

Chapter One: INTRODUCTION

Learning outcomes

After the completion of this section; you will be able to:

- ✎ Grasp the relationship between population and environment;
- ✎ Be familiar with the reasons of population increment.

1.1. The link between population and environment

The link between population growth and environmental impact seems obvious at first glance: more people consume more resources, damage more of the earth and generate more waste. Humans are a force of nature. As nations develop, they increase consumption. This simple reasoning is true as far as it goes, but the larger picture is more complex.

The number one environmental problem is the ever-growing human population. Initially (up to 1650) the human population showed slow growth rate due to diseases, insufficient food, and predators. But around 1830, the population reached more than one billion; Because of the presence of improved agriculture, industrial revolution and exploration /emigration of people to new lands.

By 2050 world population is estimated to be between 8 & 10 billion in which 90% of the growth is in developing countries (William P. & Mary A., n.d.).

Table 1: Interaction of population and the environment within different periods

	<i>Occupation</i>		
	Hunting/gathering	Agrarian	Industrial
<i>Periods</i> →	Before 10,000BC	10,000 BC-850AD	Since mid-1800's
Population	@125,000	<1.2 billion	6.25 billion
Per capita consumption	Very little	Medium	Very high
Technology	Crude	Moderate	Sophisticated
Environmental degradation	Almost none	Minor	Extensive

Technological advances can mitigate some of the impact of population growth, and market mechanisms raise prices for some diminishing resources, triggering substitution, conservation, recycling and technical innovation so as to prevent depletion.

But market systems often subsidize industries such as logging, mining and grazing without tallying environmental costs. No market considers commonly held resources such as

groundwater levels or atmospheric and ocean quality. Nor do markets consider earth's "services," such as regulation of climate, detoxification of pollutants or provision of pollinators, much less questions of human equity and social justice. When water quality is degraded, well-off people can buy bottled water, for example, but poorer people cannot.

Clearly, the greatest environmental threat comes from both the wealthiest billion people, who consume the most and generate the most waste, and from the poorest billion, who may damage their meager resource base in the daily struggle to avoid starvation. In addition, the billions in between are doing their best to increase their standard of living, in part through increased consumption.

Rapid growth is often accompanied by severe environmental degradation:

- ⌚ It can lead to depletion of resources;
- ⌚ Severe competition for food and space;
- ⌚ Increase in psychological stress and strain;
- ⌚ Rapid pollution of environment;
- ⌚ Large scale unemployment;
- ⌚ Forests are cut, oceans are exploited and the entire natural equilibrium gets disturbed;
- ⌚ A growth human population first faces the problem of food, shelter and socioeconomic problems;
- ⌚ It is the very great and continuing increase in human population in modern times.

The significant problems we face cannot be solved at the same level of thinking we were at when we created them (Albert Einstein).

The human population growth (rapid population growth) leads to the following impacts on the environment:

- ⌚ Destruction of adapted ecosystems & biodiversity is at its maximum leading to —loss of natural capital;
- ⌚ Global environmental problems are aggravating (global warming, ozone depletion, toxification, soil erosion, emissions, etc.);
- ⌚ Humans are altering the components of the earth at rates far exceeding than natural processes (Example, soil erosion);

What's behind in population growth?

☺ Three Factors

- ✓ Fertility
- ✓ Less infant death
- ✓ Longevity

☺ Animal Domestication and Agriculture

- ✓ Provided for a few to feed many

☺ Industrial Revolution

- ✓ Growth of Cities and Infrastructure

“ Water

“ Transportation

“ Energy

- ✓ Increased Productivity

- ✓ Sanitation

- ✓ Nutrition

- ✓ Medicine

Chapter Two: Classification of Natural Resources

Learning outcomes

After the completion of this portion; you will be able to:

- ☞ Be familiar with the concept of resources in general;
- ☞ Find out classification of resources based on different basis;
- ☞ Have the notion of resource conservation.

Introduction

When we say Classification of Resources, we first need to understand what is this natural resource to be classified? Generally speaking, ‘natural resources’ is a term applied to all naturally occurring substances which are considered valuable in their relatively unmodified, i.e. natural form. The value of the any resource is determined by its demand-supply situation. The demand-supply again is determined by the utilitarian value of that commodity.

Any commodity is a natural resource, only if the primary activities of obtaining it are extraction and purification, not creation. Due to this reason, petroleum, hunting, fishing, forestry and mining are classified as natural resource industry.

♠ Anything that can be used to satisfy human needs is a resource. OR

♠ All the objects in the environment, which are useful to man and have a value, are called "Resources".



Resources that we find in nature and are used without much modification are called "Natural Resources". For e.g. Air, Water, Soil, Sunlight, Minerals, Flora & Fauna, etc. All these are free gifts of nature and can be used directly.

A natural resource is given by nature and can be used as a source of energy. A renewable natural resource is one that can be renewed, or replenished in a reasonable amount of time (in years or a human-life span), once it has been used. Renewable energy is generated from natural sources (sun, wind, rain, tides, and vegetation) and can be generated again and again when needed.

It is generally replenished naturally. For example, trees are a renewable resource because once a tree is removed and used; a new tree can grow in its place.

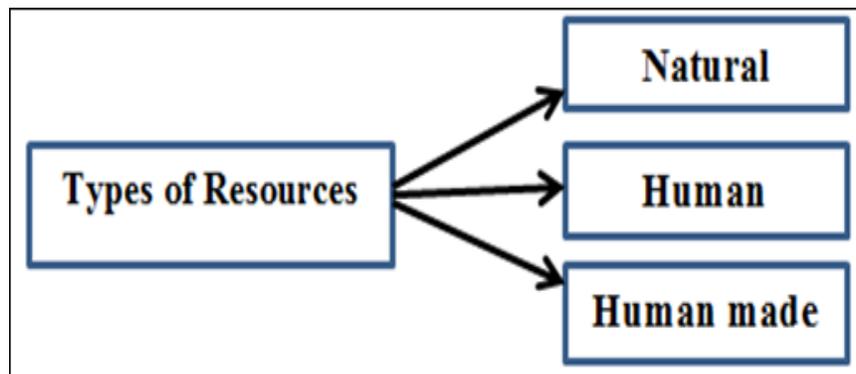


Figure 1: Classification of resources

2.1. Basis for classification

2.1.1. Based on origin (biotic and abiotic)

- a) **Biotic Resources:** are resources which come from biosphere and have a life. For example, human beings, flora and fauna, fisheries, livestock, etc. The materials obtained from them are also considered biotic, example fossil fuels, coal, petroleum, because these are formed from decayed organic matter.
- b) **Abiotic Resources:** are those resources which come from non-living, non-organic material. Example, rocks, minerals, air, water, metals, etc.

2.1.2. Based on stage of development

- a) **Potential resources:** are those which can be found in a particular region but are yet to be put to use. They can be used in future. E.g. Solar and Wind are potential resource. Example.

Regions in states like Rajasthan and Gujarat have huge potential for development of solar, wind and tidal energy, which us yet to be used.

- b) **Developed/ Actual resources:** includes resources which have been/ are surveyed and their quality and quantity have been determined for utilization with the available technology. The development of resources however depends on technology and level of their feasibility. E.g. Assam oil fields, Damodar coal fields, etc.
- c) **Stock resources:** the materials in the environment which have the potential to satisfy human needs but human beings do not have the appropriate technology to access these, are included among stock. Water for example is a compound of two inflammable gases; hydrogen and oxygen which can be used as a source of energy. But we do not have a technical know-how to use them for this purpose. Therefore, it is considered as stock.
- d) **Reserves:** they are the subset of stock/ actual which are/ can be used with the help of existing technical knowledge, but their use has not been started yet. Reserves can be used for meeting future requirements. For example water in lakes, dams, forests, etc. is a reserve which can be used in the future for electric generation.

2.1.3. Based on exhaustibility or renewability

- a) **Renewable Resources:** the resources which can be renewed and reproduced by physical, chemical or mechanical processes are known as renewable or replenish-able resources. These resources are able to increase their abundance through reproduction and utilization of simple substances. Examples of such resources are water, forests and wildlife, plants etc. we can further divide into continuous or flow and biological.
- b) **Non-Renewable Resources:** this process takes place over a long geological time. Examples of such resources are minerals and fossil fuels. This may take millions of years in their formation.

2.2. Human resources

- Human Resources refer to the number and ability of the people. For Example, knowledge, health, skill, etc.
- People can make the best use of nature to create more resources when they have the knowledge, skill and the technology to do so. That is why human beings are a special resource.
- People are human resources.

- ☑ Education and health help in making people a valuable resource.
- ☑ Improving the quality of people's skills so that they are able to create more resources is known as human resource development.

2.3. Human made resources

- ☑ Resources created by human beings are called Man-Made Resources. For example, Buildings, Roads, etc.
- ☑ Sometimes, natural substances become resources only when their original form has been changed. Iron ore was not a resource until people learnt to extract iron from it.
- ☑ People use natural resources to make buildings, bridges, roads, machinery and vehicles, which are known as human made resources.
- ☑ *Technology is also a human made resource.*



Figure 2: The collection of human made resources

Resource Conservation

Using resources carefully and giving them time to get renewed is called resource conservation.

Ways to conserve natural resources:

- ◇ Preventing wastage;
- ◇ Saving every drop of water;
- ◇ Planting trees (afforestation);
- ◇ Using alternative fuels to reduce pollution;
- ◇ Not disturbing animal habitats;
- ◇ Controlling deforestation.

CHAPTER FOUR: POPULATION DEMOGRAPHY

Learning outcomes

Here in this chapter; you are expected to have the following:

- ✎ Tangible concept on the population demography;
- ✎ The main factors in population change;
- ✎ Be familiar with the concept of different demographic variables;
 - Total population increase;
 - Migratory and natural population increase
 - Population structures; and
 - Population pyramid.
- ✎ Know different demographic transition stages.

4.1. Historical perspective of population demography

⇒ Demography is the study of human population dynamics.

Derived from Two Greek roots:

- **Demos** (people);
- **Graphy** (branch of knowledge regarding a particular science in this case, human populations).

Demography is 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.

✓ Demography deals with major “demographic processes” namely fertility, mortality and migration.

Population: Group of individuals of same species living in the same geographic area at the same time”.

Major Factors in Population Dynamics

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

01. Births (Fertility);
02. Deaths (Mortality);
03. 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.

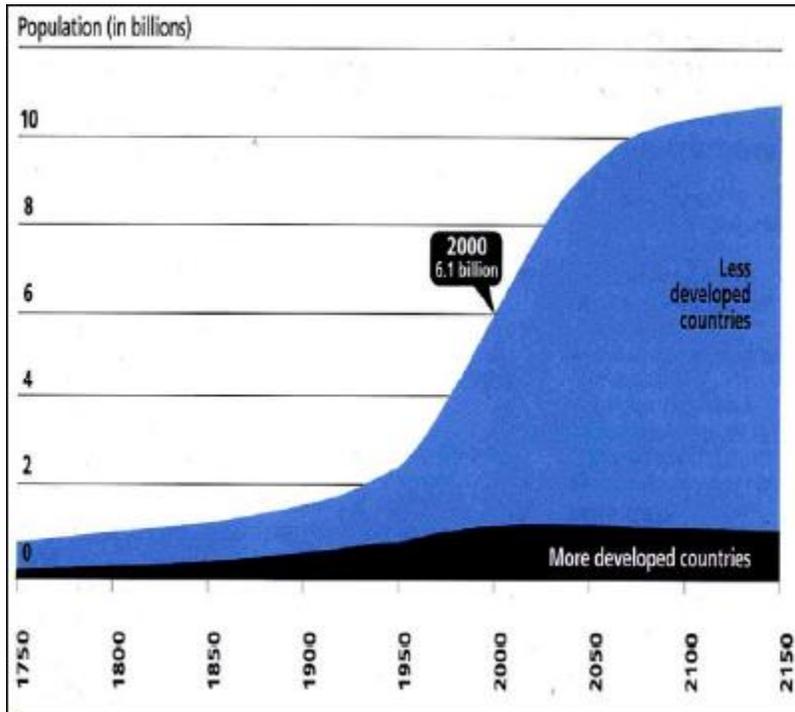


Figure 3: World population growth.

4.2. Demographic variables

4.2.1. Total population increase

When the net effect of migration is added to natural increase, this is referred to as Total population Increase (**Total population Growth**).

→ There are only two ways to *enter* a population by **birth** and by **in-migration**.

→ There are two ways to *leave* a population, by **death** and by **out-migration**.

Population growth can occur only if:

1. **Natural increase** is positive i.e. $B > D \Rightarrow B$ increases or D declines and/or

2. **Net migration** is positive i.e. $I > E \Rightarrow I$ increases or E declines

$$\heartsuit \quad r = (b - d) + (i - e);$$

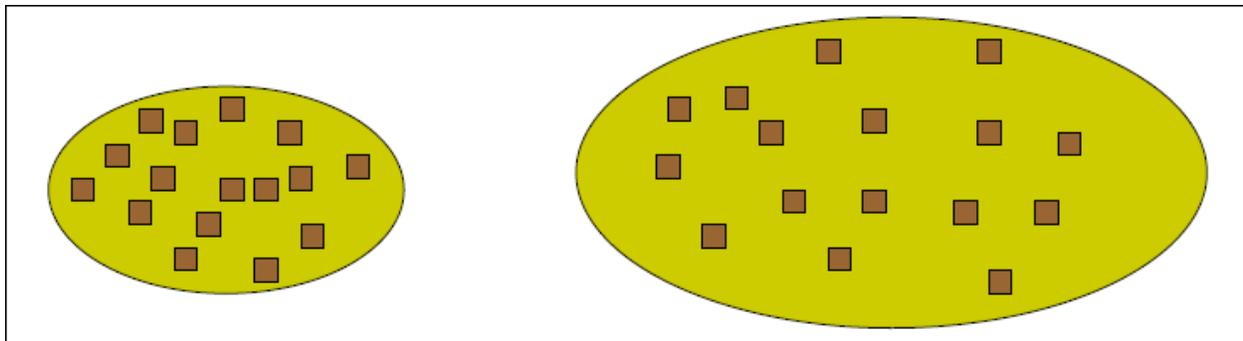
$$\heartsuit \quad b-d = \text{rate of natural increase}; \quad i-e = \text{net migration rate.}$$

For example, the population of interest may be that of students attending a specific university during a specific year. In this situation, the students are born (i.e., enter) into the population when they enroll, and they die (i.e., leave) when they graduate.

Population size is defined as the number of individuals present in a subjectively designated geographic range.

Population density

- The number of individuals of a species per unit area or volume at a given time.
- Ovals below have the same population, but different densities.
- Birth and immigration: the influx of new individuals from other areas-can increase a population's density, while
- Death and emigration: the movement of individuals out of a population to other areas-can decrease its density.



Similar to population size, population density displays distinctive characteristics at both high and low values. **Density-dependent factors**, including competition, predation, migration and disease, intensify within populations as density increases. In contrast, **density-independent factors**, such as weather, fire regimes, and flooding, impact populations regardless of their specific densities

4.2.2. Natural and migratory population increase

The differences between births and deaths in a population produces the Natural Increase (or Decrease) of a population.

The rate of Natural Population increase is the rate at which a population is increasing (or decreasing) in a given year due to excess (or deficit) of births over deaths expressed as a percentage of the base population.

$$\text{RNI} = \frac{\text{Births} - \text{Deaths}}{\text{Total Population}} \times 100 \dots \text{eq. 1}$$

Migration is the movement of individuals or groups from one place to another which involves permanent or semi-permanent change of usual residence.

Migration is the most volatile of the basic demographic variables- quickly reflecting changing social, economic and political circumstances; both at the national and international level. Internal and international migration are essentially geared by the same forces and the majority of migrants in the world today are rural dwellers moving to the towns and cities either of their own or another country.

➤ Reasons for migration are categorized as **Push** factors and **Pull** factors.

Push factors include, widespread unemployment lack of farm land, famine or war at home. In the 1980's and 1990's hundreds of thousands of Africans were pushed out of their homelands to neighboring countries because of famine and civil war.

Factors that *attract migrants*, pull factors, include booming economy, favorable immigration laws, or free agricultural land in the area to which the migrant is moving.

Net Migration: is the difference between the numbers of persons entering a geographic area (Immigrants) and those leaving the area (emigrants).



Surprisingly the **south-south migration** (migration between developing countries) is higher than the **south-north migration** (from developing countries to developed countries).

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.

4.2.4. Population pyramids

→ The number and proportion of people at each age in a population.

Age structure: the distribution of males and females among age groups in a population-in this case, the world population. Population experts construct a population age structure diagram by

plotting the percentages or numbers of males and females in the total population in each of three age categories: pre-reproductive (ages 0–14), reproductive (ages 15–44), and post-reproductive (ages 45 and older). The following figure presents generalized age-structure diagrams for countries with rapid, slow, zero, and negative population growth rates.

Population pyramids show pictorially (graphically) the effects of the three factors that influence population. Population pyramids present the population of an area or country in terms of its composition by age and sex at a point in time. The series of horizontal bars in a pyramid represent the percentage contribution of each age and sex groups in the population.

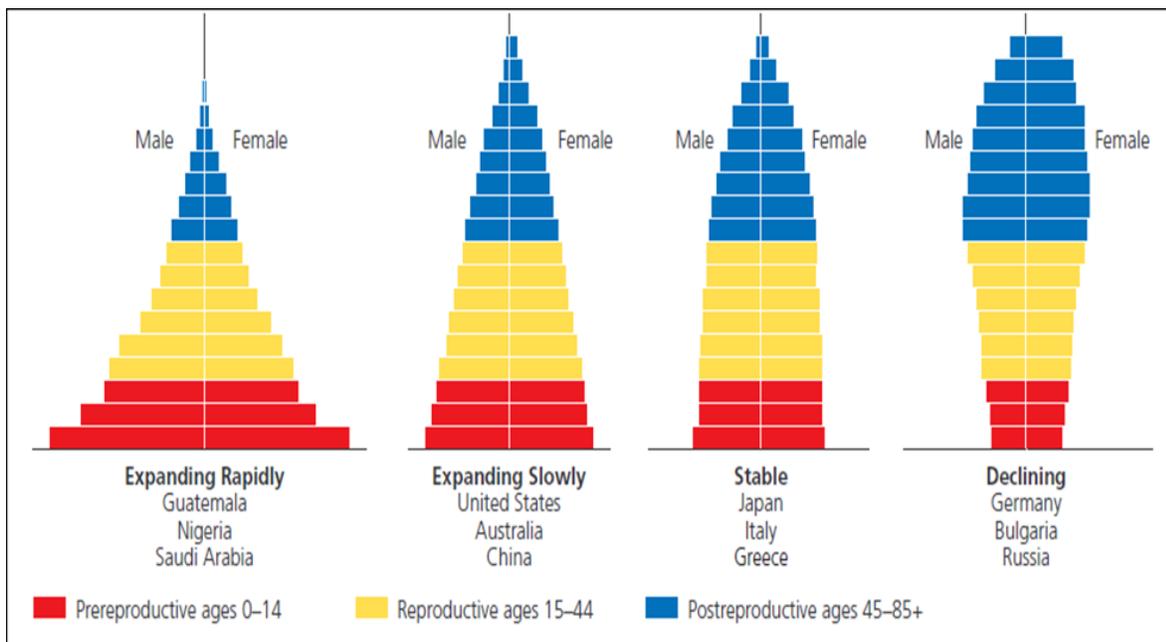


Figure 4: Generalized population age-sex structure diagrams for countries with rapid (1.5–3%), slow (0.3–1.4%), zero (0–0.2%), and negative (declining) population growth rates

A population with a large proportion of its people in the pre-reproductive age group (far left in the above figure) has a large potential for rapid population growth.

✍ A rapidly **expanding** population will usually contain large proportion of **young** individuals.

✍ A **declining** population will contain a large proportion of **old** individuals and a small proportion of young individuals.

The shape of the pyramid reflects the major influences on births and deaths, plus any change due to migration over three or four generations proceeding the date of the pyramid.

The above four representations of population age-sex structure provide an overall example of what a pyramid for different levels of population growth would look like – rapid growth, slow growth, zero growth and negative growth.

I. A pyramid with a Broad Base

This indicates a high percentage of young population. The low survivorship and high natality of human population in many developing countries result in a pyramidal stable age - structure, in which most of the population is young.

- ♠ Rapid population growth.

II. A Bell shaped Polygon

This indicates a moderate proportion of young to old Population.

- ♠ Slow population growth.

III.A Rectangular Polygon:-

In a more developed countries high survivorship and low natality produce populations with an almost rectangular, stable age structure in which all age groups are equally abundant.

- ♠ Zero population growth.

IV. An Urn - shaped Figure

This type of shape indicates a low percentage of young Population, which is characteristic of a declining Population.

- ♠ Negative population growth.

4.3. Theory of Demographic transition

Demographic transition is the historical shift of birth and death rates from high to low levels in a population; a term used to describe the major demographic trends of the past centuries (fig. 5).

The change in populations basically consists of a shift from an equilibrium condition of high birth and death rates, **characteristic of agrarian societies** to a newer equilibrium in which both birth and death rates are at much lower level.

The period of transition, at least in Western Europe, was initiated by a drop in death rates that was followed some years later by a fall in birth rates. The intermediate period was one of a rapid population growth (population explosion).

The period of transition is described by the following four major stages:

STAGE ONE

Agrarian civilizations (primitive stage) are characterized by stable or slowly growing populations with crude birth rates greater than 45 per 1000 and crude death rates greater than 35 per 1000 births. Agricultural existence favors large families. However, high birth rates are balanced by high death rates from diseases famine, war, etc. resulting in very low population growth.

STAGE TWO

Advances in sanitation and improved availability and quality of food, water and shelter leads to fall in death rate and an increase in life expectancy. This has usually occurred without an immediate change in birth rate; however, the improved conditions of life may favor an increase in fertility. During this period, a marked excess of births over deaths developed leading to a rapid expansion of population.

STAGE THREE

Characterized by falling growth Rates. After a time, birth rates tend to fall, largely as a reflection of industrialization and consequent urbanization. With industrialization people tend to migrate from rural to urban areas.

This stage is a situation in which birth rates and death rates are again essentially in balance, but at a lower level as compared with those of the primitive first stage, when both crude birth rate and crude death rate are in the vicinity of less than 20 per 1000 and 10 per 1000, respectively.

STAGE FOUR

This stage is reached in highly developed societies when both birth and death rates are low and population growth rates are zero or even negative.

Table 2: The summarized population demographic transition stages

<ul style="list-style-type: none"> ♣ Pre-industrial Stage <ul style="list-style-type: none"> → Birth and death rates high; → Modest population growth. ♣ Transitional Stage <ul style="list-style-type: none"> → Lowered death rate; → Rapid population growth. 	<ul style="list-style-type: none"> ♣ Industrial Stage <ul style="list-style-type: none"> → Birth rate decline; → Population growth slow. ♣ Post-Industrial Stage <ul style="list-style-type: none"> → Low birth and death rates; → Population growth very slow.
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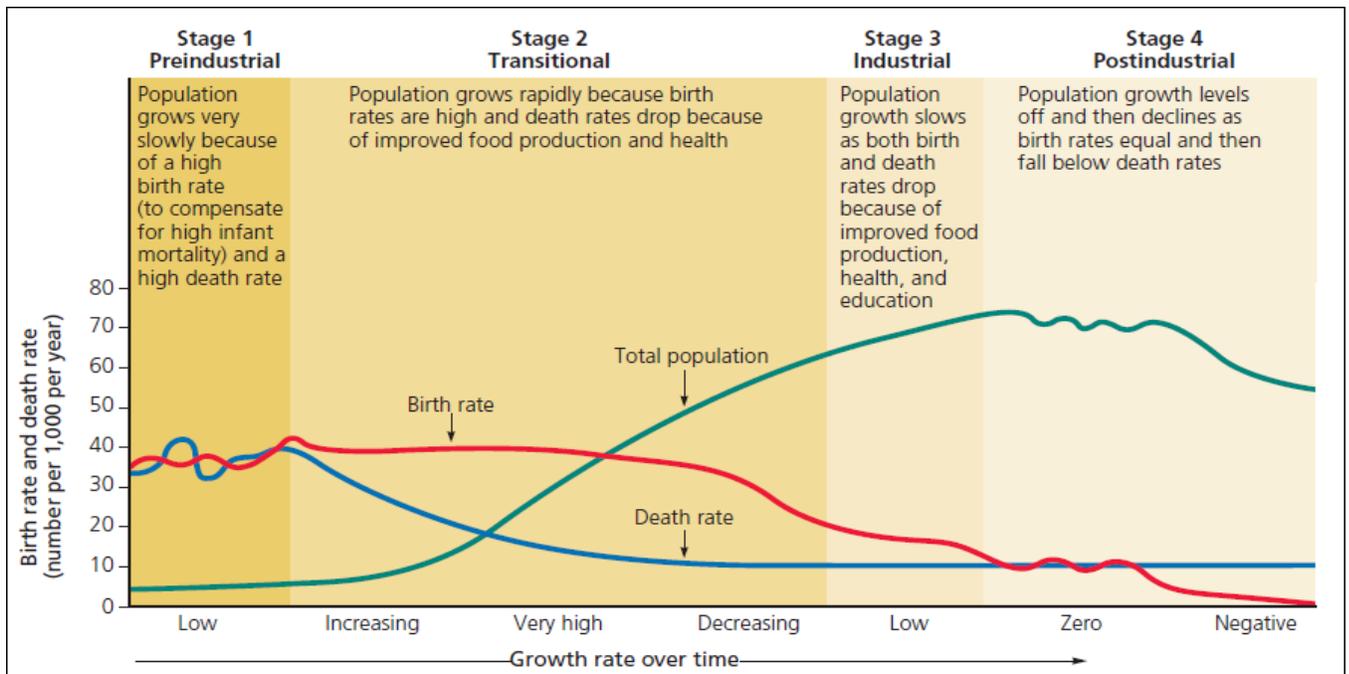


Figure 5: Four stages of the demographic transition, with which the population of a country can experience when it becomes industrialized.

🕒 As Countries Develop, Their Populations Tend to Grow More Slowly.

Chapter Five: Theory of population growth and the environment

Learning outcomes

Up on the completion of this section; you are expected to have the following:

- 🕒 How population growth matters our planet Earth?
- 🕒 The link between poverty and population growth;
- 🕒 The theory of population growth:
 - Thomas Malthus;
 - Boserupians, etc.;
- 🕒 The link between development and environment in different perspectives.

5.1. Population growth as an issue

NATURAL CAPITAL DEGRADATION! (Natural Capital = Natural Resources + Natural Services)

📖 Altering Nature to Meet Our Needs:

- ➦ Reduction of biodiversity;
- ➦ Increasing genetic resistance of pest species and disease-causing bacteria;
- ➦ Elimination of many natural predators;

- ✦ Introduction of potentially harmful species into communities;
- ✦ Using some renewable resources faster than they can be replenished;
- ✦ Interfering with the earth's chemical cycling and energy flow processes;
- ✦ Relying mostly on polluting and climate-changing fossil fuels.

Can the world provide an adequate standard of living for a projected 2.6 billion more people by 2050 without causing widespread environmental damage? There is disagreement over the answer to this question.

According to **one view**, the planet already has too many people collectively degrading the earth's natural capital. To some analysts, the problem is the sheer number of people in developing countries with more than 90% of the world's population. To others, it is high per capita resource consumption rates in developed countries-and to an increasing extent in rapidly developing countries such as China and India-that magnify the environmental impact, or ecological footprint, of each person.

Another view is that technological advances have allowed us to overcome the environmental resistance that all populations face and to increase the earth's carrying capacity for our species. Some analysts argue that there is no reason we cannot continue doing so, and they believe that the planet can support billions of more people. They also see a growing population as our most valuable resource for solving environmental and other problems and for stimulating economic growth by increasing the number of consumers. As a result, they see no need to control the world's population growth.

5.2. Framing the debate

5.2.1. Malthusian theory

Thomas Malthus, a British economist, hypothesized that the human population tends to increase exponentially, while food supplies tend to increase more slowly at a linear rate. So far, Malthus has been proven wrong. Food production has grown at an exponential rate instead of at a linear rate because of genetic and technological advances in industrialized food production.

The **Neo-Malthusians**, mainly ecologists and biologists, predict future disasters are unavoidable unless the population surge is controlled in time.

The Malthusians are of the view that natural resources are limited and sooner or later the human population will exceed the carrying capacity of the planet. The primary focus of this group is to reduce population growth rates in rapidly increasing population regions of developing countries.

- ☞ For the Malthusians, the population densities and high growth rates within these densely populated areas have special significance.
- ☞ They argue that it is difficult to maintain a high living standard in a densely populated area with a high rate of population increase.
- ☞ The reason is that due to the rapid growth of the population, adjustment time is too short for new technology to be adapted. The result is continuous degradation of the natural environment.
- ☞ Malthusians do believe that natural resources are limited and that the carrying capacity is finite and decreasing.
- ☞ As a result, they see population growth anywhere beyond this carrying capacity may have dire/terrible consequences for everyone.

❖ *What is the Malthusian theory?*

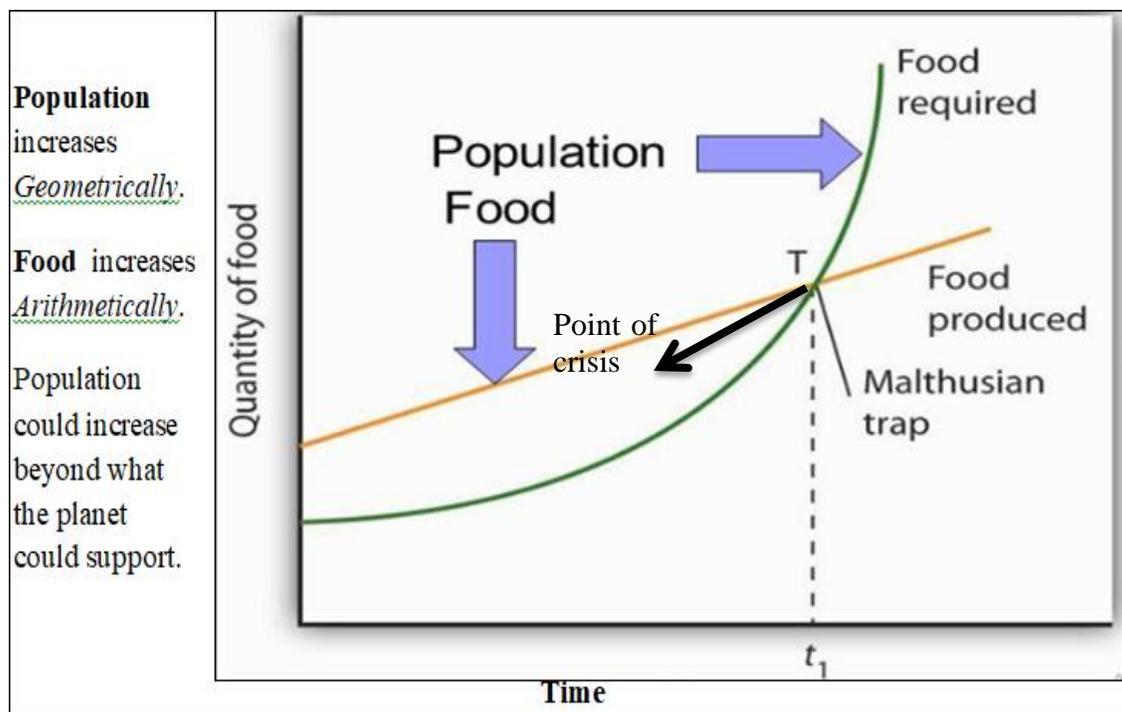


Figure 6: Malthusian Population Theory

The theory put forwarded by Malthus can be summed up in the following propositions:

- i. Food is necessary to the life of man and, therefore, exercises a strong check on population. In other words, population is necessarily limited by the means of subsistence (i.e., food).
- ii. Population increases faster than food production. Whereas population increases in geometric progression, food production increases in arithmetic progression.
- iii. Population always increases when the means of subsistence increase, unless prevented by some powerful checks.
- iv. There are two types of checks which can keep population on a level with the means of subsistence.

They are the *preventive* and a *positive* check.

- ✓ The **first** proposition is that the population of a country is limited by the means of subsistence.
- ✓ In other words, the size of population is determined by the availability of food.
- ✓ The greater the food production, the greater the size of the population which can be sustained. The check of deaths caused by want of food and poverty would limit the maximum possible population.
- ✚ The **second** proposition states that the growth of population will out-run the increase in food production.
- ✚ Malthus thought that man's sexual urge to bear offspring knows no bounds.
- ✚ He seemed to think that there was no limit to the fertility of man.
- ✚ But the power of land to produce food is limited. Malthus thought that the law of diminishing returns operated in the field of agriculture and that the operation of this law prevented food production from increasing in proportion to labor and capital invested in land.
- ♠ In fact, Malthus observed that population would tend to increase at a **geometric** rate (2, 4, 8, 16, 32, 64, etc.); but food supply would tend to increase at an **arithmetic** rate (2, 4, 6, 8, 10, 12).
- ✚ According to the **third** proposition, as the food supply in a country increases, the people will produce more children and would have larger families.
- ✚ This would increase the demand for food and food per person will again diminish. Therefore, according to Malthus, the standard of living of the people cannot rise permanently.
- ✚ As regards the **fourth** proposition, Malthus pointed out that there were two possible checks which could limit' the growth of population: **(a)** Preventive checks and **(b)** Positive checks.

a) Preventive Checks

Preventive checks exercise their influence on the growth of population by bringing down the birth rate.

- ♣ Preventive checks are those checks which are applied by man.
- ♣ Preventive checks arise from man's fore-sight which enables him to see distant consequences. He sees the distress which frequently visits those who have large families. He thinks that with a large number of children, the standard of living of the family is bound to be lowered. He may think that if he has to support a large family, he will have to subject himself to greater hardships and more strenuous labor than that in his present state. He may not be able to give proper education to his children if they are more in number.
- ♣ Further, he may not like exposing his children to poverty or charity by his inability to provide for them. These considerations may force man to limit his family.
- ♣ Late marriage and self-restraint during married life are the examples of preventive checks applied by man to limit the family.

b) Positive Checks

Positive checks exercise their influence on the growth of population by increasing the death rate.

- ♣ They are applied by nature.
- ♣ The positive checks to population are various and include every cause, whether arising from vice or misery, which in any degree contributes to shorten the natural duration of human life.

The unwholesome occupations, hard labor, exposure to the seasons, extreme poverty, bad nursing of children, common diseases, wars, plagues and famines are some of the examples of positive checks. They all shorten human life and increase the death rate.

- ✓ Malthus **recommended** the use of **preventive checks** if mankind was to escape from the impending misery.
- ✓ If preventive checks were not effectively used, positive checks like diseases, wars and famines would come into operation.

As a result, the population would be reduced to the level which can be sustained by the available quantity of food supply.

Criticism of Malthus theory

The following are some of the grounds on which it has been criticized:

- ☞ It is pointed out that Malthus's pessimistic conclusions have not been borne out by the history of Western European countries.
 - ✓ Gloomy forecast made by Malthus about the economic conditions of future generations of mankind has been falsified in the Western world.
 - ✓ Population has not increased as rapidly as predicted by Malthus; on the other hand, production has increased tremendously because of the rapid advances in technology.
 - ✓ As a result, living standards of the people have risen instead of falling as was predicted by Malthus.
- ☞ Malthus asserted that food production would not keep pace with population growth owing to the operation of the law of diminishing returns in agriculture.
 - ✓ But by making rapid advances in technology and accumulating capital in larger quantity, advanced countries have been able to postpone the stage of diminishing returns.

By making use of fertilizers, pesticide better seeds, tractors and other agricultural machinery, they have been able to increase their production greatly.

- ☞ In fact, in most of the advanced countries the rate of increase of food production has been much greater than the rate of population growth.
 - ✓ Even in India now, thanks to the Green Revolution, the increase in food production is greater than the increase in population.
 - ✓ Thus, inventions and improvements in the methods of production have belied/disproved the gloomy forecast of Malthus by holding the law of diminishing returns in check almost indefinitely.
- ☞ Malthus compared the population growth with the increase in food production alone.
 - ✓ Malthus held that because land was available in limited quantity, food production could not rise faster than population.
 - ✓ But he should have considered all types of production in considering the question of optimum size of population.
- ☞ There is no food problem in Great Britain.

- ✓ Therefore, Malthus made a mistake in taking agricultural land and food production alone into account when discussing the population question.
 - ✓ As already said, he should have rather considered all types of production.
 - ✎ Malthus held that the increase in the means of subsistence or food supplies would cause population to grow rapidly so that ultimately means of subsistence or food supply would be in level with population, and everyone would get only bare minimum subsistence.
 - ✓ In other words, according to Malthus, living standards of the people cannot rise in the long-run above the level of minimum subsistence.
 - ✓ But, as already pointed out, living standards of the people in the Western world have risen greatly and stand much above the minimum subsistence level.
 - ✎ There is no evidence of birth-rate rising with the increases in the standard of living. Instead, there is evidence that birth-rates fall as the economy grows.
 - ✓ In Western countries, attitude towards children changed as they developed economically.
 - ✓ Parents began to feel that it was their duty to do as much as they could for each child.
- Therefore, they preferred not to have more children than they could attend to properly. People now began to care more for maintaining a higher standard of living rather than for bearing more children.
- ♠ The wide use of contraceptives in the Western world brought down the birth rates.
 - ♠ This change in the attitude towards children and the wide use of contraceptives in the Western world has falsified Malthusian doctrine.
 - ✎ Malthus gave no proof of his assertion that population increased exactly in geometric progression and food production increased exactly in arithmetic progression. It has been rightly pointed out that population and food supply does not change in accordance with these mathematical series.
 - ✓ Growth of population and food supply **cannot** be expected to show the precision or accuracy of such series.

Is Malthusian Theory Valid Today?

We must, however, add that though the gloomy conclusions of Malthus have not turned out to be true due to several factors which have made their appearance only in recent times, yet the essentials of the theory have not been demolished.

- ☞ He said that unless preventive checks were exercised, positive checks would operate.
- ☞ This is true even today. The Malthusian theory fully applies in India.

5.2.2. Boserup's theory

She argued that in an agrarian scenario, when there is an increase in demand for food, producers intensify the production process.

- ☞ Boserup's thesis concludes that as certain resources become scarcer e.g. land, technology is adopted that uses more intensively the relatively more abundant factor (labor).
- ☞ Rapid population growth in this case spurs economic development.

Given these assumptions, there is a real possibility of land degradation in the short term. Since there is a time lag between increase in the population and adaptation of new technology, land degradation could be visible during the “*critical transition stage*” when the population adjusts to improved technology.

- ⇒ **Boserup** suggested that population growth and associated pressures on the environment or on its limited resources stimulate innovation or technological changes.
- ⇒ She concluded that population growth and the resulting increased population pressure on limited resources might induce technological changes necessary to allow food production to keep pace with increased population.

☞ If we properly educate and aware people about our environment, population actually a resource and can be an opportunity to improve environmental quality.

✍ **Boserupians** believe that population pressure on limited natural resources induces resource efficient technology.

- « This belief is based on the assumption that carrying capacity is fluid and may be increased by converting to technologies that conserve natural resources.

5.3. Poverty and population growth

5.3.1. Poverty

Poverty can be defined as a social condition of chronic insecurity resulting from the malfunctioning of economic, ecological, cultural and social systems, causing groups of people to lose the capacity to adapt and survive and to live beyond minimal level of satisfaction of their needs and aspirations.

- ☹ We live in a world of haves and have-nots.
 - ☹ Poverty occurs when people are unable to meet their basic needs for adequate food, water, shelter, health, and education.
 - ☹ Poverty has a number of harmful environmental and health effects.
 - ☞ Poverty affects population growth. To many poor people, having more children is a matter of survival.
 - ☞ Their children help them gather fuel (mostly wood and animal dung), haul drinking water, and tend crops and livestock.
 - ☞ Their children also help to care for them in their old age (which is their 40s or 50s in the poorest countries) because they do not have social security, health care, and retirement funds.
- While poverty can increase some types of environmental degradation, the reverse is also true. Pollution and environmental degradation have a severe impact on the poor and can increase poverty. Consequently, many of the world's badly poor people die prematurely from several preventable health problems.

5.3.2. Poverty Vs population growth

First, rapid population growth is likely to reduce per capita income growth and well-being, which tends to increase poverty. *Second*, in densely populated poor nations with pressure on land, rapid population growth increases landlessness and hence the incidence of poverty.

- ☞ The relationship between population growth and poverty is a vicious circle.
- ☞ Rapid population growth is an obstacle to economic progress in some the poorest countries, depriving the societies of funds for investment to develop.
- ☞ At the same time, poverty fuels overpopulation by depriving women of both the incentive and the means to have fewer children.

Deterioration of natural resources during the past few decades has come to prominence as one of the most important current global issues.

- ☹ Increase in population density in ecologically fragile areas and consumption of non-renewable natural resources at high rates is seen as one of the leading causes of this deterioration.
- ☹ At present, in some of the developing countries, the pollution of air, water and soil has reached life-threatening levels.

- ☹ In many of these countries population pressures, socio-political conditions and economic arrangements have resulted in massive natural resource depletion.
- ☹ In a developing country, poverty is the major factor that distorts the population transition in response to food supply.



Poverty also has a direct relationship with environmental deterioration due to its influence on population growth rates.

- ✓ Under the prevailing condition of poverty, people would not be able to afford the financial cost of conservation of natural resources.
- ✓ An example of this occurs, when demand for fuel wood increases in towns and small urban areas. The adjoining rural areas see a short-term economic gain by meeting this demand. They supply an increased amount of firewood or animal dung to these small urban centers. This leads to deforestation and loss of a valuable fertilizer resource, thereby resulting in reduced agricultural productivity.

5.4. Population and economic growth

- ⇒ Population growth alone doesn't inherently increase or decrease economic growth.
- ⇒ However, other demographic trends do affect the prospects for economic development, including poverty reduction.

Malthusians believed that high rates of population growth condemned societies to more or less permanent states of underdevelopment and that only by breaking the iron linkage of high fertility to poverty could real improvements in standards of living be achieved.

- ⇒ Neo-Malthusian, arguing that only by bringing rapid population growth under control could countries hope to achieve improved economic performance and high standards of living.

The relationship between population growth and economic development has been a recurrent theme in economic analysis since at least 1798 when Thomas Malthus famously argued that population growth would depress living standards in the long run.

- ◇ The theory was simple: given that there is a fixed quantity of land, population growth will eventually reduce the amount of resources that each individual can consume, ultimately resulting in disease, starvation, and war.

- ⇒ The way to avoid such unfortunate outcomes was ‘moral restraint’ (i.e. refraining from having too many children).
- ⇒ He didn’t foresee the technological advances that would raise agricultural productivity and reduce the toll of infectious diseases-advances that have enabled the world’s population to grow from 1 billion in 1798 to 7.4 billion today.

Marx, on the other hand, argued that high fertility was a symptom, not a cause, of poverty and said that only by bringing about a radical transformation in the underlying causes of poverty would living standards rise and birth rates begin to fall.

☞ International Conference on Population at Mexico City that “population growth is in and of itself neither good nor bad; it is a neutral phenomenon”.

Population growth helps the process of development in certain ways and hampers it in certain other ways. This is so because the relation-ship between population growth and economic development is intricate, complex and interacting.

- « *On the positive side*, an increasing population means an increase in the supply of labor-a basic factor of production.
- « And growth of population and labor supply has all along been one major source of growth in re-corded history.
- « It is to be noted that human labor, assisted by necessary tools and implements, was always and still is the greatest productive asset of nations.

A growing population leads to an increasing total output. But “it also makes for a greater number of persons among whom this output must be divided. **There are more productive hands but there are also more mouths to feed.**”

The effect of population growth on a society’s per capita output level depends on the pattern of population growth. In other words, it depends on the age composition of the population.

If, for example, population growth is associ-ated with high fertility and an increasing number of children relative to adults, then the number of consumers will be growing more rapidly than the number of producers, the dependency burden on the active workers of the society will be heavier, and the effect may be negative.

Population growth (with the associated increase in labour force) has traditionally been considered a positive factor in stimulating economic growth. A large labour force means more productive manpower, while a larger overall population increases the potential size of domestic markets.

- « However, it is questionable whether rapidly growing manpower supplies in labor-surplus developing countries exert a positive or negative influence on economic progress.
- « Obviously, it will depend on the ability of the economic system to absorb and productively employ these added workers, an ability largely associated with the rate and type of capital accumulation and the availability of other related factors such as managerial and administrative skills.

5.5. Economic development

5.5.1. Basic concept of development

Development was defined as ‘an evolutionary process in which the human capacity increased in terms of initiating new structures, coping with problems, adapting to continuous change, and striving purposefully and creatively to attain new goals’.

Did you know?

‡ *Formerly development and conservation had been regarded as conflicting ideas, because conservation was understood as the protection of resources, and development as the exploitation of resources.*

Now the concept of sustainable development emerged as a compromise between the notions of development and conservation, which came to be seen as interdependent issues.

- ☞ 'Development' is generally viewed as progress in the quality of life through social and cultural progress, rather than the more traditional goal of increasing economic activity.
- ☞ Progress does not rule out growth but it certainly dictates the type of growth which is desirable.

It has been argued, for example, that the '*quality of life*' emphasis necessitates the following dimensions to human development:

- ✓ an economic component dealing with the creation of wealth and improved conditions of material life, equally distributed;

- ✓ a social ingredient measured as well-being in health, education, housing and employment;
- ✓ a political dimension including values such as human rights, political freedom, enfranchisement, and some form of democracy;
- ✓ a cultural dimension recognizing that cultures confer identity and self-worth to people; and
- ✓ a full-life paradigm, which refers to meaning systems, symbols, and beliefs concerning the ultimate meaning of life and history.

5.5.2. Sustainable development

Establishing a balance between economic development and higher standards of living, with the population growth and depletion of natural resources, creates a conceptual basis for an entirely new approach to the development of humanity - sustainable development.

According to one of the most commonly used definition, **sustainable development** is one that meets the needs of humanity in the present, taking care not to jeopardize meeting the needs of those who will live in the future.

Sustainable development implies a balance between meeting basic needs and achieving a certain standard of living, with the available natural resources and preservation of the environment. In essence, sustainable development is a process in which there is a harmony between the exploitation of resources, direction of investments, orientation of technological development and institutional change, in order to improve the potential for the satisfaction of human needs, both now and in the future.

An author points out that the demand for raw materials and its impact on the environment have been a constant issue throughout human history. As early as the ancient Egyptian, Mesopotamian, Greek and Roman civilizations environmental problems such as deforestation and the salinization and loss of fertility of soil occurred, which we would today referred to as sustainability problems.

The majority of sustainable development perspectives appreciate that the production and consumption demands of the social system must not exceed the carrying capacity of the resource base and that resultant waste and pollution flows do not exceed the assimilative capacity of the ecological system.

A representative definition setting out these system issues is: one that meets the current and future basic resource needs of its people in a just and equitable manner without compromising the ability of future generations to meet their basic needs. This definition has two main aspects: meeting needs and compromising ability.

Thus, sustainable development requires:

- i. Opportunities for improving economic, social and ecological systems; and
- ii. Increases in adaptive capacity.

Expanding the set of opportunities for system improvement will give rise to development, while increasing adaptive capacity will improve resilience and sustainability.

In simple terms sustainable development argues for:

01. Development subject to a set of constraints which set resource harvest rates at levels no higher than managed or natural regeneration rates; and
02. Use of the environment as a 'waste sink' on the basis that waste disposal rates should not exceed rates of (natural or managed) assimilation by the counterpart ecosystem.

Development becomes sustainable if it is pursued on several fronts – the political, social, economic and environmental. And it is the interaction of policies and outcomes in all these dimensions that makes sustainability real.

Political sustainability: encompasses reproducibility of power structures and governance mechanisms, along with the evolution of institutions and the institutional framework that would carry out the tasks ensuring that the present generation maximizes its choices but not at the cost of opportunities for future generations.

Social sustainability: reflects social norms, values and culture, social structures and social cohesion, which are conducive to ensuring enlargement of choices of all segments of society in an equitable manner.

- ✓ If development is to be sustainable, it has to be owned by the entire society in terms of its philosophy, modus operandi and direction.
- ✓ Such ownership will facilitate the commitment to, and *understanding of the need for*, not compromising the opportunities of future generations while undertaking development for the present time.

Economic sustainability: addresses economic production and distribution as well as reproduction of the population.

- ✓ Economic sustainability requires building of human capabilities in an equitable manner through universal access to basic social services, equal economic opportunities, fairness in access to productive resources, sustained economic growth, etc.
- ✓ Thus equity, sustained growth and quality of life are three major dimensions of economic sustainability.

Environmental sustainability: deals with natural resources-exhaustible and renewable- and ecosystem services and the reproducibility of global ecosystems services and ecological resources.

- ✓ The overuse of natural resources and environmental degradation shrink the opportunities of future generations.
- ✓ Environmental sustainability emphasizes the proper use of natural resources and regeneration of the ecosystem so that future generations have the same opportunities as the present ones.

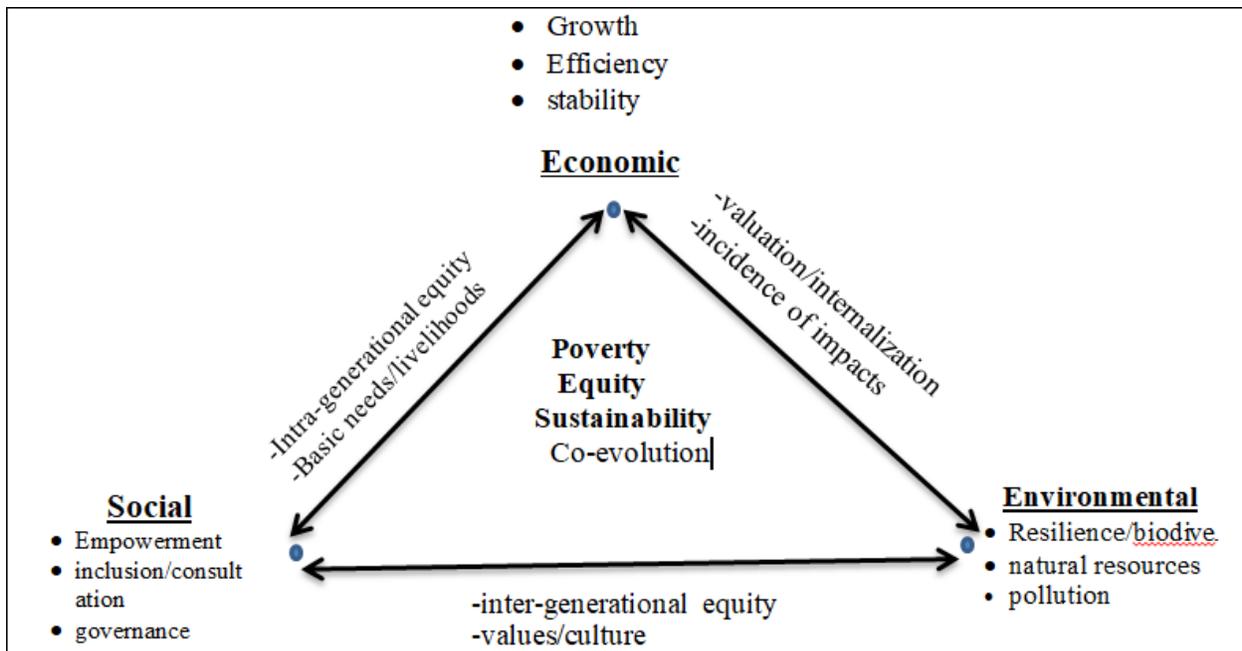


Figure 7: Elements of sustainable development-triangle

Sustainability is thus linked to all forms of capital - natural, economic and social - and their reproduction. Natural resources and their reproduction is the key to environmental sustainability.

- ‡ Economic capital, e.g. labor and its reproduction, is needed for economic sustainability and
- ‡ Social capital, i.e. cohesion, interaction and relationships among human beings within a society, is also a prerequisite for sustainability.

5.5.3. Challenges to sustainable development

There are a number of challenges for achieving sustainable development such as:

- ✓ lack of effective leadership,
- ✓ coordinated partnerships,
- ✓ investments,
- ✓ Implementation and investment indicators with effective data collection.

Leadership is essential for progress in relation to policy change, legislation, investment, implementation, advocacy and popular representation.

- Another set of challenge for sustainable development is lack of social inclusion, widespread regional disparities and urban-rural gaps, gender inequality between men and women.

A key challenge is to adopt a meaningful standard of basic needs worldwide, i.e., access to safe and sustainable water and sanitation, adequate nutrition, primary health services, and basic infrastructure including electricity, roads, and connectivity to the global information network. The global economic downturn, violent conflicts in some countries, biodiversity loss, and degradation of water, dry lands, forests, and climate change are the challenges to the peace and prosperity as they threaten to reverse the achievements to date and undermine any future gain.

Although the sustainable development goals (SDGs) have been accepted in principle, they have also been criticized for being too large in number and too wide in their scope. It is a challenge to create and maintain public awareness, mobilization, advocacy, and continuity for 17 goals and 169 targets enshrined in SDGs as compared to only 8 goals and 18 targets of MDGs which were easy to state, simple to understand, and practical for adoption by the governments, business, and civil societies worldwide.

5.6. Population, environment and development: the link

5.6.1. 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.

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.

5.6.2. 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 reduce.
- ☞ 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.

The Environmental Kuznets Curve is used to graph the idea that as an economy develops, market forces begin to increase and economic inequality decreases. More specifically that as the economy grows, initially the environment suffers but eventually the relationship between the environment and the society improves.

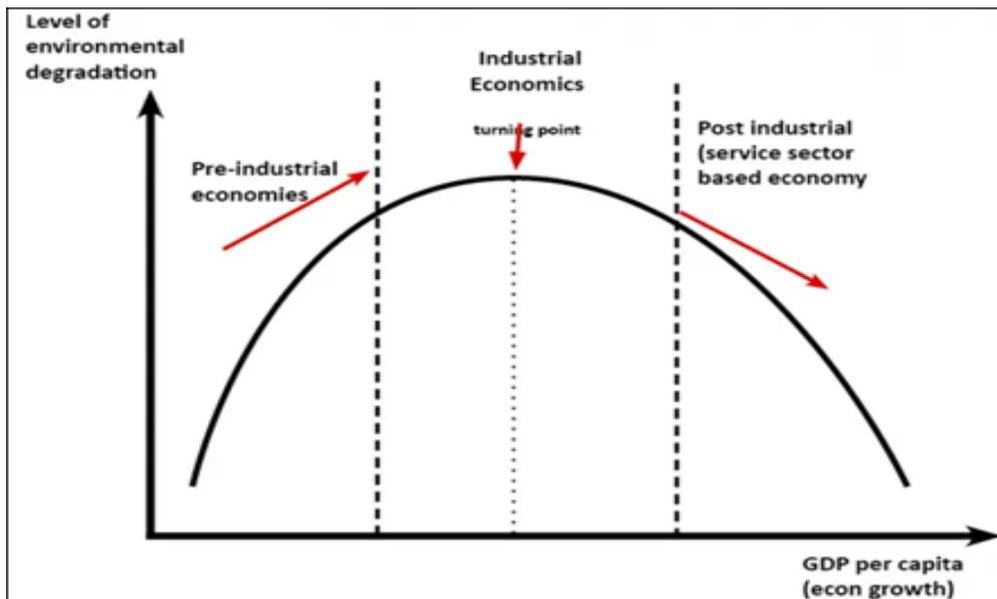
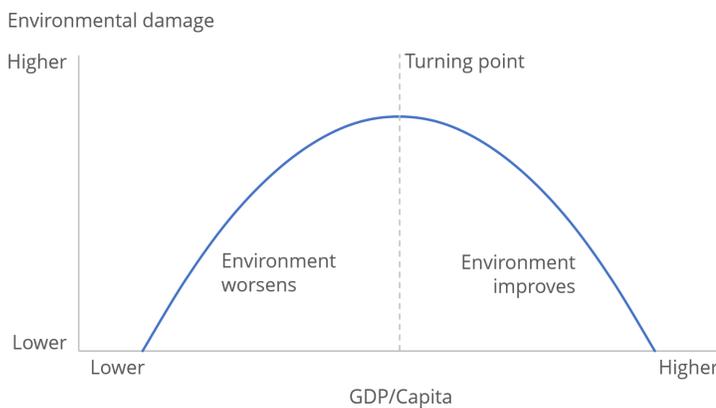


Figure 8: Environmental Kuznets curves

The environmental Kuznets curve suggests that economic development initially leads to deterioration in the environment, but after a certain level of economic growth, a society begins to improve its relationship with the environment and levels of environmental degradation reduces.

5.6.3. 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.

5.6.4. 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 wastage 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 wastage and the adverse environmental impact of production. All these enhance economic growth further.

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.

Chapter Six: Human activities and Environmental change

Learning outcomes

After ~~an~~ the completion of this portion; you are expected to capture the following thoughts:

- ☞ The reason behind for environmental change;
- ☞ The outcome of human brought environmental change; such as
 - Land degradation;
 - Food insecurity;
 - Climate change; etc.
- ☞ A number of Environment-poverty myths.

6.1. Why the environment change?

Human activities have led to the release of carbon dioxide and other heat-trapping “greenhouse” gases in sufficient quantity to change the composition of the atmosphere, resulting in an accumulation of heat in the Earth’s system, commonly referred to as “global warming”. The Earth’s climate has responded through higher temperatures in the atmosphere, land and ocean,

ice melting, rising sea level, and increases in extreme weather events (heat waves, wildfires, heavy rains and flooding).

6.2. Impact of environmental change

- Man cannot naturally be detached from his environment.
- From time to time, changes in climate and environmental conditions occur as a result of natural and human factors.
- Obviously, the natural factors are almost beyond human control. But, the human factors are to a very large extent under human control.
- “ Such **human factors** include air, water and land pollutions, production of greenhouse gases, deforestation, desertification, emission of carbon dioxide, carbon monoxide and other harmful gases.
- “ **Natural factors** include volcanic eruption, ocean variations, solar variations, Plate Tectonics, Thermohaline circulations, etc.

Environmental changes have to do with changes caused by the variation in the occurrences of some ...

- ⊖ **climatic factors:** rainfall, temperature, light wind;
- ⊖ **biotic factors:** predators, parasites, soil micro-organism, pest and diseases; and
- ⊖ **edaphic/soil factors:** soil pH, soil texture, soil structure, etc. when environmental changes occur as a result of the actions of man and other natural phenomena, lives and properties are adversely affected.

Major Current Environmental Problems

Pollution: Pollution of air, water and soil require millions of years to recoup. Industry and motor vehicle exhaust are the number one pollutants. Heavy metals, nitrates and plastic are toxins responsible for pollution.

- ‡ While water pollution is caused by oil spill, acid rain, urban runoff;
- ‡ air pollution is caused by various gases and toxins released by industries and factories and combustion of fossil fuels;
- ‡ Soil pollution is majorly caused by industrial waste that deprives soil from essential nutrients.

Global Warming: Climate changes like global warming is the result of human practices like emission of Greenhouse gases.

Natural Resource Depletion: Natural resource depletion is another crucial current environmental problem.

- ‡ Fossil fuel consumption results in emission of Greenhouse gases, which is responsible for global warming and climate change.
- ‡ Globally, people are taking efforts to shift to renewable sources of energy like solar, wind, biogas and geothermal energy.

Climate Change: Climate change is yet another environmental problem that has surfaced in last couple of decades.

- ‡ It occurs due to rise in global warming which occurs due to increase in temperature of atmosphere by burning of fossil fuels and release of harmful gases by industries.

Loss of Biodiversity: Human activity is leading to the extinction of species and habitats and loss of bio-diversity.

- ‡ Eco systems, which took millions of years to perfect, are in danger when any species population is decimating.
- ‡ Balance of natural processes like pollination is crucial to the survival of the eco-system and human activity threatens the same.
- ‡ Another example is the destruction of coral reefs in the various oceans, which support the rich marine life.

Ocean Acidification: It is a direct impact of excessive production of CO₂.

- ‡ 25% of CO₂ produced by humans.
- ‡ The ocean acidity has increased by the last 250 years but by 2100, it may shoot up by 150%.
- ‡ The main impact is on shellfish and plankton in the same way as human osteoporosis.

Ozone Layer Depletion: The ozone layer is an invisible layer of protection around the planet that protects us from the sun's harmful rays.

- ‡ Depletion of the crucial Ozone layer of the atmosphere is attributed to pollution caused by Chlorine and Bromide found in Chloro-floro carbons (CFC's).
- ‡ Once these toxic gases reach the upper atmosphere, they cause a hole in the ozone layer, the biggest of which is above the Antarctic.
- ‡ The CFC's are banned in many industries and consumer products.
- ‡ Ozone layer is valuable because it prevents harmful UV radiation from reaching the earth.

Box 1: Impacts of Environmental Degradation in the Developing World

- ☞ Water-related diseases, such as diarrhea and cholera; kill an estimated 3 million people in developing countries, the majority of whom are children under the age of five.
- ☞ Vector-borne diseases such as malaria account for 2.5 million deaths a year, and are linked to a wide range of environmental conditions or factors related to water contamination and inadequate sanitation.
- ☞ One billion people are adversely affected by indoor pollution.
- ☞ Nearly 3 million people die every year from air pollution, more than 2 million of them from indoor pollution.
- ☞ More than 80% of these deaths are those of women and girls.
- ☞ Nearly 15 million children in Latin America are affected by lead poisoning.
- ☞ More than one billion people are affected by soil erosion and land degradation.
- ☞ Over the last decade, 154 million hectares of tropical forests, covering almost three times the land area of France, have been lost.
- ☞ About 650 million poor people in the developing world live on marginal and ecologically fragile lands.

Source: UNDP (2002)

6.3. Consequences of human induced environmental change

6.3.1. Land degradation

- ☹ "**Land**" includes not only the soil resource, but also the water, vegetation, landscape, and microclimatic components of an ecosystem.
- ☹ "**Land degradation**" refers to a temporary or permanent decline in the productive capacity of the land, or its potential for environmental management.

It can also be defined as a negative trend in land condition, caused by direct or indirect human-induced processes including anthropogenic climate change, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity or value to humans. This definition applies to forest and non-forest land: forest degradation is land degradation that occurs in forest land. Soil degradation refers to a subset of land degradation processes that directly affect soil.

Soil degradation is the decline in quantity and quality of soil. It is caused by the interaction of physical forces and human activities. Its impact is increasing and is having a negative effect on food production. It includes:

- " Erosion by wind and water;
- " Biological degradation (the loss of humus and plant/animal life);
- " Physical degradation (loss of structure, changes in permeability);
- " Chemical degradation (acidification, declining fertility, changes in p^H , salinization and chemical toxicity).

The cost of land degradation in our country includes the following:

Direct Costs

- Costs of nutrients lost with top soil erosion (or the replacement costs of these nutrients);
- Lost production due to nutrient and soil loss;
- Costs of forest removal;
- Loss of livestock carrying capacity

Indirect Costs

- Loss of environmental services;
- Silting of dams and river beds;
- Increasing irregularity of stream and rivers and reduced groundwater capacity

6.3.2. Land degradation and food insecurity

Today, agriculture faces a triple challenge. The production of safe and nutritious food will need to increase to meet the growing demand and ensure food security for all. The sector has to generate jobs and incomes and contribute to poverty eradication and rural economic growth. Furthermore, it has a major role to play in ensuring the sustainability of natural resources and in combating climate change.

Food security is influenced by food production, but also its distribution and accessibility. Some current estimates suggest that the global impact of LD on food security is not significant. Wiebe (2003) claimed land degradation (focused on soil erosion) at a global scale causes annual productivity declines in the order of only 0.4 % for the major crops. However, other (often

national level) studies show LD can threaten the food security of poor people in fragile environments, particularly those whose livelihoods rely largely on agricultural activities.

Wiebe (2003) also believes that the real impact of land degradation on food production has been masked by yield growth due to greater use of technology and inputs over the last few decades, drivers expected to be less important in the future. Thus future impacts of LD on productivity and food security could be more severe making it more important to understand these linkages better now. It may also be that it is those areas already suffering most from food insecurity are likely to suffer the greatest impacts from future LD.

6.4. Relationship between environment and poverty

6.4.1. Environment-poverty-environment nexus

The connection between poverty and environmental issues is not a novel idea. Viewpoints on the environment and poverty relationship differ.

- ‡ Some see the poor and those in poverty as damaging to the environment.
- ‡ Others argue that in many cases people in poverty have demonstrated concern and protection for the environment and are affected more by environmental degradation.

Then, there is the thinking that the relationship between the environment and poverty is not one of cause-and-effect but a cyclic relationship where both factors influence each other.

One program run by the United Nations, the Poverty – Environment Partnership, runs on three basic ideas:

- « “The environmental quality of growth matters to people living in poverty;
- « Environmental management cannot be treated separately from other development concerns; and
- « People living in poverty must be seen as part of the solution rather than part of the problem”.

The United Nations Millennium Development Goals (MGDs) have the following eight goals: end poverty and hunger, universal education, gender equality, child health, maternal health, combat HIV/AIDS, environmental sustainability, and global partnership (United Nations, n.d.). Each goal is measured by certain indicators and has a detailed target to obtain by 2015. Many of these goals are connected to environment and poverty issues. The most obvious two being the goals to end poverty and hunger & environmental sustainability play a role in the environment-poverty relationship.

Robin Broad (1994) takes issue with the typical perception that people in poverty are harmful to the environment; instead, she proposes that some in poverty, in fact, are protectors or sustainers of the environment and when examining the poor and the environment better distinction needs to be made.

- ↳ Primarily, she argues that the term “poor” is too general and should be divided into “merely poor” and “very, very poor.”
- ↳ It is the very, very poor who may be harmful to the environment in their struggle for survival.

Reardon and Vosti (1995) think similarly to Broad in that they see many theories about the environment-poverty relationship as too general.

- ↳ These authors suggest that the type of poverty and the type of environmental problem impact the interconnection.

As Broad does, though using different categories, Reardon and Vosti break poverty down into two sections:

- « Investment poor and
- « Welfare poor.

- ↳ Welfare poverty is measured off the more conventional markers of poverty such as income, consumption, and nutrition;
- ↳ Whereas investment poverty is defined as “the ability to make minimum investments in resource improvements to maintain or enhance the quantity and quality of the resource base – to forestall or reserve resource degradation”.
- ↳ The authors state that not all investment poor are welfare poor, but most welfare poor are investment poor.
- ↳ That is to say that one may have enough income to get by, but not enough invest in natural resources.

↳ Hence, accordingly environment-poverty connections are affected by the following:

- level of poverty,
- type of poverty,
- type of environmental problem,
- distribution of poverty across households, and
- Income, investment, and land use strategies of rural households and communities.

Since environmental sustainability is a key dimension of sustainable development and poverty reduction is the core of the MDGs, in order to properly understand the sustainable development-MDG linkage, it is essential to grasp the environment-poverty nexus.

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.
- 🏭 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, those most affected by desertification and by the floods, storms and harvest failures brought about by global warming are the poor.
 - 🏭 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.

6.4.2. Environment-poverty myths

There are **three** popular **myths**:

- 🦋 Poor people are the principal creators of environmental damage;
- 🦋 Population growth leads to environmental degradation; and
- 🦋 The poverty-environment nexus basically stems from low incomes.

While in many ways, the poor are thought of as being environmental destructive because of their large reliance on the environment and natural resources to survive; however, in comparison to people who are wealthy, their impact is much less.

- The wealthy generate more pollution and more waste, and live lifestyles that add more to global climate change and the degradation of the environment.
- ☺ The connection between population and environmental degradation is more complex than a cause-and-effect relationship.
- ☺ In the beginning as the population of an area increases, degradation may increase as well. However, population growth is not necessarily directly correlated with environmental degradation; what is more important to examine is population density of an area and degradation. A high population density is essential for environmental sustainability.
- ♠ The environment-poverty nexus is a very complex interaction.
- ♠ To simplify the relationship to being caused only by low incomes omits all the other factors that impact the interaction. Ownership of natural resources, access to common resources, strengths or weaknesses of communities and institutions, way information about entitlements and rights to resources is shared, and way people cope with risk and uncertainty are all factors that affect the way that people and especially people in poverty behave in relation to the environment.

“Poor people are the principal creators of environmental damage.” Not true.

Even though poor people bear the brunt of environmental damage, the irony is that they are not its principal creators. It is the rich who pollute and contribute most to global warming. They are the ones who degrade the global commons, making resources scarce for poor people. In many areas, the non-poor, commercial companies, and state agencies actually cause the majority of environmental damage through land clearing, agro-chemical use, and water appropriation. The rich also generate more waste and create stress on nature's sink. Thus poor people become victims of the consumption levels and patterns of the rich.

“Population growth leads to environmental degradation.” There's no necessary correlation. While initially degradation may occur as population increases, what happens next is context-specific. Rapid population growth is not incompatible with sustainable management of

the environment and in some cases, as has been demonstrated in the Machakos experience in Kenya, increasing population density is required for environmental sustainability.

The Machakos experience clearly demonstrates that even in an area vulnerable to soil degradation, a large population can be sustained through a combination of endogenous and exogenous technological change supported by a conducive policy framework and much local initiative.

“The poverty-environment nexus basically stems from low incomes.” It’s not that simple. Arguments that maintain that poor people degrade the environment basically explain the poverty-environment nexus in terms of income levels only. The poverty- environment nexus is more complex. Questions of ownership of natural resources, access to common resources, the strength or weakness of communities and local institutions, the way information about poor people’s entitlements and rights to resources is shared with them, the way people cope with risk and uncertainty, the way people use scarce time – all these are important in explaining the environmental behavior of poor people.

Many of the natural resources that are degraded are communal property. Rights are ill-defined, often because they were originally defined within a local social and political framework that is no longer there. Institutions for managing common property that reflect the consensus of owners and can control use are lacking. In ecologically fragile ecosystems, people tend to minimize risks, not maximize output, whether they are poor or rich. Over-exploitation of sources of fuel-wood is linked more to the time available to women than to their poverty status. There is a gender dimension, but not necessarily an income dimension.

Many factors shape human behaviour towards the environment, some related to poverty or affluence, others independent of either income or poverty.