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ESM 411: POPULATION, ENVIRONMENT AND DEVELOPMENT

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UNIT 1: GLOBAL TREND IN POPULATION GROWTH AND DEVELOPMENT

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Contents

3.1 Global Environmental Constraints

3.2 Gaps in World Trade

3.3 The Need for Sustainable Development

4.0 Conclusion

5.0 Summary

6.0 Tutor Marked Assignments

7.0 References

1.0 INTRODUCTION

This unit will explain to you the trends and kinds of interaction that had existed between human population and the natural resources in man's environment. The unit takes you through the challenges encountered by man to develop his environment.

2.0 OBJECTIVES

At the end of the unit, the student should be able to:

- Explain the trends in world population growth in relation to development
- Identify how developing countries (eg Nigeria) are able to balance population growth with available resources

- Establish the linkages between population growth, its distribution and environmental degradation.

3.0 MAIN CONTENTS

3.1 Global Environmental Constraints

As the 20th century draws to a close, the world is confronted by a daunting challenged: to bring growing human numbers and their growing needs into balance with the natural resource base that underpins much development. Choices made during the next 10 years will determine, to a large extent, the future habitability of the planet. The collision between human numbers and the resources needed to sustain them will become more acute in the remaining years of this century and beyond.

A good part of the struggle to balance population with available natural resources will be concentrated in the developing world where human numbers, in many instances, have already exceeded the “red line” of resources use. As pressure intensify, some experts even envision the outbreak of resources wars in the developing world with worldwide repercussions.

The environmental dimension to population is firmly grounded in economics, among other factors. Behind the demographic issues of population growth and its uneven distribution, fertility levels, age-dependency ratios, migration patterns and urbanization, lies the imperative of economic advancement and sustainable development. The attempt to arrive at a new economic order, an order that promotes the sustainable use of natural resources at environmentally acceptable rate, is the key to long-term development.

The search for sustainability must be addressed within the context of population and natural resources issues, It is widely recognized that the current economic order does not promote sustainable development. Quite the contrary; we are using up the earth's store of natural resources at demonstrably non-sustainable rates and triggering extensive damage to the biosphere. Environmental degradation on such a massive scale cannot continue indefinitely. It is essential that government, aid agencies, international institutions and non-governmental organization (NGOs) advance the concept of sustainable management of the Earth's stock of natural resources, so that current generations will be able to broaden – not narrow – the choices future generations will have available. We can no longer afford to borrow from the future to pay for the present.

When the linkages between population growth, its distribution and environmental degradation enter the economic equation, the development outlook is altered profoundly. It is becoming apparent that we have achieved economic advancement in the past at a major cost to the future's capacity to supply still more economic development – and even at the more serious cost of an actual decline in human welfare. Much of what has passed for economic achievement may prove illusory in the long run. Many of our technological innovations have contributed to environmental decline and are turning out to be no more than temporary "fixes", merely deferring that day when the accumulated though hidden costs will have to be paid in full.

Consider the case of Green Revolution agriculture which enabled growth in grain production to keep ahead of growth in human numbers throughout the period 1950 to 1984. There appear to have been many covert costs attached to this agricultural

advancement. The continued overloading of cropland soils – brought on by over dosing of fertilizers and pesticides and intensive cropping – has led to broad-scale erosion, depletion of soil nutrients and salinization and waterlogging, among other environmental injuries. Salinization and waterlogging result from irrigation projects that have not taken account of the need for proper drainage: salts accumulate in the soil, effectively sterilizing it, and the water table rises until it chokes off the crop roots.

The deleterious practices, while unnoticed or disregarded for decades, are now levying a price in terms of falling agricultural productivity. Take India and Pakistan as examples. In India, 200,000 square kilometers – 36 per cent – to salinization. Yet these two countries have often been ranked among the prime exponents of Green Revolution agriculture. The world total of salinized land is estimated at 600,000 square kilometers or 22 per cent of all irrigated lands.

Environmental constraints of several sorts are now causing significant cutbacks in food production at a time when population growth continues with scant restraint. Soil erosion leads to an annual loss in grain output that is roughly estimated at 9 million tones. Salinization and waterlogging of irrigated lands account for another million tones; and a combination of loss of soil organic matter (through burning of livestock manure and crop residues for fuel), shortening of shifting-cultivator cycles, and soil compaction, for 2 million tones. In all, these forms of land degradation reduce grain harvest by some 12 million tones a year. On top of this are various types of other damage to crop production: air pollution reduces grain production by a million tones each year. Flooding, acid rain increased ultraviolet radiation account for another million tones in lost production.

The total loss from all forms of environmental degradation adds up to an estimated 14 million tones of grain output a year. This total is to be compared with gains from increased irrigation, fertilizer use and other inputs, worth 29 million tones a year. In other words, environmental factors are now causing the loss of almost half of all gains from technology-based advances in agriculture. It is a loss we can ill afford since the world needs an additional 28 million tones of grain output each year just to feed additional numbers of people at current nutritional levels. While the net gain in grain output amounts to less than 1 per cent each year, the world population is growing almost twice as fast, at 1.7 per cent.

In other sector too, the hidden costs of many activities associated with economic development have taken their toll on the environment. Before reunification of the two Germanys, the non-sustainable use of natural resources, coupled with environmental degradation from economic development, was costing environmental degradation from economic development, was costing West Germany some 20 billion marks a year, a full 10 per cent of the country's Gross National Product (GNP). Such cost call into question the very concept of economic growth as conventionally understood, given its progressive depletion of a given country's stock of resources. It also highlights flaws in national accounting systems which calculate economic advancement in an "environmental vacuum".

Developing countries pay an even higher price for neglecting environmental accounting. According to Dr. Robert Repetto, an economist with the World Resources Institute in Washington, DC, "Ironically, low-income countries, which are typically most dependent

on natural resources for employment, revenues, and foreign-exchange earning are instructed to use a system for national accounting that almost completely ignores their principal assets. A country could exhaust its mineral resources, cut down its forests, erode its soils, pollute its aquifers, and hunts its wildlife and fisheries to extinction, but measured income would not be affected as these assets disappeared."

While searching for a future that incorporates the key factor of sustainable development, the international community will have to devise new ways of measuring economic growth in order to incorporate both environmental and population factors.

As an intrinsic part of this process, the vast economic gap between developed and developing countries must be narrowed. Two areas in particular need to be addressed: restructuring of the debt burden and more equitable trade arrangement. Developing countries now owe around $1.3 trillion to developed-country banks and lending institutions. This debt burden weights heavily on developing-world prospects for development generally, and on population and environment concerns in particular need to be addressed: restructuring of the debt burden and more equitable trade arrangements. Developing countries now owe around $1.3 trillion to developed-country banks and lending institutions. This debt burden weighs heavily on developing – world prospects for development generally, and on population and environment concerns in particular. In sub-saharan Africa, for example, public long-term debt amounted to 58 per cent of the region's GNP in 1986, climbing to over 90 per cent by 1990. The debt crisis has prompted many poor countries to cut back on government spending for health care and

family planning activities, thus contributing to a slow-down in fertility rate declines in the Philippines, India, Tunisia, Morocco, Colombia and Costa Rica.

3.2 Gaps in World Trade

The gross imbalance in international trade also contributes to the non-sustainable use of resources and, indirectly, to excessive migration and urbanization among other things. To shield themselves against cheaper food imports from the developing world, the industrialized countries of North America and western Europe spend $200 billion a year in agricultural subsidies to protect domestic markets. These subsidies militate against agricultural exports from developing countries, depriving them of trade revenues world about$200 billion a year in agricultural subsidies militate against agricultural exports from developing countries, depriving them of trade revenues worth about $30 billion a year. In turn, these direct losses reduce developing – world farmers' profits, leaving them less to invest in better seeds, fertilizers and equipment. In addition, many developing-country farmers often receive little government incentive to stay on their farmsteads – in many instances crop prices are artificially low- and many of them over-cultivate their small plots or are forced to open up marginal areas in an effort to scratch a living from the land. Where there is a fixed amount of agricultural land and rapidly increasing populations to be supported on them, farm plots are often split into smaller and smaller fragments until they can no longer support a household. Millions of farmers have been driven off their lands and into cities where they swell shanty towns and slums, contributing to the crisis in urban services and furthering environmental degradation.

3.3 The Need for Sustainable Development

The imperatives of sustainable development are equally significant for the developed world. The level of a country's economic development and its consumption patterns make a crucial difference concerns natural resource use. Take energy as an example. Whereas each Bangladeshi consumes commercial energy equivalent to only 3 barrels of oil a year, each American consumes 55 barrels, implying that the population –derived increase in Bangladesh's consumption of oil in 1990 equivalent to only 8.7 million barrels, that of the United states 110 million barrels.

4.0 CONCLUSION

You have read about the global trends in population and the linkages between population growth, its distribution and environmental degradation. Also, you have been introduced to the multiple sets of dynamic interactions involved between population growth and environmental deterioration. Both are central to the cause of sustainable development. So strategies to promote sustainable development must integrate population and environmental concerns alike. Without such policy integration, sustainable development will remain nothing more than a proclamation on paper.

5.0 SUMMARY

This unit has introduced you to the developed countries with their highly advanced infrastructure are in a much better position to conserve natural infrastructure are in a much better position to conserve natural resources and produce less waste and pollution than developing resources and produce less waste and pollution than developing countries saddled with vast numbers of people living on the edge of survival. Enhance management of natural resources, for instance through energy-efficiency and

conservation plans, would not only make economic sense for developed countries, but could also produce spin-off benefits for developing countries, taking the form of energy supplies at cheaper prices and the transfer of environmentally-sound technologies.

A further dimension to this demographic background impinges on environmental questions. It is the distribution of population, and especially the massive shift from rural to urban areas, a process that is largely confined to developing countries. In 1985, the world's urban population was just over 2.1 billion people. It was projected to climb to 3.2 billion by 2000, and to soar to 5.5 billion by 2025. This means it could well multiply by a factor of 2.6 during the period 1985-2000, and by a factor of 1.7 during the period 2000-2025(Williams, C. C. and A. C. Millington, 2004). In the developing world, the urban population is projected to increase from 1.5 billion to 3.5 billion, a 133 per cent expansion during just the next 15 years (Mol, 2000). As early as 2010, the developing world's rural population is projected to reach 2.8 billion people (Mol, 1999). Thereafter, it is expected to stop growing altogether, possibly even going into decline. So, one of the most dominant trends in the developing world is ultra-rapid if not excessive urbanization.

6.0 Tutor Marked Assignments

1. Explain World Population growth trends
2. Mention and discuss the major environmental constraints confronted by developing countries.

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UNIT 2: THE DYNAMIC RELATIONSHIP BETWEEN ENVIRONMENTAL AND SOCIAL FACTORS

CONTENTS

1.0 Introduction
2.0 Objectives
3.0 Main Contents
    3.1 Development Benefits and Demographic Transition
    3.2 Ecological Dislocations
    3.3 Towards A Sustainable Future

4.0 Conclusion
5.0 Summary
6.0 Tutor- Marked Assignments
7.0 References/Further Readings

1.0 INTRODUCTION

This unit explains the dynamic relationship between environmental factors and social factors. It also draws your attention to impact of environment on the population.

2.0 OBJECTIVES

At the end of this unit, the students should be able to

- Identify environmental factors affecting population growth
- Mention and discuss social factors and relationship with environment
- Discuss the ecological constraints faced by developing countries

2.0 MAIN CONTENTS

3.1 Development Benefits and Demographic Transition

Variants of the basic assumption yield insights into the role of population growth on the part of a particular sector of humankind, the billion people who live in absolute poverty. Environmental impact is related to population, poverty, and the environmental resources available to support the impoverished multitudes. The interactions are again multiplicative, each one reinforcing the others impacts. But is this case, the communities is question tend to feature the highest population growth rates. Of the poorest fifth of developing- world households, between 55 and 80 per cent have eight or more members, whereas among all households at national level the proportion is only 15 to 30 per cent. Moreover, these people are unusually dependent for their survival upon the environmental resource base of soil, water, forests, fisheries and biotas that make up their main stocks of economic capital. Regrettably, they often see scant alternative to exploiting their environmental resource base at a rate they recognize is surely unsustainable. They thereby undercut their principal means of livelihood, thus

entrenching their poverty. In turn, this appears to reinforce their motivation to have large families. As a result, they face the prospect of ever tightening constraints.

Their plight also reflects the failure of development in general. They have been by passed by the usual forms of development, notably Green Revolution agriculture, and they cannot afford costly inputs such as high-yielding seeds, fertilizer, irrigation and farm machinery. So these people become "marginalized". They are marginalized, too, in that they generally lack economic, political legal or social status, meaning they can do little to remedy their plight. All too often this drive them to seek livelihoods in environments that are unsuitable for sustainable agriculture, being too wet, too dry or too steep. Hence, there is the phenomenon of the impoverished peasant who causes deforestation, desertification and soil erosion on a wide scale: a case of the marginal person in marginal environments.

Far from enjoying the development benefits that would ostensibly push the developing economies through a demographic transition to smaller families, these people are caught in a demographic trap. Given their severally constrained circumstances, population growth denies them the very inducements that could serve to reduce population growth.

Conceptual framework deals with population pressures reflected through urbanization. The mass migration of rural people to cities of the developing world is one of the more prominent processes of the late 20^{th} century. The situation can be represented by I = PMR, where I is the impact (still more localized this time, though nor confined to the cities themselves), P is population growth, M is the rate of migration, and R is the natural resource stock that sustains urban communities. The last part of this equation refers not

only to resources in the hinterland zones that support urban populations, such as food and fuel.

We can also give an example which points up a further factor that applies to all three sets of linkages. Governments have the capacity to manage the processes involved (population growth, increased consumerism and technology expansion), provided they explicitly plan for them. But this would require a host of government activities: political responses, policy interventions, institutional initiatives, promotion of technological advances, and measures to expand socio-economic infrastructure.

All of this makes for a planning challenge unprecedented in its character and extent. No societies in the past have had to cater for population growth at annual rates of 2 per cent or more for decades on end, let alone the rates of 3 to 4 per cent that have recently characterized a sizable number of nations in sub-Saharan Africa and the Arab world. Indeed, it would tax the planning capacities of the most sophisticated and established societies. Yet, it is a challenge confronting nations that often have experienced only a few decades of nationhood and the modern state system. Moreover, many developing nations are further constrained by exogenous factors such as adverse trade relations, inadequate and often inequitable aid slows and foreign debt. In these circumstances, it is remarkable that so many developing nations have managed to achieve so much in so short a period.

3.2 Ecological Dislocations

Thus, we see that growth in human numbers, in conjunction with growth in human consumption and growth in environmentally adverse technology (the I = PAT equation), can combine to precipitate a downturn in the capacity of environmental resources to

sustain human communities at their current consumption levels. In certain instances, this produces ecological discontinuities or threshold effects of irreversible injury. These occur when ecosystems have absorbed stresses over long periods without much outward sign of damage, then suddenly reach a disruption level at which the cumulative consequences of stress finally reveal themselves in critical proportions. One such example is the widespread dieback of conifers in uplands areas of Europe and eastern North America. We can well anticipate that as human communities continue to expand in numbers, they will exert increasing pressures on ecosystems and natural resource stocks, whereupon ecological discontinuities will surely become more common.

In Nigeria, the closing of the agricultural frontier in the lowlands during the 1970s, given the oil boom, led multitudes of landless people to migrate into the urban areas, leading to a buildup of human numbers at a rate far greater than that of the national population growth. The uplands contain the bulk of the country's remaining tropical forests. The result has been a marked increase in deforestation and soil erosion. In other words, there has occurred a "breakpoint" in patterns of human settlement and environmental degradation. As long as the lowlands were less than fully occupied, it made little difference to the uplands whether there was 50 per cent or 10 per cent space left. It was only when hardly any space at all was left that the situation deteriorated radically. What had seemed acceptable became critical and a profound shift occurred in a very short pace of time.

The problem of land shortages, complained by farmland fragmentation, is becoming widespread in many if not most developing countries, where land provides the main

livelihood for almost 60 per cent of their populations and where most of the fertile and accessible land has already been occupied. During the 1970s, arable areas were expanding at roughly 0.5 per cent a year. But during the 1980s, the rate dropped to only half as much. And primarily because of population growth, the amount of per capita arable land declined by 1.9 per cent a year. As far back as 1975, some 25 million square kilometers of land were worked by 1.2 billion people, yet only 563 million of them could be fed sustainably with the low-technology farming methods generally practiced. Many of these lands were in rain forest zones, susceptible to soil erosion. Population overloading served to aggravate the pace of land degradation.

Consider too an instance where a potentially renewable resource suddenly becomes overwhelmed by rapid population growth. Most people in the developing world derive their energy from fuelwood. As long as the number of wood collectors does not exceed the capacity of the three stock to replenish itself through regrowth, the local community can exploit the resources indefinity. They may keep on increasing in numbers for decades, indeed centuries, and all is well, provided they do not surpass a critical level of exploitation. But what if the number of collectors grows until they finally exceed the self-renewing capacity of the trees – perhaps exceeding it by only a small amount? Quite suddenly a point is reached where forest cover starts to decline. Season by season the self-renewing capacity becomes ever more depleted: the exploitation load remains the same, and so the resource keeps on dwindling. More and more, a vicious circle is set up, and it proceeds to tighten once the level of exploitation becomes non-linear.

Note that this scenario applies even if the number of collectors stops growing. The damage is done. But if the number of collector continues to expand through population growth or migration, the double degree of overloading (derived from an ever shrinking stock exploited by ever more collectors) becomes compounded. There ensues a positive feedback process that leads to acute fuelwood scarcity, and then all too quickly the stock is depleted to zero. The process occurs all the more rapidly as the stock is progressively used up.

The essence of the situation is that the pace of critical change can be rapid indeed. As soon as a factor of absolute scale comes into play, the self-sustain equilibrium becomes disrupted. A situation that seemed as if it could persist into the indefinite future suddenly moves on to an altogether different status.

We encounter this non-linear relationship between resource exploitation and population growth with respect to many other natural resource stocks, notably forest, soil cover, fisheries, water supplies and pollution-absorbing services of the atmosphere. Whereas resource exploitation may have been growing gradually for very long period without any great harm, the switch in scale of exploitation induced through a phase of unusually rapid population growth can readily result in a slight initial exceeding of the sustainable yield, whereupon the debacle of resource depletion is precipitated with surprising rapidity.

3.3 Towards a Sustainable Future

The effort to establish a sustainable future, one capable of supporting between 11 and 14 billion people by the year 2010, will require major changes in our economic, political and

social structures. This applies to all nations of the global community. Many policy options are available, especially the incorporation of population and environment concerns into national planning from start to finish.

Developed and developing countries alike can embark immediately upon this reorientation by formulating comprehensive development strategies that reflect the myriad interactions between population, natural resources, consumption and technology. They can also establish analytic systems of natural resource accounting, which in turn will serve to highlight the unsustainable resource-use patterns that now tend to be the norm given the same four factors of population, natural resources, consumption and technology.

These two initiatives alone will go far to establish a sustainable future for all nations. But it is also true that developing nations face [exceptional challenges of economic advancement, population growth, environmental decline and development imperatives overall.

First of all, consider two measures that will require much more collaboration on the part of developed nations viz-a-viz developing nations: correcting the imbalance in international trade, so that developing nations receive more efficient and equitable prices for their exports together with greater access to major markets; and immediate relief for the international debt burden.

At the same time, developing nations can engage in basic reforms to emphasize the sustainable management of natural resources - in conjunction, of course, with comprehensive population planning. It is only by integrating environment and population

factors into planning strategies that developing nations can hope to balance their ever growing populations with their natural resource base. It is also viral that such policy initiatives be integrated throughout government [systems, rather than being assigned to individual ministries (often at odds with each other over planning priorities and budgets). In turn, this will enable coordinated efforts to formulate policies and programmes to conserve soils, water, forests, watersheds and coastal zones and to expand family planning services and maternal and child health care nationwide. All of these policy initiatives are prerequisites for a sustainable future.

In concert with these measures, developing-world governments | should undertake two further sets of initiatives that often receive scant attention. First, they should enable local communities to exercise greater control over decisions affecting their own welfare. If governments are to make progress with such problems as depletion of natural resources, faltering food production and rural-urban migration, they should direct more emphasis to grassroots' needs as perceived by local people.

Second, developing-world governments should recognize the role of women on the environmental front. Women often play a pivotal part in managing environmental resources, yet all too often this function is over-looked by development strategies.

In sub-Saharan Africa, for example, women often produce up to 75 per cent of food grown for domestic consumption and they are responsible for much soil conservation and tree planting among other environmental activities. So development strategies should take account of women's efforts to safeguard local resources. In those countries where governments have recognized the crucial contribution of women, natural resources lend

to be utilized more sustainably and in some cases environmental degradation has been reversed.

Thus it is imperative that women's status be improved through more opportunities for education and employment, and especially For access to maternal and child health care in conjunction with family planning services. Where governments have improved the status of women, as in Nigeria, for instance, birth rates have come down.

Finally, it is evident that prospects for developing countries to make solid gains as regards population and environment issues will be at least partially contingent on major macro-economic forces that can either help or hinder their progress. To a considerable extent this will require more collaboration on the part of developed nations to provide immediate relief for the international debt burden, as well as efforts to correct imbalances in international trade, so that developing countries receive more efficient and fair prices for their exports, plus improved access to major markets.

What is generally missing is the political will to get on with the task. But this may well reflect an inadequate grasp of the concealed costs of inaction on the part of political leaders together with the many positive payoffs that will stem from incisive and timely initiatives. In the next two units, we shall lake a detailed look at the problems and the opportunities in the interconnected sphere of population and environment.

During the past decade, Nigeria has made impressive efforts to -bring down Its population growth rate. The country's population is, growing by around 3 1 per cent a year. The government has launched a nationwide family planning programmes. Modem contraceptive use has risen rapidly: from 14 per cent in 1982 to nearly 30 per cent today.

The programme, however, relies heavily on only one form of contraception - the pill. Nearly 95 percent of all women practising some form of birth control use it.

4.0 CONCLUSION

In this unit, you have learned a number of issues, which relate to environment viz-a-viz social factors. You now know what to do in order to set yourselves on the track towards a sustainable future. The scientific understanding is there, the relevant technologies are available, the economic analyses are in place; the policy imperatives are established. In addition, we have plenty of specific experience to demonstrate we can succeed when we apply ourselves to the challenge.

5.0 SUMMARY

What you have learned in this unit concerns the connectedness of environmental factors to social factors in the development processes. The role of women is particularly mentioned as they the vanguard to soil conservation as well as preservation of local resources.

6.0 TUTOR-MARKED ASSIGNMENTS

Discuss how the developing world can engage in sustainable development.

Discuss the fact that environmental impact is as a result of population growth.

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UNIT 3: THE TRANSITION OF SOCIETIES FROM HUNTING AND GATHERING TO AGRICULTURE

CONTENTS

1.0 Introduction
2.0 Objectives
3.0 Main Contents
    3.1: The Development of Early Settlements and Population Activities
    3.2: Scales and Generalisations in Population and Environmental Issues
    3.3: Distribution and Density of Population
    3.4: Population – Development Interrelations
4.0 Conclusion
5.0 Summary
6.0 Tutor Marked Assignments
7.0 References

1.0 INTRODUCTION

In the previous studies, we had seen that the environment plays an important role in our lives. We depend on the environment for our food, water, fresh air and building materials. We have also seen that the environment is under is under heavy pressure and losing its ability to produce the products we need for survival. In this unit, we will describe the population of early settlements and how they interacted with the environment.

3.0 OBJECTIVES

At the end of the unit, the students should be able to :

- Discuss Neolithic revolution
- Identify the types of plants and animals that were domesticated
- Mention and discuss the physical features which aided farming as the main occupation in the three river basins.

3.0 MAIN CONTENTS

3.1 The Development of Early Settlements and Population Activities

About 8000 BC, at the last ice age, the world's population consisted of small bands of hunters and collectors living in subtropical lands at a subsistence level. These groups of people, who were usually migratory, could support themselves only if everyone was almost continually involved in the search for food. At this time two major technological changes, known as the 'Neolithic revolution,' turned the migratory hunter-collector into a sedentary farmer. The first was the domestication of animals (sheep and cattle) and the second the introduction and cultivation of new strains of cereals (wheat, rice and maize). This gradually led to food surpluses and enabled an increasing proportion of the community to specialize in non-farming tasks.

The evolution in farming appears to have taken place independently, but at about the same time, in three river basins: the Tigris-Euphrates in Mesopotamia, the Nile and the Indus. These areas had similar natural advantages:

- Flat flood plains next to large rivers
- Rich, fertile silt deposited by the rivers during times of flood
- A dry climate which maintained soil fertility as there was limited leaching (though these areas were more moist than they are today)
- A warm subtropical climate
- A permanent water supply from the rivers for domestic use and, as farming developed, for irrigation
- A dry climate allowing mud from the rivers to be used to build houses.

By 3000 BC larger towns and urban centres had developed with an increasingly wider range of functions. Administrators were needed to organize the collection of crops and

distribution of food supplies; traders exchanged surplus goods with other urban centres; and early planners introduced irrigation systems.

3.2 Scale and Generalisations in Population and Environmental Issues

The study of any environment, whether natural or altered by human activity, involves numerous different and interacting processes. The relative importance of each process may vary according to the scale of the area under study: global or **macroscale;** intermediate or **mesoscale;** and local or **microscale.**

For example in a study of soils, it is climate which tends to impose the greatest influence upon the formation and distribution of the major global types (e.g. the podsol and chernozem). At a smaller, regional level (e.g. Mediterranean), rock type may be the major influencing factor (e.g. terra rossa and rendzina). Within a small area, such as a river valley where climate and rock type are homogenous, relief may be dominant, as seen in the catena.

A common problem with scale, as with models is that a chosen level of detail may become either too large and generalized or too small and complex to be meaningful in addressing the problem. Population distributions and densities may be studied at a variety of scales. At a world scale the pattern shown is so general and deterministic that it may lead the student into an over-simplified understanding of the processes which produced the apparent distribution and density. Indeed some of the generalized patterns do not stand up to careful scrutiny when studied at a more local scale or over a period of time.

Although it may be easier to identify and account for distributions, densities and anomalies at the national level, it is more difficult in the case of a country the size of

Brazil than it is for a smaller country such as Uruguay. Yet it is often only by looking at a smaller region or an urban area that the complexities of the different and multiple processes become most apparent.

In the study of human population it is important to remember that the situation is dynamic, not static. The number of people constantly changes in time, in space and at micro-meso and macro-scales in the population system.

3.3 Distribution and Density of Population

The distribution of population over the world's surface is uneven and there are considerable variations in density. One of the best means of illustrating distributions is using a dot map, where each point or symbol represents a given number of people. However, this method creates the problem of having to select the value and size of the dot.

Densities are usually shown by a choropleth map, although such maps are easy to read, once a class interval has been chosen they tend to hide concentrations. Densities give the impression that the number of people living in each square kilometer is equally distributed across the country. It also suggests that there is an abrupt change in the population density on crossing national boundaries, because the total population of the area has been divided by its total area.

It has been noted that population is a very important element in development planning. Population censuses are the primary sources of the basic data required for planning, for administration and also for many aspects of economic and social research. These include planning for education, housing, agriculture, rural-urban migration

which often lead to squatter settlements in the urban centres, manpower and labour, health and other infrastructural facilities. The main population questioning Nigeria has revolved around the issue of numbers. In other words, how many Nigerians are there at any point in time? The history of Nigerian census taking dates as far back as 1866 when the first organized attempt was made to' enumerate the population of Lagos area. Since 1866, there have been 15 documented attempts to' enumerate the population of either part are the entire territory of Nigeria. The earliest attempts were through conjectural estimates or through tax returns. These were followed by partial census and later complete national censuses. Since the first census was conducted, each census figure was disputed by one segment or the other in the country. There were and still are accusations of either undercount of same ethnic groups or over count of some other ethnic groups. Rather than seeing census taking as a scientific/technical exercise it has been regarded largely as a political issue in this country. It is notable that the last two census exercises in the nation; i.e. those done in 1991 and 2006 have been accepted albeit with some reservations from certain stakeholders (Oyekanmi, 1992;Oyekanmi and Ogunlade, 2008; Edewor, 2008) as quoted in Oyekanmi (2011). The counts gave total population figures of 88,992,220 in 1991 and 140,431,790 in 2006 for the nation (NPC.1998; 2009). If one uses the medium variant estimate of natural increase rate of 2.5% per annum by the United Nations the population of the country by mid-2010. is put at 158,259,000: By the year 2020 it is projected by the medium variant that the population would be 175,928,000 (UN, 2009). The age distribution shows a very young age structure where about 41 percent of the total

populace are less than 15 years of age. On the other hand about 5 percent of the nation's population are aged 60 years and above.

3.4 Population-Development Interrelations

The people are also the contributor of labour, one of the factors of production, the others being land arid capital. It is in the process of obtaining these other two factors of production that many developing countries get into trouble in an effort to develop. According to Oyekanmi (2011) the dilemma of whether to rely on local resources for production purposes or to be externally dependent has been a major problem of many developing or emerging nations of the world. First the plundering of the resources of the colonies for the sustenance of the colonial masters; then the tele-guiding of the newly independent nations especially through selected, not duly elected, rapacious leaders who saw themselves more as agents of the former masters than representing the interests of the masses whom they govern. Later on came concepts like Structural Adjustment Programme in the 1980s, Globalization in the 1990s and of recent Millennium Development Goals through which the developing nations such as Nigeria are made to feel dependent *ad infinitum* on the metropolitan and developed countries. The goals of development as defined by the developed nations are perpetually being shifted out of the grasp of the developing nations. As of September, 2010, the meeting convened by the UN in New York has already indicated that most developing countries especially those in Africa would not be able to meet the targets of the MDGs by year 2015 largely because the developed countries have not fulfilled the promises they made to donate funds for the use of the developing nations. While that bitter pill is yet to be swallowed another trap is

being laid in form of greenhouse gas effect and ozone layer depletion with recommendations being made on penalizing factories which emit 'certain gases 'into the atmosphere. It is obvious that it would be very difficult, if not impossible for industrialists who are already struggling under burdens of loans in Nigeria to get the resources to replace old machineries and re-train .the workers who will operate the new equipment. Worthy of note is the practice whereby machinery which have been used for some decades in the developed countries are now being bought by our industrialists 'as fairly used/refurbished equipment with the attendant problem of wastage of already scarce resources on maintenance in addition to environmental pollution in the country (Oyekanmi, 2011). According to her, the government structures/agencies which are supposed to make policies on economic and other issues in order to regulate the economy constitute a huddle to the polity in this country. Even the liberal democracy through which African nations are compelled to ape the governments of Western Europe, USA and Canada in governance have failed to yield good governance in the developing nations, including Nigeria. Several scholars have noted the defects of our democratic experiment in the post-colonial era (Goulet,1992) and state that 'exogeneity' is a distinctive feature of public policy in contemporary Nigeria. - This is a tendency for public policies to be influenced more by external factors considerations and the belief that solutions to local internal problems can only be found outside the country especially since 1999. Exogeneity is believed to be a negation of the core development values, with detrimental _ effects on domestic development and contributing to crisis of - legitimacy (Oyekanmi, 2011 and Goulet,1992).

4.0 CONCLUSION:

This unit has dealt with the history of the early settlers. It has also shown how the early man fed through hunting and gathering and progressively transform into cultivation of crops and domestication of animals.

5.0 SUMMARY:

This unit has introduced you to the natural advantages used by early settlers to establish sources of livelihood. The unit explains the spatial distribution of population measured in terms of density, which also vary from place to place.

6.0 TUTOR MARKED ASSIGNMENTS

1. Mention and discuss the physical features which encouraged the cultivation and domestication of animals.
2. Explain the interrelationship between population and development.

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UNIT 4: THE RESPONSES OF CIVILISATION TO ENVIRONMENTAL CONSTRAINTS

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Contents

3.1 The LDC and MDC Population

3.2 The Carrying Capacity of the Earth

3.3 Technology Versus Social Values and Social Action

3.4 Population History: The Pattern of Accelerating Growth

4.0 Conclusion

5.0 Summary

6.0 Tutor Marked Assignments

7.0 References/Further Readings

1.0 INTRODUCTION

This unit is expected to provide a background information on the transformational processes of man within his environment. The unit spans through the abilities of man and his ingenuities at solving fundamental challenges for his survival.

2.0 OBJECTIVES

At the end of this unit, the students should be able to:

- Identify the needs of mankind in his environment
- Discuss the growth pattern of population in more developed and less developed countries.
- State the carrying capacity of the earth in relation to population

3.0 MAIN CONTENTS

3.1 : The LDC and MDC Population

Mankind as a food gatherer cannot expand beyond very limited numbers. The naked ape is restricted to warm climates, and within them his population growth is held within the numbers that can be fed with available plant and animals. Learning to use fire, and make clothing, and living in caves and shelters expands the climatic areas man can live in, and so increases his maximum numbers. Tools for gathering food and for hunting—digging shard and sticks, clubs, spears, nets, bow and arrows—enable men to gather more food and to protect him against animals who want him for food.

But the animals that can be hunted and the edible plants are limited in any one area, and in the world as a whole; and so human population is limited also. As human populations approach the limit, further growth comes against the checks of malnutrition and disease, war, infanticide, and sometimes sex taboos, Harrison Brown estimates that the maximum world population of food gatherers is of the order of 10 million.

Some 350 generations back, or 10,000 years ago, the gradual discovery and spread of knowledge of cultivation of food crops and the domestication of animals used for food, multiplied by several scores of times the numbers of people that could be fed. Early

settled agriculture was productive enough so that about one out of ten in the population could be occupied by other than food production- The smelting of metals and the development of wheeled vehicles and of oar-propelled and sailing ships raised the number of people the earth could support to several billion— in the neighborhood of the present world population or somewhat more.

During the past 200 years there have been three groups of improvements that have increased food and other supplies, and/or decreased death rates. (1) The steam engine was developed and then electrical, hydroelectric, expanded use of fossil fuel, and finally nuclear power; together with associated better techniques in the production of food and clothing. (2) Sanitary practices have improved. Sewerage and water supply are crucial. Brushing one's teeth in the back streams of Bangkok, and getting one's drinking water from pits in the dried lake bottom east of Yogyakarta (Central Java) are no aids to lengthening life. Such practices have diminished throughout the world, (3) Medical knowledge and practice have improved—with respect to the prevention and cure of disease generally, and recently with the wonder world of antibiotics and chemical and other controls of insects.

In the MDCs population growth due to falling death rates has been increasingly offset by falling birth rates. With the spread of urban living, large families have been less desired. There have been successively improved means of contraception, and in some areas significant postponement of the average age at marriage. The 1971-1974 rate of increase was slightly under 1.0 percent a year, doubling numbers in a bit over seventy years.

In LDCs, though death rates have fallen from the above causes, birth rates generally have fallen only moderately, and in some countries not at all. Hence LDC populations are rising rapidly. In 1971-1974 the rate of increase was 2.3 percent, which doubles numbers in thirty years, and multiplies by sixteen times in four generations.

The world as a whole was in 1971-1974 increasing its population 2.1 percent a year—close to but under the rate of a few years earlier, which was the fastest rate of increase ever achieved. The current rate doubles population in thirty-three years.

3.2 The Carrying Capacity of the Earth

The cultivated 3.5 billion acres, or 10 percent of the earth's surface, could be multiplied to about 14 billion, or about four times the present level. The increased demands for leveling, draining, irrigating, and fertilizing require immense inputs of human effort and of capital. Sea water needs to be desalinized in huge quantities. Fertilizers, insecticides, and herbicides need to be produced and transported. Railways, trucking, and highways are needed; also chemical plants, and so metal production and concrete. The implication is a world that is heavily industrialized.

As to energy requirements, we have already seen (p, 185) that the burning of fossil fuels—oil, gas, and coal—is increasing tin carbon dioxide content of the air and increasing the dust particles in the atmosphere. The former tends to increase the earth's temperature. The latter, when added to effects of volcanic eruptions, probably tends to lower the earth's temperature; and it clearly lowers the temperature of the arctic and Antarctic region: (because sunlight must reach them through a much thicker dust blanket than it did in past centuries) relative to the tropic regions. World wind patterns are

determined by temperature differences between the polar and tropic zones, and hence this reliability of the monsoon rains is threatened, on which some 1.7 billion of the earth's people rely for farm crops.

Any changes in temperature and rainfall are "bad" because the world's plant, animal, and human life is sensitively adapted to existing conditions. Growing carbon dioxide and growing dust in the atmosphere are, as the world's human population increases, an uncertain but increasing menace.

Fossil fuels are limited in quantity. Coal is much more abundant than oil and gas: Its 7600 billion tons will last a worth population of 6 billion—now hard ahead—about fifty years. But nuclear fuels (uranium, thorium, and perhaps eventually deuterium) are in almost unlimited supply. Granite rock is a good source of such fuels, and lower-grade ores can be used. Nuclear fuels could provide energy for a 30 billion world population for hundreds of years.

Heat production is a concern- Perhaps part of the surface of the earth could be roofed with a heat-dissipating skin, and head pumps could transfer heat to the roof for radiating into space.

The food production and industrialization problems for a population of 30 billion could be met. Population density on this world's land surface would be about 2000 per square mile, about that of the great city along the U.S. eastern coast, extending from Boston to Norfolk.

3.3 Technology Versus Social Values and Social Action

The above account is fanciful. The real problems of population are different. We do not have, and we are unlikely to have, world organized toward maximum numbers. The real

problems are the extent to which increasing numbers involved in social and economic burdens, are to be added to the other problems of human societies. For MDCs the chief burdens are those of deterioration of the physical environment, and problems of social psychology and social morale, as people live increasingly in concrete and glass jungles. It is not clear that MDC real incomes (GNP), as usually measured, are threatened in the decades immediately ahead. For LDCs, their real incomes are threatened: Economic growth is checked and threatened by population increase. The burden on growth is a major one.

3.4 Population History: The Pattern of Accelerating Growth

The world's population in 10,000 B.C. is thought to have been about 1 million; in A.D. 1 about 275 million. By A.D, 700 there was probably a moderate decline in both Europe and China because of plagues, civil disorder, and war. In the next thousand years, population doubled, to about 475 million in 1650. In the next 200 years, it doubled again, to some 1,100 million-in 1850. The next doubling took less than a hundred years: by 1950 world population was about 2,500 million; in 1974 about 3,900 million; in 1975 about 4,000 million.

Over 10,000 years were needed to raise the world's population to the present level. At current rates of growth, the numbers will double—in the absence of disaster from climatic shifts, nuclear war, unprecedented plagues—in thirty-five years, or by about 2010.

Estimates of population growth rapidly grow obsolete but their errors have recently been in one direction only. The estimates have regularly understated future numbers. In 1939

population analyst Raymond Pearl estimated that by the year 1990 world population would be about 2,600 million. It achieved that total in 1950. In the same year, 1950, Boyd-Orr, of the FAO, estimated world population in 1975 to reach 3,000 million; but that number was passed in 1965.

Sri Lanka's population in 1870 was 2 million. Death rates have in recent decades fallen sharply because of a number of reasons, but conspicuously in the 1940s because of the use of DDT to cut the inroads of malaria. The death rate in 1936 was 37 per thousand; in one year, 1946-1947, it dropped from 20.4 to 13.8; by 1965-1970 it was 7.5 per thousand. The 1974 population was 13,6 million.

Java's population was in the neighborhood of 10 million in 1815; by 1974 it was over 80 million.

India, including what we now have as Pakistan and Bangladesh, had in the sixteenth century about 100 million people; by 1974 the area held 741 million.

4.0 CONCLUSION

In this unit, you have read the gradual discovery and spread of knowledge of cultivation of food crops and the domestication of animals used for food, multiplied by several scores of times the numbers of people that could be fed. Early settled agriculture was productive enough so that about one out of ten in the population could be occupied by other than food production- The smelting of metals and the development of wheeled vehicles and of oar-propelled and sailing ships raised the number of people the earth could support to several billion— in the neighborhood of the present world population or somewhat more

5.0 SUMMARY

This unit has established the origin of man's progressive growth in number and activities within the environment. It has shown the disparities in the production of food, industrialization and services between the Less Developed Countries (LDC) and the More Developed Countries (MDC). With the spread of urban living, large families have been less desired. There have been successively improved means of contraception, and in some areas significant postponement of the average age at marriage.

6.0 TUTOR MARKED ASSIGNMENTS

1. Discuss the process of survival for the early man
2. Establish the differences between the economies of LDCs and MDCs

7.0 REFERENCES/FURTHER READINGS

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UNIT 5: THE POPULATION DIMENSION

CONTENTS

1.0 Introduction
2.0 Objectives
3.0 Main Contents
    3.1 The World's Population
    3.2 The Structure of Population

4.0 Conclusion
5.0 Summary
6.0 Tutor-Marked Assignment
7.0 References

1.0 INTRODUCTION

This unit provides you with population figures in each decade. At a glance, you can appreciate the growth of population from decade to another. You can also see the distribution of population in each region of the world.

2.0 OBJECTIVES

At the end of the unit , the students should be able to

- State population distributions in different regions of the world
- Establish demographic projections and the role of economic advancements
- Discuss early population growth rates with modern trends

3.0 MAIN CONTENTS

3.1 The World's Population

In mid- 1990, the world contained 5.3 billion people. Of these, 4.1 billion or 77 per cent, in developed countries. The global total laws growing at a rate of 1.7 per cent a year,

with an average of 79 million people a year during the 1980s. This means that during 1990 the world's population expanded by the equivalent of another Mexico.

WORLD POPULATION GROWTH BY DECADE, 1950-1990 WITH PROJECTIONS TO 2000

Year	Population (billions)	Average increase each decade (millions)	Average increase each year (millions)
1950	2.516	n/a	n/a
1960	3.040	524	52
1970	3.698	658	66
1980	4.448	750	75
1990	5.292	844	84
2000	6.260	968	97

Source: WEED, 1987

Population by Region (in billions)

Region	1990	2025	2100	Region	1990	2025	2100
Africa	0.6	1.6	3.0	North America	0.3	0.3	0.3
Asia	3.1	4.9	6.3	Europe & USSR	0.8	0.9	0.8
Latin America & Caribbean	0.5	0.8	0.9	Oceania	0.03	0.04	0.04

Sources: Huw, 1990 and UN, 2010.

Of this annual increase, more than 90 per cent is in developing countries. These countries tend to be least able to cope with the development and environmental consequences of rapid growth in human numbers due to their low per capita incomes, indebtedness, and limited capacity for investments.

The latest projections indicate that the global total will reach 6.3 billion people by the year 2000 and 8.5 billion by 2025, before leveling out at an eventual total of 11.3 billion by the end of next century or shortly thereafter (Oyekanmi, 2011). These figure are rather higher than those projected a few years ago (6.1 billion, 8.2 billion and 10.2 billion), due to a slowing down in the decline of fertility rates in a number of countries. This is notably the case in China and India which together account for more than half of the upward revisions (UN, 2010). Other such countries include the Philippines, Malawi, Tunisia, Morocco, Colombia and Costa Rica. Of the projected increase of 3.2 billion from 1990 until 2025 – at least 3 billion, or 94 per cent, will occur in developing countries which, because of the challenges they already face, are least able to accommodate population growth on this scale within such a short time frame.

Moreover, the 11.3 billion figure for the eventual world to total is the medium-level projection. The high projection indicates the total could reach 14.2 billion by the year 2100, while the low projection reveals that global population could be held to just under 8 billion. The difference between the high and low projections is substantial, 6.3 billion people: more than the entire world population by the turn of the century.

This represents an unprecedented rate of rapid population growth. The increase in the last 40 years equals the total increase during the half million years from the emergence of Homo sapiens until 1950. It is not only a very recent phenomenon; it can be no more than a very transitory phenomenon. For 99.9 per cent of humankind's existence, the maximum world population was less than 10 million people, or fewer than now live in several large cities. Population growth was only about 0.001 per cent a year, by contrast

with today's rate of 1.8 per cent a year, 1,800 times greater. The first billion mark was not reached until around 1830. It took another 100 years or so, until 1930, before the world's population increased to 2 billion. The third billion was added by 1960 (30 years), a fourth by 1974 (14 years), and a fifth by 1987 13 (13 years), a fourth by 1974 (14 years), and a fifth by 1987 (13 years). The 6-billionth inhabitant of Earth will probably be born sometime during 1998 (11 years), and the 7- billionth by around 2009 (11 years). The last 3 billion (supposing an eventual total of rather more than 11 billion) will be added by 2100 or so (91 years), the bulk of them by2050)"(UN, 2010). Such a massive increase in human numbers, occurring virtually instantaneously in a historical perspective, is proving to be highly disruptive in terms of our capacities to plan for and to support ever faster growing numbers.

Thirty-two per cent, or 1.3 billion, of the people in the developing world live in countries such as China and the Republic of Korea, where birth rates are below 25, death rates below 10 and infant mortality is below 50 (per 1.000 population in all case); population growth rates are now 1 to 1.1 per cent a year, enough to produce an annual increase of roughly 15 million people each year.

- Forthy-one per cent, or 1.72 billion, are in countries such as Brazil, parts of India, Indonesia and Mexico, where birth rates have fallen (between 50 and 75) and population is still growing at around 2 per cent each year, sufficient to double it every 35 years.
- The remaining 27 per cent, or 1.1 billion, live in region such as sub-Saharan Africa, parts of the Middle East and Much of South Asia, where death rates have

fallen, but birth rates (over 30) and infant mortality (over 100) remain high. Their populations are doubling every 23 to 28 years.

3.2 The Structure of Population

Furthermore, the youthful age structure accompanying rapid population is supported by those people of economically productive ages. In the developing world, there are 2.3 people of working age to support each school-age. Their fertility as adults will make an enormous difference to population growth rates next Century and consequently to the global environment. With an early start on child bearing, teenage mothers often end up having large families. If their daughters also marry early, the pattern repeats itself, and the gap between generations is shortened, fuelling the momentum of population growth. The United Nations medium projection for populations, growth, citied earlier, assumes that world fertility will be at replacement level by 2035; a 30- year delay would means an extra 4 billion people (Oyekanmi, 2011).

Because of the youth fullness of developing-world populations, these countries will have an enormous task in creating employment opportunities. The labour force in developing countries is projected to grow from around 1.7 billion today to more than 3.1 billion by the year 2025. Every year another 38 million new jobs will be needed, not counting jobs required to wipe out existing unemployment and underemployment (estimated at 40 per cent of the work force in many developing countries). This burden will create tremendous economic, social and political pressures, leading to increased poverty, mass migrations, civil unrest and further depletion of the natural resource growth, citied earlier, assumes that world fertility will be at replacement level by 2035; a 30- year delay would means an extra 4 billion people.

Because of the youth fullness of developing-world populations, these countries will have an enormous task in creating employment opportunities. The labour force in developing countries is projected to grow from around 1.7 billion today to more than 3.1 billion by the year 2025. Every year another 38 million new jobs will be needed, not counting jobs required to wipe out existing unemployment and underemployment (estimated at 40 per cent of the work force in many developing countries). This burden will create tremendous economic, social and political pressures, leading to increased poverty, mass migrations, civil unrest and further depletion of the natural resource base (Ekop and Nwakeze, 2009).

An additional concern is the growing numbers of elderly in both the develop and developing worlds. Life expectancy averages 70 to 76 years in industrialized countries, and is now 60 to 65 years in many developing countries. Although this represents a success in health terms, it has many economic and social implications not only for dependency ratios, but for the future of the family unit. The spectre of large numbers of young people, with growing cohorts of elderly, will put increased strain on developing-world governments least able to afford them.

Moreover, it is projected to keep on climbing for a while to come, reaching an annual peak of 97 million by the year 2000. As we shall see, it is the annual increase in absolute numbers that is so critical to countries' prospects for sustainable development, meaning, in the broadest sense, development based on safeguarding the world's environmental resource base. Alternatively stated, the incremental increase in human numbers is more important than the rate of population growth – closely related though the two factors obviously are.

Projection does not reflect environmental factors: they assume there will be no Malthusian constraints. But the fast-growing degradation of the natural resource base that ultimately supports all communities may soon start- in the absence of incisively remedial measures – to exert a constraining effect on population growth. Given the record of the last two decades, it becomes increasingly hard to see how sub-saharan Africa, for example, will experience a projected quadrupling of human numbers within another century as long as gross environmental impoverishment continues to spread in the manner of the recent past. Those who consider that population growth may soon be pressing against or even exceed " population carrying capacity" are inclined to be increasingly skeptical about demographic projections made in an "environmental vacuum".

Within this overall perspective a number of demographic trends reflect a disturbing reality: one which will have profound repercussions (Ekop,2000). In terms of birth and death rates, developing countries can be divided roughly into three groups, each of which manifests demographic momentum of alarming proportions.

4.0 CONCLUSION

In this unit you have learned a number of issues which relate to the global rate of population growth which has declined a good deal- from a high of 2.1 per cent in the late 1960s to 1.7 per cent today – the number of people added to the total each year, now 84 million, is higher than ever before.

5.0 SUMMARY

What you have learned in this unit concerns the demographic projections or extrapolations of recent trends, together with some assumptions about the role of economic advancement and family planning in stemming the rate of population growth. Projections are not predictions, still less are they forecasts. By their nature they take no account for other variables such as policy changes and technological breakthroughs.

6.0 TUTOR MARKED ASSIGNMENTS

1. Discuss the factors responsible for life expectancy in developing countries.

2. What is the implication of youthful in developing countries?

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UNIT 6: POPULATION IMPACTS ON ENVIRONMENT, NATURAL RESOURCES AND QUALITY OF LIFE

CONTENTS

1.0 Introduction
2.0 Objectives
3.0 Main Contents
    3.1 Global warming
    3.2 Green House Gases
4.0 Conclusion
5.0 Summary
6.0 Tutor-Marked Assignment
7.0 References/Further readings

1.0 INTRODUCTION

In this unit, three categories of population impacts are examined, in accord with the substantive themes of the 1992 Conference on Environment and Development: global issues, natural resources and quality of life. For the sake of focusing on issues that highlight the global dimension, the first part of this analysis is confined to two specific items: global warming and ozone-layer depletion.

2.0 OBJECTIVES: At the end of this unit, the students should be able to

- Mention the causes of global warming
- Mention the effects of global warming on the environment
- Discuss issues relating to natural resources and quality of life

3.0 MAIN CONTENTS

3.1 Global warming

It has been made plain by the recent reports of the Intergovernmental Panel on Climate Change (1PCC), and by numerous other extensive analyses the buildup of so-called greenhouse gases in the atmosphere appears set to bring on a phenomenon of global warming. Because the processes and mechanisms have been dealt with at length on other occasions, there is no need to reiterate them here. Rather, we shall examine the linkages to population growth (in conjunction, of course, with attendant issues such as energy demand and environmentally disruptive technology), and try to determine how much of the problem is due lo the population factor.

Worldwide emissions of carbon dioxide, the gas that causes half the greenhouse effect, are estimated to have risen from 2.4 billion tonnes in 1950 lo at least 6.8 billion tonnes in 1985, an average increase of 3.1 per cent a year." During the same period world population grew by an average of 1.9 per cent a year. The rest of the increase, 1.2 percent per person a year on average, ostensibly derived from higher per capita consumption of goods that involve production of carbon dioxide plus changes in technology. According to this reckoning, population growth was responsible for almost two thirds of the increase in carbon dioxide emissions.

An analysis along these lines is useful as an indicative assessment. It serves to point up that population growth has indeed played a sizable role. If there had been no population growth, there would have been far less buildup of carbon dioxide.

3.2 Green House Gases

Four gases are responsible for the bulk of global warming.

- Low-level ozone, produced by *a* combination of nitrogen oxides and hydrocarbons (mostly from vehicle exhausts) in the presence of sunlight and oxygen, accounts for around 10 per ten! of the warming.
- Chlorofluorocarbons - also the main cause of ozone layer depletion - account for perhaps 20 per cent of global warming. These are used in refrigeration and air condition decomposing rapidly after forest clearance, and by the breakdown of nitrogen fertilizers.
- Methane accounts for 14 percent of global warming. Two thirds of emissions are from man-made sources Half of these come from decomposition in irrigated fields and the guts of livestock.
- Carbon dioxide is responsible for around 50 per cent of all global warming. Carbon is naturally recycled between atmosphere, ocean, rocks and the biosphere What has upset the natural balance is the burning of huge quantities of fossil fuels and massive deforestation Pleasing carbon normally locked up in today's forests and in the mineralized remains of prehistoric plant life.

4.0 CONCLUSION

This unit has treated the impact of population on environment, natural resources and quality of life. You should by now be able to describe the impact of population on the natural resources as well as the environment and quality of life.

5.0 SUMMARY

In this unit, your focus should be on the impact of population on the environment which is a very important global issue relating to global warming, green- house gases and their effects.

6.0 TUTOR-MARKED ASSIGNMENT

Describe the causes of global warming

State the effects of global warming

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UNIT 7: DEFORESTATION AND LAND DEGRADATION

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Contents

3.1 The Implication of Growing Population

3.2 Critical linkages between Population and Environment

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignments

7.0 References

1.0 INTRODUCTION

This unit discusses deforestation and land degradation processes through rapid urbanization – stemming in major measure from population growth. This population growth has many implications on environmental conditions in developing-world cities.

2.0 OBJECTIVES: At the end of this unit, the student should be able to

- State the extent of deforestation in some continents
- Explain the effects of deforestation on land
- Discuss the linkages between population and environment

3.0 MAIN CONTENTS

3.1 The Implication of Growing Population

The pressure of fast-growing human numbers engenders acute shortages of many basic requirements for acceptable living standards, including supplies of water, sanitation,

food, energy, housing and sheer space. Huge congregations of urban communities (well over half the total population in many instances) are obliged to exist in shanty towns and slums, amidst extreme squalor and deprivation. Moreover, urban concentrations of impoverished people tend to exert a parasitic impact on their resource support zones in the hinterlands, contributing, for example, to accelerating deforestation and land degradation through unsustainable demand for fuelwood.

The outlook for more than a billion absolutely impoverished people in developing countries is bleak. These "poorest of the poor", being most in need of the benefits of development, are often responsible for a disproportionate amount of environmental degradation, and feature the highest fertility rates. They totaled less than 0.5 billion in 1975, or 23 per cent of developing-world populations, but their number has now risen to 1.2 billion, still 23 per cent (Ekop, 2000). While their percentage share of total numbers is likely to decline, their absolute numbers are projected to keep on increasing (in the absence of vigorous remedial measures) until well into the next century.

Populations of the developed countries of North America, Europe, and Asia and the Pacific also bear a large responsibility for environmental degradation at the global level. Their population growth of 0.8 per cent or less a year is allied with an exceptional technological and consumerist capacity to exploit natural resources and generate enormous quantities of waste. These developed countries consume a disproportionate share of the Earth's natural resource. With barely 25 per cent of the planet's population, they account for 75 per cent of all energy used, 79 per cent of all commercial fuels and 85 per cent of all wood products. Even more important, they generate nearly three quarters

of all carbon dioxide emissions that account for half of global warming, plus a similarly disproportionate share of other greenhouse gases.

3.2 Critical linkages between Population and Environment

There are several sets of linkages at work between population and environment. What are their scope and scale? How do they operate? Do they act in both directions? What variations occur among countries and culture? What are some time horizons in question? Since the question of linkages is central to this analysis, let us examine them in some detail.

Consider, first, the central factors of population growth and its impacts. We can identify four principal components: P, being population itself, I, being environmental impact, A, being per capital consumption (determined by income and lifestyle), and T. being environmentally harmful technology that supplies A. The three factors P, A and T interact in multiplicative fashion; in other words, they compound each other's impacts. So whatever the size of A and T. the role of P is bound to be significant even when a population and its growth rate are relatively small. For any type of technology, for any given level of consumption or waste, for any given level of poverty or inequality, the more people there are, the greater is their overall impact on the environment. So we can represent the processes involved in the form of basic equation, 1=PAT.

This basic equation demonstrates why developing nations, with large population but limited economic advancement, can generate a vast impact on the environment (hence on prospects for sustainable development), if only because the P multiplier on the A and T factors is so large. Likewise, the equation makes clear that developed nations also

generate population impacts insofar as the a and t multipliers for each person are exceptionally large.

At the same time, a number of other factors are at work in addition to the three elements of the equation makes clear that developed nations also generate population impacts insofar as the A and T multipliers for each person are exceptionally large.

At the same time, a number of other factors are at work in addition to the three elements of the equation. They include socio-economic inequities, cultural constraints, government policies and the inter-national economic order. Moreover, these additional factors vary greatly throughout the global community of almost 200l nations, disparate as they are in agro-climatic zones, natural resource endowments and historical traditions. But sooner or latter all these additional factors operate through one or another of the equation's three variables.

4.0 CONCLUSION

This unit has treated deforestation, land degradation and the effects on our environment. It has presented statistics from developing countries with some projections of further damage if remedial measures are not put in place.

5.0 SUMMARY

This unit has focused on deforestation and land degradation through unsustainable utilization of natural resources.

6.0 TUTOR MARKED ASSIGNMENT

1. Explain the sources and effects of deforestation.

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UNIT 8: CONSTRUCTION OF THE NEW AND THE OLD WORLDS

CONTENTS

1.0 Introduction
2.0 Objectives
3.0 Main Contents
    3.1Agricultural Lands
    3.2 Soil Erosion
    3.3 Desertification
4.0 Conclusion
5.0 Summary
6.0 Tutor-Marked Assignment
7.0 References/Further Readings

1.0 INTRODUCTION

This unit attempt to answer the following questions:

To what extent are natural resource, concentrating on agricultural lands, water, forest and biological diversity, affected by population growth? And how far does degradation of these resources affect population questions? How do they all link in with the imperative of sustainable development?

2.0 OBJECTIVES:

At the end of this unit, the students should be able to:

- Discuss soil erosion as a major form of land degradation
- Identify the problems of land degradation in our environment
- Establish the causes of desertification

3.0 MAIN CONTENTS

3.1 Agricultural lands

After three and a half decades of increasing food output per capita, the world has now experienced several year of "plateauing" in crop yields. Much of the problem lies with degradation of agricultural lands after decades-long overloading of the natural resource base, due in part to population pressures. As much as 70,000 square kilometers of farmland are abandoned each year as a result of degradation, while another 200,000 square kilometers lose virtually all their agricultural productivity.

3.2 Soil erosion

Soil erosion is one of the chief forms of land degradation. It is the wearing away of the top soils by agents of denudation namely: water (rainfall), wind and glaciers.

Unchecked soil erosion could well cause a decline of 19 to 29 per cent in food production from rainfed croplands during the 25 years from 1985 to 2010. The problem is due to several factors apart from population growth, notably poverty: impoverished peasants cannot afford the conservation measures needed to protect soil cover. At the same time, population growth serves to induce farmers to over-use and even exhaust the soil cover and fertility that eventually results in declining agricultural productivity.

Consider, for illustration, the case of Java. The application has surged from 51 million in 1950 to 112 million today; 62 per cent of the nation's total population is now located on 8

per cent of its national territory. This rapid buildup in human numbers has served to aggravate soil erosion. In 44,000 square kilometers of upland farming areas, the population density has reached a level of 700 to 900 persons per square kilometer, even 2,000 persons or more in some localities, while the average land holding has declined to a mere 0.7 of a hectare. One third of these upland areas are seriously eroding, and more than 10,000 square kilometers of grain lands have been degraded to the point they no longer support even subsistence farming. This threatens the livelihood of 12 million people, many of whom live in absolute poverty and have no means to engage in soil-conservation practices.

3.3 Desertification

Desertification is an even more severe form of land degradation. It occurs in the semi-arid and arid regions of the world. It is a situation in which areas that had been forested have now been deprived of its vegetal cover. This process is estimated to be threatening 45 million square kilometres or a full third of the Earth's lard surface - together with the livelihoods of at least 850 million people, of whom 135 million are experiencing the rigours of severe desertification Already it eliminates 60,000 square kilometres of agricultural land each year, and Impoverishes another 200,000 square kilometres, reducing yields and requiring costly remedial measures. The costs in terms of agricultural output forgone are estimated to be in the order of $30 billion a year. One of the main causes of desertification is over-grazing by domestic livestock. Yet the 1PCC Working Group III report projects a 45 per cent increase in meat and dairy output by 2025, largely to cater to population growth and dietary upgrading. In the absence of unexpectedly productive breakthroughs in technology, this implies s marked Increase in livestock numbers.

As in the case of soil erosion, desertification stems from faulty agricultural policies, lack of extension services and inadequate attention-to subsistence agriculture, among other adverse factors. In part too, it arises from exogenous factors such as the international trading system and foreign debt that induce & number of countries to engage in cash-crop for-export agriculture rather than food-producing agriculture. At the height of the Sahel droughts, several countries were exporting more peanuts and cotton than ever before.

But population growth plays a salient part as well, through the phenomenon of the marginal peasant impelled into marginal (too dry) environments.73 Moreover, population growth is generally higher in semi-arid and arid lands than elsewhere. In over half of the 34 predominantly dry countries (those in which more than three quarters of total area is dry), population growth has been 3 per cent or more since the mid-1970s. Because it is usually too difficult to increase productivity on established croplands with their dryness (there has been much less of an increase in agricultural productivity in the drier regions of Africa and the Middle East than in Latin America and South/Southeast Asia), the main agricultural response has been to expand the area cultivated. Feeding additional people would be taxing to a degree even without drought and desertification. The problem, in turn, has served to trigger some of the most broad-scale migrations in recent decades.

These two instances of land degradation (soil erosion and desertification) show that the problem is due in significant degree' to lack of socio-economic infrastructure for agriculture and especially in support of it resource base. In turn, this includes a lengthy list of factors, such as perverse pricing practices, inadequate credit and marketing

facilities, over-regulation on the part of governments, and a general policy emphasis in favour of the urban-industrial sector to the detriment of the rural-agricultural sector. All these serve, both directly and indirectly, to exacerbate degradation.

The impact of population growth, especially the absolute increase in human numbers each year, also plays a substantive part in land degradation. In principle, it would be possible through improved agricultural policies, agro-technologies and the like, to safeguard the food resource base and to make it still more productive. But the experience of the 1980s, when population growth became an ever more prominent factor, shows that agricultural lands have been deteriorating and per capita food production declining in much of southern Asia, sub-Saharan Africa and the Andean countries. Agronomic strategies assume stability in the environmental state (if the resource base, whereas the reverse is true in many agricultural areas. There are all too few instances where new technologies for soil conservation and crop management have kept pace with the demands of surging human numbers. On the contrary, productive capacity has been declining steadily in entire regions.

To cater for increased food needs in the future we should theoretically plan for a 50 per cent increase in cultivated lands in developing countries by 2025. yet, the principal food areas, grain lands, have not increased since 19S1, following a 24 per cent expansion from 1950. Instead, they have been contracting as the amount of land opened up has not kept pace with the amount taken out of production because of land degradation. Indeed, the world average of per capita cropland has been decreasing at a rate that, if continued, will leave only half as much in 2000 as in 1950.

Overall, land degradation of various sorts has been estimated by the World watch Institute to be causing an annual loss of roughly 14 million tonnes of grain output. This translates into almost half of all gains in grain output each year. It means the overall net Increase in grain output is reduced to less than 1 per cent a year - while population growth amounts to almost 2 per cent a year. In turn, this translates into rising grain prices as reserve grain stocks have fallen 10 little more than "pipeline supplies": between 1986 and 1989 rice prices rose 3S per cent and wheat prices 48 per cent. The 1980s have seen little expansion of croplands because there is little suitable land left to mobilize for arable agriculture, and there appears to be less scope than in the past for intensification of food production through expanding irrigation. So the environmental constraint of land degradation, worth 14 million tones of grain a year, could soon become all the more constraining, in that the world needs an additional 28 million tones of grain output a year just to keep up with population growth, let alone to upgrade nutrition and to meet demands from increasing affluence.

In short, it is now becoming apparent there has been an environment- population debacle building up for decades in the agricultural sector, covert and largely disregarded until the last few years. Worse, it looks as if it has the makings of a major crisis during the 1990s. Suppose the rate of grain- output increase continues the 1985- onwards pattern of falling behind population growth, and that technological responses, plus related responses such as increased investment in agriculture, keep on providing incapable (as they did for much of the1980s) of supplying the responses that boosted grain output for all of three decades from 1950 onwards. Whatever the present problems of land degradation (they appear set

to grow worse if only because of the cumulative impacts of farmers' long- term overloading of their croplands), they will be grossly aggravated by the compounding impact of population growth with an additional 900 million people in the developing world during the 1990s. So the decade ahead could see a combination of mounting grain deficits, surging grain prices and spreading hunger among ever larger numbers of people.

This mega- problem will hit hardest at those least capable of withstanding it, the world's bottom billion poorest people or precisely those who generally feature the highest fertility rates. Thus, the agricultural-lands problem will keep on being compounded by the predominant and most persistent factor of all, population growth. The shrinking size of landholdings in many areas of the developing world is a direct result of rapid population growth, combined with poor agricultural practices, lack of rural infrastructure and inadequate government policies among other factors.

As the population growth rate remains high (2.3 per cent a year), there are more sons to inherit shares of ever smaller plots of land. The average size of upland farms has been reduced from 2 to 4 hectares 30 years ago to barely a hectare today. In the over- crowded plains along the Indian border, farms are so tiny – one third of a hectare- that farmers can no longer make a living from the land. This forces the poorer farmers to open up marginal land on steep slopes, to cut down watershed forests and to misuse water supplies. Even precipitously steep slopes have been planted with maize and wheat. Yet, in many areas, yields remain low and livelihoods continue to erode with the soils."

Nigeria faces severe land fragmentation because of rapid population growth. The average amount of land per person has fallen from 0.4 hectares in 1969, to 0.2 hectares

today. As in Nepal, poorer farmers are forced into marginal areas where soils wear out fast and yields remain low. Many landholdings in Kenya and elsewhere are already too small to provide an adequate living. Large numbers have been turned into part-time farms, with the wife and children staying at home to tend crops while the husband migrates in search of wage employment. Or the land is simply sold off to larger and richer landowners, making landholdings still more unequal and creating a still larger pool of landless labourers. This process applies in many other developing countries. In practice, for the children of the poor large families mean smaller landholdings today and landlessness tomorrow.

With no prospect of rural employment, many of the destitute migrate to towns and cities. Land reform offers a partial solution, but it is an option few countries have undertaken successfully.

With much land degradation stemming from excessive population pressures, the most productive way to reverse the situation surely lies with a rapid reduction in population growth. Otherwise, the prospect is that Africa's over-burdened lands will need to support an extra 225 million people and India's an extra 189 million people by the year 2050.

4.0 CONCLUSION

In this unit you have learned a number of issues which relate to the new world as a construct of the old world. You should have learned the various means of altering the natural environment including soil erosion and desertification.

5.0 SUMMARY

What you have learned in this unit concerns natural and human factors that are responsible for land degradation. You have also read that population growth over the years serves to induce farmers to overuse and exhaust soil fertility which eventually results in low agricultural productivity.

6.0 TUTOR-MARKED ASSIGNMENTS

What is soil erosion?
Mention and discuss agents soil erosion

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UNIT 9: NATURAL AND ANTHROPOGENIC ENVIRONMENTAL CHANGES

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Contents

3.1 Population and Anthropogenic Emissions

3.2 Ozone-layer depletion

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignments

7.0 References/Further Readings

1.0 INTRODUCTION

By now you are familiar with the growth patterns which had worked out differently, with alternative levels of demand for fossil fuel energy - especially insofar as a greater proportion of the reduced growth would presumably have taken place in industrialized nations. You can ask a question " What if the growth in energy demand the technology deployed to meet it had worked out in a manner greater than per capita consumption because of shifts in pricing items and trends? You can now read this unit for answers to this question.

2.0 OBJECTIVES

At the end of this unit, the students should be able to:

- State the difference between natural and anthropogenic environmental changes in developed and developing countries
- Mention sources of anthropogenic emissions in our environment
- Identify the effects of global warming on food production
- Discuss the effects of Ozone-layer depletion on human health and agriculture

3.0 MAIN CONTENTS

3.1 Population and Anthropogenic Emissions

As the populations increase, the benefits of a putatively extreme step elsewhere, such as the termination forthwith of all coal burning on the part of the United States without replacing it with any other carbon-containing fuel.

Overall, developing countries produce about 30 per cent of worldwide emissions of carbon dioxide today, while possessing 77 per cent of the world's population. Projections of recent trends to the year 2025 indicate that developing countries could then be accounting for 64 per cent of all emissions (which then would be much larger in total), while possessing 85 per cent of the world's population (according to the medium-variant projection for population growth). But if the global population total in 2025 were to be held to the low projection of 6.3 billion instead of the medium projection of 7.2 billion, and supposing there were to be no reduction in per capita carbon dioxide emissions, total emissions would be reduced by 1.3 billion tones.

Putting a brake on population growth could have even greater benefit as concerns a more potent greenhouse gas, methane, with a rate of increase higher than that for carbon dioxide. Half of all anthropogenic emissions of methane come from rice paddies, among other irrigated lands, and

from ruminant livestock. These two sources have expanded mainly to meet the food needs of more people, but also because of the demand for improved diets. Irrigated lands have increase by 1.9 per cent a year since 1970, roughly the same as the rate of population growth; cattle numbers have grown by 0.9 per cent a year, less than half as much. The greatest expansion by far has occurred in developing countries in line with their need to feed fast-growing populations. Their rates of methane emissions cannot be readily reduced (by contract with the case for carbon dioxide) on the grounds that they do not reflect wasteful consumption. Rather, they are likely to keep on expanding to keep pace with population growth. The IPCC report projects a 45 per cent increase in meat and dairy production by 2025, with a parallel increase in methane emissions. While there are a few technological adaptations that could eventually help the situation, the most practical way to reduce the rise in methane emissions from these two sources in the long run is by slowing the growth in human numbers.

There is a further aspect to the population-global warming connection that is still more significant. It relates to the prospects for agriculture and food supplies in a greenhouse-affected world. Recent research and analysis have generated a model that calculates population size, and the production, consumption and storage of grain under different climate scenarios over a 20 – year period. Grain supplies over half of the calories in an average diet when consumed directly, and a substantial part of the remainder when consumed in the form of meat, eggs and dairy products; one tonne of grain a year can provide four adults with adequate diets and five adults with subsistence diets. Grain also accounts for the vast majority of international trade in food. According to the model cited each one tonne deficit in grain production results in two deaths - a distinctly conservative calculation.

The model postulates an entirely plausible greenhouse scenario for early next century, one that foresees a possible 10 per cent reduction m the global grain harvest on average three times a decade (the 1988 droughts in just the United States, Canada and China resulted in almost a 5 per cent decline)- Given the way the world's food reserves have dwindled to almost nothing in recent years as a result of droughts and poor land management, it is not unrealistic to reckon that each such grain harvest shortfall would result in the starvation deaths of between 50 and 400 million people.

In addition, global warming may well reduce croplands by as much as a third (within a range of 10 to 50 per cent), because of increased temperatures and reduced rainfall plus coastal flooding Global warming's impact could be specially severe in developing lands of the tropics, since they tend to be more vulnerable to climatic change. Moreover, developing countries have next to no food reserves for the most part, and their citizens often subsist on marginal diets already, Worst of all, these countries have all too limited capital and infrastructure with which to adapt to changes in climate. Yet according to the 1990 1PGC report," the regions that appear to be at greatest risk of extreme climatic dislocations for agriculture are often those where marginal environments sometimes make agriculture an insecure enterprise already: the Sahel, southern Africa, the Indian subcontinent, eastern Brazil and Mexico. Latest climatic models show patterns of drought increasing in frequency from 5 per cent of the time under the present climate to 50 percent by the year 2050.

On top of all this, the leading grain producers in the developed world are North America, the Soviet Union, Europe and Australia, accounting for about 43 per cent of

global grain production. Yet precisely these countries, with the possible exception of the parts of Soviet Union, could well incur relatively more severe climatic consequences in a greenhouse-affected world." Even if one allows for a "fertilizer effect" on grain production as a consequence of enhanced carbon dioxide levels in the atmosphere, leading to 5 to 10 per cent increases in grain production every 3 to 5 years, this does not prevent the projected deaths of over 800 million people during a 20-year period.

Yet another adverse repercussion is expected to arise from global warming, again with a strong relationship to population growth. It concerns environmental refugees and the impact of rising sea level on human communities in developing countries with large and dense population.[44-48] This will be taken up later.

3.2 Ozone-layer depletion

The second global issue to be considered is ozone-layer depletion. Again, the causes and mechanisms, together with the impacts on human health, agriculture and marine ecosystems, have been dealt with at length in numerous studies.[49-52] So there is no need to cover those basic aspects here, except to note that on top of human health repercussions such as increased cancers and eye cataracts, there will be adverse consequences for a good number of crop plants on land and sea-base phytoplankton food chains. Rather, we shall look at linkages with population.

4.0 CONCLUSION

This unit has treated the differences between natural and anthropogenic changes in our environment. It has also shown the role of population growth in consumption and production of CFCs is illustrated by the case of China which intends to increase

significantly its stock of refrigerators, preferably utilizing CFCs. To date only one Chinese household in 10 possesses a refrigerator. The government plans a nationwide effort to increase the proportion, along the lines of the Beijing experience during the 1980s where the proportion soared from less than 3 per cent to more than 60 per cent. China has built 12 CFC production plants in order to accommodate the refrigerator needs of many more of today's 250 million households.

5.0 SUMMARY

This unit has shown the contributions of Third World countries in the emission of hydro-carbon and other gaseous substances into the upper atmosphere. The developing world, with only a tenth of the developed world's per capital consumption of the main ozone-depleting chemicals, chlorofluorocarbons (CFCs), currently produces only about 17 per cent of the global total. But if current trends were to be maintained, the developing world's production of CFCs would reach 29 per cent of the global output as early as 2000. Much of the growing demand is centered on refrigerators, this being the largest and fastest-growing use of CFCs in developing countries.

6.0 TUTOR MARKED ASSIGNMENTS

Discuss the effects of population growth on the production and consumption of chlorofluorocarbons

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