve and manage our environment.

Course Aims

The aim of the course can be summarized as follows: this course aims to give learners a clear conceptualization of the basic issues surrounding the management of environmental resources in Nigeria. This will be achieved by aiming to:

- *Introduce* you the basic concepts of planning
- *outline* essential features of the Nigerian environmental resources
- *explain* some characteristics of our resource's
- *Discuss* common environmental problems to this resources.
- *Assess* the status of these environmental resources

Course Objectives

To achieve the aims outlines above, the course set overall objectives. Added to this, each unit also has specific objectives. The unit objectives are always included at the onset of each unit; you are expected to read them before you start working through the unit. You may wish to make reference to them during your course of study of the unit to guide your progress. Cultivate the habit of always going back to check the unit objectives after completing a unit. The essence of this is to ensure that you have done what was required of you by the unit.

Outlined below are the broad objectives of the course as a whole. When you meet these objectives you should have achieved the aims of the course as a whole.

When you have successfully completed this course, you should be able to:

1. *define* planning
2. *state* the major principles of environmental planning
3. *outline* some environmental resources in Nigeria
4. *mention* basic problems associated with our environmental resources
5. *relates* environmental management to human relations
6. *assess* the status of environmental management in Nigeria
7. *discuss* on the historical issues on the environmental resources in Nigeria
8. *evaluate* the efforts of non-governmental organizations in environmental resources management
9. *assess* government and its parastatals efforts towards environmental resources management in Nigeria

Working Through This Course

To end this course you are expected to read the study units and some other materials and resources made available to you by NOUN. These will work together in facilitating your learning. You are expected to undertake all practical exercises outlined in each unit.

Course materials

Major components of the course are:

1. Course Guide
2. Study units
3. Other resources

Study units

There are twenty study units in this course, as follows:

Unit l: Fundamentals of Environmental Resources Management

Unit 2: Historical perspective of Environmental Resource Management in Nigeria

Unit 3: Planning and process; Instruments in Environmental Management

Unit 4: Techniques for Effective Environmental Management

Unit 5: Natural Resources Management: An Overview.

Unit 11: Wetlands in Nigeria

Unit 12: Flood in Nigeria

Unit 13: Erosion

Unit 14: Desertification

Unit 15: Solid Waste: Definitions and problems

Unit 16: Solid Waste Management in Nigeria

Unit 17: Mining And Oil Exploitation In Nigeria

Unit 18: Oil Spillage in Nigeria

Unit 19: Gas Flaring Problems in Nigeria

Unit 20: Gas Flaring Management in Nigeria

The first five unit which is a module concepts on basic definition and components of the environment and the Nigeria topography. The next module is on climate and vegetation. The third module is on basic environmental problem in Nigeria while the last module is on waste, mining, oil spillage and gas flaring in Nigeria.

Each study units consists of about three hours of work and includes specific objectives, directions for study, references, commentaries on some terms, other resources and summaries of major issues and ideas.

The units direct you 'to work on exercises related to the require readings. Together with tutor-marked assignments, these exercises will assist you in achieving the stated learning objectives of the individual units and of tile course.

Assessment

There are two aspects to the assessment of the course. First are the tutor-marked assignments, second, there is a written examination.

At the end of the course you will need to sit for a final written examination.

Tutor-marked assignment (TMAs)

There are eleven tutor-marked assignments in this course. You are encouraged to answer all these questions.

Course overview

This table brings together the number of units an the tutor-marked assignments in this course.

Unit	Title of unit	TMA
1	Fundamentals of Environmental Resources Management	1
3	Planning and process; Instruments in Environmental Management	2
5	Natural Resources Management: An Overview.	3
7	Wildlife Management in Nigeria	4
9	Soil Resources Management in Nigeria	5
11	Problems of Forest Resources Management	6
13	Atmosphere: Global Warming and Ozone Layer Depletion	7
15	Air Resources Management Strategies	8
17	None-renewable resources management	9
19	Enhancing environmental management through human relations	10

How to get the most from this course

In distance and open learning, the study units replace the university lecturer. This is one of the greatest benefits of open learning; you can read and work through specially designed study materials at your own pace, and at a time and place that suit you best. Think of it as reading the lecture instead of listening to a lecturer. In the same way that a lecturer might set you some reading to do, the study units tell you when to read your set books or other material, and when to undertake an exercise or a practical step. As a lecturer might give you an in-class exercise, you study units provide exercises for you to do at appropriate points.

Each of the study units has a similar format. The first item is an introduction to the subject matter of the unit and how a particular unit is integrated with the other units and the course as a whole. Next is a set of learning objectives. These objectives let you realize what you should be able to do by the time you have ended the unit. These objectives are to be used as guide study.

On completion of a unit, go back and ascertain if you have achieved the objectives. If you have made a habit of doing this you will significantly improve yourself chances of passing the course.

The main body of the unit guides you' through the will usually be either from other sources. Some units require you to undertake practical exercise.

The following is a practical strategy for working through the course. When you need help, don't hesitate to call and ask your tutor to provide it.

I. Read this course Guide thoroughly

2. Organize a study schedule. See the course overview for more details

3. Once you have created your own study schedule, do everything you can to stick to it. The major reason that students fail is that they get behind with their course work. If you get into difficulties with your schedule, please let your tutor know before it is too late for help.

4. Turn to unit 1 and read the introduction and the objectives for the unit.

5. Assemble the study materials. Information about what you need for a unit is given in the `overview' at the beginning of each unit.
6. Work through the unit. The content of the unit itself has been arranged to provide a sequence for you to follow.

7. Review the objectives for each study unit to confirm that you have achieved them. If you feel unsure about any of the objectives, reviewed the study material or consult your tutor.

8. When you are confident that you have achieved a unit's objectives,. You can then start on the next unit. Proceed unit by unit through the

course and- try to pace your study so that you keep yourself on schedule.

9. When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When the assignment is returned, pay particular attention to you tutor's comments, both on the tutor-marked assignment form and also written on the assignment. Consult your tutor as soon as possible if you have any questions or problems.

10. After competing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed in this Course Guide).

MAIN COURSE

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Table of Content **Page**

Module 1

Module 2

Module 3

Module 4

MODULE 1

UNIT 1 FOUNDAMENTALS OF ENVIRONMENTAL RESOURCE MANAGEMENT

CONTETNS

1.0 INTRODUCTION

Environmental resource management is a key aspect in environmental studies. I therefore welcome you to the first unit of this essential course in environmental studies and management. This unit is expository on some fundamental issues and background discussion to this course and this programme in general. You will find it particularly interesting as it links and expose you to fundamental truths about the genesis of environmental problems and the need for the management of our finite resources.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- Define what a resource is
- Explain human interaction with to environmental resources

- Point out seven root causes of resource problems
- Explain the role of management in environmental resources.

3.0 MAIN BODY

3.1 What Is Resource

Environmental scientist perspective: A resource may be defined as anything we obtain from the earth's life support systems or environment made available by nature for survival needs. Every form of life requires resources such as food, water and shelter for survival and wel-lbeing. Resources may be classified as:

- Renewal
- Potentially renewable
- Non - renewable (Miller, 1999).

Renewable perpetual resources are humanly speaking inexhaustible. Examples include the sun's energy, winds, flowing water.

Potentially renewable resources can be replenished by nature fairly rapidly. Examples include fertile soil, biodiversity and several others. When the rate of usage does not exceed supply the availability is referred to as sustainable yield; where it exceed supply then environmental degradation sets in.

Non-renewable resources are exhausted at the rate of consumption and are not replenished. Hence, they can be used-up or exhausted. Examples include crude oil, natural gas, metallic and non-metallic minerals.

Environmental Economist Perspective:

A resource may be defined as a means in nature that is available for **supplying** living organism's **want**.

Minerals and fossil fuels are described as

1. stock
2. resource
3. reserve (Gurdeep, 1990)

1. The stock of a substance is the total amount of that substance contained in the environment, much of which will be inaccessible or unprocessable by present day technology. Crude oil would have fallen into this category before it was discovered. It was a mysterious

fluid until we learned how to find it, extract it and refine it into gasoline, heating oil and other products that could be sold at affordable prices. Thus, a stock may not be classified as a resource because:

1. It is not a means
2. It cannot supply living organism's want

This is a result of human limitations and not a deficiency resident in the material in nature. Human are yet to unveil its use as a mean of supplying want.

2. Resource is that part of the stock that could be used based on specified social, economic and technological conditions. Estimates of resources are dynamic and are based on economic (e.g., alternation in prices), social and technological changes (e.g. a new technology may increase the quantity of a resource).

3. Reserves are that part of the resource that can be tapped using contemporary technology under current economic and social conditions. Reserves may be further classified into proven, probable and possible recoverable reserves, all of which have been identified, but some of which will be Para marginal or sub marginal, and undiscovered reserves which are either hypothetical resources or specified resources, their location being unknown or known respectively (Gurdeep, 1990).

   Some resources, such as solar energy, fresh air, wind, fresh water, fertile soil and wild edible plants, are directly available for use by us and other organisms. Some other resources, such as crude oil, tin, ground water (water found deep in the ground), and some modern crops, aren't directly available. They become available for use when and if some effort and or technology are applied or employed.

Exercise 1.1

Make a list of some resources within your locality that can:

1. easily be found or located for use;
2. not easily located but by extra efforts, scientific or technological approach
3. also classify them on the bases of where they can be found e.g (1) land (2) water (3) air (4) forest

3.2 Human Linkage To Environmental Resource

The creation by man of his own world, in his own image, within the world of nature is found in Antiquity (Simmons, 1993). Right from the very recorded times, humans have realized that the planet did not provide an ideal habitat for them.

Why? You may wonder. From the Christian religious perspective, I think it may be due to the fall of human from the Garden of Eden (the ideal world) to "outside the garden" the undead world. Well this is just an aside.

You will realise that within the earth some parts are too wet, others too dry, too mountainous or too heavily forested for easy access to a livelihood. Part of these features could not be altered, but others could be modified. For instance, swamps could be drained, forest replaced by agricultural lands, and predators upon cattle, killed.

In Western Christendom, says Simmons (1993) this could, for instance, be presented as holy work: that is, either as refining a creation which was incomplete or as trying to return it to an Edenic state, because wastes and fearsome forest were tangible evidence of the fall.

Each human demands some inputs for survival, growth and reproduction. A full grown adult for instance, requires a daily metabolic needs of about 2500kca1 (men) and 2000 kcal (women) of energy, 60g of protein, several vitamins e.g. B-complex, C,. D and others, and 2 liters of water. These, together with some other basic human requirements (such as shelter, clothing and access to services such as medicine) call for materials which are garnered from the lithosphere and biosphere. When these and other resources have been used, any wastes are led off back into water, land and the atmosphere. In general you may wish to agree with the fact that humans, "milk" or extract material resources from their environment.

The Environment, (which we may also refer to as natural - as used in some text and a synonym we can use here) to human implies or can be regarded as a set of resources for human use. For the modern human apparently, if I may conclude it in this fashion, it (nature) has no more benefit than that.

In the process of exploiting nature (I prefer to use the word exploiting here because of human "madrush" on resources to his detriment), when there are difficulties then we look up to science and technology to provide a way out. Why not change human behaviour and give a breathing space to nature. For instance, why not change human

behaviour of destroying wetlands because it is a matter of social class to construct a home near a wetland, river or sea.

Human have continued to reject therefore, the suggestion of nature which says limit your negative attitude and activities towards the environment. Rather than listening to this voice of nature we prefer that of human ego which says we must have control over nature. Simmons (1993) beautifully expressed my idea of human ego over nature "as being instrumental, since no-human nature is viewed as an instrument" particularly aimed at gratifying human's selfish purposes. Selfish because very often we are totally inconsiderate of other organisms within the environment. This-is common in less developed countries (LDC) and it is very true of our country - Nigeria.

Conclusively, human must realise that our environment - mother earth has limits. There are limits to growth: that somewhere there must be physical limits to the quantity of resources that can be produced, the amount of wastes that can be absorbed by environmental systems, and hence there are limits to the number of humans that the planet can support. This perception is tagged environmentalism.

3.3 Root Causes Of Resource Problem

What the previous section has done is to trace human as the one responsible for the environment resource problem.

This section will however, point out some of the key causes or factors that human have contributed either directly or indirectly to environmental resource problems.

Environmentalist have tried to outline these root causes to include the following:

1. Population explosion around the world
2. Poverty which has made poor people to rapidly deplete potential renewable resources, unattainably and expose them to health hazards
3. Political and economic failure to stimulate environmentally friendly policies, actions and development.
4. Parts of the earth's life support system are being simplified and degraded. Thus rendering them potentially low
5. Pollution and waste are on then increase, coupled with rapid and wasteful use of resources without adequate preventive measures
6. Pursuit to dominate, control and manage nature for human desires without adequate knowledge of complex interconnectivity of activities in nature.

Modern science and technology. have been human latest instruments . That is why nature reacts without our ability to control or predict its reaction as a result of some alternations in nature due to human activity. Example is the use of chlorofluorocarbon (EFC) which has been in use since the 1940s and 1950s. It has been linked to the destruction of the ozone layer which protects life on earth from dangerous ultra-violet radiation. For decades this problem has being there, and we are still battling with its consequences.

4.0 CONCLUSION

Humans are at the root of the current environmental problems the world is passing thoroughly. This is a fact we are all aware of but we now find it difficult to believe that the consequences of our negative attitude and actions towards the environment are threatening our survival today. For instance, there are people today even, in learned societies like the United States of America, who would not agree that global warming is a consequence of human negative activities on the environment. Their disagreement is not because they are non-literate but a matter of conviction, perhaps politics or economic reasons.

Except we begin to have a rethink and reshape our activities that are anti –environmentalism, nature will react perhaps not just against you and I but against our innocent grandchildren who never had a bit of Adam apple "that led to the consequences of son" against the environment. The "wages of sin" the Bible says "is death" - "death" perhaps not for the guilty but his grandchildren and beyond. Remember nature will always win no matter how long.

5.0 SUMMARY

This unit has within its limit, defined and explained what resource is. First, an environmental scientist perspective and secondly from an environmental economist perspective. Explanations were made on these definition and resource were classified as renewable, potentially renewable and nonrenewable.

Humans were traced to the global problem of environmental resource. This is as a result of the quest to meet human desire and to dominate, control and manage nature. However, unfortunately several environmental problems are the consequences of human's negative and activities which have been traced by environmentalist to include about six causes (see section 3.3).

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UNIT 2 HISTORICAL PERSPECTIVE OF ENVIORNMENTAL RESOURCE MANAGEMENT IN NIGERIA

CONTENTS

1.0 INTRODUCTION

As you begin to study this unit, bear in mind you are learning more of history. This will take you to historical issues, facts and dates related to environmental management especially in Nigeria. Study it systematically and patiently. Take note of events surrounding the periods or era that will be explained or discussed in different stages of phases. Historical environmental management of Nigeria is here discussed from pre - colonial days to date:

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- Discuss the genesis of Environmental management in Nigeria
- Explain the ideas of schools of thought on Environmental management in Nigeria
- Outline the phases of historical development in the classical period in Nigeria

- Identify the states of development in the Neo-Classical - period in Nigeria

3.0 MAIN BODY

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3.1 History of Resource use: A global perspective

Humans view the environment as:

1. **A resource bank** that supplies them with the raw materials needed to maintain their existence. These include food, water, energy, territory and the materials to build shelter. Human also need resources and energy to maintain social and technological structures.

2. **A habitat** that provides enough space for individual than any other species.

3. **A sink** for wastes which include things as excreta, dead tissue, trash, smoke and molehills. We humans leave more waste than other species (Harrison, 1992).

However, the world has not being significantly the same since 10,000 BC and much of that change has been at human hands. The complex nature of these changes are great. For instance as you look out of a window on a 30minute journey in most part of the globe and endeavour to identify all the ways in which what you see is made by humans greatly seeking for resources and not the provision of a pristine nature. For the present purpose, we are going to assume that the power to get a living from our natural surroundings and to change them is conferred by the success of human cultures in getting access to energy and that the levels of energy use are a surrogate for levels of resource use.

3.1.1 Hunter-gatherers and environment

The activity of hunting and gathering by their very nature change plant and animal populations. But the pressure exerted upon the populations is usually such that if humans leave, then the biodata return to their previous levels. It is in the humans' interest, too, that their exploitation should never exceed their resource supply. It implies that human should practice a type of management for sustained yield.

Through history some groups seem to have had ways of making sure that they did not over-used. Plant and animal sources. Whereas other did not, relying perhaps on their own very low population densities to bring about only minimal effects (Simmons, 1993). An animal population under natural environmental stress may not be able to cope with human hunting

pressure and this may become extinct. This seems to have happened in several places throughout the world.

3.1.2 Industrialism And The Environment

The advent of the use of fossil fuels gave societies many tools with which to affect their surroundings. The immense energy surpluses made available from coal, oil and natural gas could in part be channeled into getting at more and more resources progressively in accessible places. Hence the advent of industrial society spread. However, the spread has become more intensive in the heartlands such as Northern Europe, North America and Japan. Thus, we can envisage the environmental consequences of industrialization as a core and periphery model. We can imagine a turn of the century industrial plant such as, a large coal mine or perhaps a coke works or steel mill. The local environmental impacts of these are dominated basically by the change in land use, and the local air and water which are polluted in plumes moving downwind and downstream from the plants (Simmons, 1993).

3.1.3 Nuclear Period

The scenarios for "nuclear winter" is an index to the devastation to our environment that would be caused by even a modest 5000MT exchange of thermonuclear weapons. The experience at Chernobyl and other accidents have also made us to be aware of the potential for nuclear contamination in the civil sphere. We have to recall that planned releases of radioactivity also take place during the nuclear fuel cycle: the sediments of the Irish seen is an instance of the highest concentrations in the world of such materials outside direct human control (Simmons, 1993). –

None need doubt, therefore, that the earth we currently inherit is mainly man-made at the land surface, and to an extent above this surface including parts of the oceans. Still the fundamental fact is that biogeochemical flows and cycles of energy, carbon and nitrogen are still the basis of the human life-support system. We may have greatly modified nature, we have by no means been able to replace it.

3.2 Genesis Of Environmental Management In Nigeria

Environmental management in Nigeria is as old as Nigeria herself, however, 1900 has been mentioned as a modern date of its development (Jaja, 1995). On the 22nd of January 1900, Sir Ralph Moor's administration in southern Nigeria issued a policy circular no. 87 on the management of the environment. The circular was based on conservation and payment of royalties to local leaders in southern Nigeria. Several

other rules on forest management were enacted and enforced by forestry inspectors who also became government's advisers.

By 1906 the forest reserves system had been formalized, -five prominent ones are;

1. Olokemeji Reserve
2. Ibadan Reserve
3. Mawa Reserve
4. Illaro Reserve and
5. The Oshun River Reserve.

This same year, game, reserves were approved, the first three were in Edo, Anambra and Cross River States. They are Gwato Game Reserve, Anambra Greek Game Reserve and Oban Hills Game Reserve respectively.

3.3 Environmental Management In Nigeria; Schools Of Thought

There are various schools of thoughts associated with when environmental management began in Nigeria.

The first school of thought says environmental management in Nigeria began as a novel development. This school of thought may be termed as the **MONISTIC School of thought**. They advocate that environmental management in its proper sense, began in Nigeria just recently, since the post-Nigerian civil war days (Jaja, 1993). Any thing done before then in the name of environmental management was considered as waste and devastation of Nigeria's environmental resources only for the benefit of the industrial revolution in Europe.

The second school-of thought emphasises the relevance of the past for the benefit of the present. This school of thought may be termed as the **DAULISTIC school of thought**. Individuals in this school regard both the past and the present as complementary in many respects. A student (Sada) of this school of thought summed up his views and perhaps those of others recently by dividing the management in Nigeria into two broad phases.

1. the pre-development phase: 1900 - 1945
2. the development phase: 1945 – 1985

Agboola a student of this school sees no remarkable differences between environmental awareness of the past years and those of modern times except the inclusion of the environmental sub-sector concerning

"environmental planning and protection" in Nigeria's Fourth Development Plan.

Dualists are of the view that the problems of environmental management in Nigeria are basically buried in the colonial past. The past and the present, they say, are relevant and must be viewed as such oifany further meaningful development in environmental management is to be achieved.

You may have noticed a difference between the **monistic and dualistic** schools of thoughts. The former views the post-civil war's environmental management **one way perception** the latter views pre and post colonial days (**two way perception**).

However, Jaja (1995). observed that the dualistic school of thought may be misleading in the sense that it fails to provide an opportunity for drawing attention to the salient fact that Nigeria, like other developing nations of the world, has not yet reached the third phase of environmental management which is referred to as the system phase.

The third school of thought is the Holistic or three dimensional school of thought. This school views management, including environmental management as existing in three phases of development (Jaja, 1995). These are the early phase, the later phase and the last or the most developed phase. The last phase is the systems phase being used in developed nations.

3.4 Historical Phases of Environmental Management in Nigeria

Environmental management in Nigeria historically, may be grouped under two phases. However, environmental management globally has grown to three developmental phases. These phases are:

l. classical
2. neo-classical
3. systems

Nigeria is currently in the second phase (Jaja, 1995). In this section we shall discuss the first two phases in relation to its historical progress in Nigeria i.e. classical and Neo-classical phases.

3.4.1 Classical Phase

This phase has three basic developmental stages:

Stage one: 1900 – 1914

In its simplest form, environmental management was established between 1900 - 1914. The techniques at this time include the use of autocracy, rules extreme de-centralisation; imposition of imprisonment with no option of fine at the slightest breach of the rules.

For instance, three Forest Guards were sent to prison for extorting money from local people in Calabar.

Environmental management effort was directed to urban and rural development which included, among other things, housing, building lines control in European Reservation or Government Reservation Areas, environmental sanitation in the urban and rural areas; control of open spaces; control and management of industrial sites, mining site and several other areas.

Stage Two: 1914 -1936

During this period, environmental management was neither focused on any planned development programme nor on a systematic management process. They were centralized and controlled from Lagos following the amalgamation-of southern and Northern Nigeria in 1941. Four sectors were identified and controlled centrallys these are:

l. agriculture
2. works services and general administration
3. industrial
4. social and environmental education.

In the agricultural sector, forest reserve establishment became a national programme. Other sub-sectors include forest conservation, forest regeneration and soil conservation projects. Projects such as management of parks and gardens including village plantations through local chiefs and native Administration (Kirk-Greene, 1970) were subsumed under this section. Others are wildlife conservation and preservation, irrigation and dams.

The works services and general administration sector assisted in the direction of environmental management to ensure efficiency in road construction, building drains and bridges in a form that assures safety to traffic and reduced the incidence of flooding. Damage camps were

constructed at considerable distances and every road labourer was assigned a minimum of three miles to maintain on the road by cutting of tufts, grass on both sides of the road and by earth-filling of port-holes or coal tarring of minor breeches on roads.

The works department cleared and maintained all waterways either directly or through the native administration or local chiefs. Sea and river banks were protected by means of breaks, in Calabar, Lagos and Port Harcourt. Dredging of seas and rivers particularly in major port towns were carried out to ensure navigable waterways, free access to port services and less danger to shipping, marines and stevedores (Jaja 1995).

At this period, industrial pollution on the sea, air and land was apparently uncontrollable. Management of effluents into the seas, rivers, lakes and other water bodies had almost no attention.

Will it be out of place to say this is ignorance or limitation of this generations knowledge of the consequences of pollution of water bodies?

Distribution of chlorinated water was popular only in large cities with few communities benefiting from it. Noise pollution was unchecked in the non-European areas but was totally banned in the Government Reserved Areas (G.R.A.).

This period marked the spring-up of environmental management institutions. Example includes: forestry school, Ibadan and the temporary forestry school, Zaria.

Stage three: 1937 – 1950

Stage three marked a period of consolidation for environmental management. - Planning was integrated for effective , environmental management. This stage may be divided into two other steps.

Stage three - phase one: 1937 -1945

Isolated planning was notably employed in this phase, of note was the planned forestry development scheme of 1937. This time, forestry programmes and environmental management were closely planned and integrated to a considerable extent to achieve better success. A policy was formulated that 25% of total land area should be constituted into forest reserves throughout Nigeria.

Table 2.1 below gives a summary of Forest Reservation programme in 1937 for Nigeria.

Table 2.1

(a)	Southern province West				
	Forest Circle		Forest Division	Area Reserved a	Area proposed b
1	Western circle	1	O yo	-	1,682
		2.	Abeokuta	417	160
		3	Ijebu ode	596	-
		4	(Ibadan Hq. Ibadan Ife	675	70
2.	Ondo Circle	5.	Ado Ekiti	85	30
		6	Owo	389	171
	'	7	Ondo	753	288
3.	Benin Native	8		1,194	1,477
	Administration	9			
	Circle	10			
4	Ishan Warri Circle	11	Ishan	80	453
			Creeks (Warri		
		12	Province and Okitipupa division	35	170
5	Onitisha-Ogoja Circle	1	Onitsha	156	208
		14	O o'a	1,105	294
6	Calabar Warri Circle	15	Owerri	401	429
		16	Calabar	1,999	164
	Cameroon				-
8	Kabba-Benue	1	Kabba	2,000	367
		2	Benue	60	1
9	Ilorin-Niger	3	Ilorin	5	495
		4	Niaer	-	-
10	Sokoto	5	Sokoto	4,145	2
11	Zaria	6	Zaria	211	210
12	Bauchi-Plateau	8	Plateau	29	13
		9	Bauchi	707	-
13	Kano	10	Kano	34	-
14	Borno	11	Bornu	8	-
15	Adamawa	12	Yola		

Source: Sessional paper No. 38 of 1937

This arrangement became the model for forest reservation, forest conservation and protection throughout Nigeria. Thus, this policy was to

be employed to check urban and rural development schemes, industrial sites, roads, agricultural and property development in Nigeria until Nigeria's independence in 1960.

Forestry programme and their associated environmental management strategies were grouped into three zones:

1. the south
2. midland
3. the North

Each zone had Zonal Development Board to consider and regulate matters of common interest to all the component provinces in a zone.

Between this period (1937 - 1945) the Forestry Action Plan for Nigeria became the most important single organ for implementation and management of Nigeria's environment. This blue print divided Nigeria into three main belts of reserves and pointed out the strategies for environmental management in a micro sense in the three zones.

In the southern zone, all mangrove forests, timber concessions, forests or hilltops and steep slopes were reserved as long as the approval percentage was not exceeded forests were classified into forest reserve and subsumed in the environmental management schemes. Village plantations were established through the effort of the local chiefs, emirs and their native administration based on the ratio of one acre to every five to ten adult males in the areas conserved.

The North had all Geza and Fakakaya lands constituted into forest reserves. All farmers were mandated to separate their farmlands with hedges and drought resistant trees. Every individual was mandated to plant economic and shade trees along boundary lands, frontiers and erosion prone zones.

The Action Plan, - aside from erosion control measures, provided for control of bush fires, protection of further or boundary lands and defacement of the plan by legislation.

Stage three phase two: 1946-1950

This phase marked the approval and implementation of the first limbs of the 10 year plan of development and welfare for Nigeria. Nigeria was lunched into the phase of planned, development and environmental management. The four sectors already identified formed important components of the 24 .major schemes in the plan (Jaja, 1985).

3.4.2 Neo-Classical Phase

This period of environmental management has being in Nigeria from 1951 to date. This phase will be sub-divided into three other periods, to enable you have a clear and systematic understanding of this period. These are:

1. 1951-1959
2. 1960-1987
3. 1988 to date

This phase possesses some features which include, according to Jaja (1985).

1. change from classical management procedure to human relations approach
2. employment of human relations strategies
3. medium term planning strategies
4. popularisation education and environmental education
5. emphasis on environmental management on a wider framework
6. introduction of the War Against indiscipline (WAI)
7. the birth of the Federal Environmental Protection Agency, which later led to the establishment of other Environmental protection Agencies (EPAs) in the country.

The period (1951 - 1959) is of significance because it marked the major turning point in the process of Nigeria's development generally. Former structures for environmental management remained basically in place except that Departments became Ministries and new corporations were established to replace civil service functions.

Between 1960 - 1988, there were four Development Plans that influenced environmental management after independence. The first post independence National Development Plan (1962-68) had the Federal and state Governments placing emphasis on environmental management. Industries were beginning to emerge but little or no attention was paid to pollution control, deforestation, soil erosion control, flooding and control of slum.

The second National Development Plan initially designed to serve the post civil war objectives of reconstruction, rehabilitation and reconciliation however, assisted financially the four main sectors concerned with environmental management.

The Third Development Plan in Nigeria (1975-1980) provided more funds for health and sanitation, water supply, sewage, flood management, erosion, irrigation as well as infrastructures for environmental management. For the first time, eleven River Basin Development Authorities were set up with responsibility to plan, manage and control agricultural lands, irrigation, food production, flood and erosion control.

The Fourth National Development Plan (1981-85) also emphasized the four identified environmental sectors mentioned earlier, but added another sub-sector "environmental planning and protection". This forms the background to several major developments which touch and concern environmental management in Nigeria. Six of them that are important are:

1. emphasis on environmental planning and protection designed to check ecological imbalances with serious immediate and future consequences.

   These guidelines are:

   (i) the loss of the erosion control, cooling, shading and water-shed protection effects provided by trees, when they are indiscriminately cut down to permit urban growth.
   (ii) The conservation of flood problems and destruction of important wildlife habitats and natural communities, when marches and other wetlands are sand filled.
   (iii) The terracing of hillsides without vegetation, increased erosion and sedimentation, cause foundations to crack, and occasionally result in severe mudslides.
   (iv) Serious withdrawal of underground water in coastal areas allows intrusion of salt water in domestic water supplies.
   (v) Business organisations are stimulated to establish industries in urban centres with little consequence of water, air and land pollution.
   (vi) Smoke stacks and tailpipes pollute the air, and industries and communities discharge untreated wastes into water, with serious effects on human health, vegetation, wildlife and property.

2. The second major development was the emphasis on the need for a national environmental planning and protection policy. It was produced and lunched in 1988.

3. The third development plan which emanated from the second, is concerned with articulated goals, the need to formulate and produce for guidance of implementing ministries, departments and other agencies connected with environmental management, As earlier articulated statement of national goals on environmental management had remained for long unfulfilled.

4. The fourth major development was the establishment of a co-ordinating national agency, the Federal Environmental Protection Agency with specified goals and objectives. The essence of setting up this agency was to meet the needs and fill the -gap left by the defunct provincial Development Communities, Area committees and the Development Board of the 1930s and 1940s.

5. The fifth major development was the direct involvement of Nongovernmental organizations in environmental management. Worthy of note are oil companies, the World Wide Fund for Nature (WWF) based in Britain and the Nigerian Conservation Foundation (NCF) to mention but a few.

6. The sixth important development was the birth of Environmental Education. Although this had being out before but from 1990 a full-blown campaign on Environmental Education had been integrated into the Nigerian University Diploma and Degree programmes. Some pioneering institutions involved include Lagos State University, University of Calabar and University of Agriculture, Abeokuta.

4.0 CONCLUSION

This unit has been able to trace the historical development of environmental management in Nigeria. The idea of environmental management has been in Nigeria from as early as 1900. However, the form in which it takes vary from colonial and post-colonial days.

Environmental management has undergone various stages and processes which had contributed one way or the other into the development of improved environmental management policy and practices that are operative in Nigeria today. Without passing through these process we may not have gotten to where we are today. Yet there are several grounds uncovered in the area of environmental management both in policy and practice.

5.0 SUMMARY

You have just concluded unit two on the historical development of environmental management in Nigeria. You have learnt about how and when environmental management began in Nigeria, the schools of thought on environmental management in Nigeria and the different phases and processes of environmental management in Nigeria. That environmental management began in an old fashioned manner and it has developed to the second stage (Neo-classical) relative to the third (systems) stage that is currently in operation in developed nations of the world. The next unit will focus on planning and process as instruments for environmental management.

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UNIT 3 PLANNING AND PROCESS: INSTRUMENTS IN ENVIRONMENTAL MANAGEMENT

CONTENTS

1.0 INTRODUCTION

This unit will expose you to the basic concept of planning and especially as it relates to environmental management. Planning modes will be discussed and the relationship between planning and political power with respect to environmental management will be discussed. An outline summary of the principles of environmental planning will be made to aid you in your environmental planning as an environmental manager. Ensure you apply these principles and processes in your activities.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- Explain the concept of planning
- Outline three complementary modes of planning
- State the principles of environmental planning

3.0 MAIN BODY

3.1 The Concept Of Planning

Planning is a process of quickening the pace of natural evolution by rational action.

Planning is a technical instrument, a process and an end result. It is a concrete systematic outlined strategy mapped out in advance to guide present and future actions. Thus planning must be strategic in vision, pulling from past experiences to build the future (Uchendu 1995). Therefore you would realize that planning is essential in achieving modernity - no nation is developed today without adequate visionary

planning. Planning compels society to decide what should be done at present in the light of the best estimate of how the future will look based on available resources.

Planning as a process leads to end result, usually called a plan. The plan is tentative/temporary and problematic and thus subject to review (Uchendu, 1995).It involved intentionally, reasonable sense of direction and coordination of human activities. It is made to achieve a set of policies. Planning consumes resources and an effective planning also produce more resources as it consumes.

Human is the most fundamental basis for planning - for comfort and wellbeing for now and future generation.

3.1.1 Planning Mode And Managerial Process

Planning theory recommends three complementary modes, which can be modified to environmental management: the entrepreneurial mode, the adaptive mode and the generic planning mode.

1. The entrepreneurial mode of environmental planning is designed by an active search for new planning opportunities to stabilize the environment; the centralization of power and resources in a particular planning institution and the ability to take risk with the environment.

2. The adaptive mode of environmental planning is a reactive rather than proactive strategy of environmental management. Planning in this phase lends itself to negotiation as a step of confidence building and education in all matters involving the resolution of disputes of environmental goals.

3. The generic-planning mode involves anticipatory decision-making, a decision rule and amend-result. It conforms to Herbert Simon's characterization of a rational decision-mode which involves an intelligence activity or the search for relevant information; a decision activity or the classification of the available information into suitable lasses; and a choice activity or the selection of the best option from the alternatives available.

Now let us consider another important aspect of planning - as a managerial process.

Planning is also a managerial process. The managerial process is a tool that aids the executive to identify environmental problems and establish attainable goals for each of them in the light of available resources. The manager directs the attention of the executive to critical decision-points

and the needed administrative action in the planning cycle (Uchendu, 1995).

Environmental management requires not just planning but the basis upon which objective evaluation can be made of the degree of success or failure of management performance. This type of measurement should include evaluation of the clients involved in the project; the project characteristics; the nature of the change introduced; and the kind of feedback received as to the progress made and how far they reflect the set goals.

Planning as a process involves programming, auditing and information support systems. The programming process demands policy formulation and articulation. It means a re-statement of environmental policy in a manageable way, the collection of dependable data and workable theory of action to guide the use of data. Environmental planning procedures should state the measurable goals to be attained, when and how they can be attained in the light of the resources available. It must articulate the environmental issues facing the target community at the present time and in the foreseeable future and the "entry point", that is, where planned action should be targeted, given the opportunities available and the limitations observable. Implementation, as the day-to-day management of an environmental plan may be defined as an important part of the programming component. It should have a calendar of action, which includes the start-up time, specific time frames for service delivery; the monitoring of activities to ensure readiness and the levels of compliance and possible reprogramming in the light of the feedback received.

Managerial auditing is an instrument for executive information and control. The purpose of planning. is to specify performance, ahead of time. Managerial auditing should tell us how far, stated objectives are being met. This of course requires that resources be preferentially allocated according to set priorities and that evaluation procedures reveal the relevance of the policy and operations. Evaluation is the opposite side of the information support system. We evaluate in order to it uniform. A successful environmental management demands that critical information be available and made accessible to critical management operators on timely basis.

3.1.2 Planning And Political Power

Planning cannot be removed from politics, because of resources. This raises questions about power in the planning process: how political

power shall be be used and distributed among individuals and groups who claim legitimate interests in the end products of planned change; and how the cost or burden involved in "planning change" is to be borne. Please, dear readers understand that the first obligation in environmental planning, and in fact in every planning process, is not administrative but legislative. Legislative action involves the consideration of policy. Policy consideration is not just a technical exercise but a value-laden one in which public interest, culture, tradition and non-material elements of culture enter into play. "What kind of Nigeria or environment do we want to live in?"

This is a policy question, which does not just require a technical answer from an environmentalist like you and I. It demands the community view of "good life".Does it include a healfhy, sustainable environment? It is the community that must legislate this through balances of forces and compromises, which it must make. If the democratic solution is found inadequate, it is always open to re-legislation. Community involvement is therefore indispensable to environmental planning.

Although planning involves the exercise of power in a legislative sense, planning is also a technical, professional exercise, demanding technical analysis, rational choice based on the results of the analysis and the co-ordination of policies by mean's of a plan. Planning is premised in the belief that a positive change can be brought about or accelerated by governmental or community intervention. This means bringing "intentionally planned and rationally co-ordinated policies" to bear on an agreed environmental problem so as to move it to a desired direction. (Uchendu, 1995).

Planning as a rational instrument of environmental policy involves concrete steps designed in advance, to manage the intended side effects resulting from policy intervention. A sound planning theory should also anticipate some of the unintended effects of planned change.

Planning as a strategic action is future oriented in two senses. It projects a desirable future event from present and past experiences; and it tries to bring the future events into being at a cost that the people can bear. In effect, planning draws from the past to build the future.

Exercise 3.1

Meet with at least:

(1) 2 community leaders and
(2) 5 local residence, with your community.
Find out what kind of environment they want the community to look like.

3.2 The Concept Of Environmental Planning

The term `environmental planning' -may be globally referred to as the process of formulating, evaluating and implementing environmental policy. As simple as the definition is, it serves to hide a lot of interpretations of environmental planning which may be variously interpreted as the *technocratic, professional and political views* of the process. There are, of course, interactions between each of these interpretations, but each represents a distinctive way of looking at the processes of environmental policy and management.

Technocratic interpretations of environmental planning refer to an understanding of the process which gives precedence to the scientific knowledge deemed necessary to understand and thus manipulate natural biophysical and ecological systems. The approach does not deny the importance of the socio-economic environment within which these processes might be managed or planned, but it does tend to emphasize the importance of technical approaches and solutions. As might be expected, this approach places greater emphasis upon rural and natural environments than upon urban, built environments.

Our second category of *professional interpretations* encapsulates a rather different approach to environmental planning. Here we are referring to the responses of established professional groupings to the rapidly expanding environmental agenda and the associated sources of employment and prestige.

Although some other professions, for example environmental health officers, are currently seeking to be known as the pre-eminent `environmental' professional. It is the town planning profession which has been most effective in this respect in its search to move from town planning as its cognitive base, to a more ambitious notion of 'environmental planning incorporating a much wider policy statement.

It is by no means clear that a profession based on land use and a tradition of town design has the epistemological competence - the necessary skill and knowledge base - to justify its claims. As has been argued elsewhere, it is unlikely that any one occupation group will be able to legitimately claim the breath of wisdom and experience, and the theoretical knowledge necessary to oversee the whole of the policy field implied in the designation `environmental planning' (Evans 1995).

The final view of environmental planning that we wish to consider is the political interpretation. Here, the long-term objective of sustainability is linked to a policy process of environmental planning. The clearest expression of this position is that articulated by the Town and Country Planning Association (Blowers 1993), who argue that the only way of dealing with the complexity of environmental questions is to adopt an integrative, holistic policy approach which transcends established departmental and professional boundaries. This interpretation of environmental planning sees it as a set of arrangements for formulating, organizing and delivering policy with the objective of securing environmental sustainability.

3.3 Principles Of Environmental Planning

Planning principles cluster around three dimensions: design concepts, a design framework; and scenario construction and application (Hancock, 1980:111-117).

The design concepts constitute the intellectual component of planning. The following questions should be asked of the design component:

- How theoretical should the planning design be? The rule of the means should apply. The plan should neither be too theoretical not atheoretical.

- How far should external planning models impose themselves on any plan? The more the plan is based on local realities, the better chance it has to succeed or be accepted.

- What should be the focus of the plan? The focus should be determined by the context. Environmental planning is not an opportunity for education planning or vice versa. There are obvious inter-linkages; but they should not be over-drawn.

- What is the relationship between planning and technology? Planning should not over-stretch the available technology nor shoul. it ignore appropriate technologies.

The design framework is the theoretical structure of planning. It should address such issues as:

- The degree of flexibility and adaptability of the plan and the capacity of the plan instruments to monitor plan behaviour at various stages.

- Whether clear and precise and attainable objectives have been set, given the resources of manpower, material and funds available.

- Whether the plan relates to other important sectors of the environment.

- Whether the plan is based on realistic needs assessment of the target groups.

- Whether there is adequate data base and how far its acquisition has been built into the design.

The ‘scenario construction and application’ deals with the "choice" tripod of the planning process. The final product of a planning process is the plan. A plan represents the choice made out of other competing alternatives.

Let us apply Herbert Simon's (1860) Decision Theory to a planning framework. Planning is like decision-making. Both involve a three-fold activity: an intellectual activity; a design activity; and a choice activity. There are three possible ways of exercising a programme choice. The judgment of the decision-making or the risk bearer, made on the basis of past experience or intuition, is one way. The other way is by analysis of the alternatives presented in the design. The third option is by bargaining, an obvious strategy when parity power is involved or as in environmental matters, when multiple, or intangible interests are at stake.

Scenario construction involves people and their values. It is descriptive and prescriptive rather than analytical. It stresses the following values which are normally embedded in planning:

- In planning, people are more important than techniques. Over centralization of planning tends to cut off relevant local decision-making interests.

- Planning should normally maximize existing infrastructure and involve local talent who will carry on with the job when the professional planner departs.

- There is need for organisations to maintain the continuity of their planning teams and personnel and ensure that they update technical knowledge through a programme of continuity education.

- Every planning process should be allowed adequate- time for the execution of assigned activities

4.0 CONCLUSION

Environmental Management cannot be on the move without the process of planning. The processes of planning are the instruments that make and keep environmental management on the move.

Every environmental organisations, be it government, non-governmental or corporate must employ environmental planning principles to be able to make significant progress in order to achieve effective conservation and management of natural resources and the environment in general. There are no alternatives to the processes of environmental planning and principles. If we fail to employ them, we are planning to fail no just ourselves but future generations to come.

There are countries today, whose past generation did not fail the existing generation, just because they employed appropriate environmental planning principles and that also on time. What will be your contribution to the Nigerian Environment - to milk it or to make it? Those who have milk it made money out of it, and messed it up. For you and I we are to make it, make the Nigerian environment what it ought to be, and make a name in this generation and several ahead.

5.0 SUMMARY

So far we have discussed planning and processes in- environmental management. The concept of planning was explained in detail. Three modes of planning were outlined and managerial processes were discussed.

The concept of Environmental planning and the principles of environmental planning were articulated. The next unit will discuss on the various techniques for effective environmental management.

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UNIT 4 TECHNIQUE FOR EFFECTIVE ENVIRONMENTAL MANAGEMENT

CONTENTS

1.0 INTRODUCTION

This unit like the previous one will assist you in learning and developing very good background knowledge on environmental management. There are several techniques that are applicable in environmental management. However, in this unit seven of them are discussed which if applied in Nigeria will go a long way in assisting environmental management in Nigeria. These techniques are:

l. legal and policy technique
2. centralized technique
3. equilibrium technique
4. flood and erosion prevention and management technique
5. water supply technique
6. environmental impact assessment technique
7. environmental information and technology technique

2.0 OBJECTIVES

By the end of this unit you should be able to:

- state techniques for effective environmental management
- explain how these techniques can be applied to improve the effectiveness of environmental management in Nigeria.

3.1 Legal And Policy Technique

There are several laws and policy on conservation, wildlife protection and other aspects of environmental management in Nigeria. Some of these laws were made before the establishment of the Federal Environmental Protection Agency in 1988 (FEPA).

The Agency (FEPA) which came into being shortly after the koko waste dump of 1988 is charged with the responsibility among others, for maintaining national environmental standards. It is also empowered to make recommendation to the Ministry for the establishment of water quality standards, to protect the public health or welfare and enhance the quality of water.

The Agency also has power to establish effluent limitation for new point sources in industries which shall require application of the best control technology currently available, as well as for existing point sources which shall require application of the best management practice under circumstances as determined by the Agency (Olomola, 1998).

Under section 20(1) of the Decree, the discharge (in harmful quantities) of hazardous substance into our air or upon the land or into our waters without permission" or authority is made a criminal offence. The penalty for violation for this provision is a a fine, not exceeding N100,000 or 10 years imprisonment or both; if a body corporate, the fine on conviction is N500,000 and an addition of N1,000 for everyday the offence subsists.

We must note here that contrary to what obtains in the `pre-Koko' provisions, penalties for pollution under the Decree have been greatly beefed up but we need to say that these penalties can be further increased particularly, in the case of companies. Also appropriate provisions have been made in the Decree for the role of an Agency in the control and management of pollution generally. The question really is, how equipped or prepared is the Agency for this task.

Lastly on the FEPA Decree, we wish to mention the provisions of section 21 of the Decree which relates to oil spills or blowout. The section provides for additional liability of owner or operator of any vessel or onshore offshore facilities from which hazardous substance is discharged. The owner or operator apart from the penalties under section

20 bears the full responsibility for the cost of removal or restoration of the natural resources damaged or destroyed by the discharge. The liabilities of the owner or operator for this, is to any Government body or Agency.

Of interest here also is the liability of such owner or operator of the vessel or facility for: "costs of third parties in the form of reparation, restoration, restitution or compensation as may be determined by the Agency from time to time."

Thus under section 21 of the Decree, a person or company responsible for the discharge of hazardous substance into the Nigerian waters can, apart from the criminal sanctions be made either by a Government Agency or a third party to pay conpensations. We however believe that in the case of liability to third parties under s.21(1)(b) of the Decree, the Agency (FEPA) should not be made to the determining authority as regards the amount recoverable and that the section should be amended to make it possible for such third party to be sue the person or company responsible for the environmental damage directly.

So far, no court has been set up specifically to aid FEPA in the implementation of its onerous task as it is the case in America, Canada and other advanced countries (Jaja 1985). There is need for an Environmental Court with defined authority to act on the spot. Do you agree with this position?

3.2 Centralized Technique

Nigeria is similar in the steps of America with reference to the establishment of a Federal Environmental Protection Agency, a Council on Environmental Protection, promulgation of a National Environmental Policy and the National Guidelines on Environmental Protection (National Environmental Policy Act, 1973; national Environmental Protection Act, 1969). But, Nigeria unlike America and Canada has not placed the Agency directly under the Office of the president (America) or the Prime Minister (Canada). This bold step is very essential in order to remove the ambivalence that now seems to exist between the Agency and other ministries. Furthermore, the Federal Environmental Protection Agency is a Federal institution that has no authority over state environmental protection agencies. Consequently, state EPAs operate as independently as they can and merely look up to the Federal Government for funds and technical support. . This is a very regrettable situation which must be halted at once. There seem to be two options that are open to the Federal Government. First, it may make the Federal Environmental Protection Agency, a Federal institution that is state implemented or set up the Agency Board in every state with restricted but defined powers

like the Federal Revenue Court. The states and local governments will be authorized by law to set up state Boards and Committees to perform the remaining function not covered by the Federal Government laws. This latter arrangement may be criticised because it may give rise to duplication of functions. This criticism may be met by the view that the Federal System of High Courts and State High Courts now exist side by side in every state without duplicating functions. What is important, it seems, is to streamline their individual roles. Environmental management problems in Nigeria have now reached alarming proportions. Any strategy adopted to broaden and decentralize the scope .of institutional actions and functions may never be misplaced. (Jaja, 1995).

3.3 Equilibrium Technique

This strategy has various facets. A few of them will be discussed in this unit.

3.3.1 Industrialization And Deforestation

The rate of deforestation in Nigeria is phenomenal, this issue has been discussed in various literature and research findings.. There is need to strike equilibrium between the two competing interests - industrialisation and deforestation. One way of solving the problem is to resort to the old methods of forest reserve blocks, forest regeneration as a participatory programme involving the Federal, State and the Local Governments as well as communities, Non-Governmental organisations and especially Multi-National Companies. Every timber prospecting company must be forced by an agreement to replant and nurse young plants in approved locations to satisfy a specified percentage of the total number of trees it proposes to fell. New methods can be made a part of the routine of the proposed Environmental Court and the Federal Environmental Protection Agency (FEPA).

3.3.2 Urbanisation Pollution

THIS IS ANOTHER ASPECT OF ENVIRONMENTAL MANAGEMENT PROBLEM in Nigeria that needs a balancing strategy. You would learn more about this aspect in other units in this programme.

In this unit attention will be paid to how to achieve equilibrium between he two competing interest of urbanisation and pollution. It is suggested that every urban area in Nigeria should be clearly demarcated and planned or re-planned in such a manner as to confine specific interests to special areas - industrial locations at the urban fringe; markets at the urban fringe; super markets and shopping centres in urban cities centre; housing estate in appropriate locations with high rise buildings

occupying designated locations; railway - stations, air-ports, sea and river ports at the urban fringe. (Jaja, 1995).

Also, central sewerage system with large channelisation (say about 7 meters radius) arrangements should be introduced in every urban area for liquid waste disposal and for checking flood and erosion. In 'Israel, for example, this practice has paid off. All liquid waste as well as solid waste except cans, bottles and pieces of iron, are disposed off centrally, collected centrally in a large central trough and later treated, solidified and sold back to farmers, as manure. Agbara Industrial Estate in Lagos is a model fashioned after this however, for now effluent are treated and discharged into the environment.

In the United States since 1979, recycling of solid waste and garbage has become the most popular method of solid waste disposal. Collection of recyclable is carried out by a labour intensive method. Workers comb the collection bins before pushing the materials into storage bunkers. They compress the cans and paper into tight vast waist-high blocks and later load them in a chain driven boiler. Glass and plastics are separated and stockpiled. The glass is first crushed by a tractor to reduce its volume. Then other recyclables are fed into a granulator that grinds them into small particles that are later sold back to industries (Goldoflas, 1987).

In the wetlands of Nigeria, water hyacinth (Elohbornia crassipes) has become an environmental menace. It grows in streams, rivers, lagoons and lakes and obstructs the fret use of the water bodies, destroys aquatic life and dominates the water environment. In India, the menace is styled the Blue Devil or the bengal Terror; in south Africa, it is termed the Florida Devil and in Bangladesh it is called the German Weed (NEST, 1991). In Nigeria, a full scale international symposium was held on the theme "Water hyacinth: Menace and Resource" in August 1988 in Eko Hotel, Lagos. Scientists have realised that the weeds have economic value, for example, in paper making, cardboard, panel and ceiling boards, briquettes for domestic and rural agro-industrial use as fuel.

Some even say that it has medicinal value and can be used for manufacturing livestock feeds, biogas, distilled water, fertilizer, engine gaskets, amino acids, detergents and a natural means of preserving fish stock in water (NEST, 1991). Yet, there is still a growing concern that water hyacinth has become a dreadful menace to Nigeria's environment and so need an urgent remedy. Further studies to produce a balancing strategy now, point to a possible solution to the problem of how to control aquatic weeds by using grass carp.

3.3.3 Food Production And Desertification/Drought

The problem of food production and land use has been dealt with by the Federal Government of Nigeria by Decree, that is, the Land use Decree 1978 and the national Agricultural Land Development Authority Decree 1992. The problem of drought and desertification has been discussed in another unit in a course titled "the Nigerian Environment". An important question that I- would like to ask you is how to balance the interest of food producers especially cattle farmers and desertification. In other countries, the solutions to the problem of desertification have been either to live with it (Israel) or to combat it (Lybia, Egypt and Algeria). The Israel model is very instructive. With education, every citizen is made to be aware of desert menace; to- use every piece of earth for productive purposes; to centralize certain common services - water supply through the Dead Sea to all parts of the country; to centralize sewerage system, already mentioned above; and to recycle liquid and solid wastes for productive purposes. Of course, the issue of grazing reserves is tackled with firmness and herds are confined to appropriate locations just as the enclosure movement of 16th and 17th centuries England did. To plant trees now, to control the menace of erosion or flood or desertification, only to allow those trees and grass to be destroyed by cows and other animals in motion, is to say the least, a wasteful exercise. We may therefore suggest that while pursuing desertification, the Federal, State and Local Governments should also develop grazing reserves throughout Nigeria and enforce the modality of using them by law. The enforcement of the law may also be left within the jurisdiction of the proposed Environmental Court, which is best mobile rather than a sedentary court.

3.3.4 Mineral Exploitation And Hazard To Life And Property

This subject has often been treated as pollution in several literature, unit 17 of "The Nigerian Environment" has also treated this subject in a more detailed manner. However, it also deserves to be considered from the hazardous point of view - hazard to the life of persons, aquatic life and the entire ecosystem within the mineral oil, coal or tin mining environment. There is no doubt that mineral oil now accounts for over 80 percent of Nigeria's export earnings. Other minerals account for much less. Important as these minerals are to Nigeria's economy, the process of exploiting and extracting them has always constituted a hazard to life and property. In other mineral producing industrialised countries, the multi-nationals engaged in mineral extraction concerns are compelled by stringent laws and environmental management arrangements to ameliorate or avoid excessive damage to life and property within the environment of their operations. In the United States of America, for example, *the Nigerian Environmental policy Act of 1969, and the Regulations for Implementation of the National Environmental Policy Act, 1978, the Environmental Quality Improvement Act of 1970, the*

clean air of 1970, the Executive Order Nos. 1154 and 11991 of 1970, (Executive Office of the President, 1970), have stringent provisions not only against Federal Government agencies but also all operating companies whose activities are likely to produce some hazard to the environment in one form or the other. Federal and other organisations are registered as "cooperating bodies" and are subject to the laws, rules and regulations provided by the National Environmental Policy Act. The Council on Environmental Quality established by law also has defined powers, to ensure sound environmental quality throughout the United States of America.

If I may ask you, why is there effectiveness in America and Canada which has similar laws compared to Nigeria: The answer you may give could be related to the "Nigerian factor". This is largely so, but it must not be forgotten that the countries concerned are now operating in systems where time has become the function of all other management element. We have not gotten to that level but struggling. This is not to say, however, that Nigeria must not act now. Rather, it is true to say that there is an urgent need to reinforce greater hard-work, caution and surveillance in the process of enforcement of environmental laws, rules and regulations in Nigeria.

The Federal Environmental protection Agency should be sufficiently equipped to bring about a new change of heart among Nigerians and foreign entrepreneurs to realize that Nigeria deserves effective environmental management.

3.4 Flood And Erosion: Prevention And Management Technique

The problems of flood and erosion disasters in Nigeria have also been discussed in units 12 and 13 in the Nigeria Environment module 3. This section is intended to offer some solutions based on the experience of some industrised countries of the world. First, there is need to re-design and update all urban areas throughout Nigeria. Structures that hinder the free flow of storm water must be removed by those who placed them there. Houses built without drains along flood and erosion plains must be identified and their owners compelled to construct deep drains for run-offs. Such drains must be constructed to empty not into rivers and seas as at present, but into a central trough specially constructed to receive storm water from sewerage and public drains. The waste content of the trough should be recycled from time to time and its sediments treated and solidified for sale to farmers as manures as in Israel.

Secondly, coastal flood and erosion menace as in Lagos and other coastal cities require sand filling, piling and construction of break waters, dykes

and concrete drains. Berthing by boats and ships should be disallowed except along approved wharves, which are protected with floating buoys or harbours with landing facilities.

Thirdly, flood and erosion on land outside inhabited areas should be checked by protection of the entire erosion zone from the actions of fire wood cutters, gravel, limestone and quarry prospectors as well as from cow grazing. Thick cement or burnt brick walls should be constructed to fence off the area and prevent further storm water action. The rule, "a stitch in time saves nine", should be scrupulously observed (Jaja, 1995).

3.5 Water Supply Technique.

The ministry of water resources has set aside over a million hectares of land for irrigation and in the next twenty years, two million hectares would come under irrigation. Dams of various sizes have been constructed by the Ministry directly. Other agencies such as the River basin Development Authorities, Directorate of Food, Roads and Rural infrastructure and- State Water Agencies as well as the Agricultural Development Project (ADP) have contributed tremendously in the construction of bore holes, water wells and other water reservoirs. These are very essential development. The problem however, is that the way irrigation and water supply are being conducted in our country appears to be uncomplimentary to Nigeria's search for effective environmental management (NEST, 1991).

The process adopted often leads to promiscuous land degradation, spread of water borne diseases and sometimes flood and erosion as well as land tremor. How Israel combated this ugly experience is worth noting. Israel is an arid country, therefore, she values water very much. She uses the Dead Sea as the central point for water supply, irrigation and various services. From the Dead Seas, a long stretch of water body, constructed water supply stations and distribution mains, are conducted by Israel engineers to various points of the country, North, Central and Southern Israel. The water from the Dead Sea is treated to remove alkalinity, reduce salinity and iron contents so as to make the water potable, useable by men and beast alike. Treatment plants are installed and distribution tanks are located and maintained at strategic points (Jaja, 1995).

The advantages of the Israel model are laudable. The creation of a central delivery system for water supply reduces maintenance cost and improves specialization. The whole country is brought under water supply grid thus removing the need for isolated and wasteful water supply system and its attendant degradation of land, exposure of the country to awful water borne diseases and the possibility of earth tremor. Though Nigerians are entitled to look inwards in the process of development,

they could also borrow worthy experiments from other developing countries and learn to use Nigeria's seas and many rivers for effective environmental management.

3.6 Environmental Impact Assessment Technique

This is a very important aspect-of environmental management.- Yet, it is one of the most neglected aspects of environmental management in Nigeria.

In this unit attention will be paid to the way Environmental Impact Assessment can be used as technique for effective environmental management in Nigeria.

Environmental Impact Assessment is a "planning process which saw its formal start in 1969 with the passage of the National Environmental Policy Act in the United States" (Jones, 1985). It is a systematic way of evaluating benefits and costs (Imports) of projects or activities; it strives a systematic assessment of the implication proceeding with a proposed activity; and it encourages resolution of problems and a format for presentation of the total analysis.

The strong view of the Federal Government of Nigeria in the philosophy that a small investment in prevention would be worth many times what would later have to be spent to repair any damage in the environment led to the enactment of Environmental Impact Assessment Decree 86 on the I0th day of December, 1992. It contains a total of sixty-four sections arranged into three related parts followed by a schedule (Olomola, 1998).

Generally, the decree seeks to ensure that the likely environmental impact of implementing projects are provided consideration particularly at the early state of project identification and planning. This task was placed on the Federal Environmental protection Agency. The decree defines what are the EIA processes namely, by a screening study or a mandatory study, allows for public participation through comments, public-hearing or enquiry and enforcement powers.

Government Agencies and Stakeholders take care of health, Safety and Environmental Policy; Health and Environmental Assessment; Policy of environmental control, environmental review (auditing) and environmental research. In Nigeria, Shell Petroleum Development Corporation of Nigeria also has an environmental management department. Other oil companies also have environment safety departments.

3.7 Environmental Information And Technology Technique

This concept in Environment, with a very wide scope and. comprehensive information processing technique. Three main components of the strategy will be briefly discussed here.

(a) **Information processing**

In relation to environmental management, this involves the use of soft and hardware information technology to create awareness in a given population about the environment. The technique involves news broadcasting, debate in radio and television, play acting and role performances, seminars, conferences and group discussions, to mention but a few. The. goals include reinforcing informally and formally the need for attitudinal change among the citizenry with reference to effective environmental management.

(b) **Hydro Information**

This is the use of advanced technology to problem solving in environmental management especially those relating to aquatic environmental management. The use of this technique entrails application of process - simulation modelling, real-time control systems, advice services, alarm and alarm handling.

The technological component includes field hydraulic systems, environmental processes, numerical modelling, computer science appreciation, data acquisition, storage and transmission techniques, applicable to effective environmental management.

Already, Environmental Education has taken off in Nigeria. There is no doubt that in order to ensure effective environmental management, new strategies such as environmental information and technology has become very necessary. At the moment, information processing is used sporadically for news coverage and for demonstration. However, information and technology relevant to environmental management have not been called seriously into aid or used at least as handmaids. It is strongly suggested that this strategy should be emphasised and used more effectively.

4.0 CONCLUSION

Environmental management has dealt with the effective scientific and strategic control of natural resources and endowments of a people or

country (Nigeria) in this case and obviously applicable to the world. There must be effective scientific technique in the management of natural resources. What this unit has been able to achieve is to outline and articulate some technique that Nigeria could apply in the effective, scientific and systematic management of our environment. If we sincerely apply these technique surely our natural resources and our environment in general within few years will be a better place to live.

5.0 SUMMARY

So far what we have being discussed about in this unit is on how to help make environmental management effective by means of seven strategies or techniques.

These techniques are:

- legal and policy techniques
- centralised technique
- Equilibrium technique

Flood and Erosion: Prevention and management technique and Water supply technique

- Environmental Impact Assessment technique
- Environmental information and Technology technique

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UNIT 5 NATURAL RESOURCES MANAGEMENT IN NIGERIA: AN OVERVIEW

CONTENTS

1.0 INTRODUCTION

This unit is the last in this module. It will expose you to natural resources management in Nigeria - pattern or style in place since 1900 to date. We shall be discussing how our natural or environmental resources are managed through the efforts of others in order to ensure successful planning, organisation, motivation and controlling the natural, physical and mineral property of this great country of ours' Great? You may wonder! Yes great because we are endowed with abundant natural resources. Our prayer however, is to have better "managers' of these natural resources so that Nigeria can be truly Great. May be that is why you are in this programme.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- State at least 10 legislation with date on natural resources management.
- Outline five features on organisational structure between 1900 - 1950 on natural resources management in Nigeria
- Discuss on some vital steps taken by Nigeria government between 1988 to 1994 that enhances natural resource management.

3.0 MAIN CONTENTS

3.1 Natural Resources Management Process

3.1.1 Legal Structure

Natural resources management in Nigeria derives its strengths from a variety of sources, one of which is the legal structure for its operation and enforcement. Here, attention will be drawn to three sets of such laws now in vogue. These are conservation legislation Table 5.1 petroleum oil exploration and control legislations (Table 5.2); and environmental policy and protection legislations (Table 5.3)

Table 5.1

	Conservation legislations	Year
1	The Forestry ordinance (CAP)	1937
2	The Eastern Region ordinance with Amendments - Northern Region	1955
3	The forestry Ordinance with Amendments - Northern	1960
4	Region	
5	The Forest law (Eastern States (CAP 38)	1969
6	The Forestry Amendment Edict: Western State	1973
7	The Forestry Amendment Edict: Western State	
8	The Wild Animals preservation Law (CAP 137)	1971
9	The Sea Fisheries Decree	1972
10	The Sea Fisheries (Fishing) Regulations	1978
11	Exclusive Economic Zone Decree	1959
12	The Wild Animals presentation law Western	1963
13	Nigeria	1965
14	The Wild Animals Law (Northern Nigeria)	1972
15	The Wild Animals law (Eastern Nigeria)	1975
	The Wild Animals Preservation Law (Lagos State)	
16	The Wild Animals Law Amendment Edict	1978
17	(Northeastern	1979
18	State)	1985
19	The wild Animals Law Amendment Edict (Kano State)	1989
	The Kanji Lake national Part Decree	
	The Endangered Species Decree	
	The Natural Resources Conservation Council Decree	

Table 5.2

	Conservation legislations	Year
1		
2	Companies Act	1968
3	Exchange Control Act	1962
4	Capital Gains Tax Act	1967
5	Petroleum Act	1969
6	Petroleum (Drilling and Production Regulation	1969
7	Petroleum profits Tax Act	1959
8	Oil in Navigable Waters Act	1968
9	Oil Terminal Dues Act	1969
10	Offshore oil Revenue Act	1971
	'Offshore oil Revenues (Regulation of Grants) Art	1972
11	Agreements with the Federal Government of Nigeria	
12	Income Tax Management Act	1961
13	Oil pipelines Act	
14	The Mineral Oils (Safety) Regulations	1963
15	Nigerian National Petroleum Corporations Act	1977
16	Associated Gas Re-Injection Act	1979
17	Special Tribunal (Miscellaneous Offences0 Decree	1984

Source: Oremade, Tunde (1980)

Table 5.3

	Other Relevanf legislation's	Year
1	Land Use Decree (Act)	1978
2	National Agricultural land Development authority	1992
3	Decree	1988
4	Federal Environmental Protection Authority Decree	
5	National Environmental Sanitation Decree	
6	*State Environmental Sanitation Decree	1958
7	Public health ordinance	1976
8	River Basin Development Authority Decree	1976
9	Niger Delta basin Development Authority Decree	1974
10	Food and Drugs Decree	1993
	Oil Mineral production and Development Commission Decree	

Sources: NEST (1991).

Most of these legislations have their colonial antecedents. Others are entirely new. Though most of the laws are either enforced haphazardly or not at all, that they still exist in Nigeria's statute books is significant. They point up to an increasing awareness in Nigeria of the need for improved natural resources management.

3.1.2 Organisational Structure

Many government offices were involved in natural resources management during the first half of the last century i.e. 1900 - 1950. The most important of them were Agriculture, Forestry, Lands, Health and Sanitary and Works (Public Works Department). This style of management had various features, five of which may be mentioned in this unit. First, each department was structured hierarchically from top to bottom in a manner that ensured a single line of command, a short span of control at the headquarters of the departments, and by their field officers. The highest officer at the headquarters was the Director, a professional officer, qualified in subject that was relevant to his service such as agriculture, forestry, botany, medicine or engineering. But, the rule was that where such an officer was not available, a lower officer in rank was employed to hold his position. However, where no professionally qualified officer was available, except in the Department of Health, the District officer acted for him.

A second feature of this style of management was the use of divisional later provincial administration system for implementation of natural resources management at the grassroots level (Jaja, 1995). Though the Provincial Commissioner was in control of general coordination of the provincial administration, every professional department involved in natural resources management had a partner, professional head in the province concerned. For instance, from May, 1906, the Department of Agriculture had the Provincial Agricultural officer (PAO); and the Department of Forestry had the Provincial Forest Officer (PFO) and so on.

The third feature of this style of management was the attempt to use Provincial Development Committees between 1938 and, 1950 to coordinate and monitor natural resources management in the provinces. Ngthing, however, was done in a realistic manner to evolve a coordinating organ or body for the operations at the headquarters. Coordination and monitoring of environmental resources management at the headquarters level was therefore left to occasional and laissez faire approach to management.

The fourth characteristic of this style of management under discussion was the effort to integrate planning, first as isolated planning but later as a Ten year Plan of Development and Welfare, with management process. The Department of forestry led the way. After the 1937 Forestry Conference, the Department re-organized the natural resources management structure in the field by introduction of "forestry Circles" to

correspond as far as possible with the limits of each provincial administration; "forestry Charges' to correspond as nearly as possible with the limits of District or Divisions. Then, Forestry charges were divided into "ranges" and `ranges" into "beats". This new arrangement replaced the old order of "Provincial Charges" `ranges" and "beats" for the purpose of forestry and natural resources management (Sessional paper No. 38 of 1937; Civil Service List and Report, 1907:271-272).

The fifth characteristics were the effort by the colonial administration to use slim resources to manage vast natural resources. The staffing arrangement in two of the departments - Forestry and Health (Sanitary Branch) between 1900 and 1925 may be used here for illustration. Table 5.4 indicates the staffing arrangement of Forestry Administration headquarters from 1900 to 1906. Table 5.5 indicates the distribution of African staff at the headquarters and in the field offices during the same period; Table 5.6 illustrates the forestry staffing trend in Nigeria from 1914 to 1925; and table 5.7 illustrates the staffing structure situation in the health Department (Sanitary branch) from 1910 to 1911. The situations illustrated in these boxes varied only very marginally throughout the period of colonial administration in Nigeria.

(A) Table 5.4 Forest Administration in

Headquarters	No of Staff	Amount paid per annum
Conservator of Forests	1	£1,000pa.
Deputy Conservator of Forests	1	£800 pa.
Assistant Conservator forests	1	£500 pa.
Clerical Staff	2	
Messenger .	1	

(B)

	Western Province	Central province	-Eastern Province
Provincial Forest officer	1	1	1
Assistant Conservator Forests II	1	1	1
Assistant Conservator of Forests II	-	1	-
Curator	1	1	1
Assistant Curator	1	1	1

(A) Table 5.5: Distribution of African Staff headquarters:

Forestry Department

Conservator's Officer	Number of Staff
First Class Clerk	1
Second Class Clerk	1
Messenger	I

(B) Field Officers; Provinces and Districts

Staff	Western Province	Central province	Eastern Province
Second Class Clerks	2	3	2
Pupils	10	-	-
Interpreters	-	3	2
Rangers	4	3	2
Deputy (Rangers	1'	2	3
Forester	1	-	1
Forest Guards	23	41	20
Woodmen	40	-	-

(C) Garden and Plantation Staff

	Western Province	Central province	Eastern Province
Head overseer	-	1	-
Native Farm Overseer	1	1	2
Botanical Gardeners -	2	-	-
Outstation Gardeners	3	-	1
Clerical overseer	-	-	1
Carpenter	1	-	-
Daily paid labours .	Large Nos.	Large No.	Large Nos.

Source: Jaja 1995

The whole of Southern Nigeria during the first ten years of the 20th century had a total of 9 rangers, 6 deputy rangers, 5 foresters, 84 forest guards and 40 woodmen.

Table 5.6

(A) Comparative Figures of Staff in the Forestry Department in Nigeria 1914 – 1925

Year	Staff	Central Nigeria	Province Southern Nigeria	Northern Nigeria

1914	Chief Conserver (£1,200)	1	-	-
	Senior Conservator (£600)	1	1	1
	Conservators 13` Grade (£500)	-	2	1
	Conservators 2nd Grade (£400)	-	4	-
	Assistant Conservators	-	8	3
	Foresters (£250)	-	9	4
	Total (36)	2	24	10

Table 5.6b

Year	Staff	Central Province	Provision Southern Nigeria	Northern Nigeria
1915	Chief Conservator	1	-	-
	Senior Conservator	1	1	1
	Conservator 1st` Grade	-	2	-
	Conservator 2nd Grade	-	4	2
	Assistant Conservator 2nd Grade	-	4	4
	Assitant Conservator	-	8 .	4
	Foresters	-	9	4
	Total (45)	2	28	15

Source: Jaja (1995)

Table 5.6C

Year	Staff	Central Province	Provision Southern Nigeria	Northern Nigeria
1920	Director of Forestry	1	-	-
	Senior Conservator	-	-	1
	Conservator 1st` Grade	-	2	-
	Conservator 2nd Grade	1	4	-
	Assistant Conservators	-	8	4
	Foresters	-	9	4
	Total (340)	2	23	9

Table 5.6D

Year	Staff	Provision	
1925	Director	1	Centralized
	Deputy director	1	-do
	Senior Conservator	3	-do
	Conservators and Assistant Conservators	25	-do
	Foresters Grade 1	2	-do
	Foresters Grade 11	2	-do
	Total (340	34'	

Sources: Jaja (1995)

Table 5.7: Health - Sanitary Board 1910 – 1911
(Southern Nigeria)

Staff	Amount aid per annum	No of staff
Senior Sanitary Officer	£800	1
Sanitary officer	£600	1
Bacteriologist	£600	1
Assistant Bacteriologist	£500	1
Total (4)		4

Financial provisions to departments involved in natural resources management were equally slim during the period. The trend may also be illustrated from the financial provisions made to cover the new ten-year development programme for forest resources in Nigeria following the Forestry Conference of 1937. The financial provision's covered 100 percent expenditure; 50 per cent and 25 percent or a quarter programme to serve a contingency arrangement. The financial summary is as indicated in Table 5.8 below.

Table 5.8

A.	Full program	Initial expenditure	£166,500 1 year
		Financial	£118,900 (10 year)
		Increase over ten ears	£52,400 or 78%
B	Half programme	Initial expenditure	£66,500
		Financial	£90,850
		Increase	£24,350 or 37%
C.	Quarter programme	Initial expenditure	£66,500
		Financial	£81,100
		Increase	£14,600 or 21'/2

A variety of strategies was adopted and applied to sustain natural resources management under the various departments. A few may be mentioned:

(i) **Forestry and Agriculture**

Establishment and control of forest reserves; measurement of tree births before they were felled and issue of license to approved concessionaires only; requirement of concessionaires to assist government in forest regeneration schemes by replanting trees to replace those felled by them and using the harmer to mark every timber approved for removal from the reserves or from any forests. By 1945, the Colonial government introduced a system of Periodic Blocks (PB) and cycles to sustain the supply of wood and exploitable woodland for the next one hundred years. In order to ensure the success of the new system, forest allocations were re-scheduled by the colonial government on the following basis.

First period (PBI)	1945-1970
Second periodn (PBII)	1971-1995
Third period (PB111)	1996-1020
Fourth Period (PBIV)	2021- 2045

The first 700 square miles (1,813) square km were allocated in 1945. It was hoped that the area would be due *for another re - allocation by 1996 (NEST, 1991). However, as events proved by 1980, most of the scheduled blocks due for allocation by 1996 had already been released to concessionaires, most of whom had little or no idea of the conservation and forest regeneration policy, programmes and ideas behind the Periodic Block system. In a few years time, the Periodic Block system was abandoned and forest reserves began to be de-reserved massively for industrialization. What a terrible experience! If this continues, what will be left for generations unborn?

Exercise 5.1

Find out from local heads and community leaders in your area how are natural resources conserved for future generations. In order words what management technique is in place?

(ii) **Water Resources Conservation** of rivers, waterways and ports engaged the attention of the Works Department. The provision of

pipe-borne water in major townships was undertaken and popularised but, the scope of the services rendered was minimal. Outside the reservation areas, government stations and European factories and clubs and very few African locations received pipe-borne water. However, the few locations, which were served were given priority attention. Water taps wherever they existed were maintained. Early water supply schemes established in large cities during the period included Abeokuta (1911), Enugu (1925), Ijebu Ode (1927), Oyo (1925), Onitsha (1928), Makurdi (1928), Kano (1929), Aba (1928), Kaduna (1920), Akure (1931), Jos (1935), Okene (1936) and Port Harcourt (1937) (NEST, 1991).

> In 1906 alone, new drains 504ft. long and 4ft. wide were constructed in Lagos. The Alakoro bridge was repaired while 23 culverts were constructed. Reclamation of land in various towns took place in Southern and Northern Nigeria between 1900 and 1950. In Alakoro, 17,490 cubic yards of earth were excavated; Elagbata, 3,654 cubic yards, Isaleganga, 2,909 cubic yards; and Ajasa, 22,020 cubic yards. Other towns outside Lagos area had a similar experience. However, the effort was marginal.
>
> Sea walls were constructed by direct labour in Lagos, Warri and Port Harcourt; and fore shores were reclaimed in Lagos, Warri and Port Harcourt.

(iii) Health and Sanitation

The Health Department with its sanitary branch maintained sanitation through Sanitary Inspectors in the Department throughout Nigeria. In Lagos, however, the work of sanitation was so complex that an Assistant Engineer had to be engaged. He was assisted by a town warden, a Nigerian. Both of them worked under the Board of Health established since 1869. The Board was replaced by the Lagos Town Council established in 1919, with anumber of elected members. The Council and Lagos Executive Development Board performed similar duties. But in 1950, Lagos attained the status of a municipality and the town Council became a municipal council with a Chief Engineer and a full Health and Sanitation Department (Elias, 1967).

(iv) Flood and Erosion Control

The Public Works Department carried out the work of flood and erosion control throughout Nigeria between 1914 and 1954. It constructed breakwaters, dykes and water channels along coastal

cities and in parts of Nigeria's largest towns. However, its efforts had limited success. Flood and erosion have continued to be Nigeria's perennial problem (Jaja, 1995).

(v) **Dam Construction and irrigation**

A dam is an effective construction that regulates the flow of a river and storage of water which would otherwise escape to the sea (NEST, 1991). The first major efforts at dam construction and provision of irrigation facilities began in Sokoto River Basin in 1918. The example later spread to the southwestern parts of Nigeria in the 1950s.

3.2 Natural Resources Management Structure (1951-1987)

The style of natural resources management that evolved during this period coincided with the early human relations management posture adopted by the colonial administration in Nigeria from 1951 to 1960, and by the Federal Government of Nigeria with appropriate modifications from 1960 to 1987. Natural resources management gradually developed its human relations features, the most important of which will be highlighted from 1951. The existing departments were re-organised into divisions, branches, sections and units with appropriate heads in a hierarchical order and in line with staff management structure already in place. The period of control was lengthened but, field organisations still depended on the provincial administration structure similar to the one already mentioned above.

Secondly, staffing and motivation began to take a new shape. More staff were recruited; the civil service was regionalised in 1954 and later splited into Federal and State structures first in 1967, then 1976, 1987 and 1991. The extensive decentralisation also meant a speedy development in staff population in the civil services of the Federation of Nigeria. All the ministries responsible for the primary aspects of natural resources management benefited from the speedy growth in staff size, training facilities in Ibadan, Kaduna and other Forestry Staff Colleges. Many states in Nigeria established their own schools of Agriculture, Schools of Health Management, Polytechnics and indeed Universities that provided facilities for training of natural resources management staff. Promotions, salary increases, awards and grants of fringe benefits began to feature more prominently in the conditions of service of natural resources management officers and their staff (Elias, 1967).

Thirdly, the old Native Administration system was abolished and was gradually began replaced by new local government structure. This began on the Eastern Nigeria.The new local government system that emerged became a useful instrument for providing local support to the new drive to propagate natural resources management in the new order.

Fourthly, the frontiers of the old amorphous civil service began to break down yielding place to new statutory corporations which came into existence starting from 1950 (Jaja, 1982). In line with the status and functions of these new corporations, the various governments of Nigeria, following the. examples of Western Nigeria, began to establish Water Corporations and Boards to improve the management of natural resources especially water supply (Agboola, 1988). In 1979, eleven River Basin Development Authorities (RBDAs) were established to boost dam construction, irrigation, food production and flood and erosion control. But these functions became enormous and therefore unmanageable. The number of River Basin Development Authorities was therefore reduced to management size and their functions were streamlined to make them more effective and efficient.

Fifthly, in the fourth Nigeria Development Plan 1981 - 1985, a new emphasis was given to natural resources management by creation within the Plan, a sub sector on "environmental planning and protection". The new policy thrusts and objectives in the Plan were environmental assessment, environmental protection and environmental education as new weapons for natural resources management. The major projects emphasized in the plan to aid natural resources management of the new type were tree planting to combat desert encroachment, control of soil erosion, regeneration of forests and grassland areas and maintenance of a balance in the various ecosystems.

First in the history of our nation a Development Plan began to give an increasing attention to environmental problems and to give a substantial sum of money for natural resources management. Federal Government gave N32 million for arid zones afforestation programme and N2.5 million for watershed management including control of erosion and flooding in various parts of the country. State Governments were required to provide counterpart funding. At the beginning of 1987 ecological fund was fully established and a committee was set up to help to manage the fund equitably among the states that had genuine ecological problems (Fourth National Development Plan 1981 - 1985). Evidently, the funds allocated were not enough, 'but an important advance was made in focusing on environmental resources management as a component of Nigeria's development plan.

Conscious of its inability to implement some of the environmental resources management components alone, the Federal Government of Nigeria in 1984 initiated a request with the World Bank for assistance specifically in the installation and management of water supply. The project provided Nigeria with a further sum of US$256 million and a mechanism for financing state level sub-projects in individual participating state. The loan was negotiated finally in November/December, 1990 and an agreement was signed on 23` July, 1992 which became effective on 27th August, 1992 (Jaja, 1995).

Finally, guidelines for action on the management of environmental pollution, in Nigeria were produced in 1986 under the auspices of the Nigerian Institute of Social and Economic Research (NISER) Ibadan and Lagos State, 1986.

3.3 Patterns Of Natural Resources Management (From 1988)

As from 1988 there has been a new departure in the arrangements, institutional funding, methodology and otherwise, for implementation of natural resources management in Nigeria. A few instances will be mentioned here as illustrations.

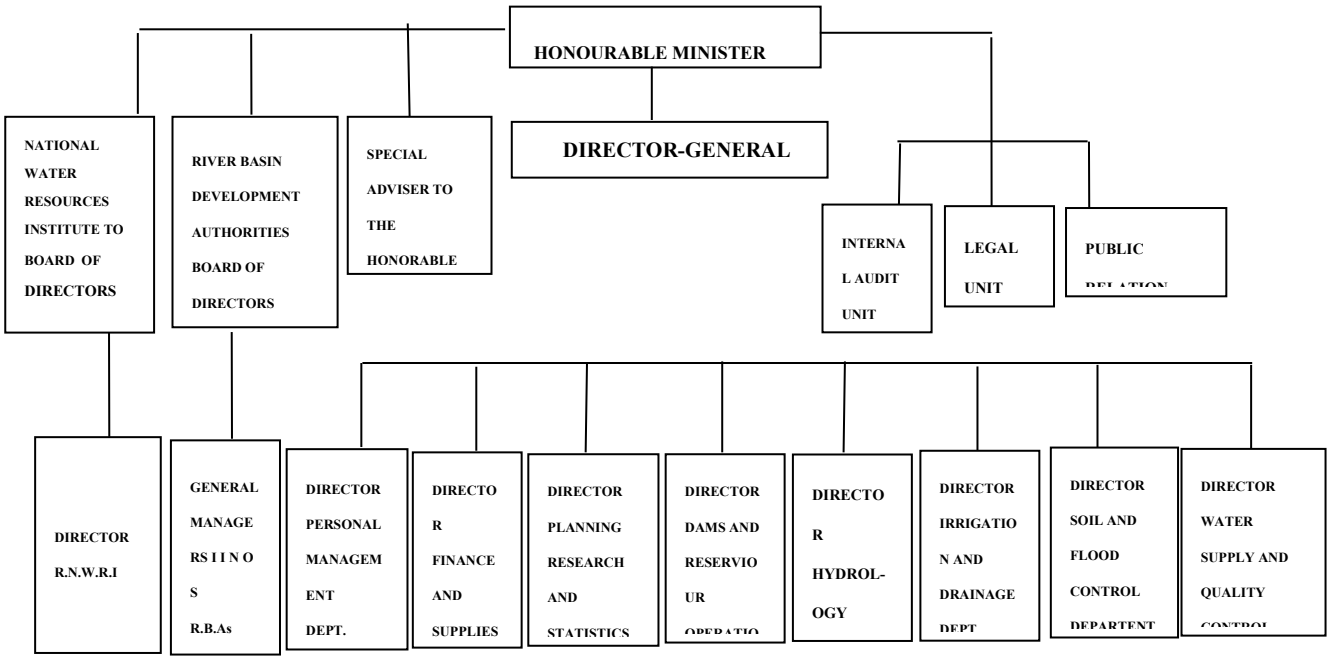
For instance, a new coordinated pattern of ministerial management of natural resources emerged from 1988. The Federal Environmental Protection Agency (FEPA) was created by Decree 58 of 1988 as an independent Agency that is responsible among other things, for coordinating environmental resources management in all its ramifications and for advising the Federal Government on environmental protection and management throughout Nigeria. The Agency has State counterparts, this could exist as either Commissions, Boards or Departments that are state implemented but have avenues for co-operating with the Agency. Do you assess these EPAs as being essential for effective environmental resources management during the period in question?

Furthermore, the Federal ministry of Water Resources and Rural Development, which had had a chequered history, was again excised from the Federal Ministry of Works and Housing and reconstituted fully as a new Ministry of Work Resources and Rural Development and given clearly defined functions. Most of its functions as may be seen from the organogram in table 5a are directly connected with implementation of environmental resources management. The Ministry also supervises the work of River Basin Development Authorities, the location, coverage and main functions of which are summarised in Fig. 5.1 below.

There is also a new emphasis on participation by Non-Governmental organizations (NGOs). The number of NGOs is the increase. The most prominent among them outside Nigeria include the World Wide Fund (WWF), United Nations International Children Education Fund (UNICEF), Canadian University Service overseas (CUSO) and the International Institute for Environmental and Development (IIED) based in London, World Resources institute' and the Commonwealth Foundation. In Nigeria, the prominent organizations include the Nigerian Conservation foundation (NCF), Nigerian Environmental Study/Action Team (NEST), Manufacturers Association of Nigeria (MAN), Forestry Association of Nigeria (FAN), Society for Environmental Management and Planning (SEMP) and the Nigerian Association of Voluntary Development Organization (NAVDO). Community and religious organizations are now directing a part of their social development efforts towards environmental resources management (NEST, 1992).

In terms of methodology, there is also a new emphasis on manpower development through increased use of the National Water Resources institute, Kaduna, Federal Universities of Agriculture and other Federal and State universities, Polytechnics and Colleges of Agriculture. The courses on environmental management, urban and regional planning are offered as integrated departmental programmes.

Organogram of the-Federal Ministry of Water Resources



4.0 CONCLUSION

Natural resources management should be seen as a process that takes place at all levels in an organisation. The management of natural resources in Nigeria has passed through several stages in this country. These passage has helped to improve on the management skills, team or personnel, organisational structure, legislation and other bodies associated with the management of natural or environmental resources in this country.

Our Natural resources management process has improved effectively the year but there is room for better performance in relation to communication and technology.

5.0 SUMMARY

This unit has given you a detailed overview of Natural resources management in Nigeria since 1900. The processes, legal structure and legislation, organisational development pattern and principles have been discussed in this unit.

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MODULE 2

UNIT 1 FUNDAMENTALS OF WILDLIFE MANAGEMENT

CONTENTS

1.0 INTRODUCTION

Here we are again to discuss another important topic in environmental studies. As you have noticed, it is captioned fundamental of wildlife management. This means that we will be discussing about wildlife management all through and this unit is the first part of our discussion.

In this unit, we shall consider the definition of wildlife and wild habitats. We shall also be discussing some inherent threats to our wild habitats

and this would lead us to considering the consequences of habitat changes.

During the course of this discussion, you will be coming across some strange words or concepts that you may not be very familiar with. Don't panic, the meaning of such words are explained immediately after the sentence or paragraphs in which they appear.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- Define-the term wildlife
- Outline the consequences of wildlife habitat loss.

3.0 MAIN CONTENTS

3.1 Background Issue On Wildlife

It is becoming fashionable nowadays for many people to want to "live off the land". But people have always lived off the land. The land grows our food, collects and stores our water, gives us paper, timber an clothing, yields up minerals, provides space in which we live and take our leisure. Unfortunately, the amount of land is strictly limited by increasing number of people the world over, and particularly in Nigeria.

It is necessary to recall that there are few areas of natural landscape left. Ever since people first set foot on the land, they have been continually changing their way of life and their surroundings, but unfortunately what we have done has not always been wise.

Every single day more than 2000 square kilometers of land are eaten up by the spread of towns, roads, factories, mining and soil erosion. As population grows, more demands for food, water and material goods, all of which produce their impact on the land (Terry, 1979).

Some scientists thought that by the year 2000 there will be no unused land suitable for farming, without great expense of on reclamation and largescale irrigation with scarce water.

At the moment, in order to supply the demand for land, we are cutting down forests, draining marshes, filling in, ponds and destroying the last remaining wilderness at an alarming. rate.

3.2 What Is Wildlife?

In its broadest sense, wildlife encompasses all living organisms that occur in the wild. According to the Claremont English Thesaurus, the word wild means undomesticated, untamed and uncultivated. The term is normally restricted to animals, particularly the vertebrates (animals with backbone) and, to a lesser extent, the invertebrates (animals without backbone). In this unit, the term wildlife will be used to include both.

Although very large and mixed herbs of ungulates (hoofed mammals), which characterise the East African plains sub-region before the arrival of the Europeans, a diversity of wildlife roamed the country's forests and grasslands in appreciable numbers. A stable ecological relationship existed between people and wildlife in many areas during this period.

I guess you are having difficulty in understanding the terms ecological relationship. The word ecological is derived from the word ecology. And ecology refers to the study of the relationships between living organisms and their environment

However, over the last three-quarters of a century, various human activities have profoundly changed the country's landscape, resulting in the modification of habitats available to wildlife. Most of the changes which have affected the wildlife resources can be linked to the arrival of Europeans and western technology.

The introduction of western medicine resulted in a rapid increase in the country's population, which, in turn, exerted tremendous pressures on her natural resources, including wildlife. Furthermore, the guns and traps introduced by the Europeans were more potent and efficient than the traditional weapons.

Exercise 6.1

Mention other ways or methods by which the wildlife and wild habitats have been negatively affected by the arrival of the Europeans.

With the exception of those animals which can thrive in habitats that have been altered by man (e.g. Quelea birds), the general trend in wildlife populations since the advent of the Europeans has been downward. What this means is that most animals would go extinct (no longer exists) once their natural habitat ondwelling place) have been altered. This is what made some prominent Nigerian wildlife biologists to predict a bleak future for the country's wildlife, unless modern technology, which is responsible for the current downswing, is used to reverse the trend and preserve the wildlife heritage for posterity.

It could be said that vegetation/forestry and wildlife cannot be separated from one another. Do you hold a similar view? Discuss

3.3 Destruction of Wildlife and Wild Habitats

Mankind has caused damage by taking plants and animals to new countries, where the have often spread out of control because of the absence of natural predators (animal which kills other animals for food). But mankind has caused even more harm to our fauna and flora by destroying natural habitats.
Do you know what the terms: fauna, flora and habitats mean? They are explained below:

FAUNA:	(a) The plants of a particular region or period of time. or The plants of a particular region or period of time
FLORA	(b) a descriptive list of plant species of such a time or place, often with a key to their identification.
HABITAT:	Dwelling place of a species or community, providing a particular set of environmental conditions (e.g., forest floor, sea floor, sea shore.)

Humans have always killed animals for food for their -skins, and for animal products such as oil and bone. They also kill animals for fun or sports. As the human population grows, animals (and plants) face increasing danger. Once an animal or plant's habitat is destroyed, there may be nowhere for it, or its offspring to move to and survive.

Consider a population of a certain species that occupies a particular range (grazing land). The population is distributed fairly evenly throughout the range and utilizes the whole of it. Then something happens to fragment the range. Perhaps a network of roads is made through it, or parts of it are ploughed for agriculture or afforested (planted with particular- trees), or rivers intersecting the range become so polluted that individuals drinking from them or trying to swim across them are killed. Whatever the cause, and human activities of one kind or another are nowadays frequent. The effect is to divide the population into several groups. These are isolated from one another by barriers they cannot cross.

They cannot cross them, but other things can. Suppose, after a year or two, there is a drought or an unusually severe cold or perhaps a disease transmitted by insects, or some other chance occurrence that affects all

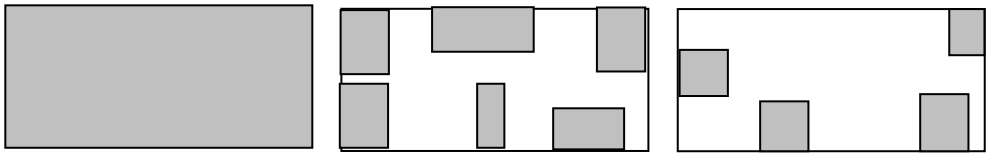
the separate groups and kills many individuals. The population is now much more severely fragmented, its groups very isolated, and each of them may comprise too few individuals to constitute a viable breeding population.

Such a sequences of events, illustrated in figure 3, is quite common and leads to the extinction of that species within that range. It explains why conservationists place so much emphasis on the need to preserve habitats as the best means to ensure the survival of species.

CONSERVATIONISTS:

People that are involved in the planning and management of resources so as to secure their wide use and continuity of supply while maintaining and enhancing their quality, value and diversity.

Fig. 6.3



(A)
population occupies entire range experiences

(B)
part of the range is opened up by roads that fragment it

(C)
The fragmented population disease, bad weather, or some other calamity, reducing its numbers to below the minimum necessary for survival

Since AD 1600, 36 different mammals and 94 species of bird have become extinct. At the present time, about 280 kinds of mammals, 350 bird species and no less than 20,000 kinds of plants are in -danger of extinction

The word extinction means; death, extinguish, destruction, extermination. etc.

According to Gerald Dunell, founder of the Wildlife Preservation Trust, "every mammal, reptile, or bird .... has taken millions of years to evolve. Suddenly it is on the brink of extinction .... Over one thousand species are threatened; thousands more are liable to vanish from the earth unless

mankind stops being a predator and becomes a protector." Terrible, isn't it? Just wait a minute.

Quoting Nwakibie in Chinua Achebe's Things Fall Apart, "Eneke the bird says that since men have learnt to shoot without missing, he has learnt to fly without perching". Interesting! Wisdom is not only limited to the human kind but also the animal kind.

Evolve/evolution: The process of cumulative change which occurs in successive generations of living organisms, and which led to the development from a common ancestor of different species and sub species.

3.4 Consequences Of Habitat Changes

Wildlife habitats may change for better or for worse, depending on how they are utilized by both people and wild animals. When there is effective protection of a wilderness area, its habitat value improves and the number and diversity of animals tend to increase.

DIVERSITY: A community (plant and animal is said to have high degree of diversity if it contains many species of fairly equal abundance.

The entire plant and animal community in that habitat will progress towards what biologist call a stable SERE (A series of plant communities resulting from the process of succession). On the other hand, when a habitat is abused, it will deteriorate, resulting in a decline in survival numbers and diversity, and regression of the whole community to a degraded state.

In Nigeria, many wild animal species have become extinct as a result of changes in their natural habitats. An environmental organisation called Friends of the Earth has identified Nigeria as one of the areas where tropical rain forests are being lost at the rate of over 405,000 hectares per annum. This is a very serious threat to our tropical rain forest wildlife heritage. Isn't it? Manga grasslands north of Gassua in Borno State, the destruction of the plant cover has been so ruthless that ancient sand dunes, long stabilized by vegetation, are on the move again. Elsewhere, habitat changes have not been so advanced but there has been widespread destruction of savanna woodlands and their replacement by grassland ecosystems (a community of interdependent organisms together with the environment which they inhabit and with which they interact). This has led to rapid increases in the population sizes of seed-eating pest species, such as rodents and the bird, Quelea. This in turn has had a negative impact on food product in the affected areas.

Severe soil erosion, flooding, and famine are often characteristic of areas where the natural vegetation has been destroyed. Evidence of these

abounds in various parts of the country. Aquatic life in our rivers and lakes has also been adversely affected by hydrological changes brought about by dam construction and drought. The wetlands 'of the Hadejia valley are a very good example.

Nothing affects the quality of our lives quite like the welfare and state of nature and no future, can be quite so bleak as one in which the living resources, such as plants and wildlife, which are very essential for human survival and development, are increasingly being destroyed or depleted by human carelessness. Put in another form, we all rely on nature for food, water, energy, clothing, shelter, minerals, drugs, and more. And we rely on the millions of animal and plant species to keep the system that provides those needs in running order. Yet despite this obvious fact, we are destroying the natural world, biting the hand that feeds us, so to speak.

As you read on, we are in danger of losing the fight for a healthy environment - and, with it, the struggle for our own survival. For today no matter where you look, you find wildlife under pressure. And of all the current threats to wildlife, loss of habitat is now the most dangerous of all. Take just a minute, over 20 hectares are destroyed - and if the devastation goes on at this rate, most of the forest will be wasteland in no time.

The erosion of all vital areas of land is today the greatest single threat to the long-term survival of a very large number of animals and plants drought and flooding also take their tolls.

You will probably agree with me that, of all the causes,, which deserve support, the preservation of life has a high priority. The total disappearance of so many forms of wildlife would be a loss that we and our children would bitterly regret.

As a result of heavy hunting for bush meat and partly because of the widespread destruction of Nigeria's rain forest, a lot of our wildlife have abandoned us and fled to neighbouring Cameroun and the Republic of Benin for sanctuary.

The white throated monkey, which is known to occur nowhere else in the world outside Nigeria and is therefore the only mammal unique to Nigeria faces a precarious future.

4.0 CONCLUSION

Perhaps you have been thinking and asking why this noise about wildlife and wild habitats. Can you see why the loss of wild animals and plants

should be a cause of concern to us? Well if you are not yet convinced then come with me to the next unit

5.0 SUMMARY

In summary, the abundance and diversity of wild animals in Nigeria have declined as a result of the adverse effects of habitat changes.

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UNIT 2 WILDLIFE MANAGEMENT IN NIGERIA

CONTENTS

1.0 INTRODUCTION

Welcome to unit two. In this unit, we shall be discussing the importance, distribution and management of wildlife. Our focus shall basically be on Nigeria although mention may be made of examples from outside the shores of Nigeria. We shall also talk about the future prospect and action. In addition, pest control shall also be part of this discussion.

As you read along, I advice you not to loose focus since questions will be asked intermittently and you are expected to answer them before proceeding to the next page or stages.

I will assume by now you are familiar with some common environmental science concepts and terminologies. I shall therefore not bother you much about interpreting most terms, especially those that were used frequently in unit one.

Peradventure you don't remember any or some of such, don't feel too lazy to flip through the previous unit to catch the meaning I hope you will enjoy the lesson. Have a nice session.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- Mention five importance of wildlife
- Discuss on three management strategies of wildlife
- State three methods of controlling wildlife pest.

3.0 MAIN CONTENTS

3.1 Importance Of Wildlife

One of the strongest reasons for protecting our remaining wildlife and wild places is that, as our towns and cities become more crowded and as we gain more leisure time, many of us increasingly feel the urge to `get away from it all". The enormous traffic jams that build up on the main roads in our cities bear witness to this.

The country's wildlife heritage is important in any consideration of the Nigerian environment from at least six reasons:

(a) **Source of protein:**
According to Ajayi, (1990), Wildlife supplies 20 percent of the annual consumption of animal protein in the rural area of the forest belt. For the country as a whole, the figure is 13 percent. Popularly known as "BUSH MEAT", wildlife meat is regarded as a delicacy in urban areas where it commands high prices. Bush meat estimates in Nigeria is about N300 million and the total value of natural produced protein food at N1000 million (Ohiere, 1999).

The following interview on BBC Network Africa published in the Nigerian field, 42, 1977 also emphasized this point.

Hilton Fyle: because of the East African tourist scene is so developed, a lot of the attention on African wildlife scene is centred on it. But, of course, the West Coast has its attractions.

The mainly tropical vegetation is a heaven for many species and the rainfall also is consistent, which makes it easier, I suppose, to select wildlife areas. Nigeria has a fair number of those wildlife areas where programmes of conservation and control are being developed - not that many of them are really accessible to tourists because they are not yet linked with the nerve centres. For the time being anyway, Nigeria gains is serving an important role as food. Dr. Beverly Halstead, the Editor of the Nigeria field, a wildlife magazine, has studied the Nigerian wildlife scene at first hand. He is here with me in the studio. Now Dr. Halstead, after what pattern would you like to see Nigeria's wildlife develop; after the East African one?

Dr. Halstead: No, I think that would be a serious mistake to think in such terms, because this is just for tourism alone. It's very sensitive as far as if you like the wealth of rich people in America or Europe, and it doesn't necessarily in the long run do a lot for the country.

Fyle: Why?
Dr. Halsted: in Nigeria for example, bush meat is some of the best meat you can get. There is a lot of wildlife in Nigeria, the bush is quite often dense, but it's there, and this is a very important natural resource that the country has, and if you have a natural resource of high quality protein the important thing is to use it - to utilize it. I think Nigeria has a potential for producing protein, cropping the animals. Now, if you' allow everyone to hunt, then you will destroy a very important natural resource.

Fyl: But is it not what is happening right now?
Dr. Halstead; Well, it is going a little bit that way but, in some of these partially preserved areas they are finding that the amount of wildlife is increasing, so, with a bit of protection against poachers, the animals will build up and once they are built up to a particular level, then you can crop them. It's just like having domestic animal living in the bush and you shoot out a certain proportion every year.

They reproduce if you do this sensibly. These Nigerian plans are very sensible; - if you do this in the proper sort of way, you have a constant source of protein that is always there. It is a renewable resource.

Fyle: So it is quite like breeding chicken in your backyard!
Dr. Halstead; Yes, exactly!

Fyle: How about this bush meat - do you like it?
Dr. Halstead; I adore it ,tender and delicious

SOURCE, NEST (1991)

This dialogue did not only emphasise the important contribution of bush meat to our protein needs but also suggest a management strategy to conserve our wildlife heritage. Can you in your own words draw out such a management plan as mentioned above? (yes say it, and) please don't be looking at the page.

Other uses or benefits of wildlife to us are:

(b) **RECREATIONAL VALUE**:

Many living things are not only interesting, but also very beautiful and appeal to our sense of beauty. People derive a lot of pleasure from viewing animals in their natural environment. For example, many Nigerians visit Yankari Game Reserve in Bauchi State during public holidays to see wild animals.

Most people feel that a world without melodious songbirds or delicate butterflies would be a much duller place to live in. Tens of thousands of amateur naturalists take their interest in the environment a stage further and belong to a local natural history society, field club or similar organisation. Added to which, many more people have as their hobbies hunting, shooting, fishing, walking and other outdoor pursuits which depend directly or indirectly on wild places.

(c) **EDUCATIONAL VALUE:**

The objectives of safeguarding generic resources, which are of current or potential use; are to preserve them for their -scientific, economic and educational uses by the present and future generation.

Schools organise excursions to wildlife parks to enable students to see, at first hand, some of the biological phenomena, which cannot be demonstrated in conventional school laboratories. This enhances their understanding. It is therefore, essential to conserve a large generic diversity of wildlife for potential was such as education.

(d) **AESTHETICS AND HERITAGE VALUE:**

Many living things are not only interesting, but also very beautiful. Most people feel that a world without melodious songbirds or delicate butterflies would be a much duller place to live in. Mankind has been introducing strange animals into different parts of the world many hundreds of years. This deliberate acts in most cases were based on the aesthetic values. Some species like grey parrot for examples are collected and exported out of Nigeria for sale as pets.

Wildlife reserves, national parks, sanctuary, conservation areas, etc have attracted visitors from all over the world because of their recreational and aesthetic values. This has resulted in a thriving tourism industry (Orhiere, 1999). Wild animals add to the natural beauty of the forest and grassland in which they are found. They feature in many of our folklores, customs and traditions. For example, Abidim's stork a migratory bird, is seen as a harbingers (that which goes before and tells or shows what will happen) of the rains in many parts of northern Nigeria. It's arrival, therefore, stimulates farmers to clear farmlands in anticipation of the rains.

Our wild animal populations also serve as reservoir from which we may, through domestication increase our stock of domestic animals in future.

(e) **ECONOMIC VALUE:**

Wildlife based tourism, a thriving industry brings in some foreign exchange into the country. As well as offering employment to the people. The several game reserves, national parks and conservation centres offer employment opportunities for several categories of people in the country.

There is also a marked increase in the harvesting and trade of wild animals. Millions of birds' species are exported out of Nigeria yearly. Some species like grey parrot are collected for sale as pets and most primates (one of the class of animals, which include men and monkeys) too are collected for sale. In most markets in Nigeria, a huge array of animals skins and parts like leopard can be found. Hunting in Nigeria used to be for subsistence and a common habit. In recent times, large-scale hunting for commercial purposes has taken its toll and it is done indiscriminately according to market demand and prices.

(f) **VALUE FOR SCIENTIFIC RESEARCH:**

Another very important function of our wildlife and wild places is in research. Since, as we have already seen from unit I, human beings form part of so many food chains and food webs, it is important that scientists should try to discover more about how they fit into the delicate balance of nature.

Our research scientists utilize wild animals in their experiments. Various species of apes, monkeys and baboons are extremely important in medical and behavioural research and in the preparation and testing of drugs and vaccines. Even creatures regarded as pests. such as the rat, mouse and pigeon, are useful to us in the domesticated state as they are widely used in scientific research. For example, newly manufactured drugs are first tested on wild animals (especially monkeys, whose body mechanisms are similar to ours) before they are demonstrated on human beings. It is also becoming increasingly necessary to cross-existing varieties of domesticated animals with their wild relatives to introduce new characteristics.

Exercise 7.1

With the aid of this unit, state and explain the importance of wildlife to the Nigerian socio-economic development.

3.2 Distribution Of Wildlife

The rapid depletion of natural habitats in Nigeria is a very serious threat to our tropical rain forest wildlife heritage. Only a few wildlife habitats in Nigeria can still be described as virgin. These are to be found mainly in the rigged slopes of highlands where topography and soil factors preclude the growth of conventional farm crops and timber, thus rendering the areas unattractive to human settlement. One of such area is near the Boshi Okwangwo forest in Cross River State, where lowland gorillas and the bareheaded rock fowl(Picathartes), formerly thought to extend only to the Republic of Cameroun, have been found. The slopes of the mambilla and Jos Plateau hold similar surprises. Thus a 1980 expedition to the mambilla plateau sighted a breeching group of Chimpanzees in addition to several other facinating wildlife (NEST, 1991).

The Obudu plateau, which is part of the Oban-Boshi Okwangwo compex, is another area where wildlife habitats in the primordial state (primary state) may be found. It represents the best example of mountain flora and fauna in Nigeria. About 60 bird species and many mammals, reptile and amphibians found nowhere else in Nigeria occur in this unique habitat (NEST, 1991).

3.3 Wildlife Management/Conservation

The term `management' is highly misunderstood among many because it is not easy to find a coincise and suitable definition that will please all concerned. It would therefore be used in this discussion interchangeably with the concept of conservation.

Conservation may be defined as the use of earth's resources in such a way that they will be able to support all life, including human life in the future (Noibi & Lawal, 1993). Conservation, according to Pinchart (1966) means "the greatest good to the greatest number for the longest time".

Although conservation is a word in common use, it does not have a precise meaning. It is not merely the preservation of some beautiful area of landscape in which everything is protected from change. Rather, conversation is the careful use of land, air, water, mineral resources including wildlife so that they are not destroyed by thoughtless or selfish action, despite all the various demands made upon them by the growing world population.

3.4 Wildlife Conservation In Nigeria

In pre-colonial times, religious beliefs and practices played important roles in the protection of forest patches and their wildlife in various parts of the country. Sacred animals and habitats were not exploited by people and so they remained in their pastime (original or primary) state. However, with the institution of the colonial government and the spread of western values and culture, our traditional methods of conservation gradually disappeared and sacred forests become hunting grounds.

Clearly much of the word's wildlife needs immediate care and protection, the question is how? This is one of the functions of both national (Nigerian conservation Foundation) and international (International Union for the conservation of nature and national Resources). These organisations are concerned in general with the scientific study of rare and endangered species and their preservation.

Another international body, the World Wildlife Fund raise money for the purchase and care of special areas, and for mounting rescue operations where species are in danger of extinction.

The Nigerian conservation foundation like the World Wildlife Fund also works actively by educating adult and children in the benefits of, and urgent need for, conservation.

3.5 Management Strategies

There are three main ways in which attempts may be made to preserve wildlife. The first is to remove animals or plants from the natural habitat, and breed them in captivity under control conditions (captive breeding). The second method of attempting to preserve wildlife is to surround the habitat of one or more of these rare plants or animals with a fence in order to protect the habitat plus the wildlife in it. The third method is to give the endangered species legal protection.

Let us now consider these methods one after the other sitting examples in our environment.

Captive breeding

When a species is in danger of extinction, it may be necessary to transfer a breeding stock to an animal or botanic garden for plants. This is not an ideal solution since, for animals in particular, no matter how good the zoo, it is an artificial environment very far removed from the natural conditions. However it is better than losing a species altogether.

There are a number of examples where captive breeding has been so successful in Nigeria. These include: the zoos at the University of lbadan, Obafemi Awolowo University Ile-Ife, Kaduna, Kano and maiduguri.

Nature Reserves

Nature reserves or game reserves can be designated for many purposes: for preserving a particular type of habitat, for the protection of certain rare or uncommon species of plants or animals in the natural environment; for scientific research; for education, and in certain areas, with the larger reserves, for public recreation.

Many reserves have become an economic asset, earning large sums of money from tourists and interested naturalists. The game reserves of, Asokoro Forest Reserve and Agwai-Karu Hills in the Federal Capital Territory, Abuja, the Kamuku Game Reserve of Kaduna State, the Kainji Lake national park in Niger State, and that of the Nigerian Conservation Foundation at Lekki in Lagos State, to mention just a few. All these form an important source of wealth, because tourists spend huge sums of money to see large mammals such as elephants, zebras, giraffes, antelopes and lions. Some of these animals prove useful for meat production in what is called game ranching e.g. the Obudu cattle ranch in Cross River State. Where surplus animals may be sold out, and skins and

tusks of those animals slaughtered for meat are also sold to tourists as souvenirs.

The variety of different types of habitats, scenery and natural phenomena which have been designated as reserves and National Parks is thus tremendous. Their names can be confusing; a reserve can be called a sanctuary, a refuge, a game park, a wildlife park, a game reserve, a national park or a national monument. Some are private, others are open to the public, a few are in urban area, while most are in remote locations.

Legal Protection

Certain wildlife species are found to be on the verge of extinction.Such species were therefore declared endangered species, with laws prohibiting its exploitation: hunting, harvesting or killing. Examples of such rare species are;-grey parrot, the white-throated monkey, elephants, and water buffalo etc. Although there are laws, on endangered species such as Decree No. 11, with penalties for trading in the most precious species (Keynote species), it is rare to prosecute people on wild animal offences in Nigeria.

The distribution of important forest and wildlife reserves and parks is shown in figure 1.0. It is clear from this map that Akwa-Ibom, Benue Imo, Katsina, and Rivers States as well as the Federal Capital Territory (FCT) do not have any noteworthy game or forest reserves.

3.6 Problem Of Managing Protected Areas

It is one thing to constitute an area into a game reserve. To carry out effectively the work of wildlife conservation in it is a completely different and difficult task. The most important aspect of this task is management. The main duties of the manager of a wildlife reserve are to control the vegetation wild animal populations, and people, in order to achieve the desired conservation goal. The work of managers of nature reserves in Nigeria is made difficult by the absence, until 1989, of a coherent national environmental policy. States vary in their commitment to conservation and this has made it difficult to formulate and effectively enforce legislation on environmental protection.

There is also a general inadequacy of well trained staff and a lack of operational equipment. Funding is often inadequate and staff receive salaries late resulting in low motivation and morale. In a typical Nigerian nature reserve, especially in the savanna, frequent bush fires ravage the vegetation; illegal grazing by cattle is a problem; poachers (the illegal hunters of protected wild animals) indiscriminately chop down trees and kill wild animals, and visitors are often not well catered for.

The problems of managing wildlife reserves in Nigeria have been reviewed by several wildlife experts, (Conservation and recovery of the wildlife resources of Nigeria, the Nigerian Field, 50, 1985). It must however, be noted that each of our game reserves has its own peculiar set of problems.

3.7 Wildlife Pests, Control And Management

3.7.1 Major Wild Pests Of Nigeria

Some of our wildlife species are nuisance because of their offensive activities which are injurious to people or their property. The group of pests include some vertebrates (e.g. locust and termites)

Some wildlife (e.g. tsetse flies and termites cause severe economic losses to people. Another group (e.g. rodents and grasshoppers) is classified as potential pests because they do significant damage not under normal conditions but when habitat alterations provide suitable conditions for rapid population increase. Outbreaks of moth or butterfly larvae may occur sporadically and cause occasional but severe damage to property. Quelea birds and locusts belong to the migrant group which are not sedentary, but move from one location to another in response to food availability. Rats, monkeys, and elephants may occasionally feed on and destroy farm crops.

Some domesticated animals, which have reverted to the wood also constitute nuisance. For example cats that have gone back to the wild cause considerable damage to poultry in rural communities.

In most places in Nigeria where wildlife has attained a pest status, it is the direct consequence of habitat alteration by people.

3.7.2 Control and management of wildlife pests

Method of controlling pests may be:

(a) biological, using biological agents;
(b) chemical, using pesticides or poisons, or
(c) physical, causing direct bodily injury or death.

Of these, only the chemical method has been widely used to control wildlife pests. In Nigeria vast areas of northern Nigeria have been sprayed in an attempt to control Quelea birds.

Locusts, tsetse flies,, and other insect pests of agricultural crops have also been extensively sprayed with chemicals in various parts of the country. Unfortunately, only temporary relief has been achieved from time to time.
The continued use of chemical as the major method of controlling wildlife pests is undesirable. An integrated approach involving biological, physical and chemical methods, where appropriate, should be adopted after the ecology of the population to be controlled has been thoroughly studied. For example, the damage caused by the migratory elephants of Borno State could be controlled by creating nature reserves. Those, which venture outside the game reserves, should be harassed until they learned to confine themselves within the limits of the reserves.

Another way of reducing damage to farm crops by wildlife is to ensure that every game reserve has a buffer zone, to serve as a cushion between areas of human activity and the game reserve. Regulated hunting and trapping could be carried out in the buffer zone to prevent animals from spreading into areas of human activity.

In conclusion, each pest outbreak has its own peculiarities and conditions, which lead to the rapid increase in the number of species. It is important that the biology of the pest species and the ecology of the population be properly understood before any control measures are embarked upon.

3.8 Future Prospects And Action

Although the future of Nigeria wildlife appears bleak, coherent strategies, backed up by well-coordinated policies could remedy the situation. The following strategies are recommended (NEST, 1990).

(a) Investigations of breeding status: It is not known. at the moment how many of the country's fauna breed in protected areas where breeding success would presumably be ensured. Checklists of animals, including their population estimates, in protected areas will be required before we can fully ascertain the preservation status of our wildlife.

(b) Environmental education: There is a need to increase public awareness of the values of wildlife other than as a source of bush meat. Extension services in wildlife conservation by government agencies concerned would go a long way to do the job.

(c) Increasing local involvement in the management of protected areas; heads of the communities in the immediate vicinity of our nature reserves should be involved in the day-to-day management of the reserves.

(d) Establishment of local forest-related industries; Local industries, such as bee-keeping, which do not pose any threat to wildlife, should be encouraged in the communities living near nature reserves. Such integrated land use practices inculcate the spirit of ownership in the local population and induce them to protect a nature reserve and its resources as theirs.

4.0 CONCLUSION

Awareness, training and education for sustainable development is imperative to the conservation of wildlife and wild habitats in Nigeria. The present structure and processes for management of our wildlife resources area not adequate enough for a sustainable development. Strategies towards integrating the principles of sustainable development in conserving wildlife resources have been highlighted. We must therefore vigorously pursue these strategies so as to achieve our expected goal.

5.0 SUMMARY

This unit focused on the importance, distribution and management of wildlife. The discussion was mainly in the context of the Nigerian environment. The basic importance of wildlife resources as mentioned in the discussion include; source of protein, for recreation, educational value, aesthetics and heritage value, economic and for scientific research. The distribution of nature reserves and wildlife resources in the country were also highlighted.

Various management strategies and associated management problems in wild life conserve were not left out.

Wildlife pests' problems, control and management formed part of this discussion. And, finally, future prospects and action were also outlined and emphasised.

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UNIT 3 BASIC CONCEPTS OF SOIL RESOURCE MANAGEMENT

CONTENTS

1.0 INTRODUCTION

You are welcome to today's lesson. Infact, I'll say this session of our discussion has already been a very interesting one to me as an environmentalist. Ever since my undergraduate days, the topic soil resources has been my subject of interest. I can't actually say the reason why, perhaps, probably because of my rural background. You know, rural dwellers are always very close to the soil. However, going by the way Prof Akin Mabogunje put it, I am an urban man with a rural mind.

In this unit, we shall be dealing with soil as an environmental resource. To make it more easily understandable, we will also be looking at classification for soil, types of soil, properties of soil, and soil pollution etc.

It should however be noted that some of these sub-topics may not be discussed in detail in this lesson as you might have come across in some texts of agricultural science, geography or any other soil science. It would therefore be advisable to make further reading where necessary.
My friend, you may be coming across some questions in the course of this study. Please make sure you answer them very sincerely before proceeding to another stage. I hereby urge your conscience to condemn you if you fail to comply. But if you don't, goodness and mercy shall follow you all the days of your life....

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- List five important types of soil
- State the properties of soil
- Explain the consequences of soil degradation

3.1 Soil As An Environmental Resource

Soil is basic to life. It is the primary means of food production, directly supporting the livelihood of most rural people and indirectly of everyone; it is an essential component of terrestrial (land) ecosystems, sustaining their primary producers (all living vegetation) and decomposers (microorganisms, herbivores, carnivores) while providing major sinks for heat energy, nutrients, water and gases (Wild, 1993). That soil in physical terms, is merely the unconsolidated material on the Earth's surface yet is the hub for a host of life-supporting processes is testimony to the marvels of the natural environment.

Soil is defined by Encyclopedia International (1982) as a loose mantle of mineral and organic matter of varying thickness that covers most land. It was formed under the combined influences of physical, chemical and biological activities.

The outermost layer of the earth's crust is extremely thin when compared with the rest of the crust. It is hardly half a meter thick. Human existence depends primarily on it. Within this very thin layer is the soil, an exceedingly fragile zone wherein nearly all of man's food, fiber, energy and industrial crops are cultivated and on which all of his livestock are reared. This soil has been under assault from human and non-human agencies for thousands of years. The precious types and magnitude as well as the duration of the assault have varied in space, sometimes enormously.

Exercise 8.1:

1. What is soil?
2. State the major resources of the soil.

3.2 Classifiction Of Soil

According to Encyclopedia International (1982), all soils can be classified into three major groups called zonal, intrazonal and azonal. The soil characteristics depend on texture, colour, chemical composition, acidity and liming.

3.2.1 Types Of Soil

In different ecosystems of the world, soil vary widely in colour, content, pore space, acidity (PH) and depth. These differences can be used to classify soils throughout the world into ten major types or orders.

Five important soil orders are molliosols, alfisols, spodosols, oxisols and aridisols, each having its own distinct profile. Most of the world's crops are grown on grassland mollisols and alfisols.

The soil resources of landscapes vary widely in their suitability for use. Each soil type has its climatic factors, restricting crop-growing seasons (FAO, 1978). For example, in the humid tropics, plant stresses are mostly the result of nutrient deficiencies exacerbated by leaching and surface removal rendering the soil acidic and nutrient-poor. In contrast, in the vast areas of seasonal tropics of south Asia, Africa and South .America, where rainfall is concentrated into part of the year only, plant-available water capacity is the major handicap.

3.2.2 Properties Of Soil

The relative amounts of different sizes and types of particles determine soil texture. The texture of soil is a very important factor that determines the quality of a particular soil. For instance, the gritty and coarse texture of a sandy soil would make it a very poor soil type for most crop types. This is because most of these types of soil are naturally porous. In other words, soil texture determines soil porosity. And soil porosity refers to the relative spaces between and among the soil particles of a given soil type. A soil with high porosity holds more water and air, and as well looses them quicker than a less porous soil

3.2.3 Soil Permeability

This refers to the rate at which water moves up the soil layers from below the surface. A soil with this quality would be good for crop cultivation. Loamy soils are best for growing most crops because they retain a large amount of water and also make it available for plants roots. Put in another way, loamy soils allow the water stored underground to transport to the surface soil within the reach of plants' roots.

3.2.4 Soil Acidity (Ph)

The acidity or alkalinity of a soil (measured in PH ranges) determines the type of crops it can support. This implies that various PH levels favour various crops. While some crops would flourish on soils with high acid content, others would do well on alkaline soils, while some others would thrive on soils that are neutral.

Manure or other organic fertilizers can be added to neutralise soil acidity and alkalinity and thereby maintaining soil fertility.

3.3 Soil Pollution

Soil pollution is a build up of toxic chemical compounds, salts, pathogens or radioactive materials that can affect plant and animal life. Unhealthy soil management have seriously degraded soil quality, causing soil pollution and erosion. Treating the soil with chemical fertilizers, pesticides and fungicides interferes with the natural processes occurring within the soil and destroys useful organisms such as bacteria, fungi and other microorganism. Salt deposits as a result of improper irrigation can cause crop failure e.g. the Nile valley in Egypt.

Many less developed countries have made substantial investments in irrigated agriculture, which have boosted yields at a cost to the environment (the soil). In some parts of the Indus plains in Pakistan, for example, irrigation led to water-logging and salinisation of the soil (high soil salt content).

3.4 Land Misuse

According to the new book of Popular Science (1982), many current environmental problems have been caused or aggravated by the careless use of land and natural resources (soil inclusive). Overgrazing of ranch land has led to erosion. Draining and dredging wetlands have led to disappearance of coastal wildlife. Dams prevent rivers from carrying sediments to ocean. As a result, beaches are disappearing. Mining has transformed large tracts of land in Pennsylvania, Ohio, Enugu, Yagba

East in Kogi State into a maize of deep pits and huge soil mounds. Strip mining has altered soil making it vulnerable to erosion and flooding.

Increased construction is a land use problem especially in the coast. Trampling on the coastal dunes have resulted in a loss of stabilizing vegetation and erosion of the dunes. Building projects are so numerous that the soil is loosened and erosion speeds up.Contractors increase the damage by taking gravel from coastal areas. While cutting trees in European countries to open up ski slopes creates a clear path for sliding snows, ironically enhancing glacier erosion of the soil. In Nigeria, tree felling causes erosion and ecological damage.

Urbanisation has led to many construction works, which have turned many urban and suburban areas into commercial jungles. The physical deterioration of inner cities, the lack of parkland and the proliferation of high ways all contribute to an unpleasant and psychological upsetting environments. The soil eventually playing the culprit, bearing the penalty of other crimes. Keen (1975) reported that serious consequence of land misuse is the loss of various life-forms. Urban sprawl, the spread of agriculture, the building of dams and the loss of forest have destroyed wildlife habitats. As a result, wildlife is threatened. Beside destroying wildlife habitats, we are poisoning animals and their food with pesticides, herbicides and other chemicals. These chemicals eventually find their ways into the soil, killing soil micro and macro organisms that help in the soil building and rebuilding processes. They also kill large numbers of fishes, birds and beneficial insects. They also threaten human life, killing hundreds of people each year and injuring thousands (killer beans saga in Nigeria 1999).

Dear reader, someone recast this experience:

I would like to draw your attention to one interesting but pathetic situation, which I found myself this morning.

Let me begin by telling you that I have always been very environmentally conscious. I don't like to walk across even the lawns of my campus, let alone dropping pieces of papers arbitrarily. I always make sure I hold onto what ever waste it might be till I see a waste bin or a dumpsite.

Something happened this morning, an unusual practice. I was about leaving my room this morning to the office and found some rough sheets of papers from the previous night work and picked them, with the intention of dropping them into the waste bin in my compound. Unfortunately, I forgot and went out to board a vehicle with the folded pieces of papers in my hand. When I realised what I was holding, I

became so embarrassed and quickly threw the stuff through the bus window into the road. As soon as that was done, the God in me, I mean my conscience started to condemn and accuse me of joining the enemies of safe environment.

My friends, if I may ask, do you belong to the club of-friends of the environment or that of enemies of the environment? What about the pure water' nylon you throw about. Do you know that' nylon cannot decompose? Well, you may be saying in your mind that you and I are guilty of the same offence. True anyway! But note that my pieces of papers will decompose eventually.

I hope you have by now decided to turn a new leaf by becoming environmental friendly. If so, say this after me; I (your name) have this day promised and swear by my conscience that I shall never again misuse and pollute the land/soil. I shall always do things that enhance its protection. Happy are you, if you do them. Else, your conscience will fight you.

Exercise 8.2

1. Enumerate some activities that may lead to soil pollution
2. How do these activities cause or bring about soil pollution.

3.5 Land Degradation

That the integrity of the world's soils is under threat, is a great challenge to the environmental manager. Soil quality is diminishing. Crop production is becoming more difficult and more expensive as soil fertility, water holding capacity and depth decline, bad lands are increasingly evident in vulnerable places.

Soils can be restored, even quite quickly, with large technical input. Productivity decline can be masked by ever-increasing application of irrigation, fertilizer and other chemicals. These cost money and worse still render land use reliant on outside inputs. The fundamental question is how to employ technology to maintain the quality of the soil resource at an acceptable cost without having to resort to the treadmill of excessive inputs.

The session examines the processes of soil degradation, looks at the extent of soil erosion in terms of its consequences at both national and international levels and then concludes with an overview of management responses to the degradation threat.

Soil degradation is defined as a decrease in soil quality as measured by changes in soil properties and processes, and the consequent decline in productivity in terms of production now and in the foreseeable future.

Soil erosion is one of the main processes of degradation and consists of physical detachment of soil particles by wind and water and their transport elsewhere in the landscape to rivers and water storage or to the sea. Land degradation is a composite term describing the aggregate diminution of the productive potential of the land, including its major uses (rain fed arable, irrigated, rangeland, forestry), its farming systems (e.g. smallholder subsistence) and its value as an economic resource.

3.5.1 Processes Of Soil Degradation

Six processes of soil degradation are usually recognised.

- Definition and measurement of the degradation processes pose problems for the environmental manager because of difficulties of obtaining the data, interrelationships between the processes and errors inherent in measurement methods Timothy (1995). The six processes include:

• Water erosion - splash, sheet and gully erosion, -s well as mass movements such as landslides

• wind erosion - the removal and deposition of soil by wind

• Excess of salts - Processes of the accumulation of salt in the soil solution (salinisation) and of the increase of exchangeable sodium on the cation exchange of soil colloids (sodification or alkalinisation).

• Chemical degradation - A variety of processes related to leaching of bases and essential nutrients and the build-up of toxic elements

• Physical degradation - an adverse change in properties such as porosity, permeability, bulk density infiltration capacity and plant-water deficiency.

• Biological degradation - increase in rate of mineralisation of humus without replenishment of organic matter.

These processes act such that, soil degradation will challenge plant productivity in a number of ways simultaneously. For example, sodication is the greatest single factor in the tropics rendering soils erodible: when dry, the soil becomes massive and hard: when wet, it loses, erosion results in loss of structure, surface sealing and breakdown

of water-stable aggregates; on high clay so its in Zimbabwe, once organic-carbon content goes below a threshold of 2 percent, erodibility suddenly increases. Such interrelationships underline the vulnerability of many soils and farming systems, especially in the tropics, to soil degradation.

Short fallows have eroded the support capacity of the traditional farming system of shifting cultivation thereby rendering most of the land infertile. Consequently, over 200 million cultivators, in many tropical countries, have migrated to inland watersheds in search of available land.

Deforestation has led to highly impoverished soils, poor food crop yields. Continuous cultivation without appropriate soil conservation strategies lead to land degradation (Adeola, 1996).

3.5.2 Consequencies Of Soil Degradation

The best demonstration of soil's value as a resource is to monitor what happens when it degrades. On site, soil productivity is affected and this may be assessed in a number of ways. First, nutrients are lost in sediment and run -off .Generally, those nutrients associated with organic matter (N and C) and the cation exchange of soil colloids (K and Ca) are most at risk. Nutrients in sediment are approximately ten times the quantity of those dissolved in runoff (Timothy O. 1995). Values may be attached to lost nutrients via the equipvalent cost of fertilizer containing the same amounts of elemental N, P or K.

Because water erosion is selective of the finer, more fertile fraction of the soil, the eroded sediments are usually always richer in nutrients and organic matter than the soil from which they were taken, known as the environment ratio (ER), a measure of the relative degree of concentration of key nutrients which indicate the proportional seriousness of the decline in soil quality.

Although on-site damage to soil resources is quantitatively most significant to land users, off site impacts have received wide publicity because of disruption to society. In the USA, it is estimated that sediments derived mostly from agricultural lands cause damage-to canals, water storages, irrigation schemes, ports and hydro-electric power plants. Of new reservoir storage capacity, 10-25 percent is built to accommodate sediment rather than water (Clark, 1985). Damage in developing countries can be equally serious. Five major dams in the Hill country of Sri Lanka, built with aid-donor finance, supply electricity to Colombo and water to the dry-zone irrigation schemes of Malawi. Not only has the erosion of fertilizers from the rich tobacco crops of the catchments caused eutrophication, but also damage to the turbines has

caused power cuts, incurred economic costs in lost production and reduced the credibility of the government.

It is estimated that about 0.5% of Nigeria's land surface has been ravaged by gully erosion. The damage amounts to about 30 million metric tonnes of soils loss annually through the process. The situation is very severe in the Eastern parts of Nigeria where the Ideato autonomous community in Imo State was deserted because of loss of land for agriculture and residential area (Okozie, 1994). The erosion sites of Agulu (Nanka, Efon Alaye and some parts of Ondo State are frightening. In northern Nigeria, wind erosion effects can be easily noticed on farm fields, and dunes sites and sad continuous moving communities who have been displaced (Adeola et al, 1995).

3.5.3 Explanation Of Soil Erosion, An Overview Of Management Strategy

An analysis of erosion rates and immediate site causes, demonstrates that a number of factors can explain the variation. Soil type is a determinant of soil erodibility. In the tropics especially, erodibility is greatly enhanced not only by the physical and chemical properties of the soil, but also by management factors which allow the soil to crust, increase in bulk density or reduce in- organic matter. Topographic factors such as slope steepness, length and shape are also influential. Physical measures such as contour binding - which cuts the slope into shorter lengths or terracing - which alters the effective slope steepness - are ways that the influence of topography may be reduced in land use. Rainfall is an important factor giving rise to erosivities varying according to amount, intensity and seasonality of storms. The only way to protect the soil from the erosivity of rainfall is to ensure a cover of vegetation to intercept the kinetic energy of raindrops and absorb it harmlessly into leaves and surface organic matter.

4.0 CONCLUSION

No explanation of soil erosion and land degradation are possible at a number of levels. For example, a valid question is why should human beings erode their soil when many know full well that, their practices jeopardise their future well-being? Part of the answer lies in the decision making and prioritisation of income opportunities of different households. This, we shall see in the next unit where we will be discussing the human impacts on soil resources and management strategies or responses in Nigeria.

5.0 SUMMARY

To be able to manage and properly use a given item or phenomena, there is need to fully understand its properties and characteristics. Soil resource management is the subject of this discussion. In order to be able to effectively manage our soil resources, the discussion of this unit centered on soil itself.

The importance of soil as a resource, soil properties and characteristics were highlighted. Issues such as soil pollution, land misuse, land degradation and its processes, and consequences were also part of the discussion. Management strategies that could reduce the problems of soil degradation also form part of this unit. The discussions under this unit was however not limited to Nigerian environment only. Examples were drawn from both within and outside Nigeria for a better understanding.

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UNIT 4 SOIL RESOURCE MANAGEMENT IN NIGERIA

CONTENTS

1.0 INTRODUCTION

You are welcome again to this unit. How was the last lesson? Hope you complied with all the instructions. Well, let me say here again that if you failed to sincerely abide by the rules of the game; then your conscience would not let you alone. You can however, remedy the situation now by making a fresh commitment. Of course, the rules remain the same.

Human beings go a long way in influencing the land/soil on which they live. As mentioned in the previous unit, the land/soil is the home of man where every of his activities take place. It is on the land we build our houses, industries, construct roads, explore and exploit our mineral resources. It is on the same land/soil we grow our food crops, rear our animals, even our forest resources are derived from the soil The water we

drink is also sourced from the soil. Despite all these laudable importance of the soil to human beings, it has been discovered that man's activities impact a great deal on the land. This impact could be both positive and or negative. In most cases, it is a negative impact, biting the finger that fed him, so to say.

It is in view of this unfortunate development that this unit is designed to examine some human economic activities or cultural practices, most especially in the Nigerian environment and how these affect the soil resources. Although there are several and varies numbers of activities that influence soil resources, our focus in this context would be limited to agricultural and mining/exploration activities only. We shall then go further to discuss the soil management practices, techniques and or strategies as used* or could be adopted to ameliorate these negative impacts.

You may discover in the course of your reading that some of these methods strategies for soil resources management have been mentioned earlier in the previous unit. I want to remind you that we are now focusing our searchlight on the Nigerian environment.

Enjoy your reading!

2.0 OBJECTIVE

By the end of this unit you should be able to:

- State the pattern of crop production in Nigeria.
- Outline the types of pastoralism employed in Nigeria.

3.0 MAIN BODY

3.1 Land Tenure

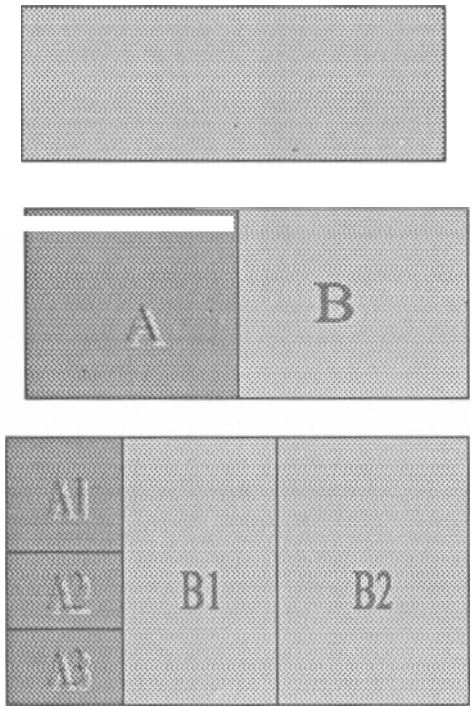
Practically everywhere in the country, Nigerians share land as a common denominator wherein lie most of their hopes and most of their problems. Land means many things, and the manner in which it is acquired, owned, used, and transferred is referred to as land tenure.

3.1.1 Land Acquisition And Transfer

Before rights can be exercised over land, it has to be acquired in one way or the other. The principal methods of land acquisition in Nigeria are inheritance, purchase, lease, pledge, exchange, and gift.

3.1.2 Inheritance

In nearly all parts of Nigeria, not only does land belong to the man but also it is split among his male children, either BEFORE OR AFTER HIS DEATH. This is generally either his wish or is the tradition, and is still strongly in force in rural and semi-urban regions, despite provisions to the contrary in the Land use Act which was promulgated over ten years ago. Thus, unless some of the heirs in successive generation have been able to add to the orignal total holding, the size of land available. to the average person in the family or community continues to decline (fig. 9.1).



I First generation father has two sons, A and B

ii Second generation

iii Third generation (SON 'A' has 3 sons and son 'B' 2 Sans)

iv Fourth generation

Fig. 9.1
Land inheritance and progressive Diminution of land available per heir

Source: U.M. Igbozurike, 1987

3.1.3 Land Ownership And Land Use

Land is in Nigeria falls under four broad ownership classes regardless of who the law says holds the land in trust for whom. They are individually owned, family owned, community owned, and government owned land. For the vast. bulk of Nigerians, land ownership is the primary determinant of degree of wealth, level of social welfare, access to power, and, in many instances, even basic survival. Indeed, in rural Nigeria, as

someone has remarked about rural Ethiopia, to be landless is to be sub-human (NEST, 1991).

Two important issues should be mentioned in the context of individual and family land. They are: land fragmentation and land abuse. Land fragmentation is a situation in which a landowner possesses or uses several plots of land in various locations. In Benue State as in Anambra, Niger, Delta, Edo, and Ogun States a man may own over ten different pieces of land all amounting to well under five hectares. With distances between two of his widest-spread plots ranging up to six kilometers and more, it is easy to appreciate some of the problems he encounters as he committes between his land parcels.

Probably, because individual family Land is very personal property, and partly because its size is generally not very large, there are hardly any instances of abuse of such land by its owners. Often they take painstaking care of it, closely monitor it _for signs of environmental degradation situations where parts have been rented out, and are apt to react vigorously when outsiders (e.g. oil companies, road construction firms, and refuse disposal authorities) cause damage thereon.

In theory, substantial and abuse can occur in cases of temporary land assignment (as characterised by communal land). However, because of the shortness of the privilege (ordinarily, one year or less) and because most communities have. ready-made sanctions against serious land abuse, the degree of misuse of such land is quite low. The sanctions include denial of future allotment. This is a potent stigma and loss of economic opportunity, which few rural persons are prepared to risk.

On the other hand, the system of temporary assignment of communally owned land does not encourage land users to invest in land development, such as the drainage of swamp land or the building of anti-erosion works. Although this seems to be a weakness of the system it could be argued that joint community efforts could as well be geared towards developing the land.Since no individual member of the community can be allotted the same piece of land year in year out.The plots of lands rotate among the community members. It is also easier to allow the impoverished land to fallow, since the use of the land is being regulated by the community leadership.

3.2 Crop Agriculture

Under the impact of various influences, agriculture in Nigeria has slowly evolved from the basically simply 'task of land tillage addressing the problems of personal and family subsistence, to complex activities which now include raising food and fiber plants, processing crops, and formal

marketing of commodities. Similarly, there has been a marked increase in the variety, complexity, and quantity of its tools and products, as well as in the public and private expectations it has continued to generate. Moreover, a substantial part (36%), (NEST, 1990) of the land area of the country is now devoted to agriculture.

As agriculture has become more complex, more extensive, and more demanding on the land, so has there been a striking increase in the environmental and socioeconomic problems associated with it. These problems range from the ill-advised use of certain types of chemical fertilizers and an increase in pest attacks soil erosion and from inappropriate choice of cropping strategies to farmland shortage.

3.2.1 Mixed Cropping Versus Sole Cropping

Crop production in Nigeria takes one or the other of the six general patterns. These are:

- shifting cultivation, which rarely occurs these days, '
- rotational bush fallowing, by far the dominant farming system;
- sedentary or fixed tillage, with or without some livestock rearing;
- plantation agriculture, which normally involves tree crops and very large hectares
- terrace cultivation, which is infrequent in occurrence and takes place on steeply sloping land, and
- irrigated agriculture, especially in the drier northern half of Nigeria.

Cutting across these six crop farming systems are two contrasting cultivation systems; namely, mixed cropping (or polyculture) and sole cropping (or monoculture). Mixed cropping is a traditional, centuries-old system and it is dominant. In the system, two or more crops are cultivated simultaneously on the same farm plot. Sole cropping on the other hand, means only one crop per field and is a very recent development, having started to feature in Nigeria's agriculture from about the 1940s when the British colonial government began to take serious interest in "improving" agriculture in Nigeria (NEST, 1991).

Until recently, sole cropping was considered by all government, corporate, university research, and other officials who deal directly with agriculture as the best form of enlightened agriculture. Therefore, practically all educated farmers in Nigeria regard it as the best way to produce crops. That this is not the case, however, is readily evident. Among the many contrasts between these two systems, one of the most

outstanding is that the level of chemical fertilizers required by mixed cropping is 60 to 70 percent lower than that required by sole cropping (NEST, 1991). This therefore implies that the damage caused by chemical fertilizers to soil is also reduced by 60'to 70 percent, when mixed cropping is practiced. Very interesting! It's therefore a favoured system for soil resource management.
Polyculture has so many socioeconomic merits and more important, such critical ecological implication: that it is astonishing that researchers and development planners have always brushed it aside as an obstacle to progress. Indeed, it is not just surprising, it is criminal: what can be more genocidal than divesting the earth of its capacity to support mankind on a sustained basis.

A most significant of polyculture relates to soil wash and soil fertility. Many a writer on humid tropical land use has bewailed the great intensity of erosion and soil wastage under conditions of `clean cultivation", plantation economy, or single cropping. At least two of the remedies popularly suggest for such a problem, namely, the use of cover crops and shading, are automatic and inherent components of mixed cropping. Here, without any specific investment in erosion control or without the adoption of regular soil conservation measures, the farmer can be assured of the safety of his land.With the dense tier of leafy material associated with polyculture, the ground surface is (almost) completely covered, the impact of raindrops on the soil is sharply reduced, overland runoff is greatly decelerated, and weeds are shaded out.

An inherent soil resources management strategy system indeed. Isn't it?

3.2.2 Alley Cropping

Increasing pressure of population on the land in many parts of the tropics has resulted in a shortening of fallow periods. Since farmers in many developing countries cannot afford costly inputs (including ecological cost), it is necessary to develop a low-input soil management technology that can sustain crop production. One promising technique is alley cropping.

Alley cropping is essentially an agro forestry system in which food crops are grown in alley formed by hedgerows of trees or shrubs. The hedgerows are cut back when crops are planted and kept pruned during cropping to prevent shading and to reduce competition with food crops. When there are no crops, the hedgerows are allow to grow freely to over the land.

Alley cropping retains the basic features of bush fallow. It can easily be adopted by resource poor farmers in the tropics.

- provide green manure or mulch for companion food crops. In this way, plant nutrients are recycled from deeper soil layers,
- provide pruning, applied as much during cropping
- provide shade during the fallow period and this helps to suppress weeds
- provide farourable conditions for soil microorganisms and macro organisms;
- when planted along the contours of sloping land, provide a barrier to control soil erosion;
- provide pruning for browse (animal feed), staking material, and firewood, and
- provide biologically-fixed nitrogen to the companion crop

The major advantage of alley cropping over the traditional shifting cultivation and bush fallow system is that the cropping and fallow phases can take place concurrently on the same land, thus allowing the farmer to crop for an extended period without returning the land to bush fallow.

Alley cropping has been practiced on a sandy soil at Ibadan, where the yield of maize alley-cropped was maintained continuously for six years. As a biological low input soil management strategy, alley cropping should be a preferred production technique in Nigeria where cases of land degradation and problems of chemical fertilizers and pesticides abound.

3.2.3 Pastoralism

Pastoralism is a social organisation which has livestock rearing as its primary economic base. In Nigeria, this means a long series of livelihood activities involving one or more of the following types of animals: cattle, sheep, goats, poultry, pigs, and rabbits.

3.2.4 Types Of Pastoralism

There are seven principal types of pastoralism in Nigeria. Five of these classes are sedentary. The sixth and seventh are non-sedentary, being known collectively as nomadic pastoralism or nomadic herding. Below are the classes of pastorlism:

(a) Sedentary pastoralism

1. mixed farming
2. intensive livestock farming
3. Ranching
4. Lay farming

5. Free-ranging

(b) Nomadic pastoralism

6. Absolute nomadism
7. Transhumance

The simultaneous cultivation of crops and raising of livestock on the same farm is referred to as mixed farming. It occurs in all parts of Nigeria, but more pronounced in the north. The integration of crops and livestock in Nigeria is many centuries old. It reflects a keen indigenous understanding of the self-perpetuating cycle of fertility in agricultural production. The cycle is illustrated in fig. 1.2

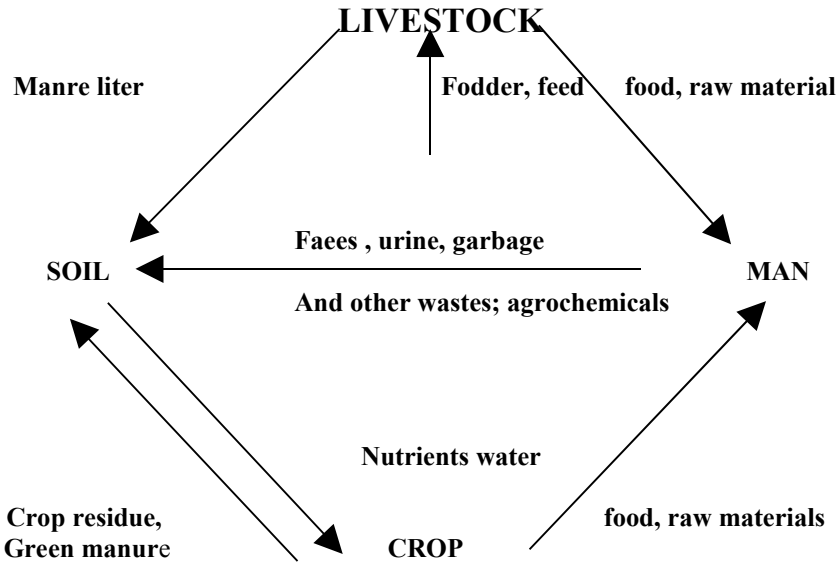


Fig. 1.2
The links between man,
crop farming livestock keeping, and the soil

Ley farming is another sedentary pastoralism that bear a relationship with soil resources management. A ley is simply any arable land which from time to time, is used for grazing. During this periods, the animals drop their litters which enriches the soil. After one or more years, the land is put under cultivation of crops.

Under nomadic pastoralism, the animal owners do not have a permanent place of residence, nor do they practice regular cultivation. They live directly off the animal products, especially milk, milk derivatives, and meat. The nomads and their animals have to keep moving because water and fodder are not sufficient for them to stay permanently in one place. Availability of forage and water in Nigeria (the north) is seasonal.

One implication of this situation is that once new pastures are found in an area, there is a rapid invasion of the area by the nomads during which process the grasses and herbs may all be uprooted and eaten up by the cattle, sheep and goats. The obvious result is overgrazing and consequent devegetation of the area, since what the cattle do not graze at a higher level is consumed by the goats and sheep lower down, or trampled upon by the hooves.

In the high cattle population regions of northern Nigeria, overgrazing has resulted in serious soil erosion in many areas. Apart from the problem of overgrazing, there is erosion damage following the destruction of the top soil as the animals trample to and fro, grazing and drinking. The pulverised and destroyed topsoil is easily washed away during the dry season. The problem is especially grave in years of drought.

It should also be mentioned that nomads have a habit of bush burring, which contributes to erosion. Soon after the grass withers and dries up following the onset of the dry season, it is indiscriminately set ablaze so that there may be an early flush of grass for the animals. The soil in areas, which are burnt is less well protected from water erosion when the rains come or from wind erosion during the dry season.

The ultimate solution to these environmental menace (soil degradation) associated with the system of pastoral nomadism is to enforce sedentarisation among the nomads.

Sedentarisation of the pastoral nomads implies restricting the live stock and the herdsmen from moving from place to place in search of food and water.

3.2.5 Mining

In Nigeria, mining started many centuries before the arrival of the Europeans and of the Arabs who preceded them. It was carried out by traditional methods, with locally available technology. Following the arrival of the British in the last century, the number and variety of minerals mined in Nigeria increased and truly commercial-scale mining commenced. Among the many other minerals which occur in Nigeria are petroleum, natural gas, coal, limestone, lead, zinc, sand, feldspar, diamonds, sapphire, gemstone, tantalite, marble, columbite, zircon, and uranium.

The mining of solid minerals such as coal, tin and ironoire and the quarrying of limestone and construction materials are considered here,

the production of petroleum and natural gas is a subject of later discussion.

Despite the economic gains of mining which include raw materials for our industries, foreign exchange for our economy, source of building and construction materials, employment and job creation etc. There are very many negative environmental impacts created by the mining activities.

General land degradation is quite pronounced in some mining regions, typified by large stretches of the Jos Plateau where open cast mining of tin has been going on for several decades and by many areas in which limestone is quarried. On the Jos Plateau, in particular, there is a tremendous amount of scarification of the land surface, resulting in the existence of numerous mine pits of various sizes.

Among these pits are hills formed by the material excavated during mining operations. These hills greatly disturb the movement of people livestock and, more important, make the places where they occur unsuitable for agriculture.

Smaller, but nevertheless locally significant and very numerous, examples of land scarification occur in many parts of Nigeria as a result of quarrying of building materials. In Lagos alone, there are more than eight major sites for the quarry of sand for building. This devil is ravaging seriously in where sand mining has become a brisk business. The local chiefs were thereby lured into selling out the river beds within their territories for mining. The resultant effect being a devastating coastal (river bank) erosion.

In order to solve or ameliorate these problems, the ministry of mineral resources especially solid mineral department should revise, update, and effectively apply the minerals Act to ensure adequate landscape restoration in all mining and quarrying sites.

3.2.6 Oil Exploration And Exploitation

Chukwuma (2000) reported that there has been an increase in oil production in Nigeria, and oil has to be moved from the points of production to the area of utilisation. This is because the major producers are not necessarily the consumers. During the passage, either by sea or land, it is inevitable that occasionally a vast quantity of this commodity will be lost through tanker accidents, pipeline rupture, chronic discharges from refineries and some oil process facilities. Petroleum exploration exploitation and refining as well as transportation, storage, marketing and use of petroleum products have all created pollution problems in various parts of the country. Their seriousness however, vary from place

to place. During exploration and exploitation, drill cutting, drilling mud (Fluids used to stimulate the production processes) and especially accidental discharges of crude petroleum constitute serious water (including ground water) pollutants in the oil-producing -areas of the Niger Delta.

The three refineries at Port Harcourt, Warri and Kaduna produce refiner effluents which include oil and grease, phenol, cyanide, Sulphide, suspended solids, chromium and biological oxygen deaminating organic matter which may pollute the soil, water and air.

Motor mechanics characteristically throw used lubricating oil carelessly into any available space. These wastes often find their way through runoff and the erosion of contaminated soil into water bodies, thus polluting them.

3.2.7 Bioremediation Of Soil

This implies the use of what nature provides such as micro-organisms, plants, air, water and animals to treat polluted soil and return it to its original state.

Basically, micro-organism play a major role in mopping up soil from crude oil contaminated environment and in oil exploration. Scientists have discovered an unusual community of micro-organisms in the soil and water that can break down crude oil products into environmental friendly compounds, leading in this feat are bacteria and fungi. Research findings show that some group of bacteria can breakdown methane gas in the soil (Boetus, 1998).

In some cases, Kenag mat, a subspecies of hibiscus is planted and the plant has the ability to absorb the oil from the soil; just like vetiver grass being used to restore the land and at the same time using it for its biosynthesis.

3.2.8 Gas Flaring

The production of natural gas in Nigerian has, so far been merely incidental to oil product, since no specific drilling for natural gas has been undertaken. The gas has simply been escaping from wells drilled for oil. Rather than insist that the oil companies operating in the country should re inject the gas into the ground for future use, as is the practice -elsewhere in the world, Nigeria unbelievably allows the companies to flare off the unwanted gas.

This senseless act of flaring off the Nigerian natural gas has not only cost her economic losses, but also environmental problems. Such environmental problems manifest in form of atmospheric pollution which in turn affect our soil resources negatively. When the combustion contaminants pollute the atmosphere, the rain that falls to the land surface (soil) is also contaminated destroying living things around. Vegetation, micro and macro organisms which inhabit the soil are affected, resulting in soil degradation (through erosion) and impoverishment (loss of organic nutrient).

In order to save the environment from further degradation, as well as continued economic losses, the oil companies must be made to stop gas flaring. Bioremediation techniques should also be developed to restore the affectected environments.

4.0 CONCLUSION

The issue of soil resources management as viewed in respect of the aforementioned human activities is a very serious one. All of the named activities (land ownership, crop agriculture, pastoralism, mining etc) are daily manifested in the Nigerian environment. In other words, their associated negative and positive impacts are also there with us. To stop or decelerate the negative impacts therefore, concerted efforts must be made by both government, private and corporate individuals to enhance safe environmental practices and management strategies.

5.0 SUMMARY

This unit aimed at discussing soil resources management in respect of some human economic activities or cultural practices. Land tenure, land acquisition and transfer, inheritance and landownership in the Nigerian context were considered. All these practices or systems of land ownership in Nigeria were seen to have one or two impact on soil. These also determine the value attached to land and the importance of its judicious use and management.

Other economic activities such as pastoralism mining and crop agriculture also featured prominently. The focus of these discussions on each subtopic was to examine the unhealthy impacts each made on soil as a resource. Ways of solving the problems or decelerating the negative impacts were also highlighted, probably for policy formulation and or implementation.

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UNIT 5 GEOGRAPHICAL DISTRIBUTION OF VEGETATION IN NIGERIA

CONTENTS

1.0 INTRODUCTION

Hello friends, I welcome you to this new session of another very interesting and important discussion. How has it been with you? I hope you are coping well with the lectures. Anyway, there has never been anything good that ever come easy in life. It require discipline, determination and endurance to achieve. I therefore encourage you to keep on working hard. Success is just at the door.

The topic of our discussion today is forest resources management. We shall therefore be discussing the geographical distribution of forest reserves in Nigeria in this unit because we are environmentalists, and concerned about our immediate environment, we decided to focus on Nigeria. As usual, some examples may be drawn from outside Nigeria when it becomes necessary.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- Outline the types of forest zones in Nigeria.
- Mention the types of savanna zones in Nigeria

3.0 MAIN BODY

3.1 Why Forest Resource Management

Natural vegetation provides us with an array of products and services that play important roles in our national economy and general well being. Prominent amongst products from forest is wood, a versatile raw material, the use of which is almost infinite. Solid wood forms the basis of numerous labour-intensive industries like sawmills, ply mills, industrial and residential construction and furniture manufacture, all of which create employment and help to stem rural - urban population drift.

The vegetation cover of the country forms habitats for a great variety of wildlife which are of economic and aesthetic value. Many Nigerian, depend on wildlife as their main source of animal protein.

In addition to the above functions, vegetation also plays indispensable roles in creating and preserving a stable and high quality environment. It moderates local climates, reduces soil erosion, and regulates stream flow by forming a protective screen over the land (Watershed).

By shielding the ground from the direct impact of raindrops, offering obstruction to water moving on the ground, and holding the soil particles together with its roots, vegetation helps to reduce soil erosion. Vegetation also has a profound influence on water resources. It reduces the amount of rainwater, which runs down the slope and increases the amount which percolate deep down into the soil. The results are that river flow is more regular: maximum flow during 'the rains is reduced while minimum flow during the dry season is enhanced.

This all indicates that vegetation provides not only tangible products for our use and consumption but also performs vital environmental protection functions. And yet vegetation is a very fragile element of the environment. All it takes is a man, a matchet, and a box of matches to reduce a forest or woodland, which may have developed over a long period of time, into charred tree stumps and heap of ashes and charcoal within a few weeks.

3.2 Types Of Vegetation

Some scientists believe that before human beings came with their growing numbers, economics and cultures to dominate the environment, Nigeria was covered by three major types of vegetation:

(i) Tropical Rain Forest, apparently covering the southernmost 39% of the country;
(ii) Tropical Deciduous forest immediately to the north and also covering about 39% of the country; and
(iii) Tropical xeroplytic woodland, covering the northernmost 22% of the country. (NEST 1991).

In none of the three was grass an important element. Even in the Tropical xeroplytic woodland, grass was limited to occasional patches only.

3.3 Forest

Forest vegetation is dominated by woody species, the majority of which are trees.

Not so long ago, such vegetation covered much of southern Nigeria. Logging farming, particularly of the bush-fallow land rotation type associated with bush burning, urban and infrastructural development and conversion to plantation have reduced the true forest area to patches found in forest reserves. The latter totals only about 10% of forest land area. Much conversion of forest reserves to plantations of fast growing exotics has taken place in these reserves so that the current area of true high forest in the south is probably not much more than 1 million ha (NEST, 1991).

3.4 Vegetation Types In The Forest Zone

The forest zone contains the following major types of vegetation:

(a) coastal vegetation
(b) mangrove forest
(c) freshwater swamp communities

(d) riparian forest
(e) lowland rainforest

3.4.1 Coastal Vegeation

This vegetation type is associated with the mangrove formation. It occurs mainly as strand vegetation dominated by halophytes (salt tolerant plants) growing at the edges of the mangrove swamps, near the seaboard, or mixed with the mangroves themselves. Strand vegetation consists mainly of shrubs, such as conocarpus erectus and Hibiscus tilioceus, and herbs, such as ipomoea pes-capre.

3.4.2 Mangrove Vegetation

Inland from the strand vegetation is mangrove, most of which occurs in the Niger Delta because such vegetation is best developed in the deltas of large tropical rivers where the vigour of the sea surf is broken by sandbars and where rain forest climate prevails. Mangrove also thrives in marine and brackish habitat, in the zone between the high and low tide marks, and may be seen as narrow strips, for several kilometers inland, along the banks of the major rivers in the delta.

Mangrove in Nigerian is dominated by red mangrove (Rhizophoraceae), in association with white mangrove (anicennia) and Laguncularia racemosa. The red mangrove Rhizophora racemosa is the commonest species, covering over 90 percent of the mangrove area (NEST, 1991).

At present only about 3% of our mangrove vegetation falls within forest reserves.

3.4.3 Freshwater Swamp Communities

Aquatic grasslands freshwater swamp forests, deltaic swamps, and undifferentiated swamps make up the freshwater communities that succeed mangrove and continue in low lying places along waterways inlands in the forest zone. Until recently, these communities were largely protected from human activities by the swampy ground on which they exist.

3.4.4 Riparian Forest

These are closed stands of irregular structure, commonly found by stream banks. They are mature stands of trees with closed canopy and an open undergrowth. Riparian forests vary in their width along the water courses which they fringe. A typical example exists around Obrikon pontoon crossing the delta area.

Riparian forest are less complex than the lowland moist forests of the forest zone, but denser than similar woodlands in the savanna area. Characteristic tree species include Brachystegia eurycoma, cola laurifolia, cleistopholis etc.

3.4.5 Lowland Rain Forest

The main block of the Nigerian forest formation at low and medium altitudes is called lowland rainforest. High human population densities have greatly transformed the complex structure and species richness of this vegetation type. Most of it has been converted into farm land, oil palm bush, cocoa and cola plantations or, at best, degrading forest. Mature patches remain only in some forest reserves or as isolated sacred groves.

The lowland rain -forest belt extends from the western to the eastern boundary of the country, and is continuous with similar forest in the Cameroon Republic and beyond. Lowland rain forest proper is nowhere more than 190km wide. North of Ondo town, the farthest northern extension of the rainforest belt reaches slightly beyond the 8°N parallel. East of River Niger, the northern limits are represented by Anambra Forest Reserve at Ogurugu (slightly north of Mamu Forest Reserve) close to the eastern boundary, north of Ikom, The northern edge turn north to include the forest of Obudu, up to latitude 6°30N. Lowland rainforest occurs only below 900m altitude, being succeeded by sub-montane and montane vegetation above this elevation.

3.4.6 Plateau Mosaic Vegetation

On the highlands rising to over 1000m such as Jos, Obudu, and Mambilla plateaux. Vegel peak Massif and Gotel mountains, grassland are mixed with leguminous woodlands, mostly isoberlinia, to form distinctive submontane vegetation types that have however been much modified by deforestation, bush burning, and overgrazing. Grassland forms a continuous cover on these highlands, with a few low shrubs and trees (Ficus spp., Euphorbia, spp.) but no climbers or scrambling plants.

Now we have come to the end of this unit. You can see I didn't ask you any question in the course of the discussion. Of course, I didn't forget. I know the discussion is bugged with so many strange, funny and jaw breaking terminologies which, if care is not taken, might have made the whole exercise disgusting. I therefore wanted you to run through the

pages and get acquainted or familiar with some of these botanical names and forest types.

If I am right in my thinking, then it would be advisable to go over this lesson and then come back to answer the questions below. It would even be an advantage, having read the questions before going over the reading. It will make you figure out the correct answers without stress.

Exercise 10:1

1. Enumerate the uses of forest or vegetation to human kind.
2. Attempt an explanation of each of the major vegetation types.

3.5 Savanna

Savanna occupies nearly 80 percent of the land surface of Nigeria, extending from about 6°N to the northern borders of the country. This is seasonal vegetation in which there is a closed or nearly closed cover of grasses at least 80cm high with flat, usually cauline, leaves. Savanna is usually burnt annually. On the basis of the density and proportion of woody species, savanna is usually distinguished into:

(a) savanna woodland, with fairly closed canopy trees and shrubs,
(b) tree savanna, where the woody plants are scattered,
(c) shrub savanna, where trees are absent, and
(d) grass savanna, where woody plants are absent

The various forms may exist side by side but tend to occur in varying proportions in the different zones into which savanna is subdivided. Keay's scheme is the basis for classifying savanna into zones from the south northwards into:

(a) Derived savanna
(b) Guinea savanna
(c) Sudan savanna, and
(d) Sahel savanna

The highlands in the zone bear distinctive grassland/tree vegetation types.

3.5.1 Derives Savanna

The traditional forest-savanna mosaic, occuring immediately north of the lowland rainforest belt is called derived savanna. The derive savanna belt covers parts of Ogun, Oyo, Kwara, Edo, Delta, Anambra, Imo, Benue, Cross River, Gongola and Taraba States, reaching 8°30N in the west and 6°40N in the east. It covers an area approximately 75,707 sq km (about 81% of the country) being the widest (about 240 km) north of Okigwe. The dry season in this zones is about 3 months and mean annual rainfall is 1,440 - 1,780mm (NEST, 1991).

The vegetation of the zone is believed to have been derived from forest, through prolonged .cultivation and annual burning. Fire tender forest trees aare replaced in the zone by fire tolerant species, and the vegetation changes rapidly in character over short distances, such that low forests, dense woodlands, and thickets alternate with open tree and grass savanna. The soil palm (Elaeis guineasis)is still abundant in this zone in which the typical savanna species are Danicellia oliveri, vitex doniana, ficus capensis, lophira Lanceolata, and hymenocardia acida. Relict forest species include albizia spp, cola spp,m etc. The dominant grasses in this belt are andropogon tectorum (southern ganba grass) loudetia arundinacea.

3.5.2 Guinea Savanna

This is the most extensive vegetation zone in the country, covering 50 percent of the land area. It occurs immediately north of the derived savanna belt in an area where the dry season lasts 4 to 6 months and the annual rainfall varies from 1,020 to 1,520mm. The Guinea savanna encompasses much of the thinly populated middle belt region. Recent developments indicate increased imigration of farmer particularly operators of large-scale mechanized farms, into the area and increased movement and incipient sedentisation of cattle rearers, encouraged by government programmes of tse-tse eradication and demarcation of grazing reserves. In the southern parts, Daniellia aliveri is a common tree while Andropogon gayanus replaces tectorum as the major grass. Northwards, Afzelia africana and isoberlinia spp. replace Danniellia as dominant trees, while hyparrhena spp., Andropogon spp., and schizachyrium become common dominant grasses. Guinea savanna is thus sometimes divided into southern and northern zones, but on the bases of structure and species composition it may be grouped into:

(a) mixed deciduous woodland, covering most of the Niger and Benue troughs,
(b) Afzelia africana and semi-deciduous forest, around Abuja

(c) Isoberlinia - savanna; around Kaduna and extending southwestwards;
(d) A partch of Burkea africana savanna, north of the kainji lake,
(e) Wooded savanna to the northeast of the zone.

3.5.3 Sudan Savanna

Except in the northwest where Sahel savanna occurs this is the northernmost savanna belt in the country, covering a 250km band running east to west. Mean annual rainfall is 510 - 1,140mm, the dry season lasts 5 to 7 months. Increased seasonmality and irregularity of rainfall impose semi-arid conditions on the zone. It is the belt currently being ravaged by desertification. The vegetation is typically mixed combretaceous woodland with vitellaria paradoza (formerly Butyros permum paradoxum, shea butter), Acacia Senegal, Acacia albida, zizyphus, Adasnia digitata (baoba), and piliostigma reticulatum being common trees: The common grasses in this zone are Aristida, Branchiaria, panicum, Chloris, Digitata, and Eragrostis, are mostly short. Cultivation is intense, and together with heavy grazing, bush burning and cutting for fuel wood and browse, has contributed to extensive desertification in the zone.

3.4.5 Sahel Savanna

This exists in the northern part of Borno State. Here there is less than 500mm annual rainfall and the dry season lasts 7 to 8 months. The main vegetation layer consists of low-growing shrubs, mostly Acacia spp., anogesus leiocarpus, balanites aegyptiaca, commiphora quanrisincta, cardia rothiii, and salvadorapersica. Sorghum grass is dominant. The vegetation cover is sparse, the ground being bare and sandy under the short bushes.

4.0 CONCLUSION

Every region, climatic belt, and or ecological zone has its peculiar characteristics as well as its associated environmental problems. Having identified the geographical distribution of Nigerian forest resources, enumerating, and discussing their peculiarities, we are now placed on a better ground to be able to look into the problems associated with the forest resources management in the country. The next unit will therefore focus on the problems of forest resources management.

You can now fasten your seat belt and enjoy your reading.

5.0 SUMMARY

Forest resources constitute a very great proportion of our environment, the importance of' these God-given resources is a common knowledge at both local, national and international levels. The threat to these environmental resources therefore calls for its proper management. And in an attempt to do this, this unit focused on the geographical distribution of forest resources in the Nigerian landscape.

Several vegetation or forest types have been identified together with their various sub-groupings. The associated characteristics were also examined with a view to determining their problems of management.

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MODULE 3

UNIT 1 PROBLEMS OF FOREST RESOURCES MANAGEMENT

CONTENTS

1.0 INTRODUCTION

We have just finished our discussion on the distribution of forest resources in Nigeria (that was in unit1). If you could remember, our umbrella topic is forest resource management.

In this unit, we are going to continue our discussion. The topic we shall be looking at is: problems of forest resources management. Although our major focus is on the local level (Nigeria), we will be setting examples and some peculiar problems as relate to countries other than Nigeria. This posture would be taken because forest resources management has come to be a very sensitive global issue.

When we talk of problems of forest resources management, we are referring to any action, or inaction by man and other living things as well as non living things that affect health and livability of the forest. This descriptive analysis can be qualified with just a word. The word is DEFORESTATION.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- Outline the causes of deforestation.
- Discuss the extent and implications of deforestation

3.0 MAIN BODY

3.1 Deforestation

Deforestation is the removal of forest and other forms of vegetative cover from a site without its replacement. Although this phenomenon has occurred since the dawn of civilisation, reports from various parts of the world indicate that it is now on the increase due to increased socioeconomic activities. Very often, also, these reports show that the alteration of the landscape following deforestation has led to economic and environmental disasters.

3.1.1 Major Causes Of Deforestation

The major causes of deforestation in Nigeria are population growth and the expansion of economic activities, including:

- logging or timber exploitation • farming
- urbanisation
- farming
- bush burning
- firewood collection

- grazing, and
- infrastructural development

Apart from the outlined factors; there are some other known causes that could affect the health of a forest. These other factors may not be so serious on the Nigerian scene. They are however a very common problem in most industrialised nations. We shall have cause to site some of these factors in the course of this discussion

3.1.2 Logging Or Timber Exploitation

During the oil-boom years of the 1970s, there was a massive increase in construction activity which hightened the demand for both construction and furniture timber from forest in Ondo, Edo, Delta and Cross River States, but a substantial amount also came from outside forest reserves. There was a breakdown in the regulation of logging activities in both of these areas. And, as a result, the country's standing crop of valuable species (e.g. iroko and the mahoganies) of merchantable size has been severelly depleted.

3.1.3 Farming

Outside constituted forest reserves, the main deforestation agent is the farmer who recklessly clears the forest for food. Over 75 percent of the total forest area cleared yearly is by these farmers. (NEST, 199-1). In the last few years, multinational companies and large-scale, mechanised farming enterprises have also joined the forest clearing band-wagon in the drive to derive raw materials locally and increase food production. The current back-to-land policy of the government to increase food production further aggravates the deforestation problem. These factors have created increases in the number of farmers requiring farmlands, with corresponding pressure on forest lands and the clamour for dereservation of forest reserves.

It is still true that agriculture, in one form or another, remains the immediate cause of most deforestation. Shifting cultivation accounts for 45 percent of all clearance of closed forest, commercial farming and grazing for a further 15 percent each, dams and roads for 10-15 percent, and forestry for 10 percent. When allowance is made for planting, the next annual forest-loss in the world as whole is probably 11-12 million hectares (Allaby, 1996). In the tropics, the drier and mountain forests are being lost much more rapidly than the rain forests.

Shifting cultivation was once widely practiced in temperate regions, but now survives only in the tropics. It is a system of subsistence farming

that begins with the clearance of trees and shrubs from an area. Such timber as may be of use is taken and the rest is commonly burned, clearing the ground and fertilizing it with wood ash. Crops are then grown and cultivation continues until the land became poor, and cannot support any good yield. The operation then moves to another site, where it is repeated, resulting in the permanent disappearance of forest.

There is actually nothing new in the conflict between agriculture and forestry. Where forests and farms compete for land, confrontation invariably presents victory to the farmers, for the simple reason that the economic return from farms always exceeds that of forests. If necessary, the farmers can buy out the foresters. Yet forests are vital resources.

3.1.4 Urbanisation

The last twenty years have witnessed the creation of new settlements and the large-scale expansion of existing ones, often taking over forests or some other form of natural vegetation. In Ajoda New Town in Ibadan, in Agbara, Ogun State, on a very much larger scale, in Abuja, the new Federal Capital Territory, forests and woodlands have been and are being destroyed to make way for new cities and industrial and housing estates. The phenomenal growth of Lagos along Badagry or Ikorodu roads amply illustrates the consequences of urban population growth. Nearly all the farmlands between Lagos and Ikorodu have been engulfed. Similar situations are found around Ibadan and Kano.

3.1.5 Bush Burning

Bush burning is another notorious agent of deforestation in Nigeria. The burning results mainly from farmers who use if for land clearing, herdsmen who use it to generate grass, hunters to kill wildlife,-and some villagers to clear their surroundings. Under control, fire serves the above useful purposes.But more often than not, the fires get out of control to consume adjacent non-target vegetation. Ultimately, destructive bush burning derives from careless disregard for the value of vegetation, perhaps because of lack of awareness or the attitude that vegetation is “bush” and a symbol of lack of "development".

3.1.6 Firewood Collection

Over exploitation for firewood as well as overgrazing is a major cause of deforestation in the savanna. Clear-felling of trees for commercial firewood without any thought being given to regeneration is a common practice, even on land, such as the rocky slopes of the Naraguta Hills in 70’s, which should have been allowed to remain wooded. On the Jos Plateau itself, trees roots appear to have been "mined out" for fuel so that

the possibility of self regeneration is slim, even if the people could afford to set aside land for this purpose. Elsewhere, the problem with firewood exploitation is that of species attrition, i.e. the cutting of those tree species which are preferred as fuel, leaving behind a less balanced ecosystem.

3.1.7 Grazing

Overgrazing is a serious problem in the Sudan-Sahel belt where overstocking abound .

3.1.8 Air Pollution And Climate Change

Forest at high elevations and those downwind from urban and industrial centers are exposed. to a variety of air pollutants that can harm trees especially conifers. Besides doing direct harm, prolonged exposure to multiple air pollutants makes trees much more vulnerable to drought, diseases, and insects.

In coming decades, an even greater threat to forests 9especially temperate and boreal forests) may come from regional climate changes brought about by projected global warming (Miller, 1999) points often results in serious damage to the vegetation. In the high density livestock areas of the savanna, excessive lopping for browse has reduced many trees to mere skeletons. AIR POLLUTION AND CLIMATE CHANGE.

3.1.9. Infrastructural Development

The construction of infrastructural facilities, such as roads, airports, educational establishments, gas and oil pipelines has consumed large areas of forest.

According to Skoup and Co. report, in the past 30 years, the country had been losing on the average, about 23,000 ha of the gazette forest estate per annum through government dereservation. For example, 410 ha of Ogba forest in the old Bendel state was used for government projects and airport. The Army School of Artillery, the Nigerian Defence Academy, and the Police Mobile Training School have together claimed about 7,420 ha of forest reserves in Kaduna State. In Kwara State, the Ilorin airport claimed 1,140 ha of the Ajaokuta Forest Reserve (NEST, 1991).

3.2 Extent And Implications Of Deforestation

Although the extent of deforestation in Nigeria is difficult to estimate owing to lack of any country-wide resource survey, available records indicate that the area involved is enormous.

Skoup & Co. reported that in the previous 30 years, about 23,000 ha of the gazetted forest estate per annum were lost through government dereservation alone for execution of infrastructural projects. (NEST, 1991).

In addition to the effects of these government dereservations, indiscriminate bush burning clears large areas of forest land, leaving behind it colossal socioeconomic losses to the nation. For example, in the 1982/83 dry season over 1,700 ha of plantations, including those of two Agricultural Development Projects, were burnt. Between 1980 and 1982, over 900 ha of Gmelina pulpwood plantation in Oluwa Forest Reserve, Ondo State, and 490 ha of pine pulpwood plantation in Anambra State, both established with loans from the World Bank, were lost to fire.

The socioeconomic implications of these deforestation processes are quite disturbing. Acute shortage of both industrial timber and fuelwood are already with us while deforestation is also robbing us of numerous shrubs and herbs of food and medicinal value, as well as valuable plants genetic resources.

The loss in biodiversity and genetic resources can be imagined from the list of 484 species in 112 families compiled by Gbile et al as species threatened with extinction, the so called endangered plant species.

Deforestation is synonymous with the destruction of wildlife habitats and has drastically reduced animal populations, their productivity, and species diversity, while rare species are being threatened with extinction.

Deforestation automatically means the loss of the protection, which the plant cover gives to the soil, against agents of erosion.

Accelerated runoff resulting from deforestation also give rise to flash floods, very often with disastrous consequences to life and property. The Ogunpa flood disaster at Ibadan in 1980, which claimed no less than 200 lives, displaced over 50,000 people and destroyed a great deal of property is a case point.

In the savanna areas, the reduced infiltration rates associated with deforestation adversely affect groundwater recharge and storage.

4.0 CONCLUSION

Because vegetation has been regarded as an inexhaustible bounty of nature, we have traditionally treated it casually. We have also regarded its. Protection, functions and potential value for raw materials supply

lightly.Yet, loss of vegetation cover is directly related to desertification, accelerated soil erosion, declining soil productivity and loss of farmland, flooding, and siltation of water bodies, which are serious environmental problems in the country. The great biological diversity of our natural vegetation, particularly of the rain forest type offers considerable opportunities for developing new products. Pharmaceuticals, foods, flavours, and dyes.

5.0 SUMMARY

In a large extent, human factors in form of socioeconomic activities are responsible for forest resources degradation. Several of such activities were examined in this unit. They include, logging or timber exploitation, farming, urbanisation, bush burning, firewood collection, grazing of animals and infrastructural development. Of course, the outlined activities in themselves pose no problem to forest resources management. Instead, their uncontrollable situation constitute the food for thought.

The extent and implications of the said activities were also discussed under this unit.

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UNIT 2 FOREST RESOURCES MANAGEMENT STRATEGY

CONTENTS

1.0 INTRODUCTION

Now we have come to the end of the discussions on forest resources management. This unit would mark the end. We have started from unit one with the study of the geographical distribution of our forest reserves in this country. We went on to look at problems associated with the management of our forest resources. Today we shall be discussing strategies for managing forest resources. As usual, we will not be strictly limited to Nigerian cases. Management techniques adopted in other parts of the world may also form part of the discussion. Although some of these methods may not be familiar, it would be nice we discuss them after all, we are here to learn.

I hereby welcome -you to this part of our discussions. Please, give your total attention, do not give room for distractions so that you can gain maximally. Enjoy yourself!

2.0 OBJECTIVES

By the end of this unit you should be able to: .

- Explain the strategies for managing forest resources.
- Mention some specific or special forest management strategies.

3.0 MAIN BODY

3.1 Management Strategies

Forests are of such importance that on economic grounds alone it is our interest to manage them with care. Unfortunately, however, much of the land they occupy is capable of producing food, and through history forest have been cleared mainly to provide agricultural land. Today, the proportion of the total land area that is forested varies widely from one country to another. This is not an entirely fair way to consider the situation, because some countries also vary greatly in size and population density. Russia, for example, has 57 percent of the world's boreal forest and Canadian forests cover an area greater than that of Western Europe, but in neither country do forests occupy so large a proportion of the total land area as they do in Japan. At the other extremes, Ireland, only 6 percent of which is forested, has large areas that are unsuitable for trees.

In general terms, there are two major approaches to forest resources management, which are reforestation and conservation strategies. We shall be looking at these within the Nigerian context, after which we will come down to some specific strategies. Probably such that are common to both local and international situations.

3.2 Reforestation

One of the best ways of countering deforestation is reforestation. Figures presented by Nwobishi show that between 1981 and 1985 - a period that has witnessed the highest rated reforestation ever - a total of about 30,000 ha, or about 10 percent of the annual deforestation rate, was reforested. The range gap between removal and renewal is due to lack of adequate funding, lack of cooperation by land users, and lack of appreciation by the public of the value of forests and forest cover, as well as the narrow perception of forestry practice by foresters. The level of funding for reforestation depend on the political will of the government. The Nigerian government has realised that over-exploited areas need to be purposefully and vigorously reforested and has shown some

willingness to check wanton deforestation. With increasing awareness that our forests and associated vegetative cover play key roles in our agricultural production, sustenance of water resources, and general environmental quality, Federal and state governments should substantially step up their financial commitment to reforestation.

It has been suggested that a reforestation fund of one naira per taxable adults throughout the country to be ploughed back into some targeted reforestation projects will not only be helpful in providing a reforestation fund but also be beneficial in driving home to everybody the need to check unnecessary deforestation. It is further suggested that the Federal and state governments should enlist the cooperation of large-scale farmers and open-cast miners by including in their concession agreements the need to rehabilitate and reforest, with woody species, their areas of operation before quitting them.

Private individuals or communities should also be encouraged to establish and own woodlots by creating necessary incentives, such as free or subsidised supply of seedlings, operational machinery, or rebates. Ideas of social forestry should be fully developed to assist in tackling both the magnitude and the diffuse nature of the reforestation needed to address adequately the damages of deforestation. In the Sudan-Sahel states of Sokoto, Katsina, Kano, Bauchi, and Borno, where shortages of fuel wood are already critical, energy requirements could be met through the establishment of energy plantations or wood-lots by the communities and diversification of energy sources.

Furthermore, since forest ecosystems means more than wood to the local inhabitants, conversion of natural forests to single species plantations will, as the natural forest areas diminish, constitute some form of deforestation in terms of loss of useful forest components like edible fruits, nuts, vegetables and medicinal plants. The wildlife population and diversity are also reduced in plantations. To remedy this situation, we herein. call for the redesigning of the species composition and structure of our plantations in order to incorporate all these other forest components, including plant and animal species being threatened with extinction.

There is hardly any agricultural research institute in the country which has developed or is developing any system of managing abandoned farmland for quick recovery, beyond mucuna planting. Until recently, the rehabilitation of eroded sites and sand dune fixation were in the same plight. However, in the past 10-15 years, studies have been initiated on the reforestation of degraded farmlands and eroded sites through the process of agri-silviculture whereby arable crop production is integrated with tree planting for fruits, vegetable, fodder, poles or yam stakes. The

adoption of agri-siviculture as an agricultural land use policy will be immediately helpful in checking deforestation and its adverse consequences, especially in the eastern states of Anambra, Imo, Akwa Ibom, and Cross River states as well as in Edo and Delta state (the old Bendel state). Agro-forestry practices, especially planting trees on farms, could also help in reforesting and rehabilitating large tracts of degraded farmland in the savanna, while contributing to further protect the environment from desertification.

Reclamation and stabilisation of degraded savanna is increasingly being purposed through reforestation. Drought-hardy and relatively fast establishing trees are required for this purpose. In addition to exotic species now being used (e.g. Eucalypts) local and naturalised trees which could be used include Balanites aegyptiaca, Piliostigma reticulatum, Salvadora persica, Acacis spp., anacardium accidentle, and Tamarindus indica. In the same way, fire-tolerant species could be planted in fire prove areas and as firebreaks around plantations of fire-susceptible trees. Monotes kerstingii, uapaca togoensis, maranthes (formerly parinari) currentellifolia, and combretum nigricans appear to be such fire-tolerant trees.

3.3 Conservation

From the foregoing, it is quite clear that the vegetation cover of Nigeria, both within and outside forest reserves, on dry land and in wetlands, has increasingly been under threat in recent years. The average Nigerian appears to be either ignorant of the need to conserve this valuable asset or lack the resources to do so.

Formal action. to conserve Nigerian vegetation started at the turn of this century when the first forest reserve was created. By 1939, most of the existing forest reserves was created.

Today 9.6 million ha of land (a little more than 10 percent of the country's land area) exists under forest reserves. (NEST). This includes the 1.7 percent or so of the country's land area protected specifically for wildlife conservation (some reserves, parks and inviolate plots). Along with the creation of reserves was the establishment of a system of administration and protection of the reserves. The first forestry ordinance was promulgated in 1901 and the foundations of the Forestry Department, whose officers were to be known as conservators of Forests, were laid before the First World War began in 1914.

Emphasis is laid on forest reserves because they have been the most effective ways of conserving our natural vegetation. Although vegetation

by human activities probably no longer exists in the country, the most mature natural vegetation types remain in forest reserves.

Traditional methods of conserving natural vegetation, such as reserving certain areas for religious purposes, prohibiting firewood collection from certain areas and on certain days, or stipulating only seasonal collections of natural products from forests, have largely been overwhelmed by pressures from increased population and so called "enlightenment". Traditional farming practices had distinguished farming areas from protected forest which were exploited only for occasional collection of large trees for making such objects as large wooden gongs (Okoro in Igbo), logs for seats in town squares (Ogwel, dug-out canoes or totem poles. They had also depended on long fallow periods, which permitted a high level of soil and plant vegetation between one period of cropping and the next. These benign systems of land use have, unfortunately, succumbed to the pressures of increased population.

Apart from reforestation, which has already been discussed, several conservation measures may be suggested to tackle the problem of deforestation. They include effect monitoring of deforestation, public enlightenment, fuller utilisation of available wood resources, the development of multipurpose forest ecosystems, and the enforcement of existing legislation.

Federal government should view deforestation as a serious ecological disaster. It should set up a monitoring system to collect data on deforestation and ensure that Federal assistance to ecological disaster areas includes full assessment and revegetation of all affected areas within and outside constituted forest reserves. Both Federal and State governments should sustain the present active campaign against deforestation down to the village level emphasizing the benefits of vegetation and the disastrous consequences of deforestation without replacement.

Fuller utilization of available land resources could also help to check deforestation. For example,. proper manipulation of (allow vegetation through the introduction of profuse litter-producing or nitrogen-fixing species would accelerate the pace of fallow recovery and thereby relieve pressure on forest lands.

Deforestation could also be checked through more efficient utilisation of harvested wood resources. Since one of the major economic effects of deforestation is the rapid depletion of the stock of forest resources required by the economy, greater use of enormous quantities of wood currently left in the forest by loggers or wasted in sawmills or burned in farming will help to extend the life of the existing forests.

Other conservation strategies yet to be fully explored include the development of multipurpose forest ecosystems that would support grazing, in addition to providing other benefits, especially in the Sudan - Sahel belt now experiencing acute shortages of browse material.

3.4 Some Specific Management Strategies

The total volume of wood produced by a particular strand of forest varies as it goes through different states of growth and ecological succession (figure l.1). If the goal is to produce fuel wood or fiber for paper production in the shortest time, the forest is usually harvested on a short rotation cycle, well before the volume of wood produced peaks (point A in figure 1.1). Harvesting at point B in figure 1.1 gives the maximum yield of wood per unit time. If the goal is high-quality wood for fine furniture, managers use longer rotations to develop larger, older-growth trees (point C in figure 1.1), whose rate of growth has leveled off and is much lower than that of young trees.

There are two basic forest management systems even-aged and uneven aged. With even-aged management, trees in a given strand are maintained at about the same age and size. A major goal of even-aged management, sometimes called industrial forestry, is to grow and harvest trees using monoculture techniques. This is achieved by replacing a biological diverse natural forest with a simplified tree farm of one or two fast-growing and economically desirable species that can be harvested every 10-100 years, depending on the species. Crossbreeding and genetic engineering can improve the quality and the quality of tree-farm wood.

Even-aged management begins with one or two cuttings of all or most trees from an area, then the site is usually replanted with seedlings of one or more species. -In a natural forest, dead and fallen trees are seen as vital wildlife habitats and integral parts of natural cycle of decay and forest renewal. In most industrial forests, they are viewed as debris to be removed and burned to make way for the growth of planted tree seedlings.

Even-aged management of an area leads to more even-aged management of that area. Once a diverse forest has been cleared and replaced with even-aged strands, the only economical thing for timber companies to do is to keep repeating the process cutting down a strand of trees before it turns into a true forest. In even-aged management, forests are viewed

primarily as lumber and fiber factories, and old-growth forests are seen as timber going to waste rather than essential centers of the earth's biodiversity and ecological integrity.

In uneven-aged management, a variety of tree species in a given stand are maintained at many ages and sizes to foster natural regeneration. Here the goals are biological diversity, long-term production of high-quality timber, a reasonable economic return, and multiple use. Mature trees are selectively cut; the removal of all trees is used only on small patches of species that benefit from such a practice.

3.5 Harvesting Of The Trees

Once loggers can reach a forest, they use various methods for harvesting the trees. With selective cutting, intermediate-age or mature trees in an uneven-aged forest are cut singly or in small groups (group selection), creating gaps no longer than the height of the standing tree. Selective cutting reduces crowding, encourages the growth of younger trees, and maintains an uneven-aged stand of trees of different species. It also allows natural regeneration from the surrounding trees, thereby avoiding the financial and environmental costs of site preparation (usually by bulldozer or herbicides) and planting of trees after clear-cutting. If done properly, selective cutting also helps to protect the site from soil erosion and wind damage.

And unsound type of selective cutting is high grading, or clearing, which removes the most valuable trees. This practice, common in many tropical forests, ends up injuring one-third to two-thirds of the remaining trees when they are knocked over by logging equipment or by the large target trees when they are felled and removed.

Some tree species grow best in full or medium rate sunlight. Such sun - loving species are usually harvested by shelter wood cutting, see-free cutting, or clear-cutting. Shelter-wood cutting removes all mature trees in two or three cuttings over a period of about 10 years. The first cut removes most mature canopy trees, unwanted tree species, and diseased, defective, and dying trees. This opens the forest floor to light but leaves enough mature trees to cast seed and to shelter growing seedlings some years later, after enough seedlings take hold, a second cut removes more canopy trees, although some of the best mature trees are left to shelter the young trees. After these are well established, on third cut removes the remaining mature trees, and the even-aged stand of young trees grows to maturity.

This method allows natural seeding from the best trees and keeps seedlings from being crowded out. It leaves a fairly natural-looking

forest that can give a variety of purposes;' it also help reduce soil erosion and provides a good habitat for wildlife. The danger is that loggers may take too many trees in the first cut.

Seed-tree cutting: harvests nearly all of a stand's trees in one cutting, leaving a few uniformly distributed seed - producing trees to regenerate the stand. After the new trees become established, the seed trees may be harvested.

Clear-cutting: is the removal of all trees from an area in a single cutting. The clear-cut area may be a whole stand, a strip, or a series of patches. After all trees are cut, the site is usually reforested; seed is released naturally, b the harvest, or artificially as foresters broadcast seed over the site or plant seedlings raised in a nursery.

On the positive side, clear-cutting increases timber yield per hectare, permits reforesting with genetically improved stocks of fast growing trees, and shortens the time needed to establish a new stand of trees.

However, clear-cutting, leaves ugly, unnatural forest openings and eliminates any potential recreational value for several decades. It also destroys and fragments some wildlife habitats and thus reduces biodiversity and disrupts ecological integrity. Environmental degradation from clear-cutting above ground is obvious, but equally serious damage occurs underground from the loss of fungi, worms, bacteria, and other microbes that conditions soil and help protect plants from disease.

Furthermore, trees in stands bordering clear-cut areas are more vulnerable to being blown down by windstorms. Large-scale clear-cutting on steep slopes leads to severe soil erosion, sediment water pollution, and flooding.

A variation of clear-cutting that can allow a sustainable timber yield without widespread destruction is strip cutting. A strip of trees is clear-cut along the contour of the land, with the corridor narrow enough to allow natural regeneration within a few years. After regeneration, another stip is 'cut above the first, and so on. This allows a forest to be clear-cut in narrow strips over several decades with minimal damage.

3.6 Conservation: A Shared Concern

Nigeria's forest reserves are managed and protected by state forestry services, which also control the commercial removal of forest products from lands outside forest reserves. At the Federal level, the Division of wildlife management of the Federal Department of Forestry and Agricultural and land Resources, in the ministry of Agriculture and

natural Resources, has responsibility for conservation matters in the country.

The idea of environmental conservation as a shared concern between the government and the public was slow to catch in Nigeria. The first non-governmental organization (NGO) with a commitment to conservation was the Nigerian Field Society, which was established in 1930. The next one was not established until 1970. One of the very happy developments of the last few years has been the formation of several organisations interested in promoting the conservation of natural vegetation in the country. Thus, from being a largely government affairs, conservation has become a shared concern between government and people.

4.0 CONCLUSION

Sound forest management provides us with forest products on a sustainable basis. The forested area is increasing in many high latitude countries, including Britain, and many will be increasing overall (Allaby, 1996). If we wish to reduce the rate at which primary tropical forests, particularly Nigerian forests are being cleared, better forest management will suffice. Far more radical economic, social, and political reforms will be needed.

5.0 SUMMARY

This unit concerned itself with discussing the management strategies for forest resources. Two general approaches that is: reforestation and conservation were elaborated purely within the Nigerian context. Some other specific management strategies which are more or less associated with the developed nations were also discussed. Most of the techniques highlighted were not without some levels of environmental implications. As such, the discussion touches oSn some of the implications of these management strategies as concerned the environment.

As a matter of fact, management of forest resources or reserve should also involve harvesting the resources. The discussion therefore covered some harvesting management strategies.

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UNIT 3 ATMOSPHERE: GLOBAL WARMING AND OZONE LAYER DEPLETION

CONTENTS

1.0 INTRODUCTION

So far, we have discussed on number of environmental management issues. A lot of the topics discussed seem rare and probably attract the attention of the common man and even when seen on the pages of papers. Others were so common that we tend to lose sight of their importance. One of such topics is the air resources management, which we shall be discussing today.

You may be asking the question, why do we have to border about air resource management? Is air no longer free and free flowing? Can anybody or national, control the air that flows around/ Well, you may continue asking why this, why that, from now till tomorrow. But I want

to let you know that the open space that you see above your head has a limit. Not only that, it is also demarcated (relatively), and each layer has a specific impact on you and the environment. You and your environment on the other hand can as well impact on this open space called the atmosphere both positively and negatively. Yes, that's right! You are now waking up.

We shall therefore be discussing about the atmosphere, its classification ozone layer depletion and its chemistry, as well as the consequences of ozone depletion. We will also look at the concepts of global warming, its effects and green house effect.

It is therefore hoped that at the end of this lesson, you should be able to appreciate the importance of the essence of managing our air resources. Have a nice reading.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- Outline the layers of the atmosphere.
- Outline the Chemistry of the Ozone layer Depletion.
- Explain the consequences of ozone layer depletion

Mention the consequences of global warming.

3.0 MAIN BODY

3.1 The Atmosphere

The atmosphere is our air resource. It is a thin envelope of life-sustaining gases surrounding the earth. The atmosphere is divided into several spherical layers characterised by abrupt changes in temperature, the result of differences in the absorption of incoming solar energy.

If the earth is compared to a lemon, the atmosphere can be compared with the skin of the lemon. The atmosphere clings tightly to the Earth by the attraction of gravity. The atmosphere serves to moderate the extremes of heat and cold on the Earth. During the day as the heat of the sun penetrates the-air and warms the Earth, the atmosphere traps this heat so that it escapes more slowly into space, making the night warmer than it would be without this effect. The atmosphere also protects the earth's inhabitants to some extent from meteorological particles, cosmic rays, radiation from the sun, stars, atmospheric dust and other harmful gases.

The atmosphere is in constant motion due to the Earth's rotation and changes in temperature and pressure. The sometimes violent changes that take place in the atmosphere are experienced on Earth as weather, wind, ocean currents, lightening and rain bow-large masses of air moving above the earth's surface can cause changes in weather and produce winds with speeds of over 160km/h. Vital exchanges of matter and energy occur between the atmosphere and the oceans, which are vast reservoirs of heat moisture and carbon dioxide needed by the atmosphere. The atmosphere in turn, supplies ocean surfaces with the energy of motion that produces ocean currents.

3.2 Layers Of The Atmosphere

According to Okebukola (1997) scientists have developed a three classification system for the atmosphere on the basis of;

1. varying temperature
2. varying electrical characteristics
3. varying composition

3.2.1 Temperature

Based on temperature, the atmosphere has five distinguished layers. These are: troposphere, stratosphere, mesosphere and ionosphere (exosphere).

The troposphere extends up to 10km above the earth's surface. It is characterised by a decrease in temperature with increasing altitude. Winds in this layer move mostly in a vertical direction.

1. Above 75% of the mass of the earth's air is found in the atmosphere's innermost layer, the troposphere. Throughout the earth's long history, the composition of the troposphere has varied considerably. Today, about 99% of the volume of clean, dry air in the troposphere consists of two gases: nitrogen (78%) and oxygen (21%0. The remainder has slightly less than 1% argon (Ar), 0.036% carbon dioxide (CO_2), and trace amounts of several other gases. Air in the troposphere also holds water vapour in amounts varying from 0.01% by volume at the frigid poles to 5% in the humid tropics.

2. My friends, it is unfortunate our interesting discussion has run into these chemical jargons. It is a pity I cannot help but present it this way. Although I know not many of us are familiar with chemistry and its mathematics, we just have

to learn it at this juncture in order to be able to get the reality of the much talked about ozone layer depletion.

The stratosphere extends up to 40km above the earth and is characterised by an increase in temperature with increasing altitude and by jet streams that move mostly in a horizontal motion. The distinguished feature of the stratosphere is the ozone layer, which is located between 16 and 32 km above the earth.

The mesosphere extends up to 65km above the earth and is characterised by a rapid rise in temperature with increase altitude.

The highest layer of the atmosphere, the exosphere/ionosphere, extends beyond the atmosphere. The density of the air is so low in this layer that the concept of temperature loses its customary meaning. Ultraviolet rays fill the exosphere and faint glows called zodiacal light that are due to sunlight reflected from particles of meteoric dust originate in this layer.

3.2.2 Electrical Properties

Scientists also divide the atmosphere into layers on the basis of electrical properties. Overall, they recognise and neutral atmosphere, which. lies about 60km and ionosphere above it. The ionosphere, a region of electrically charged particles, or ions may be divided into regions according to the degree of ionization.

3.2.3 Composition

In the lower regions of the atmosphere, up to about 100kilometers above the earth, turbulence causes a continuous mixing of the constituent elements of the atmosphere so that the composition is relatively uniform. These regions make up the homosphere. Above this is the heterosphere where various constituents tend to separate out. The concentrations of heavier elements, such as nitrogen and oxygen, decrease with increasing altitude, so that eventually the atmosphere is dominated by the light elements, such as helium and hydrogen.

3.3 Ozone Layer Depletion

A lot has been discovered about the earth, and its various components have been classified in line with their function and constituents. The ozone layer is one of such classes. It-can be likened to an umbrella, which shields mankind from dangerous ultraviolet rays of the sun. An illustration of this is in the event of heavy rainfall, and individual suffers discomfort if he/she removes his/her umbrella which shields one from the effect of the rains. This is exactly the case with the ozone layer in the

atmosphere, the depletion of which has thrown the world into a fidgeting state, and of which the scientific world has been frantically searching for a solution.

The depletion of this layer from the atmosphere has been not to have only far reaching effects on mankind, animals, and vegetation known but can lead to a change in global climate which will affect everybody if allowed to continue. The depletion of the ozone layer causes a lot of dangerous ailments which include cancer and cataracts and also causes lower crop yields and has a 'green-house' warming effect on the atmosphere. The destruction of the ozone layer comes as a result of the emissions of chlorofluorocarbons (CFCs) used in aerosols, packaging, air-conditioning and refrigerators. Scientists of the Antarctic survey in the United Kingdom were the first to discover the hole in the ozone layer and it was believed to have been caused by chemical pollutants.

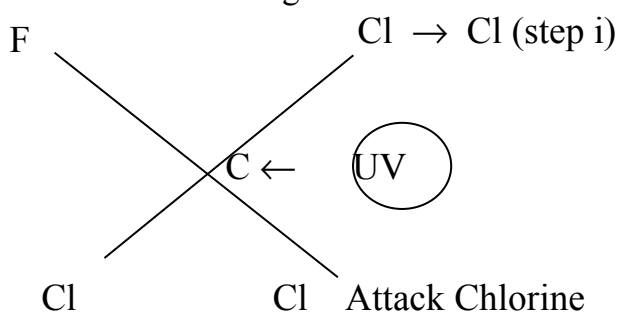
3.3.1 Chemistry Of The Ozone Layer Depletion

The University of California scientists, called Rowland, has wondered about an important industrial chemical called chlorofluorocarbons (CFCs). This compound that was invented about the late 30s has been found to have very important applications because they had desirable physical properties, and one very important chemical property is that CFCs are essentially inert. They do not react with anything, so they don't react with living organisms, including humans. They are therefore non-toxic, and perfectly safe around people, if any few cylinders of these gases were emptied in crowded room, nobody would notice.

Industries the world over, have been using about a million tones of CFCs every year, and ultimately end up in the atmosphere. This consideration made Rowland curious and he therefore speculated that the CFCs, once in the atmosphere, would move slowly up to the stratosphere, which may take a maximum of about 25 years to attack the ozone layer.

His reaction he explained experimentally when he found that ultraviolet (UV) light can break of CFCs molecules (step 10 knocking chlorine atoms out of them.

Fig. 13.2



$$Cl + O_3 \rightarrow ClO = O2 \text{ (step ii)}$$

Source: Ahove (2001)

He discovered that if he included some ozone in his reaction vessels, the chlorine atoms destroyed it, thus, liberating diatomic oxygen (step ii).

So, the so-called chemically inert CFCs will react if you expose them to highly energetic UV light. Rowland's work led him to the conclusion that the actual chemical culprit was not just the bar chlorine atom, but rather an unusual molecule made up of one atom of chlorine and oxygen called chlorine monoxide - ClO. He thus further explains how this ClO continues to deplete the ozone layer with the equations below:

Breaks up

$ClO \longrightarrow Cl + O$ **Step iii**

$ClO + O_3 \longrightarrow ClO + O_2$ **step iv**

$O + O_3 \longrightarrow 2O_2$ **step v**

When ClO absorbs UV light, it splits into chlorine atom and one-oxygen atom, each of which can attack ozone molecules. The ClO is not used up in the process, and can go on and on, destroying more ozone molecules. ClO is infact what is called catalyst in chemistry.

3.3.2 Consequences Of Ozone Layer Depletion

With less ozone in the stratosphere, more biologically harmful ultraviolet radiation will reach the earth's surface. This form of UV radiation damages DNA molecules in animals including our very skin. Do you realise that for every 1% loss of ozone leads to a 2% increase in the UV radiation striking the earth? And consequently leading to 5% - 7% increase in skin cancer?

The following are the effect of ozone depletion:

1. Increase in the cases of skin cancers running into millions annually. This includes curable and incurable cancers.

2. A sharp increase in eye cataracts (the clouding of the eye that causes blurred vision and eventually blindness and severe sunburn in people and eye cancer in cattle).

3. Suppression of the human immune system which would reduce our defences against a variety of infectious diseases, an effect similar to AIDs virus.

4. Decreased yields of important food crops such as corn, rice, soya beans and wheat, due to gradual loss of chlorophyll in plants.

5. Reduction in the growth of ocean phytoplankton that form the bases of ocean chains veins and help remove carbon dioxide from the atmosphere.

6. Degradation of points (building, etc), colours from exposed to too much sunlight), plastics and other polymer materials

7. Increase in global temperature and its attendant consequences.

3.4 Concept Of Global Warming And Green House Effect

The green house effect can simply be described as the heating or warming of the earth's atmospheric layer. The earth's atmosphere, like the glass of a green house traps the sun's heat, the sunlight warms the earth but the heat that is generated is reflected by terrestrial or infrared radiation and cannot easily escape the atmosphere because the green house gases block the radiation and send some of it back toward the earth, thus adding to the warmth of the earth's surface.

The glass-roofed structure in which plants are grown is called a greenhouse. Usually, the walls are also made of glass. A green house creates an artificial environment by careful control of temperature, light, humidity, air quality, soil moisture and heat levels.

Like the glass walls of a green house, the atmosphere is nearly transparent to short wave and visible solar radiation. Part of the energy absorb by the earth is radiated to the atmosphere as long wave infrared radiation. Because it contains carbon dioxide and water vapour, which absorb much of the long wave radiation before partial radiation back to the surface of the earth. This causes the earth and its atmosphere to warm up which had remained nearly constant until the 20th century when the burning of fossil fuels such as coal, fuel oil, petrol, kerosene, diesel and

natural gas began to release large quantities of carbon dioxide into the atmosphere.

The combustion of fossil fuel has brought about an ever-increase in the carbon dioxide concentration in the atmosphere. The rapid eradication of the tropical rainforests is depleting the earth's plant growth and diminishing their capability for absorbing carbon dioxide. The unabsorbed carbon dioxide rises to the upper atmosphere and blocks the re-radiation of solar energy back into space. This precipitates a global temperature increase called the "green-house effect" which scientists say is causing the ice caps to melt.

3.4.1 Green House Gases

These green house gases are projected to cause an increase in the average temperature of the troposphere. According to Miller (1991), the major ones are:

1. carbon dioxide
2. chlorofluorocarbon (CFC)
3. methane
4. nitrous oxide

3.4.2 Consequences Of Global Warming

1. A warmer global climate could have a number of possible effects. One is changes in food production, which could increase in some areas and drop in others. Current climate models project 10 - 70% declines in the global yield of key food crops and a loss in current cropland area of 10 - 50% especially in most poor countries.

2. Global warming would also reduce water supplies in some areas. Lakes, streams, and aquifers in some areas that have provided water to ecosystems croplands, and cities for centuries could shrink or dry up altogether. This would force the entire population to migrate to areas with adequate water supplies - if they could.

3. Global warming will also lead to a change in the make up and location of many of the world's forests.

4. Climate change would lead to reductions in biodiversity in many areas. Large-scale forest diebacks would cause mass extinction of plant and animal species that cannot migrate to new areas. Fish would die as temperatures. soared in

streams and lakes, and as lowered water levels concentrate pesticides.

5. In a warmer world, water in the world's oceans would expand and lead to a rise in sea level. The warming at the poles will cause ice sheets and glaciers to melt even partially and thereby rising the global sea level.

6. Global warming also poses threats to human health. According to the 1995 International Panel on Climate Change (IPCC) report, global warming would bring more heat waves. This would double or triple heat related deaths among the elderly and people with heart disease.

7. Atmospheric warming also affects the respiratory tract by increasing air pollution in winter months and increasing exposure to dusts, pollens, and smog in summer months.

4.0 CONCLUSION

The problem of global warming and ozone layer depletion is universal, being a global village, Nigeria shares in its consequences and human and the biodiversity. Except concrete and urgent steps are taken this problems will remain with us. Nigeria is already taking steps in ensuring that ozone friendly chemicals are used in our 'industries that produces insecticides, paints, and foam making industries. More of such actions will yield better results for this and future generations.

5.0 SUMMARY

We have been talking about air resources management. In this, we examined air as an environmental resource in which our attention was focused on the atmosphere. Three standard classification systems of the atmosphere on the basis of temperature, electrical characteristics and composition was made. The ozone layer depletion, chemistry of the ozone layer depletion and its consequences, the concept of global warming and green house effect as well the consequences of global warming were also treated.

6.0 REFERENCES/FURTHER READINGS

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Other Resources

Okebukola, P.A.O (1997): Understanding our Environment. Paper presented at Federal Governement College, Ijanikin, Lagos.

UNIT 4 AIR POLLUTION

CONTENTS

1.0 INTRODUCTION

This unit will be focused on air pollution. As you go through this unit various sources of air pollution and their types will be considered. Various forms of pollutants will be articulated including the ones that are common in the Nigerian atmosphere.

The effects of these air pollutants especially on humans will be stressed. Their effects on plants and other aquatic organisms will be mentioned including acid rain or acid deposition.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- Mention examples of pollutants especially the ones in Nigeria.
- Outline the consequences of air pollution on humans

3.0 MAIN BODY

3.2 Sources And Types Of Air Pollutants

Most pollutants in urban areas enter the atmosphere from the burning of fossil fuels in both power plants and factories (stationery sources) and in motor vehicles (mobile sources). In car-clogged cities such as Lagos, Port Harcourt, Benin etc, motor vehicles are responsible for 80 - 88% of the air pollution.

Generally, there are about five principal sources of atmospheric pollutants:

(a) industrial and mining processes;
(b) fuel combustion (including fuel wood burning, bush fires, and flaring of natural gas);
(c) waste disposal by burning;
(d) road traffic and other abrasive forces which raise dust from the ground, and
(e) naturally occurring pollutants, like pollen, spores, and bacteria.

In many industrial processes, substances with offensive odours, fluorides, and beryllium are emitted to pollute the air. Mining may produce some gaseous pollutants, such as oxides of sulphur, but by far the most important and wide spread are the dust particles which can present very severe health hazards to workers. Even when man's health is not directly affected there can be important economic effects from damage to materials, vegetation, and livestock. On a regional scale, the production of chlorofluorocarbons (CFCs) for a variety of uses, such as solvents, refrigerator fluids, and spray-can propellants, is of concern because of their ability to destroy stratospheric (upper atmosphere) ozone which shields man from the direct impact of ultraviolet rays from the sun.

Fuel combustion releases most of the nitrogen and sulphur in the fuel, mainly as oxides of nitrogen and sulphur and methane, among others. When incomplete combustion of any liquid fuel occurs, a visible plume, which is normally accompanied by fine suspended particles, may be emitted. Incomplete combustion of waste may lead to the production of very irritating and potentially harmful compounds, such as hydrocarbons and aldehydes.

Human beings face the hazards of fumes emitted from vehicles, especially in urban centres with heavy road traffic. The exhaust tunes from diesel-burning vehicles contain oxides of nitrogen. Such vehicles also emit black smoke if the engine is poorly maintained. Petrol engines give out a mixture of hydrocarbons, including carbon monoxide and oxides of nitrogen and lead. In certain circumstances, complete photo-chemical reactions can occur between the components of exhaust gases, giving rise to toxic compounds. Where air is stagnant, exhaust gases from car and generators will accumulate, leading to eye irritation, plant damage, and even fatalities.

In the category of naturally occurring pollutants, dust and other suspended aerosols are the most important. Dust may consist of a mixture of both inorganic and organic substances, such as sulphur released by sulphate fertilizers, silica, alumina, lime, ferric oxide, and various salts.

3.3 Evidence Of Air Pollution

That our air is far from clean is clear from many studies of our pollution in the country.

3.3.1 Dust Pollution

Dust particles, which are the most evident air pollutants, have many sources in the country.

Vehicular traffic is an important source. It was estimated that the annual amount of dust kicked up in the air by the country's motor-vehicles were 612,000 tonnes and 181,000 tonnes for unpaved and paved roads, respectively (NEST, 1991).

The intensity of the harmattan dust haze, which not only disrupts traffic but also causes respiratory infections, has been observed to be on the increase. The total annual harmattan dust load over the country was estimated to have increased from 160,000 tonnes in 1979 to between 300,000 and 600,000 tonnes in 1988 (NEST, 1991).

In addition, about 584,000 tonnes of smoke particles were estimated to be emitted annually into the atmosphere from the burning of about 80 million cubic meters of fuel wood. The burning of an estimated 18.25 million tonnes of domestic waste is capable of throwing about 58,400 tonnes of dust into the air annually.

There is also evidence of severe dust pollution by some industries in the country, notably cement and steel. Akeredolu obtained kiln stack dust losses of between 1 and 4 percent of clinker produced from two cement plants. These values were found to be rather high when compared with an average kiln stack dust loss of about 0.15 percent for similar cement plants in Germany. (NEST, 1991). Recent estimates for dust pollution by the Alada steel plant indicate that more than 20 tonnes and as high as 62 tonnes of dust, made up of oxides of calcium magnesium, sulphur and iron, could be discharged into the atmosphere annually.

3.3.2 Vehicle Emission

The oil boom of the 1970s has accelerated the rate of motor vehicle utilisation by almost 300 percent during the last three decades. In large cities such as Lagos which suffer from traffic congestion, with peak hour operating speeds of less than 10km per hour, there is high emission rate of carbon monoxide and sulphur dioxide from automobile exhaust. Values far greater than the limit of 0.03 parts per million (ppm) recommended by the World Health Organization have been recorded for many of our cities.

The current specification of lead in gasoline sold in the country is about 0.74g per liter. On the basis of about 20.22 million liters of gasoline being consumed per day in the country in 1985, it was estimated that the annual emission of lead into the Nigerian environment was about 5,200 tonnes.

3.3.3 Fuel Combustion

Fuel combustion for commercial primary energy production in the country was estimated to be capable of emitting 44,700 tonnes of dust particles, 1.2 million tonnes of oxides of nitrogen, 5,760 tonnes of oxides of sulphur, and about 73,500 tonnes of carbon monoxide into the air. This is aside from the thousand generators used as standby electricity sources that are capable of polluting the atmosphere.

3.3.4 Biomass Burning

Isichei and Akeredolu estimated that about one third of the more than 60 million hectares of the Nigerian savanna is burned annually. This would

result in the annual loss of about 269 million tonnes of nitrogen into the air. In addition about 1 million tonnes of nitrogen is emitted annually into the atmosphere through burning of the semi deciduous forest.

3.3.5 Steel Plant Emission

Nigerian has two integrated steel plants located at Aladja and Ajaokuta. It is estimated that the Ajaokuta Steel Complex will emit 5,600 tonnes of sulphur dioxide per year into the atmosphere when competed. Additional gaseous emissions expected from the steel rolling mills at Jos, Katsina and Oshogbo which utilise billets from the steel plants, and those at Enugu and Kano, which make use of scraps, are probable contributors to the potentially high level of acidity found in the Lagos, Kano and Warri, Port Harcourt belts.

3.3.6 Conclusion

There is undoubtedly a good indication that, in an attempt to improve the quality of life of citizens through industrialization, Nigeria is releasing increasing amounts of pollutants into the atmosphere. The hydrocarbons of petroleum refineries, the dust and fumes of metal melting and cement works, the odorous gases of chemical and allied industries, the carbon monoxide and oxides of sulphur and nitrogen of internal combustion engines, the charred particulate and sulphur dioxide emissions of pulp and paper industries, for instance, are all pollutants, which are increasing the acidification potential of the Nigerian environment; manifesting in increasing damage to lakes, soils, plants, animals, forests and fisheries. In addition, atmospheric pollution poses a number of health hazards.

Our government and our people must take necessary action in order to slow down and eventually reverse the deterioration of the atmosphere. No wonder, Hayford Ahiadu in his article tilted: saving the ozone layer in The LASU Geo planner vol. l, 1993, made a clarion call for people and governments to think of generations to come and try to build a better tomorrow for them by putting social benefit cost analysis, ahead of their private benefit cost. Why don't you heed the clarion call?

3.4 Effects Of Air Pollution

3.4.1 Effects On Humans

Your respiratory tract is made of thousands of hair that help filter the air. The hairs in your nose filter out air pollutants. The sticky lining of your upper respiratory tract sticks captures little particles and dissolves some gaseous pollutants. The process of sneezing and coughing are means of naturally expelling these pollutants buy our respiratory system.

Years of inhaling these pollutants (including smoking) can overload and break down these natural defenses, causing or leading to respiratory diseases, which include:

1. Lung cancer
2. Asthma
3. Chronic bronchitis evident with regular inflammation and damage to the cells lining the bronchi and bronchioles, causing mucus build up, painful coughing, and shortness of breath.
4. Emphysema. This is the irregular damage to air sacs or alvoli resulting abnormal dilation of air sacs, loss of lung elasticity and acute shortness of breath (Miller, 1999).

Note that elderly people, infants, pregnant women, and people with heart disease, asthma or other respiratory diseases are especially prone to air pollution. On your own part, kindly educate and save guard them.

The reaction of carbon dioxide with haemoglobin in the red blood cells reduces the propensity of blood to carry oxygen. This hinders perception and thinking, slows reflexes and consequently leads . to headaches, drowsiness, dizziness and nausea. It can also generate heart attacks in people with heart diseases.

Sulphur dioxide results into some constriction of the airways in healthy people with asthma. Severe exposure leads to condition similar to bronchitis. Sulphur dioxide and suspended particles react to form more hazardous sulphate particles, which are inhaled more deeply into the lungs than sulphur dioxide ($S0_2$) and remain within the body for long (Miller, 1999).

3.4.2 Effects On Plants

There are some gaseous pollutants e.g. ozone, that damage leaves of crops plants and trees directly when they enter leaf pores. Serious exposure of leaves to such air pollutants cause breakdown in the protection waxy coating that helps prevent serious water loss and damage from diseases, pests, drought and frost. This kind of exposure also interferes with photosynthesis.

Consequently,. plant nutrient uptake is reduced, growth impeded and causes leaves or needles to turn yellow or brown and drop off.

3.5 Acid Rain

Acid deposition has a number of harmful effects, especially when the pH falls below 5.1, including:

(1) Damaging statues, building, metals and car colours
(2) Killing fish, aquatic plants, and micro-organisms in lakes and streams
(3) Weakening or killing trees, especially conifers at high elevations, by leaching calcium, potassium and other plants nutrients from soil.
(4) Damaging tree roots by releasing ions of aluminium, lead, mercury and cadmium into the soil.
(5) Making trees more susceptible to attacks by diseases, drought and promoting the growth of fungi and moss that thrive under acidic conditions.
(6) Stunting the growth of crops such as tomatoes, soya beans, carrots and cotton.
(7) Leaching toxic metals such as copper and lead from city and home water pipes into drinking water.

3.5.1 Damage To Aquatic Life

Acid deposition has a severe harmful impact on the aquatic life of freshwater lakes in areas where surrounding soils have little acid-buffering capacity. Much of the damage to aquatic life in the Northern hemisphere is a result of acid shock. Acid shock is caused by the sudden runoff of large amounts of highly acid water into lakes when snow melts in the spring or when heavy rains follow a period of drought. The aluminium, leached from the soil and lake sediment kills fish by clinging to their gills.

4.0 CONCLUSION

There is undoubtedly a good indication that, in an attempt to improve the quality of life of citizens through industrialisation, Nigeria is releasing increasing amounts of pollutants into the atmosphere. The hydrocarbons of petroleum refineries, the dust and fumes of metal smelting and cement works, the odorous gases of chemical and allied industries, the carbon monoxide and oxides of sulphur and nitrogen of internal combustion engines, the charred particulate and sulphur dioxide emissions of pulp and paper industries, for instance, are all pollutants which are increasing the acidification

5.0 SUMMARY

What this unit has been able to pass across to you is basically the problem of air pollution which is not been properly managed in our

country, Nigeria. It has pointed out the sources and types of pollutants and has proved that air pollution exits in Nigeria through dust, vehicular emission, biomass burning, fuel consumption, steel plants emission. The effects of this pollutant reflect on humans, plants, aquatic organisms and even some materials.

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Other Resources

Okebukola, P.A.O (1997): Understanding our Environment. Paper presented at Federal Government College, Ijanikin; Lagos.

UNIT 5 AIR RESOURCES MANAGEMENT STRATEGIES

CONTENTS

1.0 INTRODUCTION

From the discussion in the last unit, we have been able to establish the fact that the atmosphere (the open space above our head) is the source of our air resources. It was also seen from the scientific point of view that the atmospheric strata or layers perform a very important function in nature. Each in turn creating grave consequences when there exist visible and, or invisible imbalances. The ecosystem – man, animals, plants and the nonliving environment being at the receiving end of the negative effects.

The ozone layer depletion, global warming, air pollution and their attended consequences therefore call for a quick action and reaction by every individual and governments. A management approach or strategy that would rescue the dreaded situation needs to be adopted and

implemented religiously. Some attempts and propositions to this effect have been made in the past by the scientific world and nations. We shall therefore be discussing these issues in this unit.

In as much as the problems of ozone layer depletion, global warming and air pollution are current issues and putting the wheel of the scientific world on the run, the strategies for managing the crisis as discussed in this unit may not be enough for resolving these problems as new discoveries are daily being made about these issues.

I will however enjoin join you to come along as we go through these strategies - a bird in hand they say is more valuable than a thousand in the wilderness.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- outline strategies to protect the ozone layer
- mention how to deal with the problems of global warming.

3.0 MAIN BODY

3.1 Solutions; Protection Of The Ozone Layer

The scientific consensus of researchers in this field is that we should immediately stop producing all ozone - depleting chemicals. Even with immediate action, the models indicate that it will take 50 - 60 years for the ozone layer to return to 1975 level and another 100-200 years for full recovery to pre-1950 levels.

Substitutes are already available for most uses of CFCs, and other are being developed (Individuals matter, p.294). One substitute for CFCs is hydro-chlorofluorocarbons or HCFCs such as CHF_2, containing fewer chlorine atoms per molecule than CFCs. Because of their shorter lifetimes in the stratosphere, these compounds should have only about 2.5% of the ozone depleting potential CFCs. If used in massive quantities, however, HCFCs would still cause ozone depletion and act as potent green house gases.

Another substitute for CFCs is hydro-fluorocarbons or HFCs (such as CF_3, containing fluorine but no chlorine or bromine). Recent research indicates that HFCs have a negligible effect on ozone depletion. However, they may need to be restricted or phased out because they re powerful greenhouse gases than CFCs or C02. In addition, a 1996 study

indicated that one widely used HCFC (HCFC-123) may be causing acute hepat is and other living abnormalities.

To a growing number of scientists, hydrocarbons (HCs) such as propane and butane are a better way to reduce ozone depletion while doing little to enhance global warming. HCs are especially useful as coolants and insulating foam in refrigerators recently developed by German scientists.

Some other scientists have suggested using tens of thousands of lasers to blast CFCs out of the atmosphere before they can reach the stratosphere.

However, the energy required, and decades of research would be needed to. perfect the type of lasers needed. Moreover, we can't predict the possible effects of such powerful laser blasts on climate, birds, or plants.

So far, the cut in, or reducing the production of ozone depleting gases seems to have borne some hopeful progress. In 1987, 36 nations meeting in Montréal developed a treaty, commonly known as the Montreal protocol, to cut emissions of CFCs (but not other ozone depleted) into the atmosphere by about 35% between 1989 and 2000. After hearing more bad news about ozone depletion, representatives of 93 countries met in London in 1990 and in Copenhagen in 1992 and adopted a protocol accelerating the phase-out of key ozone-depleting chemicals, with some phase-out schedules accelerated in 1995 and 1997.

The agreements reached so far are important examples of global cooperation in response to serious threats to global environmental security. Because of these agreements, CFC production fell by 76% between 1988 (its peak production year) and 1995. Global production of halons, carbon tetrachloride, and methyl chloroform has also dropped sharply, but that of methyl bromide and HCFCs continues to rise.

Developed countries have set up a $250 million fund to help developing countries make the switch away from CFCs, but much more money will be needed. It is encouraging that 50 developing countries have committed themselves to phasing out CFCs early. However, the world's two most populous countries, China and India, have refused to sign the ozone agreements. Even if the 1992 agreements are upheld, scientists estimate that the ozone layer will continue to be depleted until around 2080 and will cause ozone losses of 10-30% over the Northern Hemisphere (where most of the world's people live). However, without the 1992 international agreement, ozone depletion would be a much serious threat.

3.2 Should We Do More Research Or Act Now?

There are three schools of thought concerning global warming. A very small group of scientists (many of them not experts in climate research or heaving funded by the oil and coal industries) contend that global warming is not a threat. Widespread reporting of this no-problem minority view in the media has clouded the issues, cooled public support for action, and slowed international negotiations to deal with this threat.

A second group of scientists and economists believe we should wait until we have more information about the global climate system, possible global warming, and its effects before we take any action. Proponents of this waiting strategy question whether we should spend hundreds of billions of dollars pleasing out fossil fuels and replacing deforestation with reforestation (and in the process risk disrupting national and global economics) to help ward off something that might not happen. They call for more research before making such fAr reaching decisions.

A third group of scientists point out that greatly increased spending on research about the possibility and effects of global warming will not provide the certainty decision makers want because the global climate system is so complex. These scientists urge us to adopt a precautionary strategy. They believe that when dealing with risky and far-reaching environmental problems such as possible global warming, the safest course is to take informed action before there is overwhelming scientific knowledge to justify acting.

Those who favour doing nothing or waiting before acting point out that there is a 50% chance that we are overestimating the impact of rising greenhouse gases. However, those urging action point out that there is also a 50% chance that we are underestimating such effects.

One question Hayford Ahiadu asked. about the melting of polar ice cap with a consequent flooding of some coast lines due to global warming is: "why should there be any flooding, when the amount of heat that is capable of melting a given volume of ice is also capable as well as to absorb the same volume of water resulted from the melting, going by the principle of water balance/budget?"

3.3 Strategies To Reduce Global Warming?

According to the 1994 IPCC report, stabiliSing CO_2 levels at the current level would require reducing current global CO_2 emissions by 66-83%. This is highly unlikely and politically charged. The International Energy Agency project, that CO_2 emission will increase by nearly 50% between 1990 and 2010 with most of the increase coming from developing countries. (Do developing countries engage in more CO_2 generating activities than the developed nations?). According to climate models,

even stabilizing CO_2 concentrations at 450 ppm requiring cutting CO_2 emission by more than half.

Some analysts call for increased use of nuclear power because it produces only about one-sixth as much $C0_2$ per unit of electricity as coal. Other analysts argue that-the danger of large-scale releases of highly radioactive materials from nuclear power-plant accidents and the very high cost of nuclear power make it a much less desirable option than improving energy efficiency and relying more on renewable energy sources.
Using natural gas could help us make the 40 to 50 year transitions to an age of energy efficiency and renewable energy. When burnT, natural gas emits only half as much CO_2 per unit of energy as coal, and it emits far smaller amounts of most other air pollutants. Shifting from high-carbon fuels such as coal -to low-carbon fuels such as natural gas could reduce CO_2 emissions by as much as 40%. However, without effective maintenance, more reliance on natural gas can increase inputs of methane (a potent greenhouse gas) from leaking tanks, and pipelines, and thus increase global warming.

One method for reducing CO_2 emissions would be to phase out government subsidies ON fossil fuels over a decade and gradually phase in carbon taxes on fossil fuels (especially coal and gasoline) based on their emissions of CO_2 and other air pollutants.

Reducing deforestation and switching to more sustainable agriculture would reduce CO_2 emissions and help preserve biodiversity. According to most analysts, slowing population growth is also crucial. If we cut per capita greenhouse gas emissions in half but world population doubles, were back where we started. Some analysts argue that it is vital to global environmental security that developed countries transfer energy efficiency, renewable energy, pollution prevention, and waste reduction technologies to developing countries as soon as possible.

It has also been suggested that we remove CO_2 from the exhaust gases of fossil fuel-burning vehicles, furnaces, and industrial boilers. However, available methods can remove only about 30% of the CO_2 and using them would double the cost of electricity.

Some call for a massive global reforestation program as a strategy for slowing global warming. However, studies suggest that such a program (requiring each person in the world to plant and tend an average of 1,000 trees every year) would offset only about 3 years of our current CO_2 emission from burning fossil fuels. A recent study suggests that forests store much more carbon than previously thought, primarily in peat and other organic matter in soils.

Some scientists have suggested various techniques for dealing with possible global warming, including adding iron to the oceans to stimulate the growth of marine algae which could remove more CO_2 through photosynthesis. It is however believed that adopting improved energy efficiency and shift to renewable forms of energy that don't produce carbon dioxide would be much more effective and cheaper.

3.4 Strategies For Preventing And Reducing Air Pollution

Brooks and Brook (1979) stated that research in methods of controlling air pollution is being intensified because the seriousness of .the problem is being increasingly recognised. Special air-monitoring equipment built by the United States public Health Service automatically measures and analyses the levels of sulphur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide, ozone, and total hydrocarbons and oxidants. Information is gathered on particulate pollutant concentration, pollutants, washed out of the atmosphere by rainfall and local wind turbulence.

Igwe (1998) suggested that in management of environmental problems especially our pollution, there should be efforts of those connected with education in appealing to all individuals to rethink and develop-a positive attitude towards our environmental health in general.

The Federal, State, Local Environment protection agencies should develop control measures which should include the development of devices to reduce the toxic substances thrown off in the imperfectly burned exhaust of automobile exhaust pollution in cities; example, ‘mulue’ buses in Lagos State.

The burning of rubbish within city limits has to be forbidden. There should be restriction on the use of high sulphur containing coal as fuel.

The press and other mass media should reflect the concern of Federal, State, Local governments, industries and individuals in our attempt to have breathing air.

3.5 How Can We Protect The Atmosphere? An Integrated Approach

As population and consumption rise, we can generate new air pollutant faster than we can clean up the old, even in developed countries with strict air-pollution control laws. As a result, environmentalists believe that protecting the atmosphere, and thus the health of people and many

other organisms, will require a global approach that integrates many different strategies. Suggestions for doing this include.

- Putting more emphasis on pollution prevention
- Improving energy efficiency
- Reducing use of fossil fuels (especially coal and oil)
- Increasing use of renewable energy
- Slowing population growth
- Integrating air pollution, water pollution, energy, land-use, population, economic, and trade policies
- Regulating air quality for an entire region or air shed
- Phasing in full-cost pricing, mostly by taxing the production of air pollutants
- Distributing cheap and efficient cook stoves and solar cook stoves in developing countries
- Transferring the latest energy-efficiency, renewable energy, pollution prevention, and pollution control technologies to developing countries.

4.0 CONCLUSION

Air resources need to be effectively managed and protected to safeguard the many lives that depend on them. and avoid leaving unhealthy legacy for our future generations. Urgent recording is therefore required in these resources quality and environmental monitoring so as to forestall disasters.

5.0 SUMMARY

It is a common saying that being able to identify a particular problem is equal to 50% solution to the problem. How much then is the solution to the problem itself?

The much concern about the ozone layer depletion, global warming and air pollution have aroused many research interests. Governments, corporate bodies and individuals have for a long time been adopting various management strategies in reducing the threats pose by the degrading air resources. It is in view of this that our discussion in this unit centered on air resources management strategies.

We have therefore been able to examine the ways we can protect the ozone layer from total depletion, as well as restoring it back to normal. The global warming also received attention, in which ways to slow possible and further global warming was reviewed. Air pollution, a problem as common as air itself was not left out. Possible management

strategies were highlighted to curb the menace. An integrated approach to protecting the atmosphere was also outlined.

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Module Four

UNIT 1 RENEWABLE RESOURCES MANAGEMENT; FISHERIES

CONTENTS

1.0 INTRODUCTION

About 70.8% of the surface of the globe or 360 million square kilometers is ocean and coastal water. For modern science, the seas is the very source of life on earth. Over 90% of the planet's living and non-living resources are found within a few hundred kilometers of the coast (Mayor 1998).

The coast is an amazingly awkward zone to manage, yet it is of crucial significance for economic development. 80% of the world's biodiversity is concentrated within the coastal region, much of which is undiscovered. ⅔ of marine biological action takes place at or near the coast, and most especially in estuaries (Hey, 1995). The trouble is that the coast has numerous but limited resources - renewable and non-renewable which are in too much demand to be left unmanaged. This, therefore necessitated the management of coastal resources.

In this unit therefore, we shall be discussing about the available coastal renewable resources especially in Nigeria. Our focus will however be on fishery resources.

2.0 OBJECTIVES:

By the end of this unit you should be able to:

- outline the general classification of fish resources
- mention the problems of fish resources management

3.0 MAIN BODY

3.1 Coastal Resources: Fisheries

In this lesson, coastal resources refer to natural resources obtainable within coastal water and shoreline (including inland water bodies within coastal zone). Nigeria in 1978, established an exclusive economic zone

(EEZ) of 200 nautical miles adjacent to the territorial seas and extends from same baseline from which the territorial seas is measured. The EEZ covers an area of a 21,0,900 km^2 within which Nigeria exercises sovereign rights for the purpose of exploring, exploiting conserving and managing the natural resources (Dublin-Green & Tabor, 1992).

Generally, coastal resources can be classified as either living or non-living resources. The living resources are renewable which include small plants like algae, phytoplankton, other higher plants, fin fish, reptiles, shell fish which include lobsters, shrimps molluscs and crabs. The non-renewable resources include oil and gas, sand, gravel, salt, clay, heavy solid minerals.

3.2 Importance Of Fish To Nigeria

Fish provides an estimated 40% of the total animal protein consumed by the average Nigerian. In some parts of the country (e.g. Akwa Ibom, Cross River, and Rivers State), fish may account for up to 80% of the animal protein consumed by the people. With the periodic decimation of our livestock population in the northern part of the country by drought, the future role of fish in helping us to meet our animal protein needs would increase. In addition, about four million people are directly or indirectly engaged in fishing activities.

In spite of it relative importance in our diet and its contribution to the national economy, the fishery resources of the country have not been properly exploited and managed. Thus between 1971 and 1981 the country imported an increasing proportion of the fish consumed.

3.3 Sources Of Fish

There are two main sources of fish in the country. Offshore and inland waters. Although Nigeria's offshore area is not one of the major fishing zones of the world, the country is blessed with a fairly long coastline and a high fishery potential. More than 60% of the country's fishery resources are to be found in the offshore coastal region, and they are made up of mostly pelagic (or open sea) and demurral (bottom) fishes. Nearly 67% of the marine fish landings are in the form of pelagic fishes, while the rest are made up of demurral types. The dominant pelagic fishery resources are carangids, mackerel, barracuda, mullets, seer fishes, bonga, sardine and ribbon fishes. Those of the demurral resources are sciaenid, elasmobranches, big eye, catfishes, soles, threadfins, and prawns.

3.4 General Classification Of Fish Resources

3.4.1 Fin Fish

Most of the living resources exploited for food in Nigeria are fin and shell fishes, tonnes of such resources are in the EEZ zone. An existing diversity of fin fish consisting of about 199 species from 78 families in the brackish and marine environment (Tabor, 1992) with the except of the family Tetraodentidae fishes which are poisonous, all other Nigerian fishes are edible (Amadi, 1991).

3.4.2 Shell Fish

Coastal shell fish resources include shrimps, crabs, lobsters and molluscs.

3.4.3 Shrimps:

They are richly found in the Niger-Delta area, at the mouths of Badagry-Lagos, and Lekki Lagoon system. About 2,000 tonnes of shrimps are caught annually (Amadi, 1991). Dominant among the species are the pink shrimp (penacus notialis).

CRABS:

They are under exploited because there are no specialized fishery for crabs. About 30kg of crabs are landed per hour by Lagos based trawlers as by-catch.

3.4.4 LOBSTERS:

Spring lobsters (palinuridae) and locus lobsters (Scyllaridae0 occur in Nigerian waters. The royal spring lobster panulirus regius is common but has no commercial importance because of its low occurrence (Dublin-Green and Tobor, 1992).

3.4.5 Mulluses:

Gastopods (marine snails) occur in low frequencies in Nigeria waters. Cephalopods-squids, cattle fishes and octopus exist commonly in offshore depths of 90-250m, taken as by-catch in bottom trawl catches.

3.4.6 Reptiles:

Among the reptiles, only sea turtles have been discovered in small quantity in Nigeria during fishing. Two families, 5 general, and 6 species have been identified so far in Nigerian marine waters.

3.4.7 Marine Mammals:

Only mammals of the foothed whales, the odontocedi have been found in Nigerian coastal and offshore waters (Dublin-Green & Tobor, 1992). The common **dolphin, Dolphins deeplis is regularly found**.

3.5 Modes Of Fishing

The bulk of fish launchings from Nigerian's offshore fishery resources comes from peasant fishermen. By 1979, there were about 382,000 coastal artisan fishermen operating 79,000 wooden canoes of various sizes, with only a small proportion fitted with outboard motors ranging from 18 to 40 hp. Fishing gear used from these canoes comprises mainly set-gill nets, beach seines, long lines, basket traps, cast nets and so on. The mode of fishing is very labour intensive, resulting in low productivity. Nevertheless, the peasant fishermen accounted for about 50% of the country's total offshore fish catch in 1979 (NEST, 1991). The use of indigenous dug-out canoes and less effective gear is rapidly giving way to better fishing boats and nets.

Today, there are over 100 fishing companies that operate trawler fishing in the Nigerian seas in Lagos alone. These fishing trawlers that operate a single trip ranging between 3 days and 45 days on Nigerian waters turn in several thousands tonnes of fish annually. They are therefore employers of a very significant proportion of the Nigerian labour force. Quite a great number of foreign hands also form part of this population. The reason however is not far fetched - most of these fishing companies are owned by foreigners.

3.6 The Inland Fish Resources

Nigeria's estimated 12.5 million hectares of inland waters are capable of producing about 512,000 tonnes of fish annually, (NEST, 1991). In spite of the high potential, however, our inland water bodies are currently producing less than 250,000 tonnes of fish per annum, (NEST, 1991).

This is due to the somewhat haphazard methods of fish exploitation because of lack of inland fishery laws and regulations. There is also an inadequate stocking of the growing number of small, man-made reservoirs, and, in spite of the recent efforts of the directorate of Food, Roads and Rural infrastructure (DFRRI), our performance in the area of

aquaculture remains poor. The only important fishes culture in Nigeria are:

(a) Tilapia nilotica or Oreochromis niloticus
(b) Tilapia galilaea or Sarotherodon galilaleus
(c) Clarias lazera
(d) Heterotis niloticus
(e) Cypmus carpio
(f) Chrysichthys mtrodigitatus
(g) Liza falcipinnis
(h) Heterobranchus bidorsalis, H. longifilis
(i) Tarpon atlanticus
(j) Gymnarchus- niloticus

3.7 Problems Of Fish Resources Management

Factors responsible for the low production of the inland water fisheries include low rainfall (drought, lack of modern fishing inputs such as fishing craft and gear), lack of adequate facilitaties -for fish handling, processing, transportation, and marketing, and shortage of trained manpower.

3.71. Human Impacts

Because the coastal areas of the country are not very rich in fishing resources, the future of fish, as a major contributor to the protein needs of Nigerians, depends on how the freshwater fishery resources are managed. Unfortunately, as an integral part of the country's ecosystems, our fisheries suffer from the same poor management which is the lot of our land, water, human habitats, and vegetation. Eventually, much of the misuse to which these other aspects of our environment is subjected result in the pollution of our rivers, lagoons, and natural and artificial lakes and ponds, within the coastal zone to the detriment of our fisheries.

3.7.2 Effluents And Solid Waste Disposal

Effluents and solid waste from industrial and domestic sources, which are discharged into these water bodies, as well as oil spillage in the country's oil producing riverine areas are increasingly, reducing some of our water bodies to a veritable sewage depots for poisonous chemicals which either kill or contaminate our fish and other aquatic life. The Lagos lagoon for example is a testimony of this circumstance. Driving across the bridges within the lagoon system exposes the commuters to a very bad stench emanating from the waters. By 1981, it was reported that about 6 million tonnes of petroleum was being discharged into our

offshore waters annually. Of this amount, about 600,000 tonnes resulted from sudden accidental spillage, while the remainder was from constant dripping of petroleum products from activities in all phases of the oil industry, from exploration to utilisation. Other sources of water pollution by petroleum products include fallout from gas flares, spent lubricating oils, ballast water, and leakages, from marine vessels and outboard engines.

While there is no accurate information about the amount of damage done to fishery resources from the annual oil spillage in our riverine areas, the huge tonnage of petroleum products entering the water bodies suggests a high level of fish contamination and destruction. Wastes from our industrial activities contain toxic metals, such as lead, zinc, copper, arsenic, antimony, mercury, beryllium, cadmium, nickel and so on. These trade metals are dangerous to human health when ingested in sufficient quantities and are now recognised as posing a potential threat to our fishing industry.

3.7.3 The Use Of Chemicals And Poisonous Substances

The use of plant poisons such as leaves, roots, and fruits, to catch fish is a very common and longstanding traditional practice in Nigeria. Fishermen from Cross River and Akwa lbom States use Derris elliptica, Acadia pennata, and Munidulea sericea fish catching fish. To the extent that they destroy small fish and non-target populations generally and pollute the aquatic environment. It' is a question of increasing the fish catch for a day or two but at the expense of the fish harvest for the next year or two.

Very much more worrisome is the trend amongst artisan fishermen to attempt to increase their catches by using dangerous agrochemical, such as Gaminalin 20, didimac 25, and Aldrex 40, and even explosive to catch fish. These chemicals and explosives have devastating effects on aquatic life and their habitats.

From time to time, the dailies carry news of people having suffered food poisoning and even death after consuming fish and it is not unlikely that such accidents are due to the use of chemicals in fishing. Moreover, the long-term effects of these chemical on the environment and human health are simply unknown.

3.7.4 Dispute Over Fishing Areas

Fishing is the only form of hunting on which we continue to rely for a significant proportion of our food and, like hunters of old, we are beginning to quarrel on the hunting grounds as rival tribes compete for

what appear to be dwindling stocks. In 1994, fishermen from France and Cornwall came to blows with Spanish fishermen in the bay of Biscay where both groups were hunting tuna. The Spanish fishermen maintained that their traditional fishing method using poles and lines, allowed them to catch bigger and better fish and that the French and Cornish boats, using drift nets they claimed exceeded the maximum length permitted in European Union waters, were catching smaller and therefore younger fish and so depleting the breeding population. Similar incidents occur in both marine and fresh water fishing industries in Nigeria. There are many instances where the local coastal peasant fishermen accuse fishing trawer companies of trawling too close to the shore waters and as such, damaging their fishing apparatus (nets, lines, ropes etc). they also allege that the activities from within their catchments areas. Most of these disputes often result to court cases, and in favour of the peasant fishermen.

3.7.5 Over Fishing And Habitat Degradation

Fish are potentially renewable resources as long as the annual harvest leaves enough breeding stock to renew the species for the next year. Ideally, an annual sustainable yield - the size of the annual catch that could be harvested is definitely without a decline in the population of a species - should be established for each species to avoid depleting the stock.

However, determining sustainable yields is difficult. Estimating mobile aquatic populations isn't easy, and sustainable yields shift from year to year because of change in climate, pollution, and other factors. Furthermore, sustainable harvesting the entire annual surplus of one species may severely -reduce the population of other species that rely on it for food.

Over-fishing is the taking of so many fish that too little breeding stock is left to maintain numbers; that is, over-fishing is a harvest in excess of the estimated sustainable yield. Prolonged over-fishing leads to commercial extinction - reduction of a species to the point at which it's no longer profitable to hunt for them. Fishing fleets then move to a new species or a new region, hoping that the over-fished species will eventually recover.

According to the UN Food and Agriculture organisation, since 1993, 15 of the world's 17 major oceanic fisheries have been fished at or beyond their estimated maximum sustainable yield for commercially valuable species and 13 have been in a state of decline. As a result, 70% of the world's commercial fish stocks are fully exploited, over-fished or rebuilding from past over-fishing and pollution.

According to 'the U.S National Fish and wildlife Foundation, 14 major commercial fish species in U.S waters (accounting for one fifth of the world's annual catch and half of all U.S. stocks) are so depleted that even if all fishing stopped immediately it would take up 20 years for stocks to recover.

4.0 CONCLUSION

Although very little has been done to determine the level of exploitation of our fishery resources, there is some evidence of over-fishing, especially in some of our man-made lakes and creeks. Such over-fishing is due to the fact that much of our fishing is haphazardly based on the needs and modes of operation of individuals, and corporate organisations. The consequences of human activities on our fish resources as seen above pose a very serious threat to our survival.

This therefore necessitated the need for a pragmatic management strategy in order to avert total extinction of breeding population and species.

5.0 SUMMARY

It is a common view that fish as a natural diet and economy. There is also an enormous stock of fish within the coastal zone that constitute an' important resource. It is due to this importance that mention is always made to fish and fishery resources in most environmental management issues.

In this unit, we dwelt on a number of issues on fishery resource management. These include: the definition, importance of fish, sources and general classifications. The modes of fishing, inland fish resources and problems of fish resources management also form the bulk of the discussion.

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UNIT 2 NON RENEWABLE RESOURCES MANAGEMENT

CONTENTS

1.0 INTRODUCTION

In the previous lesson, we discussed coastal resources and laid a particular emphasis on fishery resources. The fishery resource stated is a renewable resource. Renewable in the sense that this resource has a regenerative capability when sustainably exploited.

In this unit, we shall be looking at the non-renewable resources within the coastal zone especially in Nigeria. For a detail and extensive discussion, some issues within this framework may also dwell on other regions other than the Nigerian environment. I would however implore

you to please pay attention to this study. At any rate, when you seem not to have understood anything, don't be discouraged a repeat reading would make it clearer. Have a nice time and enjoy the reading.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- mention the characteristics of non-renewable resources
- outline factors determining the amount of available non-renewable resources.

3.0 MAIN BODY

3.1 What Is A Non-Renewable Resource?

Apart from objects ejected into space by modern technology, Earth is a closed system for materials. When therefore, we talk of non-renewable resources we mean first of all materials which are so transformed by their use that they are not employed again by human societies. But in one form or another they are still present on the planet. There are in fact three main categories: those which are `consumed' by use such as coal, oil and natural gas whose complex molecular structure is broken down into much simpler components; theoretically recoverable materials such as minerals, which are technologically capable of being recovered after use, and recyclable substances such as metals and glass which can be re-used without an enormous amount of re-processing.

In practical terms, materials such as metals, ceramics and plastics may become so dispersed by use that they cannot readily be sieved out again from the repositories in which they are placed. Plastic bags and wrappings are an example. They may be physically impossible to recover since they are in a very dilute form and dispersed. in water or, air: the lead in aerosol form used as an additive in petrol is an example. At the other extreme they may be so concentrated that they are too toxic to handle at any rate for a long period. Some of the wastes from nuclear power generation fall in this category. Lastly, the materials may be sequestered for such a long time that for all practical purpose they are lost to re-use: the steel frame of a large building locks up great quantities of materials.

Certain patterns of use, too, can turn renewable resources into non-renewable ones: the human-induced extinction of a biological species is a form of irreversible consumption.

3.2 Characteristics Of Non-Renewable Resources

The general characteristics of non-renewable resources are:

1. that they are usually products of the lithosphere;
2. that they usually need complex processing before use (with linkages to energy consumption and the production of wastes);
3. that they enter world trade and so are moved around the globe and have been much more important quantitatively since the 19th century;
4. that they get depleted after a very long time of use.

The last quality of a non-renewable resource therefore raises the question for optimal depletion rate: should it emphasise the perceived needs of future generations and thus conserve the material as much as possible, or will we do the best for our descendants by using as much as we wish in order to turn it into knowledge of how to do without it?

In such analyses, a fundamental question about any non-renewable resource is always, how much of it is there? This is not a simple question, if only for the reason that exploration of the earth's mineral resources, for example, is not complete, indeed, the amounts available in practice at a given time depend upon five factors as enumerated by Rees.

3.3 Factors Determining Amounts Of Available Non-renewable Resources

1. The availability for technological knowledge and equipment and their location in the right places and amount.

2. Levels of demand, which encompasses many constantly changing variables like population growth, affluence, tastes, government policies and the availability of alternatives.

3. Cost of production and processing. This reflects the nature of the material and its location, the state of the art of production as reflected in its costs, including those of energy but also capital, the rate of interest on loans, taxation. And the risks of being nationalised or terrorised.

4. End-price: this will- reflect not only the factors above, but also pricing policies of the producers and government subsidies or taxes.

5. The attraction and availability of substitutes, including the use of recycled produces as against virgin materials.

Hence the resource is scarcely a fixed physical quantity (though this must exist) but a rather fluid economic and social construction. A common variable, for example is price: as the price of the material increases it becomes more worthwhile for prospecting to take place, or for better method of recovery of crude oil from rock strata rose from ca 25% in the 1940s to' ca 60% in recent years. These considerations have led to a conventional classification of earth materials (especially minerals) of the non-renewable resource category. In turn, these are classified into measured, indicated and inferred groups, which are self explanatory terms.

3.4 The Main Categories

Minerals are the core of non-renewable resources, which are usually divided into fuel minerals (oil, natural gas and coal), and non-fuel minerals. We may also consider, albeit briefly the land itself as resource of this kind since it is very largely, though not entirely, a fixed quantity.

3.4.1 Land As A Non-Renewable Resource

Each year, there are land gains and losses, with the portions of the surface of the earth becoming a resource in the sense of a useable surface, or losing that status. Coastal erosion and exposition are the most obvious categories, but landslides and soil erosion may also be found. Some of these changes are the result of natural processes, as when cliffs of soft material are exposed to high-energy seas; others result from human activity as when for example coastal structures provide traps for silt and sand and thus build up ground above tide levels. Occasionally, more spectacular losses occur, as when a volcano spews lava over former forests or cropland, the equivalent gains are made when a nation like the Netherlands dykes off large areas of coastal mudflat and salt marsh for conversion to pasture and crops.

If land is in short supply, then the response of many societies with a choice is analogous to agricultural expansion. Option one is to intensify the use, leading to multi-storey buildings in sought - after areas of cities; option two is to extend outwards by reclamation, which may mean many things but usually signifies the bringing into the economic framework of land whose benefits were formerly negligible like industrial wasteland, or not quantifiable, like coastal marshes.

Thus, although not strictly speaking, a classic non-renewable resource, land has enough in common with the others of 'that kind to merit

mention. Mark Twain said that he figured he would invest in land, cause they aren't making no more.

3.4.2 Sand And Gravel

This is the most obvious mineral resources of the marine and submerged beaches. They exist up to 40m on the shallow inner continental shelf - Nigeria. These resources are being depleted due to urbanisation and erosion. Sand mining from the coastal streams in Lagos is a flourishing business, leading to enhanced erosion and degradation of the river-bed. The consequences are decreased level of fishes catch. The flora and fauna that inhabit the area. As the vegetation cover along the streams/creeks got eroded, wildlife in the area tend to move away.

Some of the sand deposits of our continental shelf are pure quartz-which have industrial relevance in glass making, iron and steel manufacture and also as additives in lubricants and capacitors in computer. While the fine smooth sand from the creeks are very vital in building and construction industry.

3.4.3 Refractory Clays

There exist offshore large accumulations that are suitable for making refractory bricks used in furnaces for steel manufacture

3.4.4 HEAVY MINERALS

Studies have shown that marine beaches and submerged beaches of Nigeria are depository of heavy minerals such as germent, rufite, spatile, zircon, tourmaline, illmenite and sillimanite. These are important industrial raw materials, and are used as gem stone (Dublin-Green & Tobor, 1992). These heavy minerals have been reported to be found at Benin, Forcados river between the coastal zone of Badagry and Aiyetoro, and the Niger Delta.

3.4.5 Iron Minerals

Research findings from the Nigerian institute of oceanography and Marine Research (NIOMR) indicates that iron minerals are important constituent of bottom sediments, in Nigerian shelf, however their economic values have not been assessed. Goethite is the dominant form of the iron minerals found along a narrow 6km belt peripheral to the Nigerian coastline.

3.4.6 Salt

Salt is an important mineral resource of the sea and can be commercially extracted in large quantities. A wide range of techniques such as solar evaporation, freezing, precipitation are available for the extraction from sea water.

3.4.7 Oil And Gas

Oil and gas occur within the thick sedimentary strata of the Nigerian continental shelf. The shallow inner continental shelf was first exploited by Gulf (Chevron) in 1965 for oil and gas at Okan field. Exploration for oil and gas in the last 10 years has gone to the deep offshore, from the shelf break to the deep offshore, from the shelf break to the continental scope (approx. 3000m depth).

4.0 CONCLUSION

The importance and the characteristics of natural resources most especially the non-renewable resources is a factor that cannot be ignored by any society. This therefore calls for a prudent and sustainable use of these resources. The danger however is, uncontrollable exploitation leads to its depletion and environmental degradation. It is therefore the responsibility of any forward-looking society to make concerted efforts in conservation planning. No wonder the Federal Government of Nigeria is committed to the conservation of natural resources. The country is a signatory to the United Nations Law of the Sea Convention, the 1969 African convention for the conservation of Nature and Natural Resources etc.

It is the essence of this therefore, the next unit is focused on discussing the conservation management measures for renewable resources.

5.0 SUMMARY

Concern over future supplies of all kinds of resources has sometimes invested ‘the term non-renewable' with a kind of negative air, as if a normative judgment was being made that somehow it was wrong to use these materials.

Nevertheless, current civilisations are built upon them in the most liberal of sense, and the history of their use is very long indeed. At the same time, the growth of population, the rise of material expectations and the extra energy needed to extract poorer grades of minerals, all make a challenging future. Given that in most cases it is less energy-consumptive to recycle, and less costly overall to re-use them, many societies will find it in the interests of the population to move in the

direction pointed out by their economic guide-post - from waste to wealth.

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UNIT 3 CONSERVATION MANAGEMENT STRATEGIES

CONTENTS

1.0 INTRODUCTION

If the condition of the global environment is to be improved, we must clearly define the ways in which it is being damaged and then devise appropriate means of addressing them. In the first instance, this involves environmental management. Our coastal renewable resources (fishery) can best be protected by eliminating available damage to natural habitats and species. This may be impractical or insufficient in some instances and then, areas may need more complete protection from economic use by people.

Certain practices may be modified or even abandoned. Alternative means of fishing most especially by peasants may allow chemicals and poisons use to be greatly reduced or eliminated. Environmentally damaged areas, such as over-fished species and over-fished waters may be restored, if not to its original state, at least to a condition that may allow it to support a more diverse population.

As our awareness of environmental threats have grown and our skill at diagnosing them improved, institutions have been developed to coordinate research, and monitor our national policies, the most prominent of all being the United Nations Environmental Programme. The Federal Government of Nigeria is also committed to the conservation of natural resources. The country is therefore a signatory to the United Nations Law of the Sea Convention. In 1985, the Federal Government formulated a National Conservation strategy which addressed conservation through a sustainable approach to management of ecosystems that would guarantee continuous usage by present and future generations.
It is however clear from the fore-going that the need for proper management cannot be gain-said. We shall therefore be discussing the conservation management strategies for our non-renewable fishery resources. As usual, we shall both be taking the local and global view of managing these resources at the same time.

2.0 OBJECTIVES

By the end of this unit, you should be able to:

- outline conservation strategies for fisheries as outlined in Decree No. 71 of 1992
- discuss commercial fishing techniques.

3.0 MAIN BODY

3.1 Managing Our Fisheries

By proper management of our fishery resources, Nigeria's fishery potentials can be exploited in such a way as to maintain the environment and also increase its contribution of the protein needs of the people. Several options are available to the people and the government for improving and expanding the fishery resource base.

There is widespread concern that fish stocks may be unable to sustain so intensive a fishing effort, The maximum sustainable yield (MSY) for any harvested species is calculated as being equal to the number of individuals entering the population, by birth or migration during the harvesting period, usually one year. Prudence requires an allowance to be made for unpredictable events that might deplete the population, so the optimum sustainable yield (OSY) is lower than the MSY based on the crude replacement rate.

3.2 Conservation Management Measures For The Nigeria Fisheries

The vast inland, brackish and marine bodies of water in Nigeria contain enormous fin-fish and shell fish resources with an estimated total annual yield potential of 517,360 tonnes (Tobor 1990).

Ajao (1994) however related this to over population of 88.5 million people in 1991, with a growth rate of 2.1 % and per capita fish consumption of 12.Okg per person per annum. Thus fish demand in Nigeria in the next 15 years will increase from 1,282,910t in 2000 to 1,757,870t in 2015 (Tabi). The demand figures could increase with improved per capita consumption of fish. The demand figures from 1992 to 2000 are lower than the annual fish yield potential. This implies the country can be self-sufficient in fish production and have room for exports. This will be a reality if our fishery resources and development are appropriately managed and conserved to provide production levels that are sustainable.

Table 18.1 Fish demand in Nigeria 1991 (Tobor, 1992)

YEAR	HUMAN POPULATION (MILLIONS)	FISH DEMAND (M.TONS)
1991	80.5	1.062
1992	90.378	1:08454
1993	92.2959	1.0755
1994	94.2543	1.13105
1995	96.2543	1.15505
1996	98.2968	1.17956
1997	100.388	1.20459
1998	102.513	1.23015
1999	104.688	1.225626
2000	106.688	1.28291
2001	109.178	1.310141
2002	111.495	1.33794
2003	113.861	1.36633
2004	116.277	1.39532
2005	118.744	1.42493
2006	121.264	1.45517
2007	123.837	1.48605
2008	126.465	1.51758
2009	129.149	1.54978
2010	131.889	1.56267
2011	134.688	1.61625
2012	137.546	1.65055
2013	140.464	1:68557
2014	143.445	1.72134
2015	146.489	1.75787

Tobor (1992). found that fishery resources in Nigerian inland and marine waters are at levels of exploitation. (The Sea fisheries Act of 1971

contained laws and regulations for the conservation of some of these resources. Major weaknesses in the regulations compounded the problems of conservation and management. The Act has been repealed and replaced with a Sea Fisheries Decree No. 71 of 1992. The Decree, contains some improvements and salient provisions for conservation which include the following:

1. Effort limitation through mandatory annual licensing of fishing vessels operating in Nigeria's territorial waters.The obvious loop hole of the provision are the absence of limitations on the local number of vessels that can be licensed in any particular year and the exemption of coastal fishing canoes from licensing regulations. These factors eliminate the chances of predicting with any degree or accuracy the existing level of fishing effort being applied in the artisans coastal fishery. Currently there is a reduction in catches, size and value of commercially important fishes (Kusemiju, 1992)..

2. Limitation on the capacity of finfish and shrimp trawlers - finfish and shrimp trawlers shall not exceed 25.3m length over all (LOA) with a gross registered tonnage (GRT) of not more than 150t and 130t respectively. This provision is also targeted at limiting fishing effort.

3. Gear restriction - Gear restriction imposes minimum cod end stretched mesh sizes of 76mm (31nch); and 44mm in trawl nets when trawling for fin fish and shrimps respectively.

4. The Nigerian institute for oceanography and marine Research has the responsibility of publishing, before January 31 of every year, the minimum total length of fish catch-able during the year for each of the commercial species, taking into consideration the following:

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   (i) the 5% retention length of the legal cod-end mesh
   (ii) the fish demand and supply situation
   (iii) the heal of the fish resources

   The provision will discourage fishermen from using nets with small mesh size and from landing undersized fishes. However, a. replacement of the existing 76mm and 44mm cod end mesh sizes with a standard 65mm 9 cod end mesh) for all trawl nets will lead to the preservation of productive

pre-spawning population of large valuable fish e.g. croakers, shinynose, soles and prawns. This measures will outweigh the loss of small sized fish which will escape from the nets.

5. The non-trawling zone in the inshore waters is extended from 2 to 5 nautical miles from the baseline from which the territorial sea is measured. This restriction protects and allows canoe fishing. It also protects the nursery grounds, of valuable commercial fishes.

6. The minister responsible for fisheries may take the followings:

   (a) Regulate, prohibit or restrict the taking of fish in any specific area within the territorial waters of Nigeria.

   (b) Prohibit or restrict the use of fishing boat, considered harmful to the sea fishing industry in Nigeria. Destructive and illegal fishing practices have the inherent capability of indiscriminately depleting fish stocks and rendering management and conservation measures ineffective.

   (c) Regulate any other matter relating to the conservation and protection of the stocks of sea fish (Ajao, 1994).

Tobor (1992) noted that the three other factors have aggravated the problems of conservation of Nigeria's fishery resources, namely:

(i) inability to put in place strong enforcement mechanisms
(ii) the fishermen's ignorance of the adverse consequences of harmful methods of fishing on fish stocks, and
(iii) the multi-species base nature of the fisheries which creates difficulty at targeting selected species of fish for conservation measures.

3.3 Conservation Of Aquatic Resources Through Aquaculture

The total yield potential in fisheries could be increased over two-fold to at least 1300,000 tones by culturing some of the highly valued indigenous species of finfish and shell fish (Tobor, 1990). These include Claria garipinus, Chryschthys nigrodigitatus, Nugil spp, Heterobranchhus bidorsalis, Tilapia spp., Macrobrachium spp., Penaeus

notialis and Crassostrea gasser. It is generally accepted that aquaculture could bridge the gap between fish demand and supply that is presently experienced in fish production.

An evaluation of the aquacultural potential of Nigeria shows that over 1.5m hectares of land are available for its effective management. This includes wetlands in the three ecological zones of fresh, brackish and marine waters. Availability of cultured fish will reduce the exploitation pressure on the commercially important species and this ensures their conservation.

3.4 Commercial Fishing Techniques

Fish continue to be caught by methods developed over many centuries. The hunt is, indeed, traditional. Hooked lines are still used, sometimes from the boat, as with Spanish tuna fishing, mackerel handling in British waters, and trolling in which the line is trailed astern of the moving boats, and sometimes as long lines. Hundreds of meters long, these are baited and left in position for several hours, or overnight, weighted at one end and buoyed at the other. The trawl net is a bag, tapering from an end held open by `otter boards' to a narrow `code end', that is towed through the water. A ring or seine net is a curtain-like net, with weights along the bottom and floats along the top, that is paid out to form a circle enclosing the fish. The seine net is converted to a purse seine by drawing together the edges so the caught fish are entirely enclosed within it. A drift net is a curtain, or series of curtains, that hang vertically and trap fish swimming into them. Figure 1.1 illustrates these main techniques.

It is not the techniques that have changed, but the scale on which they operate and the ancillary equipment that supports them. Modern fishing boats are big and powered by large engines,. which allow them to store and tow much larger nets than were once used. In some cases, see Fig. 1.18 A & B) two boats can collaborate, allowing even larger nets to be used.

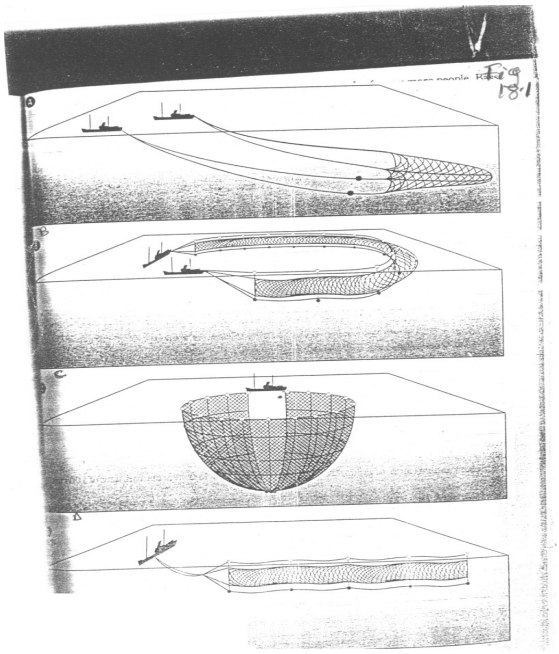

Fig 18.1 **Commercial fishing methods. A. Mid-water pair trawling. B, ring (seine) netting. C, Seining. D, Drift netting**

4.0 CONCLUSION

Sustainable coastal resources management requires a holistic and comprehensive approach. It is therefore expedient to define a broad management zone - one extending from coastal hinterlands and lowlands (the dry side) to the coastal waters and the deep. sea. A multi-sector management programme must be designed that will. incorporate all stakeholders and all affected government agencies and the general public should be involved.

This therefore called for the organization of integrated coastal zone management (ICZM) on the one hand and its full implementation on the other side. Many countries are now organizing (ICZM) but few have implemented it e.g. U.S.A. and Sri Lanka (Clark, 1992).

The Nigerian based integrated coastal zone management policy should have broad policy objectives and philosophy that will solve all conflicting uses of our coastal zone. Such a national policy must put in place effective legal provisions for national, co-ordinated and effective management and control for all industrial, agricultural and domestic activities.

5.0 SUMMARY

The increasing demand for fish by an astronomical rise in human population the world over is plagued with an unequal amount of fish supplies. Human impact on the environment has affected our fish resources. Problems of pollution and over fishing are some of the negative impacts on our fish resources both in the marine and inland waters.

The management of the coastal-fishing resources then became paramount. This unit in response to this demand looked into the various management strategies that could be adopted to conserve these vital resources. The strategies adopted to conserve these vital resources. The strategies adopted in this lesson involve policy formulation, monitoring, checking and controlling all the activities of fishing companies and individual s that have to do with the coastal system. Conservation and fishing techniques were also discussed.

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UNIT 4 ENHANCING ENVIRONMENTAL MANGEMENT THROUGH HUMAN RELATIONS

CONTENTS

1.0 INTRODUCTION

Good human Relation is no doubt very important in the management of environmental resources and conservation. Human relation is an influential technique in disseminating information as well as relate with the public about government policies and other contemporary issues of national-and international importance.

This unit will assist you as an environmental manager to appreciate your need for and relevance of good human relation in the management of environmental resources. Issues Added to this include communication factors, conflict resolution management principles and features of effective human relations in environmental management among others will be discussed.

2.0 OBJECTIVES

By the end of this unit you should be able to:

- Explain what is human relations
- State ten key goals of human relations in sustainable development
- Out-line four features for effective human relations of environmental management

3.0 MAIN BODY

3.1 What Is Human Relations?

Human relations can not be separated from human interaction. The focus of human relations is human interaction that produces cooperation and develops morales in individuals as a fundamental issue for achieving results in organisations. There are two ways of looking at human relations (Anijah-Obi, 1995) these are:

1. As a means
2. As a resource

3.1.1 Human Relation As A Means

To rate human relations as a means implied economic objectives. Human is seen as an economic instrument. The concept of the "economic human" informed the. assumptions of "Theory X". McGregor (1960) made two sets of contrasting assumptions about human beings. He called them theory X and theory Y. Theory X assumes that:

1. people inherently dislike work and, when possible, will avoid it.

2. They have little ambition, tend to shun responsibility and prefer to be directed.
3. Above all, they want security
4. In order to get them to attain organisational objectives, it is necessary to use coercion, control, and threats of punishment.

Theory X portrays the human being as purely an ‘economic human’ who is motivated by money or economic considerations alone. This is perceived as misleading and an erroneous assumption of the nature of man. It is a single dimensional view of a multi-dimensional human. Human is not a tool. Human beings have needs. They' want a sense of belonging and relevance, they want to be consulted and treated with regard. You cannot always achieve the objectives of environmental management with human relation with the threat. How can you for example, punish a man because poverty has driven him into the forest in search of food and living? How can you force a married man and his wife to stop procreating in the name of overpopulation, if they want more children. Rather it is through persuasion, cooperation and understanding, that people's inclinations and beliefs are changed. You have to realise that humans develop habits, likes and dislikes and that people change slowly. You cannot buy enthusiasm, or devotion of hearts, minds and souls. You have to earn these things.

3.1.2 Human Relations Is A Resource

Individuals who classify human relations as a resource are keen about organising and manipulating human relationship in such a way that produces the greatest personal satisfaction from their work environment. People work not just because of the money they receive, but because of the quality of life of the people they interact with in the work environment. Human relations viewed as resource is a capital that can be developed and invested; and it may result in a gain or loss. Those in a position of leadership who hold the resource view of human relations are required to treat people as human beings and aim at developing and training the individual so as to improve him for his own benefit and the benefit of the society. McGregor summarises the human resource view of management as Theory Y under the following assumptions:

1. Work is a natural phenomenon and if the conditions are favourable people will not only accept responsibility they will seek it.

2. If people are committed to organisational objectives they will exercise self-direction and self-control.

3. Commitment is a function of the rewards associated with goal attainment.

4. The capacity for creativity in solving organisational problems is widely distributed in the population and the intellectual potentialities of the average human being are only partially utilised.

In contrast to Theory X, theory Y presents a dynamic view of human. The individual is seen as having potential, growth and development capacities which have to be tapped. This is similar to the concept of sustainable development. The focus is on how to make effective use of people, their ideas and their resources to. produce the desired change towards the environment so that nature remains an infinite treasure to human. In environmental management, you can obtain people's loyalty if they are able to realise and understand the advantages of a good and healthful environment.

3.2 Goals Of Human Relations In Environmental Management

The goal of building sound human relations in environmental management is to establish goodwill, goodwill between people, goodwill between states and nations, between communities and their governments, between organisations and the public, between man and the environment. Research and studies in the use of human relations in the process of establishing goodwill in environmental management has two objectives.

First, to find out why people act the way they do in their relationships with one another and in their relationships or with the environment. For example, we can ask the question, what has driven man to exploit his environment? Is it hunger, poverty, greed (as we have it in developing countries like Nigeria) civilisation, development as we have it in developed nations. Is it his culture, religion, tradition or values.

Secondly, to make the fullest use of that knowledge in dealing with individuals, groups and situations, the information gathered will enable you determine what to do and what actions to take so that you can minimise the damages inflicted on the environment if you must preserve it for future generations.

Anijah-Obi (1995) pointed out the key goals of human relations in the context of sustainable development to include:

1. Guidance and counseling based on the proper conception of human nature and the environment. Counseling must aim at improving behaviour towards the environment, and also, changing our values and the, way we use and manage the earth's resources and in the use of existing technologies.

2. Analyzing the future environmental trends and problems and predicting their consequences.

3. Preventing conflicts, uncertainties and understanding about the environment.

4. Promoting mutual respect and social responsibilities in our dealings with people and the community and between human and the environment.

5. Researching into public opinion, attitudes and expectations in relation to the environment in order to **discover their** level of awareness and commitment to the environment.

6. Establishing and maintaining two-way communication with the aim of achieving co-operation in the solution of environmental problems.

7. Organising workshops, seminars and conferences aimed at sensitising the citizens on global and local environmental problems.

8. Establishing environmental clubs in schools and other institutions for the creation of environmental awareness and enlightenment.

9. Carrying our community and nation-wide campaigns using the mass and folk media.

10. Promoting harmonious relationships with associations and organisations interested in environmental health and protection.

11. Protecting community and governmental interests in the development of projects as well as harmonising the economic and social needs of the people and that of environmental conservation.

12. Emphasising environmental education as the surest means of instilling a lasting sense of environmental ethic and

discipline necessary for ensuring the quality of life of the people and the environment**.**

3.3 Features For Effective Human Relations In Environmental Management

Human relations in environmental management involves meeting people and making them accept the concept of sustainable development. To achieve this goal Anija-Obi (1995) mentioned that some features

(1) Audience Analysis

As an environmental manager, you must study your audience ahead. Your view is not very easy. It is crucial therefore that you learn as much as possible about our audience's beliefs and attitudes toward our subject or position. Some listeners are open-minded, some are hard and some are moderate. Sometimes you may come across an audience that is polarized at two inflexible positions. Emotional issues that cut deeply into their lives such as - religion, abortion, population. So there is absolute need to know your audience. But before you can make that assessment, you should try to answer the following questions and any others that pertain to your particular situation:

(a) . What are your goals? In other words, what is your specific purpose in speaking?

(b) What is your audience feeling on your subject or position?

(c) What emotional and psychological appeals will move these people?

(d) What logical reasoning, will reach your target audience?

(e) Do they appreciate innovations?

(f) Why should this audience listen to you?

(g) Is there anyone familiar with this audience and can help you answer these questions or give any useful information and suggestions?

Answers to these questions will help you plan your strategy. But remember that you do not move to find answers to every question before you can face the audience. All we are saying is that answers to these questions may provide you with some basic information or understanding about the attitudes, feeling and motives of your audience.

(2) Style of Approach

Style of approach is directly related to performance. We must recognise that in any group, a leader must emerge to influence the activities of the group. and the achievement of a common goal. As environmentalists you are being prepared for leadership, your task as a leader or facilitator is to champion the crusade for a better environment and the way you do that will determine the success or failure of your mission.

(3) Appearance

Self-image is very critical not only to us personally, but to how other people perceive us. Before you even open your mouths, you have already made an impression, favourable or unfavourable about someone. We communicate with our clothes and what we wear. An authority on apparel writes, when you step into a room, even though no one in that room knows you or has seen you before, they will make ten or more decisions about you based solely on your appearance. To be successful in almost any endeavour, you must be sure that these decisions about you are favourable, because first impression makes you who you are. You are what you wear.

If you are going to address a group of rural women in your community, appearing in the traditional attire will enhance your acceptability. But if you are going to address some officials of an industry or company, the conventional executive wear will be more appropriate. This is not to say that the traditional attire should not be worn. What you wear should

really depend on the type of audience you're going to meet. Essentially, you must ensure that whatever you wear is neat and tidy. The colours must be coordinated, not what I may call colour-riot!

Your breath, your body, your hair and fingernails, your deodorant, perfume and aftershave all help to enhance yourself image.

Posture often reflects your attitude, pride, confidence, authority, courage, determination and general health. When addressing people, try to stand straight. Do not slump, drop, lean or start shifting from one leg to the other. Good posture projects a positive image.

(4) Communication Medium of Language

Your choice of words and sentences expresses your thoughts, feelings and opinions and influence your total impact on your audience. The level of language you use in a speech should reflect the kind of audience you are addressing. The more you know about your audience the better you will communicate. Audience characteristics size, sex, age, social or economic status, religion, political affiliation, race and national origin are important elements to evaluate when you want to communicate.

Please note that you may have a powerful delivery, an expressive voice, an attractive appearance, and thorough knowledge of your subject, but if your words are poorly chosen or expressed, your speech will fail to communicate.

With the right words, you can communicate your thoughts, your feelings and your emotions. With the right words you can tech people, give them understanding, entertain them, even persuade them to do your bidding.

But before you can do any of that, you should learn as much as possible about words. The standards for words use must be clarity, accuracy and appropriateness.

If the audience doesn't understand the message instantly, then to some extent you have failed. You must therefore ensure that your words and thoughts are perfectly clear to the audience. As a conscientious speaker, your information should be current and accurate. This is very important as misinformation can damage your credibility. In addition to being precise, the language should be suitable to the subject, audience, and occasion.

3.4 Grassroots Strategies For Environmental Management

Since most people live and work in communities, it therefore means that most of environmental awareness education should be directed to the grassroots. The community is very important in environmental management.' A community is not just a gathering of isolated individuals performing their specific functions. It is also a social system or a set of social relations, made up of social groups which influence the attitudes and actions of their members. The tendency for people who live together to develop social groups has important implications for human relations, as it can materially assist or considerably handicap environmental objectives (Anijah-Obi, 1995).

To achieve environmental objectives you will need to interact freely with the community leaders and work through them to achieve the goals of environmental management. The traditional chiefs are very important, recognise and respect them. You can make effective use of them and other people; their ideas and their resources, to produce the desired change towards the environment. This is particularly true when you are working in an oil community.

In trying to reach the people it may be necessary to consider the use of their folk media. For instance, the Town Crier should be used to summon or assemble the people instead of the public address system, which is strange to them.

When possible, use the language of the people. There is nothing as warm as saluting the people in their own way. This will earn your immediate acceptance and attention. A lot could be achieved through the opinion leaders because working with them will enable you to identify their needs and their problems. These sets of people may be employed as public relation officers, where a community is a host to a company.

Also other interest groups should be utilised to give environmental -education to the community, as these strategies will enable information reach people of all classes, ranks, vocations and aspirations. These include social clubs such as Parents Teachers Association ((PTA), Age Group Association, the Church, etc.

3.5 Environmental Conflict Management And Human Relations

Although people – generally see conflict as destructive, distasteful and detrimental, conflict also has its constructive functions and desirable conditions because conflict is a way of calling attention to problems that exist such as the conflict between man and nature which we are trying to solve. The awareness of a possible conflict brings the problem to focus and causes the problem to be solved if possible. Without awareness, no

attention will be directed towards the solution of the global environmental problems that are threatening human's existence on earth. So conflict generates energy and action and can serve as a corrective mechanism.

What we are saying in effect is that conflict can have both constructive and destructive outcomes for individuals, groups, communities as well as the environment. The question then is how do we manage conflict to achieve constructive effects while minimising destructive consequences.

3.5.1 Techniques Of Conflict Resolution

The technique of conflict resolution is important in environmental issues.

As environmental managers, we should realise that the way a conflict is resolved affects the nature of the outcome it produces.

Filley (1975) identified three ways in which conflicts can be resolved.

These are:

1. The Win/Lose resolution: using various methods, one group manages to win the conflict by obtaining its goals and frustrating the other groups in its attempt to meet its goals. The other group therefore loses.

2. Lose/Lose resolution: Each group gives up some of its desired goals through some form of compromise. Neither gets all; therefore both groups lose.

3. The Win/Win resolution: the groups succeed in identifying solutions in the problem that will allow both groups to achieve their desired goals. Thus both sides to the conflict are able to win.

4.0 CONCLUSION

This unit has so far discussed the concept, relevance, role and other characteristics features that will enhance human relations in environmental resource management.

Without effective human resources management skills, abilities and principles, resource management will not be successfully achieved.

Citizenry's attitude would not be easily changed and environmental policies may not be executed successfully.

5.0 SUMMARY

This unit has stressed that good human relations can help in the realisation of the goals of environmental management. The idea and meaning of human relations as well as the objectives of human relations in environmental management were explained. Human relations is a continuous effort designed to promote the best possible understanding of policies, activities and social attitudes. Factors that enhance effective human relations, such as audience analysis, style of approach, appearance and language were highlighted.

Finally, principles of good human relations and approaches to conflict management were suggested.

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UNIT 5 THE NIGERIAN CONSERVATION FOUNDATION AND OTHER AGENCIES CONCERNED WITH ENVIRONMENTAL RESOURCE MANAGEMENT

CONTENTS

1.0 INTRODUCTION

In the management of Environmental Resources, aside from Government involvement in the management of environmental resources, non-government agencies referred to as non-governmental organisations, NGOs for short have also being involved in the management of environmental resources in Nigeria for few decades now.

One example of such NGOs is the Nigerian Conservation Foundation (NCF) located in Lekki, Lagos as headquarters. This unit will discuss on the historical background of the Nigerian Conservation Foundation and its contributions towards the effective management of environmental resources and environmental education.

Non-governmental organisations are independent of government and have as their main responsibility improvement of the environment and effective management. They include powerful groups of primary humanitarian, charitable and religious organisations which source for private funds within and without the nation for the improved management of our environment.

2.0 OBJECTIVES

By the end of the this unit, you shall be able to

- state the names of different non-governmental organisations in Nigeria.
- Outline the achievement of the Nigeria Conservation Foundation

3.1 Background Of The Nigerian Conservation Foundation (Ncf)

The Nigerian Conservation Foundation (NCF) is one of the foremost environmental non-governmental organisation (NGO) in Nigeria today. The NGO with a nationwide network was inaugurated by the then president of Nigeria, Alhaji Shehu Shagari on the 12th of February 1982. It became formally affiliated to the World Wide Fund for nature (WWF) in 1989.

It was established to achieve the following purposes:

(i) saving the country's flora and fauna from extinction
(ii) protecting the environment from pollution and degradation
(iii) improving the quality of life of the custodians of our wildlife heritage.

Since its inception, NCF has been deeply involved in specific projects targeted at improving the quality of the Nigerian environment and its management.

NCF projects are designed- and formulated in a form that integrates ecological management that hinders soil erosion and promotes soil conservation (Aminu-Kano & Lawal, 2000). Thus the rain forest protection project in Okomu, Hadejia-Nguru Wetland Conservation Project, Kano Desertification Control project, Nipa palm utilisation project in Oron and the technical support given to the Cross River National Park have all had integral input that has gone a long way in improving environmental management in Nigeria.

3.2 Ncf's Management Records

The Nigerian Conservation Foundation (NCF) employing environmental conservation, awareness and advocacy activities has been involved in a lot of projects overtime. These projects can be described as having practical intervention measures for the control and management of environmental problems in Nigeria. They can be said to have in one way or another contributed greatly to the reduction of ecological problems in Nigeria. Some of these projects in which they have played this key role include:

- Hadejia-Nguru Wetland Conservation project
- Okomu Wildlife Sanctuary Conservation project
- Kano Desertification Control Project

- NCF/WWF-U.K Conservation Project in the Cross River National Park
- Urban Tree Planting or Beautification

Wetland Conservation Management

The Hadejia-Nguru Wetlands Conservation Project (HNWCP) is located in Northern Nigeria. It was initially started by the Nigerian Conservation Foundation (NCF) and Royal Society for the protection of birds (RSPB) primarily focused on the protection of migratory birds. The local people's perception of a project that was only interested. in birds instead of something that can better their lots facilitated the need to expand the focus of the project. This led to the realisation that the issue of equitable access to water is an issue of concern to all downstream water users. This has since influenced the focus of the project. Specifically, some of the activities of one of the components of the project, that is, sustainable wetland use involve technical interventions such as -agro forestry, gardening.

This project ensured that communities and individuals were involved in nurseries for fruit trees and multi-purpose trees for construction, timber and other uses. The agroforestry activity carried out around the wetland area could be accepted as capable of having significant implications for sustainable fuel wood sourcing, income generation, source of food, desertification and erosion control. As at 1998, there were six individual nurseries set up and 10 community nurseries with. approx. 20,000 seedlings each (Aminu-Kano & Lawal, 2000). This activity by the people reduces pressure on the exploitation of natural vegetation resources, which in turn protects the soil from erosion and enhances ecological processes in the region. What a practical way of involving the grassroots people in environmental management.

The construction of dykes has become common with the people around the project area because it facilitate the prevention of early flooding and the destruction of rice seedlings by herbivorous fish and this in turn increases rice production. There is also another component which had some short-term'impact. For instance, it has been able to assist the Hadejia River Basin Authority on timing of releases to best suit the needs of the farmers in the flood plain. However, the value and future impact of this component would have been far greater if resources had been available for collection of river flow data for the entire river basin.

Okomu Wildlife Management

The Okomu Wildlife Sanctuary Project, which used to be managed by NCF, was officially handed over to the National Parks Service with a

new status as a national park. At the time of NCF's management of the sanctuary, specific management and environment of education projects were carried out. The management component of the project through its support zone programme has involved the communities in activities targeted at promoting management of the natural resources within and around the sanctuary (now park). Some of these activities have in one way or another improved the ecological processes among the variety of species found around the project site. Specifically, some activities have been carried out with the local community through the projects support zone programme. These have included training workshops on sourcing for alternative means of survival and skill development for income generating activities around the buffer zone in the sanctuary. 'All these are aimed at promoting natural forest regeneration and management, which is very essential for increasing wildlife species and promoting more ecological stable rainforest environment. One other important activity which the project was fully involved in was the protection and enforcement against illegal logging which has been known to be one of the major sources of deforestation if not properly managed.

Deforestation on the other hand leads to flooding, erosion and loss of genetic resources. The project has also been involved in a lot of advocacy and environmental education aimed at enlightening all stakeholders about the need to conserve the natural resources in and around the sanctuary.- One typical case, which yield very fruitful result in the case of ecological succession and erosion control, was that of NCF and Okomu Oil Palm Company.

Kano Desertication Management Project

This project was based in Kano State where desert encroachment is a common ecological phenomenon. A major feature of the project was that it was implemented by the rural community on land owned by them under joint supervision of local government council authorities and the Nigerian Conservation Foundation local chapter.

The project was premised on some identified causative factors of -the Sahelian drought of the 1970s. Some of these factors included poor livestock grazing and agricultural practices, intensive fuel wood harvesting and climatic factors.

> Aminu-Kano & Lawal (2000) mentioned that the Nigerian Conservation Foundation (NCF) therefore employed Management strategies such as the establishment of,
>
> - Fuel wood plantation plots of land set aside by local government authorities and communities for the purpose.

- Orchards for the production of succulent fruits for human consumption as well as for attraction of bees that will eventually colonise artificial beehives placed in trees for honey production
- Grazing reserves, and so on.

These management strategies yield, tangible outputs which could be noted as evidences that could have unquantifiable positive effects on grassroot people's style of resource management. For example, between 1996 - 1997 10,000 seedlings of Neem, (Azadirate India) *Terminatia, Acacia* were planted in about 7 hectares of the woodlots to serve as sources of fuel wood, poles and shelter belts for checking wind erosion and southward movement of sand dunes.

In order to divert the attention of the community away from reckless fuelwood which is a major source of desertification and wind erosion, bee-keeping and small ruminant projects were also embarked upon as components of the Desertification Control project.

Nipa Palm Utilisation Management Project

This management project is based in Oron, Akwa lbom State. It was born as a result of the need to control the excessive invasion of a foreign species called Nipa palm (Nypa fruitcans) from Malaysia. This species has spread at a rate that is impacting adversely on the mangrove ecosystem.

NCF sees the utilization of invasive plant species as a strategy in environmental management. Hence, a pilot scheme was set up in Oron to produce mats, buttons, fishing gears, beverages, sugar, vinegar and ethanol from Nipa as a means ofrestoring the stability of the mangrove ecosystem in Nigeria as well as controlling coastal erosion (Aminu-Kano & Lawal, 2300).

Exercise 20.1

Carry out quick review of NCF's past efforts and: identify what you feel the organization should have done but did not do through any of its management projects.

3.3 Ncf Educational Efforts

The education department of NCF has a co-ordinating/Conservation Education Unit at Lekki,-that co-ordinates three other member units, which include.

(1) The Environmental Education Unit (EEU) in Benin City
(2) EEU, Calabar, and
(3) Okomu Community Education co-ordinates or supervises four functional programmes, notably

(i) school's programme
(ii) community education
(iii) curriculum and training, and
(iv) special projects.

As recorded in the WWF (UK) sponsored mid-term evaluation of the programme, the achievements shall be categorised into four sections:

1. SCHOOL'S PROGRAMME

The NCF's achievement in school's programmes include the followings:

(1) Facilitating the establishment of 302 active conservation clubs in Nigeria;
(ii) organising annual conservation week beginning from 1989;
(iii) organising annual Art and Eassay competitions;
(iv) organising a debating competition in 1989;
(v) staging musical concert "Yanomamo" on the environment in 1989 and 1990;
(vi) hosting school visits to the Lekki conservation centre;
(vii) administering the WWF/Longman Reading for the Environment competition in 1991
(viii) conducting along with academic associates a short story competition which resulted in several children going to the Youth for Environment and service camp in Virginia, USA;
(ix) organising a poetry competition in 1992;
(x) devoting a stand in the exhibition hall at the lekki Conservation Centre to show various works carried out by children

.

2. Grassroots Education

(i) Conducting adult literacy classes which has led to the acquisition of knowledge on conservation, sustainable

development and the development of basic literacy and numeracy skills;

(ii) Developing urban environment education programme;

(iii) Making appropriate provisions for infrastructural facilities to foster conservation education in protected areas in Lekki and Okomu;

(iv) Co-ordinating and supervising community education efforts of the field unit;

(v) Conducting fieldwork in community-based environmental education project towards evolving a viable strategy for community education.

CURRICULUM DEVELOPMENT AND TRAINING

(i) Developing the national Conservation Education Strategy (approved by Government in 1990/91);

(ii) developing EE curriculum for secondary schools, already accepted by government for inclusion into the citizenship education programme (1991);

(iii) developing Teacher's conservation guide for EE;

(iv) Developing textural materials for the postgraduate and Ordinary Diploma in EE (on-going);

(v) Establishing seminars, conferences and training workshops;

(vi) Publishing resource materials;

(vii) Adding five Nigerian Educationist to the 19 trained in EE at the Jordan Hill College, Glasgow,;

(viii) Visiting lectureship of the head of Education at the Jordan hill College for nine months (1991);

(ix) Developing curricula for the Ordinary Diploma and postgraduate Diploma in EE at the University of Calabar;

(x) Contributing "Nigerian Environment and Development" to the WWF book series on `What We Consume';

(xi) Organizing the first National Conference on EE in march 17th -19th, 1993;

(xii) Facilitating the formation of the Nigerian Association for Environmental Education (NAFE) in 1993;

(xiii) Establishing a Research and Publication Committee to facilitate research and publication in EE; and

(xiv) Publishing the Journal of Environmental Education.

SPECIAL PROJECTS

Amongst the special projects embarked upon are;

(i) Research on relationship between environment and development in Nigeria, towards the publication of a text on environment and development for use by schools in the U.K. and Nigeria;
(ii) Co-ordination of research and text-development on Benin History and Environment project, which examine the relationship of Benin culture with the natural environment;
(iii) Exhibition of EE materials at the Shell Petroleum Company's Health and safety Week activities in Lagos and Warri;
(iv) Ecology and Religion project.

However, the education department still anticipate to achieve the following

(1) Strategic planning for the sustainability of on-going projects;
(ii) Developing EE programme of Gashaka-Gumpti National Park;
(iii) Promoting international exchange programme in the implementation of EE projects in Nigeria;
(iv) Establishing conservation clubs in ALL schools in Nigeria;
(v) Promoting sustainable life-style through awareness, training and education;
(vi) Professionalising EE though NAIEE;
(vii) Collaborating further with State, Federal, National and international agencies.

In order to enhance the attainment of the proposed projects, the four functional units are adequately staffed, with member comprising of professionals from universities, Federal Ministry of Education, Colleges of Education, and other resource centers.

3.4 Agencies involved in Environmental Management

Table 20.1

Agencies concerned with the Environment and their major Activities in Nigeria

	Agency	

S/No	Abbreviation	Full Name	Major Activities
1	CBN	Central Bank of Nigeria	Research on impact of foreign debt on the nationals
2	FAN	Forestry Association of Nigeria	(i) Combating drought (ii) Desertification (iii) Wildlife conservation
3	FE	Friends of the Enviroment	(i) Conservation and arousing public awareness on the negative effects of bush-burning, overgrazing, over fishing and deforestation
4	DFRRI	Directorate for Foods, Roads and Rural Infrastructure	(i) Development and construction of rads to rural areas (ii) Assistance in the production of food
5	GCF	Green Croc Foundaton	(i) Creating awareness through formal public cautions on environmental issues in Greenscope
6	NALDA	National Agricultural Land Development Authority	(i) Acquisition of land from Communities for the purpose of better management in small holder farming schmes.
7	NARESCON	National Resources Conservation Council	(i) Protection of endangered species (ii) Conservation of biodiversity
8	NIRADO	Nigerian Integrated rural Development Organization	(i) participation in programmes of sustainable development.
9	NNPC	Nigerian	(i) Conducts research on

		national Petroleum Corporation	Environmental protection and safety
10	NFS	Nigerian Field Society	(i) Publishes Conservation articles in journals. Has been in existence since the 1930s
11	WB	The World Bank	(i) Assistants in various research on the environment
12	WHO	World Health Organisation	(i) Research on tropical diseases
13	RBDA	River Basin Development Authority	(i) Water resources management in the various basins
14	WIN	Women in Nigeria	(i) Creating public awareness of discrepancies/inequalities and problems faced by women
15	SAJJU	Samuel akpan Joshua Japhet Ukpong Institute and Research Foundation	(i) Public environmental awareness (ii) Organises Nigerian voice, children international campaign programmes
16	UNEP	United Nations Environmental Programme	(i) Monitors and evaluates environmental research
17	NCF	Nigerian Conservation Foundation	(i) Education on the environment (ii) Protection and conservation of Nigerian Environment
18	NEW	Nigerian Environmental Watch	(i) Conversation of Biodiversity (ii) General environmental protection
19	NES	Nigerian	(i) provision of

		Environmental Society	consultancy services on environment (ii) National Policy formulation on the environment
20	NEST	Nigerian Environmental Study and Action Team	(i) Documentation of the state of Nigerian environment (ii) Conduction of impact studies (iii) Identification of environmental management issues in Nigeria (iv) Creation of environmental awareness through workshops, seminars, etc.
21	FEPA	Federal Environmental Protection Agency	(i) of air, water and noise standards (ii) Pollution control for air, water, soil and the stratosphere (iii) Control of flood, erosion and desertification
22	WWF	World wildlife Fund	(i) Creating public awareness on the environment through organised seminars, conferences

			and workshops (ii) Supporting and organising programmes on the environment (iii) Supporting conservation practices in the environment

Source: *Compiled from information obtained from the Federal Ministry of information, Federal Republic of Nigeria and Nigerian Environmental Education and Management (1993).*

4.0 CONCLUSION

The growth trend on environmental management over the past decade has been encouraging in terms of increased number of agencies. The agencies influenced the adoption and spread of environmental concern, which was to affect our national environmental policies and management. In reality, initial contributions were made by the United Nations Environmental Programme (UNEP), World Wildlife Fund (WWF) and others.

Some of these agencies assisted technically and provided funds to evolve activities on environmental management and conservation. Their efforts resulted in the establishment of Lekki Conservation Centre, the Okomu Wildlife Sanctuary, the Creek project, the Gashaka-Gumpti National Project, Hadejia Nguru Wetland project and the Cross River State National Park Project.

5.0 SUMMARY

This unit has been able to outline and discuss on the activities of Environmental NGOs especially the NCF acclaimed to be the foremost environmental NGO in Nigeria. These organizations raise awareness and influence public and government policies, actions, attitude and management of the environment. Significant contributions in this direction have been made by NCF, NEW, NES, and NEST, which constitute an important segment of environmental NGOs in this Nation.

6.0 REFERENCES/FURTHER READINGS

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