Chapter 1 Introduction

1.1 Population

Population is the number or body of habitats in a place belonging to specific social, cultural, socio-economic, ethnic or racial group. A population is the number of all the organisms of the same group or species, which live in a particular geographical area, and have the capability of breeding. In sociology, population refers to a collection of humans. Demography is a social science which entails the statistical study of human populations.

1.2 Environment

Human beings live in, are influenced by, and influence four types of environments: the physical, the biological, the socio-cultural, and the supernatural. However, in this section we will discuss about the physical environment, biological, socio-cultural, and their relationships among themselves.

The physical environment: It is known as a-biotic environment or natural environment. The meaning of ‘a-biotic’ or ‘physical’ is non-living which includes like land (soil), water, air conditions and the atmosphere. So, we can say that physical environment is the environment which includes non-living-things which are constitutes of soil and its effect on the living-things. In addition, the physical environment constitutes the climatic factors such as sunbeams, rainwater, precipitation, moisture, pressure and wind speed etc (Daniel and Keller, 2011). Although, the physical environment has some effect on the biotic environment it has the following importance:

1. The most important thing to make house is residential space, and for residential space, we need land area. The land area is included under the physical environment.
2. The a-biotic environment like soil, water and air are the necessary elements to provide nutrients for the living organisms.

3. All of living beings are surrounded by atmosphere; it is the combination of different gases. The living beings take oxygen (human's), carbon dioxides (Plants) and other gases from the atmosphere.
4. The a-biotic environment also controls the climatic elements like weather (temperature and precipitations).
5. The physical environment also constitutes soil which is responsible for the existence of living things by providing different minerals which are necessary for the growth of plants.
6. Water is one of the most necessary things for all life forms. Water resources are also grouped under physical environment.

Biotic environment: It is known as biological environment or organic environment. In the opposite side of the physical environment, the biotic or biological environment is responsible for the living beings. So, the biological environment is the environment which involves the living part of the planet Earth. This type of environment includes the plants, trees, animals, mammals, underwater living beings, and microorganisms like bacteria and fungi. Like the physical environment the biological environment has also some importance:

1. The living beings are highly dependent to each other. For example humans are highly depend upon **plants (trees)** for food and oxygen, and plants and trees are also depend upon humans and animals because they produce large quantity of CO_2 (Daniel and Keller, 2011).
2. Fungi perform activities essential to the functioning of all natural ecosystems. They are among the foremost decomposers of organic matter, breaking down plant and animal remains and wastes into their chemical components. As such, fungi play a critical role in the recycling of minerals and carbon.
3. Perhaps the most important ecological function of trees is protecting the land against erosion, the wearing-away of topsoil due to wind and water. The trunks and branches of trees provide protection from the wind, and tree roots help solidify soil in times of heavy rain. In addition, trees and forests store water reserves that act as buffers for the ecosystem during periods of drought. Trees and forests also provide habitat, protection, and food for many plant and animal species.

Socio-cultural environment: Socio-cultural environment involves the culture and life style of human beings. The social or cultural environment is an environment which is created by man through his different socio-cultural activities and thinking. The historical, cultural, political, moral, and economic aspects of human life constitute to socio-cultural environment (Daniel and Keller, 2011). The importance of social or cultural environment:

1. Culture involves the religion of the human, relations with each other etc. In a society there involve different types of people, they have different religion, different thinking, and different type of languages, which has culture of its own and people having their own life style.
2. The socio-cultural environment affects how human beings can be organized and hence it has the great importance in social organization and re-organization. For instance, the development of a child is highly depending upon culture and societal environment in which that child grows up.

1.3 Link between population and environment

Large population size with rapid growth rate depletes natural resources and degrades the environment. Resource issues are clearly related to population size – more people use more resources. Rapid population growth plus poverty, the characteristics of developing countries, can cause overexploitation of both renewable and nonrenewable resources. In developing countries, renewable resources, such as forests, fisheries, and agricultural land are particularly important for survival, providing food, and are being more overexploited, resulting environmental deterioration. *Small population size but large resource consumption depletes resources and degrades the environment*. Population size is not the only factor for natural resource overexploitation and environmental degradation. An equally important factor for environmental degradation is the population’s resource consumption. According to Raven, et al. (2010), *people in highly developed countries are extravagant and wasteful consumers; their use of resources is greatly out of proportion to their numbers*. A single child born in a highly developed country may have a greater impact on the environment and on resource depletion than 12 or more children born in a developing country. Many natural resources are used to provide the automobiles, cell phones, DVD players, computers, furniture, boats, and other “comforts” of life in highly developed countries. The disproportionately large consumption of resources by highly developed countries thus affects natural resources and the environment as much as or more than the population explosion in the developing world.

Population, Consumption, and Environmental Impact: The *IPAT* Model: The impacts of human being on the environment are difficult to assess. One way to estimate them, as described by Raven, et al. (2010) and Cunningham and Cunningham (2011), is to use the three factors most important in determining environmental impact *(I)*. These are: the number of people *(P)*; affluence, which is a measure of the consumption or amount of resources used per person *(A)*; and the environmental effects (resources needed and wastes produced) of the technologies used to obtain and consume the resources *(T)*.

These factors are related in this way: ***I = P* x *A* x *T***

For example, to determine the environmental impact of emissions of the greenhouse gas CO_2 from motor vehicles, multiply the *population* times the *number of cars per person* (affluence/consumption per person) times the *average car’s annual* CO_2 *emissions* per year (technological impact). This model demonstrates that although increasing motor vehicle efficiency and developing cleaner technologies will reduce pollution and environmental degradation, a larger reduction will result if population and per capita consumption are also controlled. *The IPAT equation is valuable because it helps identify what we do not know or understand about consumption and its environmental impact*. For example, which kinds of consumption have the greatest destructive impact on the environment? Which groups in society are responsible for the greatest environmental disruption? How can we alter the activities of these environmentally disruptive groups? *Our ultimate goal should be to reduce consumption so that our current practices do not compromise the ability of future generations to use and enjoy the riches of our planet*.

Chapter Two: Classification of Natural Resources

2.1 Basis for classification

Resources can be classified in a number of ways. Usually, resources are classified into three groups as **natural resources, human resources,** and **human-made resources**. Again, each of these resources is classified into various subdivisions based on different criteria.

Natural Resources: natural resources are those resources that are part of or derived from the natural environment. Many of them are essential for our survival (e.g., water, air, soil, etc.) while others are used for satisfying our wants (e.g., minerals like gold and diamond). Natural Resources may be further classified in different ways. Usually, they are classified into different groups based on the criteria of origin, renewability, and stage of development

2.1.1 Based on origin (biotic and abiotic)

On the basis of origin, natural resources may be divided into *biotic* and *abiotic* resources.

A. *Biotic Resources*: **-** are the ones which are obtained from the biosphere. Flora and fauna and their products, such as forests and their products, animals, birds and their products, fish and other marine organisms are important examples. Sources of energy such as Coal and Petroleum are also included in this category because they were formed from decayed organic matter.

B. *Abiotic Resources*: **-** comprise of non-living things. Examples of this group include land, water, air, and minerals (gold, iron, copper, silver, etc.)

2.1.2 Based on stage of development

Natural resources are also categorized based on the stage of development: **Potential Resources** are known to exist and may be used in the future. For example, petroleum may exist in many parts of India and Kuwait that have sedimentary rocks, but until the time it is actually drilled out and put into use, it remains a potential resource. **Actual resources** are those that have been surveyed, their quantity and quality determined, and are being used in present times. For example, petroleum and natural gas is actively being obtained from the Mumbai High Fields. That part of the actual resource that can be developed profitably with available technology is called a **reserve resource**, while that part that cannot be developed profitably because of lack of technology is called a **stock resource**.

2.1.3 Based on renewability

On the basis of renewability, natural resources can be categorized into **renewable** and **non-renewable** resources.

A. **Renewable Resources**: **-** are generally both living and non-living resources which can be replenished or reproduced easily. These resources have a continuing process of renewal and supply in nature and thus they are commonly called “flow resources”. Some of them like sunlight, air, wind etc, are continuously available and their quantity does not get affected by human consumption. Unlike other renewable resources, these resources do not need regeneration. Many other renewable resources can get depleted by human use but may also be replenished thus maintaining a flow. Some of these like agricultural crops take a short time to renew; others like water take a comparatively longer time, while still others like forests take even longer. However, these resources can renew themselves if they are not over-harvested but used sustainably.

Once renewable resources are consumed at a rate that exceeds their natural rate of replacement, the standing stock will diminish and eventually run out. The rate of sustainable use of a renewable resource is determined by the replacement rate and the amount of the standing stock of that particular resource.

B**. *Non-renewable Resources***: **-** are those resources that exist in a fixed amount that cannot be remade, re-grown, or regenerated as fast as they are consumed and used up. They are formed over very long geologic periods. Minerals and fossils are included in this category. Since their rate of formation is extremely slow, they cannot be replenished once they get depleted. Out of these, the metallic minerals can be reused by recycling them. But coal and petroleum cannot be recycled. The non-renewable resources are often defined as “stock resources”.

Chapter Three: Natural Resources Basis of Ethiopia

3.1 Climate

Weather is the current atmospheric conditions, including temperature, rainfall, wind, and humidity at a given place. If you stand outside, you can see that it is raining or windy, or sunny or cloudy. You can tell how hot it is by taking a temperature reading. Weather is what is happening right now or is likely to happen tomorrow or in the very near future.

Climate, on the other hand, is the general weather conditions over a long period of time. For example, on any given day in October, we expect it to be Sunny in Gondar, Amhara and rainy and calm in Hosanna, Southwest Ethiopia. Climate is an aggregation of near-surface atmospheric conditions and weather phenomena over an extended period in a given area. It is characterized by statistical means and such variables as air temperature, precipitation, winds, humidity, and frequency of weather extremes.

Table 1. Traditional Agro-climatic Zones and their physical characteristics

Zone	Altitude (metres)	Rainfall (mm/year)	Length of Growing Period (days)	Average Annual temperature (^{o}C)
Wurch (cold and moist)	3200 plus	900 – 2200	211 – 365	>11.5
Dega (cool and humid)	2300 – 3200	900 – 1200	121 – 210	17.5/16.0 – 11.5
Weyna Dega (cool sub-humid)	1500 – 2300/2400	800 – 1200	91 – 120	20.0 – 17.5/16.0
Kola (warm semi-arid)	500 – 1500/1800	200 – 800	46 – 90	27.5 – 20
Berha (hot arid)	under 500	under 200	0 – 45	>27.5

Recently, however, 18 major agro-ecological zones (AEZs) and 49 sub-agro-ecological zones have been identified and grouped under six major categories (MoA, 2000 and EPA, 1998). The major categories consist of:

1. Arid Zone – less productive and pastoral and occupies 53.5 million ha (31.5 percent of the country);
2. Semi-arid - less harsh and occupies 4 million ha (3.5 percent of the country);
3. Sub-moist – occupies 22.2 million ha (19.7 percent of the country) highly threatened by erosion.
4. Moist – covers 28 million ha (25 percent of the country) of the most important agricultural land of the country, and cereals are the dominant crops.
5. Sub-humid and Humid – cover 17.5 million ha (15.5 percent of the country) and 4.4 million ha (4 percent of the country) respectively; provide the most stable and ideal conditions for annual and perennial crops; home of the remaining forest and wildlife and biological diversity;
6. Per-humid – covers about 1 million ha (close to 1 percent of the country) and suited for perennial crops and forests.

These agro-ecological classifications have important implications for strategies in development of appropriate technologies for agricultural and rural development, natural resources management (NRM) and migration,

3.2 Water and drainage basin

- Ethiopia has a vast water resource potential and the Ethiopian highlands are the source of many of the international rivers (such as the Blue Nile and Wabe Shebile) draining into the neighboring countries.
- Yet only 1 percent of the estimated annual surface water of 110 billion cubic meters is used for irrigation and hydropower.
- It also has groundwater resources estimated at 2.6 billion cubic meters and many springs and small streams that can be used for water harvesting during the rainy seasons.
- The country’s irrigation potential is estimated at 3-4 million hectares (excluding water harvesting and underground water) but only 160 000 hectares are currently under irrigation (EPA, 1997).

- The geographical location of Ethiopia and its endowment with favorable climate provides a relatively higher amount of rainfall in the region.
- The country is with plenty of rivers (~96 rivers), which either traverse territorial boundaries or form part of such boundaries.
- Unfortunately, only about 2 percent of the total water in Ethiopia is utilized, leaving the remaining 98 percent to replenish the oceans.
- All of Ethiopia's rivers originate in the highlands and drain into the surrounding lowlands.
- The country has: Adequate average annual rainfall; Several major rivers and lakes and significant groundwater resources
- The total renewable surface water resources are estimated at 122 billion cubic meters per year from 12 major river basins and 22 lakes
- Renewable ground water resources are estimated to be about 2.6 billion cubic meters
- Ethiopia stands second in hydropower potential to the Congo (*DR of Congo*)

Table 2. Ethiopian surface water resources by major river basins

No.	River basin	Catchments area (km^2)	Annual run off ($\times 10^9$ m^3)	Specific discharge ($litres/km^2$)	Share out of total
1	Abay	199,812112,00	52.6	7.8	43.05/17.56
2	Awash	112,700	4.6	1.4	3.76/9.9
3	Baro-Akobo	74,100	23.6	9.7	19.31/6.51
4	Genale-Dawa	171,050	5.88	1.2	4.81/15.03
5	Mereb	5900	0.26	3.2	0.21/0.52
6	Omo-Ghibe	78,200	17.96	6.7	14.7/6.87
7	Rift Valley	52,740	5.64	3.4	4.62/4.63
8	Tekeze	90,000	7.63	3.2	6.24/7.9
9	Wabi-Shebele	200,214	3.16	0.5	2.59/17.59
10	Danakil	74,000	0.86	0	0.7/6.5
11	Ogaden	77,100	0	0	0/6.77
12	Aysha	2200	0	0	0/0.19
Total		1,138,016	122.19		

3.3 Forest and Tree Species

In the late nineteenth century, about 30% of **Ethiopia** was covered with **forest**. The clearing of land for agricultural use and the cutting of trees for fuel gradually changed the scene, and today forest areas have dwindled to less than 4% of Ethiopia's total land. The northern parts of the highlands are almost devoid of trees. However, about 45,000 square kilometers of dense forest exist in the southern and southwestern sections of the highlands. Some of these include coniferous forests, found at elevations above l, 600 meters, but a majority of the forestland consists primarily of woodlands found in drier areas of the highlands and in the drier areas bordering the highlands.

In February 2015 Ethiopia adopted a new forest definition as follows: *'Land spanning at least 0.5 ha covered by trees and bamboo), attaining a height of at least 2m and a canopy cover of at least 20% or trees with the potential to reach these thresholds in situ in due course" (Minutes of Forest sector management, MEFCC, Feb. 2015*).

This forest definition differs from the definition used for international reporting to the Global Forest Resources Assessment (FAO) and from the forest definition used in the National Forest Inventory which both applied the FAO forest definition with the thresholds of 10% canopy cover, a 0.5 ha area and a 5 m height. The reason for Ethiopia to change its national forest definition is to better capture dry and lowland-moist vegetation resources. In specific, the reason for lowering the tree height from 5 to 2 m is to capture *Termilania-Combretum* dense woodlands found in Gambella and Benishangul Gumuz Regional States which in its primary state consists of trees reaching a height of around 2-3 m and above. The proposed change in forest definition results in the inclusion of what previously was classified as Ethiopia‟s dense woodlands which have a wider distribution through the country (See Figure 1).

Lumber from the coniferous forests is important to the construction industry. The broadleaf evergreen forests furnish timber that is used in construction and in the production of plywood. The woodlands are a major source of firewood and charcoal. Certain trees *boswellia* and species of *commiphora* are of special economic significance. Both grow in the arid lowlands and produce gums that are the bases for frankincense and myrrh. A species of acacia found in several parts of the country is a source of gum arabic used in the manufacture of adhesives, pharmaceutical products, and confectionery. The eucalyptus, an exotic tree introduced in the late nineteenth century and grown mainly near urban areas, is a valuable source of telephone and telegraph poles, tool handles, furniture, and firewood. It is also a major source of the material from which fiberboard and particleboard are made.

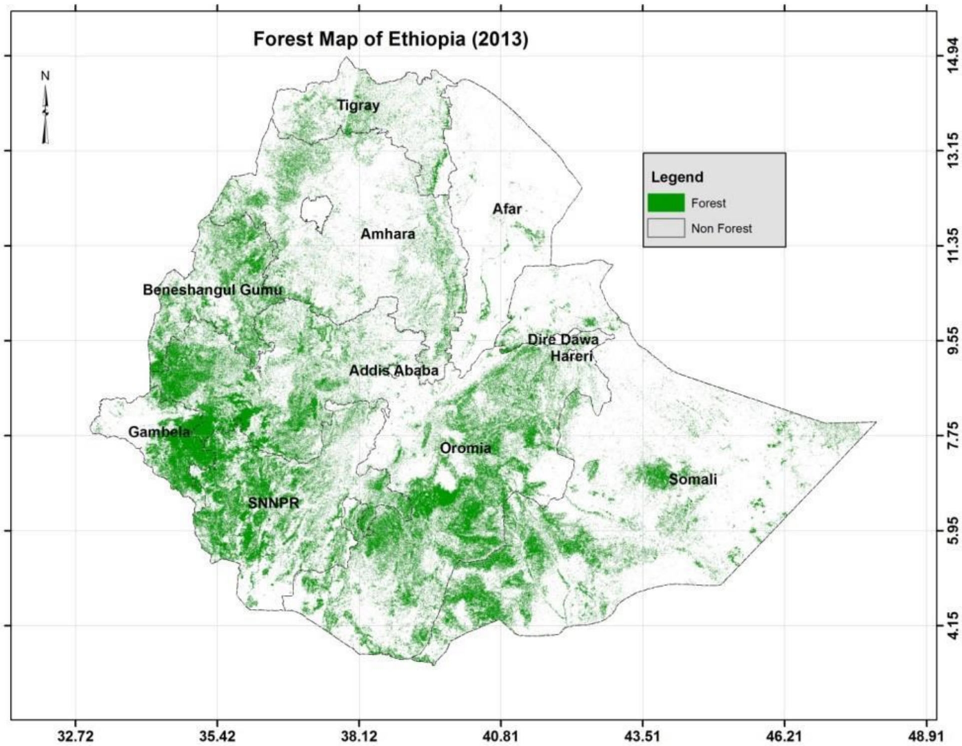


Figure 1: Illustration of the approximate impact of the revised forest definition

3.4 Wildlife and parks

- Ethiopia is one of the world's rich biodiversity countries and it deserves attention regionally and globally.
- It has a very diverse set of ecosystems ranging from humid forest and extensive wetlands to the desert
- Ethiopia has varied topography from 116 m below sea level at Afar Triangle to 4533 m above sea level at mount Ras-Dejen

- The variation in climate ,topography and vegetation have contributed to presence of a large number of endemic species
- Wildlife populations in Ethiopia are under continuous threat, despite the presence of parks and protected areas, over the past several decades, deforestation, farm expansion, draught and illegal hunting were widespread and they were ranked in order of severity from most severe to lesser threats.
- It is recommended that community based wildlife conservation is an important solution. However, for self sustaining ecosystem benefiting the people around the park although important, the ultimate goal should be to educate them.

National parks

A **national park** is a park in use for conservation purposes. Often it is a reserve of natural, semi-natural, or developed land that a sovereign state declares or owns. Although individual nations designate their own national parks differently, there is a common idea: the conservation of 'wild nature' for posterity and as a symbol of national pride.

Ethiopia's many national parks enable the visitor to enjoy the country's scenery and its wildlife, conserved in natural habitats, and offer opportunities for travel adventure unparalleled in Africa. Ethiopia has 20 major national parks (See table 3).

National Park	Region	Established	Area	Image	Coordinates	Administered by
Abijata Lakes National Park	Oromia	1963	887 square kilometres (342 sq mi)		7°31′46″N38°31′07″E	Federal Government
Alatish National Park	Amhara	2006	2,666 square kilometres (1,029 sq mi)		12°06′32″N35°33′13″E	Federal Government
Awash National Park	Oromia, Afar	1958	756 square kilometres (292 sq mi)		9°04′42″N39°59′36″E	Federal Government
Bahir Dar Blue Nile River Millennium Park	Amhara	2008	4,728 square kilometres (1,825 sq mi)		11°29′27″N37°35′16″E	Regional Government

National Park	Region	Established	Area	Image	Coordinates	Administered by
Bale Mountains National Park	Oromia	1962	2,200 square kilometres (850 sq mi)		6°53′09″N39°44′05″E	Federal Government
Borena Saynt National Park	Amhara	2001	4,325 square kilometres (1,670 sq mi)		10°51′00″N38°46′00″E	Regional Government
Chebera Churchura National Park	SNNPR	1997	1,190 square kilometres (460 sq mi)		6°53′14″N36°38′11″E	Regional Government
Dati Wolel National Park	Oromia	1998	431 square kilometres (166 sq mi)			Regional Government
Gambela National Park	Gambela	1966	5,061 square kilometres (1,954 sq mi)		8°00′17″N34°03′51″E	Federal Government
Geraille National Park	Somali	1998	3,558 square kilometres (1,374 sq mi)		4°21′56″N40°57′44″E	Regional Government
Gibe Sheleko	SNNPR	2001	248 square kilometres (96 sq mi)			Regional Government

National Park	Region	Established	Area	Image	Coordinates	Administered by
National Park						
Kafeto Shiraro National Park	Tigray	1999	5,000 square kilometres (1,900 sq mi)		14°14′47″N36°43′58″E	Federal Government
Loka Abaya National Park	SNNPR	2001	500 square kilometres (190 sq mi)			Regional Government
Mago National Park	SNNPR	1974	1,942 square kilometres (750 sq mi)		5°31′08″N36°20′38″E	Regional Government
Maze National Park	SNNPR	1997	202 square kilometres (78 sq mi)		6°26′29″N37°11′19″E	Regional Government
Nech Sar National Park	SNNPR	1966	514 square kilometres (198 sq mi)		5°56′01″N37°40′53″E	Federal Government

National Park	**Region**	**Established**	**Area**	**Image**	**Coordinates**	**Administered by**
Omo National Park	SNNPR	1959	3,566 square kilometres (1,377 sq mi)		5°49′19″N35°49′24″E	Federal Government
Simien Mountains National Park	Amhara	1959	412 square kilometres (159 sq mi)		13°18′23″N38°15′51″E	Federal Government
Yabello National Park	Oromia	1978	2,500 square kilometres (970 sq mi)		4°55′00″N38°25′00″E	Regional Government
Yangudi-Rassa National Park	Afar	1969	4,731 square kilometres (1,827 sq mi)		10°32′16″N40°52′40″E	Federal Governmen

Table 3 National Parks

3.5 Mineral resources and soils

Mineral resources can be classified in different ways, but usually they are classified into two: *metallic mineral* resources and *non-metallic mineral* resources based on the nature of minerals.

A. *Metallic mineral Resources*: are those minerals of metallic in nature, or are those which yield metals. A *metal* is any chemical element with a metallic luster, ductility, and the ability to conduct electricity and heat. About 40 metals are commercially important. Some, such as iron, lead, copper, aluminum, silver, and gold are familiar. Others, such as vanadium, titanium, and tellurium, are less well known but are vital to industry.

Metallic minerals/metals are found in ores. The concentration of a mineral in a mineral deposit or in an ore is critically important in determining whether it can be mined profitably. (A *mineral deposit* is a local enrichment of one or more minerals. *Ore* is rock sufficiently enriched in one or more minerals to be mined profitably. Geologists usually use the term *ore* to refer to metallic mineral deposits, and the term is commonly accompanied by the name of the metal – for example, iron ore or silver ore.

B. Non metallic mineral Resources: A nonmetallic resource is any useful rock or mineral that does not have metallic properties, such as salt, sulfur, sand and gravel. Of course, most rocks and minerals contain metals, but when non-metallic resources are mined it is usually to use the rock (or mineral) as at is (example using gravel and sand for construction projects); whereas metallic ores are processed to extract metal. With the exception of gemstones such as diamond and rubies and fossil fuels, non-metallic minerals do not have the glamour of many metals. Coal, petroleum and natural gas are included under the non-metallic group by non-geologists.

Some of the minerals found in Ethiopia are:

- **Phosphates:** Considerable efforts have been made by the Ethiopian Institute of Geological Surveys (EIGS) over the last few decades to discover phosphates in Ethiopia.
- **Potash:** There are large potash resources in Ethiopia in the extremely hot and arid Danakil depression near Dallol.

- **Limestone/dolomite:** Soil surveys of Ethiopia show that the soils of large areas of western and southwestern Ethiopia are acid, with pH levels below 5.5 (Schlede 1989). The largest volumes of limestone are located, however, in the eastern part of the country.
- **Gypsum/anhydrite/ sulphur:** There are extensive and thick gypsum and anhydrite deposits in central Ethiopia (in the Blue Nile area), and some deposits of lesser thickness in the Mekele area of northern Ethiopia and in the southeast of the country (Abera 1991).

The development of soils depends primarily on geologic and climatic conditions. In Ethiopia, seventeen major soil units have been identified (EMA, 1988). The FAO Soil Map of Ethiopia (1998) classifies 19 soil units, which do not all coincide spatially with the EMA soil map. For this course, the FAO classification system has been selected and is used in the following descriptions and analyses (FAO, 1998). Figure 1 illustrates the distribution of the different soil types within Ethiopia. Various general clusters of similar soil types can be distinguished:

- Nitisols in the southern part of the Western Ethiopian Highlands;
- Luvisols and Leptosols, with isolated occurrences of Cambisols in the northern part of the Western Ethiopian Highlands;
- Gypsisols and Calcisols as well as Solonchaks and Solonetz in semi-arid to arid Somali Lowlands;
- Cambisols and embedded Luvisols in the transition zone between the Highlands and the Somali Lowlands;
- Fluvisols and Andosols in the Rift Valley, and in endorheic basins;
- Vertisols located across the country in small fragmented pattern.

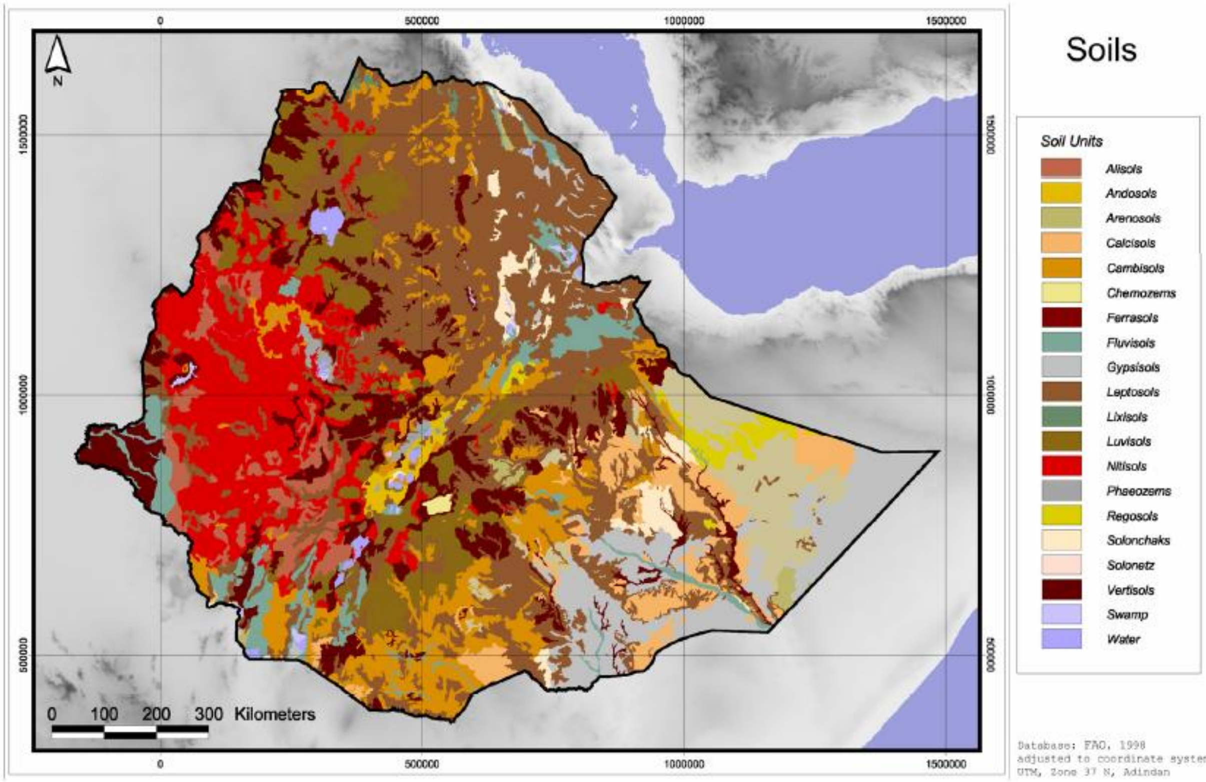


Figure 2: Soil Map of Ethiopia

Chapter Four: Population Demography

4.1 Historical perspective of population demography

Demography: the study of populations, especially with reference to size and density, fertility, mortality, growth, age distribution, migration, and vital statistics and the integration of all these with social and economic conditions.

Historical demography is a major component of demography that studies population changes, but it is primarily concerned with applying demographic methods to population data from the past. Demographers wishing to test a proposed hypothesis on contemporary population can, at least theoretically, always collect the data they need according to their research design. Historical demographers, however, have to use existing data – they cannot go back in time to collect the required data. The available data may not have been collected for the purpose of demographic research; they may suffer from various types of registration problems or biases that are often related to the rules or procedures applied in creating the data. This makes historical demographic research a more challenging task than the study of contemporary population issues. For this reason, historical demographers often need to develop new techniques or modify conventional demographic methods so that they can be effectively used in analyzing surviving historical data.

Historical demography has made a significant contribution to the development of demography. Through enriching the knowledge about demographic behavior and population changes in the past, historical demography helps us to gain a better understanding of demographic trends in contemporary societies and future. **Louis Henry** (1911-1991), the founding father of historical demography, once suggested that, to answer the two questions about population changes that intrigued demographers in the mid-twentieth century, “Where are we?” and “Where are we headed?” we should begin by answering a third, “Where were we yesterday and the day before?”. This reference to the past is, he said, essential for it alone can tell us about the day after (Rosental 2003: 98). The importance of historical demography to the development of demography does not stop here, however. After the Second World War, there was a considerable increase in the interest in population issues throughout the world, and demography as an academic discipline entered a period of rapid development. Mortality and fertility, which had decreased notably in the nineteenth century and the first half of the twentieth century, fell to low levels in most developed countries. These countries had well established vital registration systems and conducted regular censuses and population surveys. Population data obtained through these modern-day efforts were, however, simply insufficient for uncovering the process of demographic transition and people's demographic behavior in the pre-transition society – both of which were of overriding importance to the development of demographic theories and the understanding of population changes of the time. Even in countries where detailed mortality and fertility data had been collected during the process of their demographic transition, those available to researchers were usually limited to publish census or survey results.

4.2 Demographic Variables

Three major factors or variables determine the population of a defined area and its growth over time. There are:

♦ Births (Fertility)

♦ Deaths (Mortality)

♦ Migration a) immigration (in migration) b) emigration (out migration)

The balance among these three factors determines whether a population increases, remains stationary, or decreases in number. The relation between births and deaths is referred to as Natural Population Increase (Natural Population Growth). When the net effect of migration is added to natural increase, this is referred to as Total Increase (Total Growth).

4.2.1 Total Population Increase

The size of the world population, estimated at 6.7 billion in 2007, is projected to increase by 2.5 billion to just over 9 billion by 2050, according to the UN's most recent medium variant projection. The increase, which is equivalent to the size of the world's population in 1950, will occur almost entirely in the less developed regions of the world. The population of the developed world is projected to remain constant at 1.2 billion; without immigration, however, it is projected to decline slightly.

The number of countries with shrinking populations is likely to grow in the first half of the 21st century. Low rates of in-migration combined with “very low” or “lowest low” rates of fertility necessarily lead to population decline. Today sixteen countries in Eastern Europe and the former Soviet Union are losing population. Other countries in Europe with “very low” or “lowest low” fertility rates, such as Spain, are able to sustain their population size only through immigration

4.2.2 Natural and Migratory Increase

The Crude Birth Rate (CBR):- CBR is the most readily calculated measurement of fertility. It is expressed as, the number of live births in a time period (usually a year), divided by the total population at the mid year of that time. A multiplier of 100 is used to control for the decimal so that the form of the equation is:-

CBR = No of live births in year Y*1000

Mid- year population

In order to describe the world pattern of CBR, a standard 5 level classification is used

The Crude Death Rate (CDR):- The simplest and most commonly used measure of mortality is the CDR. it is simple because what are required to be known are only the total population and number of death which occur in a particular period. It is expressed as:-

CDR=	***No of deaths in year Y * 1000***
	Total mid -year Pop in year Y

The CDR has an advantage that it is easily understood by common people, but has draw backs because it doesn’t show age and sex differentials in mortality.

NI=CBR-CDR

C) Net Migration Rate (NMR): This is calculated by subtracting emigrants from immigrants and it's expressed per 100 populations. That is,

NMR =	***No of immigrants -No emigrants X 1000***
	Total population

Immigration Rate (IR): The Immigration rate of a place is defined as the number of immigrants arriving at a destination in a given year per 1000 population at the destination. that is,

IR =	***No of Immigrants X 1000***
	Total population of Destination area

Emigration rate (ER): This is derived by using the number of emigrants leaving an area per 1000 population of origin. That is,

ER=	***No of emigrants X 1000***
	Total population of place of origin

Population change= NI±NMR

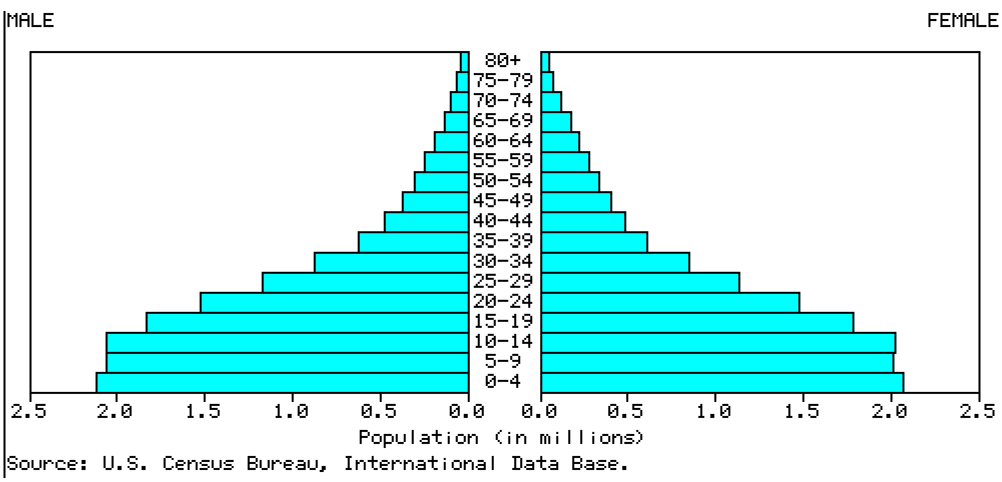
4.2.3 Population Structure

Aside from the total size, the most important demographic characteristic of a population is its population structure. Population structure refers to the composition of the population in terms of Age, sex, occupation, religion, educational status, geographical distribution, socio– economic status etc. The structure of a population is influenced or affected by births, deaths and migration and their predisposing factors.

The age – sex structure determines potential for future growth of specific age groups, as well as the total population. For these reasons the age structure has significant government policy implications. A population of young people needs a sufficient number of schools and later, enough jobs to accommodate them. Countries with a large proportion of older people must develop retirement systems and medical facilities to serve them. Therefore, as a population ages needs change from child care schools and jobs toll to jobs, housing, and medical care.

4.2.4 Population Pyramids

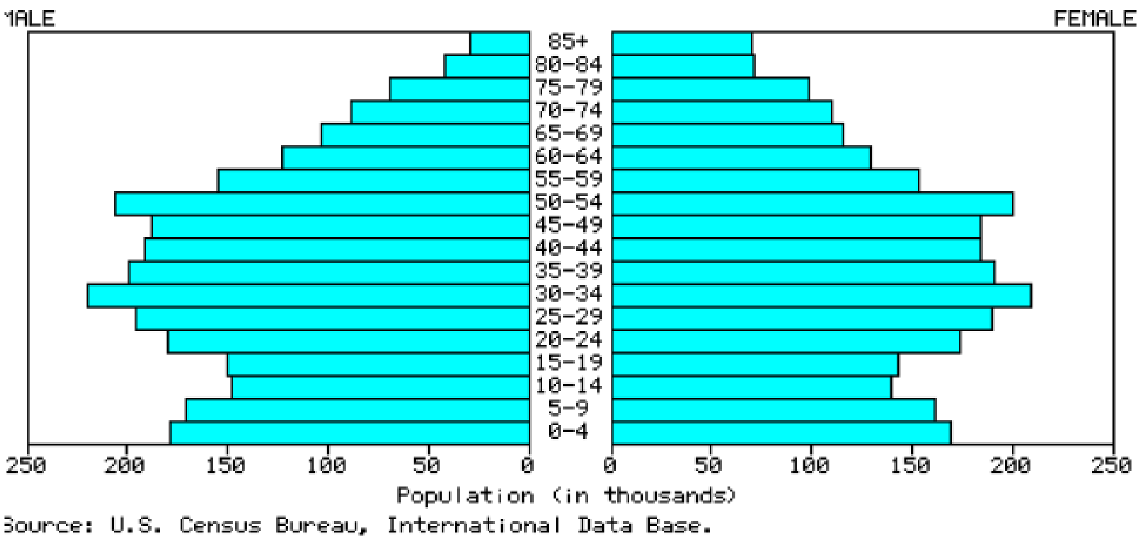
Demographers display the age structure of a population by constructing a graph in which the population size in each age band is depicted by a horizontal bar that extends from a centerline to the left for one gender and to the right for the other, with the age bands arranged from lowest (at the horizontal axis) to highest. A population pyramid for a population that is growing rapidly, e.g. Kenya, resembles a pillar that is very broad at the base (age 0-1 years) and tapers continuously to a point at the top. In contrast, the population pyramid for a zero-growth population, e.g. Denmark, resembles a bowling pin, with a broader bottom and middle, and narrower base and top.



Kenya.1998

The population pyramid for a country shows the pattern of birth and death rates over the past decades, since apart from immigration and emigration, the maximum size of any age group is set by the birth cohort that it began as, and its actual size shows its subsequent mortality experience.

For example, the 1989 population pyramid for Germany shows the deficit of older males resulting from losses in World Wars I and II and narrowing corresponding to the markedly lower wartime birth rates. Similarly, bulges in the reproductive years often produce bulges at the bottom, since more women of reproductive age usually translates into more births



Denmark, 1998 (note change in scale)

Using the pyramid it is easy to see how a growing population becomes younger and the transition to lower fertility makes it older. Widespread family planning makes new birth cohorts smaller, so that the pyramid consists of a broad middle (persons born before the adoption of family planning) is pushed upward by a narrower base. Initially this age distribution makes life easier for adults, especially women, since effort and resources for childrearing and support are proportionally lower. However, when the adults who first adopted family planning reach retirement age, there are fewer younger people available to support them. Unless productivity and savings have risen sufficiently, the society will be hard pressed to support its elderly members—an issue of concern in affluent societies today.

4.3 Demographic Transition

A fundamental model developed to describe population dynamics is the Demographic Transition model. The model posits four stages in the evolution of the population in a society.

1. High fertility, high mortality (pre-industrial)

2. High fertility, declining mortality (industrializing)

3. Declining fertility, low mortality

4. Low fertility, low mortality (stable population)

The first stage (pre-industrial) prevailed throughout the world prior to the past few centuries. Rapid population growth takes place in Stages 2 and 3, because high birth rates, necessary for population survival in Stage 1, are embedded in the cultural, religious, economic, and political fabric of pre-modern societies. As economic and public health advances decrease mortality rates, rapid population growth occurs until the society adjusts to the new realities and fertility decline.

The Demographic Transition Model was constructed from the European experience, in which the decline in death rates was gradual. It remains to be seen how this model will play out in the developing world of today, in which the decline in death rates has occurred much more rapidly and in which social change takes place against a backdrop of and in interaction with the post-industrial world of electronic communications, multi-national production and marketing, and international travel. There is some evidence that the model will also apply to the developing world of today. But the timetable for completion of the demographic transition in the developing world will determine the ultimate size of the world's population.

Chapter Five: Theory of Population Growth and the Environment

5.1 Population growth as an issue

World population expanded to about 300 million by A.D. 1 and continued to grow at a moderate rate but, after the start of the Industrial Revolution in the 18th century, living standards rose and widespread famines and epidemics diminished in some regions. Population growth accelerated. The population climbed to about 760 million in 1750 and reached 1 billion around 1800.

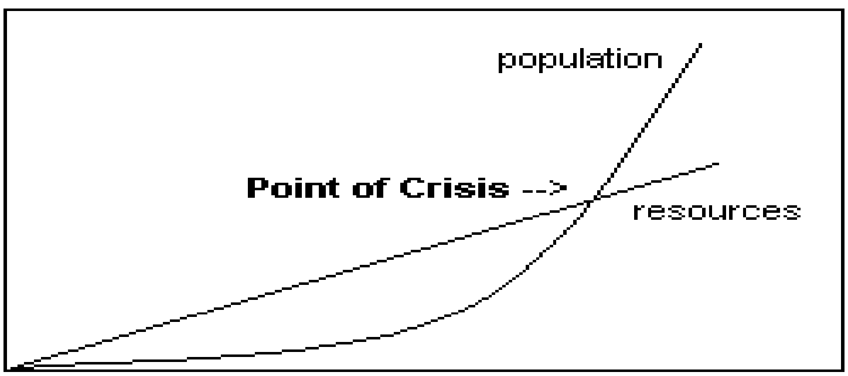
World population growth accelerated after World War II, when the population of less developed countries began to increase dramatically. After millions of years of extremely slow growth, the human population indeed grew explosively, doubling again and again; a billion people were added between 1960 and 1975; another billion were added between 1975 and 1987.

Throughout the 20th century each additional billion has been achieved in a shorter period of time. Human population entered the 20th century with 1.6 billion people and left the century with 6.1 billion. The growth of the last 200 years appears explosive on the historical timeline. The overall effects of this growth on living standards, resource use, and the environment will continue to change the world landscape long after.

5.2 Framing the debate

5.2.1 Malthusian theory

Malthus (1766-1834) was an English clergyman who thought deeply about economic problems and is best known for his Essay on the Principle of Population, from which this selection is taken. The Malthusian theory is based on the fact that “a population can never increase beyond the food supplies necessary to support it”. Malthus believed that human population increased geometrically while food supplies can only grow arithmetically, which means that food supply should be high enough before any geometric population growth takes place. Taking the whole earth, the human species would increase as the numbers 1, 2, 4, 8, 16, 32, 64, 128, 256, and subsistence as 1, 2, 3, 4, 5, 6, 7, 8, 9. In two centuries the population would be to the means of subsistence as 256 to 9; in three centuries as 4,096 to 13, and in two thousand years the difference would be almost incalculable. This is an interesting case because since this all took place before the Industrial Revolution, Malthus used math and what he believed was logic to figure out how to balance food supply and population growth. He found it more important to deal with food supply first because of the fact that food supply can remain without human population while human population cannot remain without sufficient food supply. Though some might think the Malthusian theory is very limited and "closed", it is certainly not. At his time, Malthus could not foresee globalization so he worked with what he had. During that time period the world was closed and the Malthusian theory was a great way to maintain the balance between food supply and human population growth.



Malthus' Basic Theory

Population Checks

- Population could not continue un-checked and Malthus classified two different types of checks
    - Positive Checks: Factors increasing mortality (War, Famine, Disease, etc…)
    - Preventative/Negative Checks: Factors decreasing fertility (Moral restraint, contraception, abortion, etc…)
- Argues moral restraint is best way to avoid "misery"

5.2.2 Ester Bousrup's theory

- Danish economist born in 1910
- Worked at the United Nations and studied both agricultural and economic development
- Developed her theory in 1965 in Denmark
- Wrote several notable books, including "The Conditions of Agricultural Growth" and "Population Growth: Anthropological Implications"

Boserup's theory is different than the Malthusian theory due to increased amount of technological advancement. Unlike Malthus, Boserup believed that "an increase in population would stimulate technologists to increase food production". This is the opposite of what Malthus believed because during her time, the farming technology had dramatically risen and food supply was not the main concern for human population. The base of Boserup's theory is "necessity is the mother of invention". This is an important saying because it describes how after this rise of technology and industry, food supply would come after the growth of human population. In other words, the food supply depended on the population size unlike in Malthus' time where human population depended on food supply. Like any theory, Boserup's theory contains various limitations, one being the act of immigration and emigration. This is a limitation to her theory because emigration for example usually occurs in areas of over population and lack of globalization that means that some of Malthus' theory should still be in action today. Also, the fact that overpopulation is occurring shows that food supply is not high enough, or that it is not distributed equally.

A theory is a supposition or system of ideas intended to explain something. Malthus and Boserup both had their own theories about population growth relating to food supply. A general limitation of this evaluation is the fact that they lived through different eras that resulted in the theories being published based on how the world was in that particular time period. Thomas Malthus lived through the 18th– 19th century while Ester Boserup lived through the 20th century. This time frame is essential due to the fact that these theories were divided by the Industrial Revolution, which automatically means that the view on the world was different.

5.3 Population, environment and development; the link

The question of knowing to what extent population growth and distribution create a distinctive impact on the quality of the environment has become extremely controversial.

5.3.1 Downward spiral hypothesis

The hypothesis maintains that poor people and environmental damage are often caught in a downward spiral. Past resource degradation deepens today's poverty, while today's poverty makes it very difficult to care for or restore the agricultural base, to find alternatives to deforestation to prevent desertification, to control erosion and to replenish soil nutrients. People in poverty are forced to deplete resources to survive, and this degradation of environment further impoverishes people (Ostrom et. al. 1999).

While this can and does happen, as an overarching model, it is a rather simplistic view of a much more complex reality. Environmental degradation can sometimes be associated with poverty, but there is not necessarily a direct causal relationship. Other factors also shape human behavior to the environment. The danger of the Downward Spiral Hypothesis is that it may often lead to policies that either reduce poverty (often in the short run) at the expense of the environment or protect the environment at the expense of poor people.

5.3.2 The Kuznets curve

The Environmental Kuznets Curve shows a relationship between air pollution and economic growth. It maintains that pollution will increase initially with economic growth, but if growth continues and as society becomes more affluent, pollution will be reduced. Thus, by measuring economic growth in terms of per capita income in an economy, it establishes an inverted U-shaped curve implying increases in pollution initially, but a decline as per capita income continues to grow. The Environmental Kuznets Curve has been severely criticized on conceptual, statistical as well as policy grounds (Banuri, 1998). Conceptually, an inverted U-shaped relation may exist between a few selected pollutants and income, but not necessarily at an aggregative level. In the area of statistics, there are the problems with aggregation, with identification of appropriate variables, and from weakness of the data. Evidence indicates that there is nothing inevitable about the link between economic growth and environmental degradation. In fact, policies and institutions can significantly influence the Environmental Kuznets Curve. The removal of perverse subsidies, the internalization of externalities and the identification of property rights can change the relationship between income levels and levels of environmental degradation.

5.3.3 Beckerman hypothesis

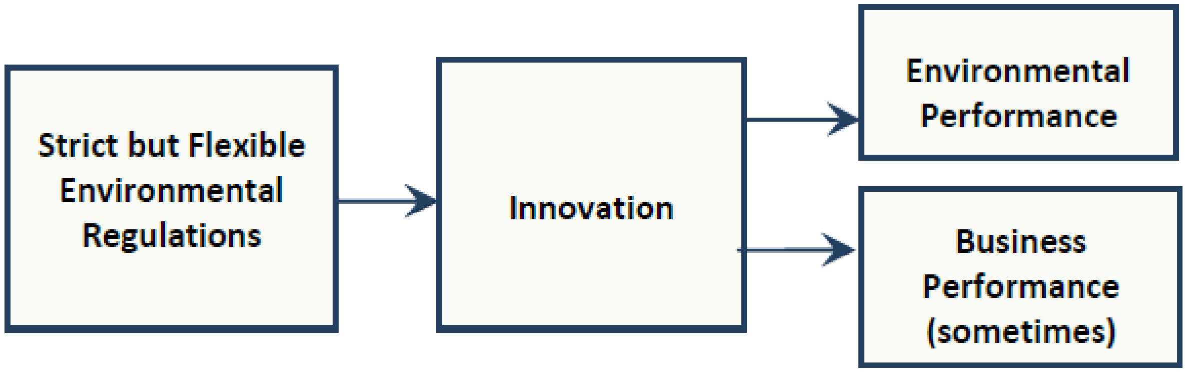
The hypothesis maintains that as growth provides accumulated assets that can be used to ameliorate environmental degradation, it makes sense to degrade now and pay later to put things right. There are three major problems with this hypothesis (Munasinghe and Cruz, 1995). The first one is that economic growth can generate accumulated assets, but there is no guarantee that a part of such resources would be used to ameliorate environmental degradation. Such resources, as experience has shown, might have been used for other purposes, sometimes for unproductive ones. Second, like the Environmental Kuznets Curve, the Beckerman Hypothesis also seems to undermine the need for conscious policy interventions. It indirectly implies that growth would provide accumulated assets that would take care of environmental degradation. Third, it takes a simplistic approach towards the intergenerational equity issue. It basically says that there will be physical degradation at present, but that monetary compensation will be made in future, without answering how this would provide the same sort of opportunities as those enjoyed by the present generation or how compensation would be translated into physical natural resources or how the amount and the nature of future compensation are agreed upon.

5.3.4 Porter hypothesis

Porter argues that high levels of environmental protection are compatible with high levels of economic growth and may encourage innovation that supports growth. The hypothesis makes two fundamental points. First, environmental protection is justified not only for pure environmental reasons, but because such protection makes economic sense as well. Environmental protection by ensuring minimizing waste of resources, by enhancing efficiency in resource use and by minimizing adverse environmental externalities of the production process, may contribute positively to economic growth. Second, if people see the economic value of environmental protection, initiatives may be undertaken for innovations in technology, input-mix, and management to increase resource-use efficiency and also to minimize resource waste and the adverse environmental impact of production. All these enhance economic growth further (OECD, 2001). But the hypothesis can lead to an extreme situation whereby environmental standards are imposed on trade. Using trade restrictions in the name of environmental standards is protectionism. For domestic environmental problems, such restrictions are inefficient; for trans-boundary problems, they are both inefficient and inequitable.

Both for poverty reduction and environmental sustainability, economic growth is critical. Such growth must be pro-poor and resource-saving, in order to contribute to those two objectives. Efficiency in resource use is crucial on two fronts: first, it releases resources that can be devoted to poverty reduction; and second, it reduces environmental degradation.

Fig: 3 Schematic Representation of the Porter Hypothesis


Strict but Flexible Environmental Regulations
Innovation
Environmental Performance
Business Performance (sometimes)

Chapter Six: Human Activities and Environmental Change

6.1 Why the environment change

Many texts on environments or environmental change assume from the outset an understanding of what is meant by the terms ‘environment’ and ‘change’. Take time to consider the following dictionary definitions:

Environment:

a. That which environs; the objects or the region surrounding anything.
b. The conditions under which any person or thing lives or is developed; the sum total of influences which modify and determine the development of life or character.
Change: The act or fact of changing; substitution of one thing for another; succession of one thing in place of another (Oxford English Dictionary, 1993)

How do these correspond and contrast with commonly used applications of ‘environmental change’, either in texts or in everyday situations? Technical usage may call for an understanding of environmental systems. A useful background to the understanding of environmental systems can be found in Chapter 2 of Park (1997); Chapter 2 of Slaymaker and Spencer (1998); and Mackenzie (1998). Harvey (2000) gives a good perspective on the climatic aspects of environmental change. It should be remembered that climate change is only a part of environmental change as a whole, which covers change in the lithosphere (type of rocks and on long timescales their configuration into continents, landscape (geomorphology), hydrological systems (including the oceans and ice), vegetation and fauna, as well as climate change.

Global environmental change to mean the outcome of processes that are manifest in localities, but with consequences at multiple spatial, temporal and socio-political scales

6.2 Impact of environmental change

Humans are challenged to find a set of policies, practices, and standards of behavior that provide long-term economic opportunities and improved quality of life around the world while maintaining a sustainable climate and viable ecosystems. Recent analyses by U.S. and international experts conclude that the world should invest in minimizing the amount of climate change that occurs and in adapting to the changes that cannot be avoided. The appropriate level, financing, and structure of these investments are questions to be discussed among all members of society. Some of the issues are so big that the involvement of governments will be required. These include decisions about the best ways to reduce a country's carbon emissions and where to invest funds in research on alternative energy sources. Other decisions are best addressed at the individual, family, or business level. Each time a car, home appliance, or light bulb is purchased, a decision is made that has a small influence on climate change. But many small decisions, made by billions of people, can combine to have very large effects.

6.3 Consequences of human induced environmental change

Of most concern globally is the gradually changing composition of the atmosphere caused by human activities, particularly changes arising from the burning of fossil fuels and deforestation.
These lead to a gradual buildup of several greenhouse gases in the atmosphere, with carbon dioxide being the most significant. They also produce small airborne particulates— aerosols— that pollute the air and interfere with radiation. Because of the relentless increases in several greenhouse gases, significant climate change will occur—sooner or later. The greenhouse- gas component of this change in climate is called the enhanced greenhouse effect. While this effect has already been substantial, it is extremely difficult to identify in the past record.

This is because of the large natural variability in the climate system, which is large enough to have appreciably masked the slow human-produced climate change. The amount of carbon dioxide in the atmosphere has increased by more than 30% since the beginning of the industrial revolution, due to industry and the removal of forests. In the absence of controlling factors, projections are that concentrations will double from preindustrial values within the next 60 to 100 years. Carbon dioxide is not the only greenhouse gas whose concentrations are observed to be increasing in the atmosphere from human activities. The most important other gases are methane, nitrous oxide, and the chlorofluorocarbons (CFCs).

6.3.1 Land degradation

Land degradation is a composite term; it has no single readily-identifiable feature, but instead describes how one or more of the land resources (soil, water, vegetation, rocks, air, climate, relief) has changed for the worse. A landslide is often viewed as an example of land degradation in action – it changes the features of the land, causes destruction of houses, and disrupts activities. In the longer term, however, the area of a landslide may regain its productivity. In places such as Jamaica and Papua New Guinea, old landslide scars are noted for supporting better crops and more intensive agricultural possibilities than on the adjacent land not affected by landslides especially when the new soil is derived from less weathered rock materials, such as calcareous mudstones. So, land degradation is far from being a simple process, with clear outcomes. This complexity needs to be appreciated by the field assessor, before any attempt is made either to define land degradation or to measure it.

Land degradation generally signifies the temporary or permanent decline in the productive capacity of the land (UN/FAO definition). Another definition describes it as, "the aggregate diminution of the productive potential of the land, including its major uses (rain-fed, arable, irrigated, rangeland, forest), its farming systems (e.g. smallholder subsistence) and its value as an economic resource." This link between degradation (which is often caused by land use practices) and its effect on land use is central to nearly all published definitions of land degradation. The emphasis on land, rather than soil, broadens the focus to include natural resources, such as climate, water, landforms and vegetation. The productivity of grassland and forest resources, in addition to that of cropland, is embodied in this definition. Other definitions differentiate between reversible and irreversible land degradation. While the terms are used here, the degree of reversibility is not a particularly useful measure – given sufficient time all degradation can be reversed, as illustrated by the landslide example above. So, reversibility depends upon whose perspective is being assessed and what timescale is envisaged.

Whilst soil degradation is recognized as a major aspect of land degradation, other processes which affect the productive capacity of cropland, rangeland and forests, such as lowering of the water table and deforestation, are captured by the concept of land degradation. Land degradation is, however, difficult to grasp in its totality. The "productive capacity of land" cannot be assessed simply by any single measure. Therefore, we have to use indicators of land degradation. Indicators are variables which may show that land degradation has taken place – they are not necessarily the actual degradation itself. The piling up of sediment against a down slope barrier may be an 'indicator' that land degradation is occurring upslope. Similarly, decline in yields of a crop may be an indicator that soil quality has changed, which in turn may indicate that soil and land degradation are also occurring. The condition of the soil is one of the best indicators of land degradation. The soil integrates a variety of important processes involving vegetation growth, overland flow of water, infiltration, and land use and land management. Soil degradation is, in itself, an indicator of land degradation. But, in the field, further variables are used as indicators of the occurrence of soil degradation.

6.3.2 Land degradation and food insecurity

Intensification and increased mechanisation of agriculture have led to the abandoning of many sustainable traditional agricultural practices in favour of increased yields and faster production. Various methods, techniques and equipment now used in agriculture at different scales are destructive to the soil and water resources, and consequently gradually decrease the productivity of the land and thus the viability of the industry. These include:

- Overgrazing of pasture land
- Overcultivation of cropland and monocropping
- Waterlogging and salinisation of irrigated land
- Overextraction of wells, rivers and dams
- Land clearance e.g. slash-and-burn, deforestation
- Excessive and continuous fertiliser, herbicide and pesticide use
- Conversion of unsuitable lands to agriculture e.g. use of marginal lands, clearance of tropical forest for livestock rearing

Over cultivation and monocropping are usually associated with high levels of mechanisation which can compact the soil, leaving the land bare between harvest and planting, both of which increase the potential for erosion, and continuous loss of nutrients with application of large quantities of fertilisers. Monocropping deprives the soil of specific nutrients because the same crop is always planted. Traditional agricultural practices incorporated inter-cropping (planting e.g. yams and sweet potatoes between rows of cane or banana trees) and rotation cropping (e.g. growing a cycle of potatoes, peas, yams and tomatoes one after the other on the same plot of land). These help to secure the soil and prevent erosion, and ensure nutrients are not depleted because different crops have varying nutrient requirements for growth. Legumes in particular are usually planted in rotations because they fix nitrogen in the soil, a nutrient which is usually very limited. Fallow or "rest" periods were also used in the past. Once every few years nothing was planted to allow the soil to recuperate so that organic matter and nutrients re-accumulate and soil structure rebuilds.

Poor irrigation practices can lead to water logging which means there is no air in the pore spaces of the soil, thus none available for plants. Stalinization is the excessive accumulation of salts in the soil, which can render it infertile. This can occur due to a variety of reasons e.g. when irrigation water has high salts content, when water evaporates leaving salt deposits to build up, where there is poor drainage, or in areas with shallow water table when capillary action brings the water to the surface where it evaporates leaving the salts. Ploughing straight downhill increases the rate and severity of soil erosion because it creates instant rills which can be deepened into gullies. Good practice would dictate that when cultivating on slopes there are a number of soil conservation methods that should be used. Terracing divides the soil into steps/levels with flat or nearly flat surfaces that can be planted on. This is used where there is little mechanization. Contour ploughing uses the shape of the terrain and goes around or across the hillside. Strip cropping is similar to inter-cropping, but instead of planting between rows, several rows of a crop are planted before switching to another crop. Thus alternating bands of e.g. cotton and soybeans are created. This not only helps with maintaining soil fertility but creates barriers to water and minimize erosion. The use of these practices is dependent on the gradient of the slope and the amount of rainfall received in the area.

6.4 Relationships between environment and poverty

The environment-poverty nexus is a two-way relationship. Environment affects poverty situations in three distinct dimensions: by providing sources of *livelihoods* to poor people, by affecting their health and by influencing their vulnerability. On the other hand, poverty also affects environment in various ways: by forcing poor people to degrade environment, by encouraging countries to promote economic growth at the expense of environment, and by inducing societies to downgrade environmental concerns, including failing to channel resources to address such concerns.

Environment matters a lot to poor people. Their well-being is strongly related to the environment in terms of, among other things, health, earning capacity, security, physical surroundings, energy services and decent housing. In rural areas, poor people may be particularly concerned with their access to and control over natural resources, especially in relation to food security. For poor people in urban areas, access to a clean environment may be a priority. Prioritization of environmental issues may vary across different social groups. For example, poor women, reflecting their primary role in managing the household, may regard safe water, sanitation facilities, and abundant energy services as crucial aspects of well-being for poor people.

Some of the environmental degradation reflects truly global concerns, such as global warming and the depletion of the ozone layer. Some is international, like acid rain, the state of the oceans, or the condition of rivers that run through several countries. Some is more localized, though it may often occur worldwide, like urban air pollution, water pollution, or soil degradation. Even though poor people also feel the impact of global environmental degradation, it is local environmental damage that affects the lives of poor people more.

The impact of environmental degradation is unequal between the poor and the rich. Environmental damage almost always hits poor people the hardest. The overwhelming majority of those who die each year from air and water pollution are poor people. So are those most affected by desertification and by the floods, storms and harvest failures brought about by global warming? All over the world, it is poor people who generally live nearest to dirty factories, busy roads and dangerous waste dumps. The loss of biodiversity is most severe for poor rural communities. Environmental degradation, by depleting the health and natural support systems of poor people, may make them even more vulnerable.

Fig 4: Relationship between poverty band environment