

UNIT 4 CONSEQUENCES OF POPULATION CHANGE

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4.0 INTRODUCTION

We know that the population during ancient time was experiencing a high mortality due to lack of progress in science and technology. Therefore, the concern about population in ancient societies was restricted to replacement of population lost through the unusually high mortality. During Greek period there were some definite views on population. For example, Plato, the great Greek philosopher, emphasized that for human perfection stability of population is indispensable. In other words, he emphasized the importance of quality of population rather than mere quantity. Kautilya, ancient Indian administrator and economist was of the view that too few people is a greater evil than too many. At the height of the Roman Empire, being *pro-natalist* was more common. Cicero was of the view that rapid population growth is necessary to replace war casualties; this was an era of colonization which would be easier with more people.

However, with decline of the Roman Empire an *anti-natalist policy* started gaining ground. It was a period of economic stagnation and "fatalist period" of European history. Celibacy was considered to be the highest form of human existence. By the thirteenth century, slight changes in the anti-natalist policy were visible. For

example, Thomas Aquinas argued that marriage and family building were not inferior to celibacy. With the growth of mercantilism, where nations were built on increasing trade and wealth, population assumed new importance. Thus, there were different views and policies as a response to changing population situations. Such efforts have gradually led to theorizing about the population changes keeping in view the consequences of population change.

In this unit, we attempt to present you different views, schools of thought or the theories of population change and the consequences or effects of population change on important aspects such as education, social development, environment, economic development and welfare measures.

4.1 OBJECTIVES

After going through this unit, you should be able to:

- Explain important theories of population change; and
- Analyse the consequences of population change on education, social development, environment, economic development and welfare measures.

4.2 THEORIES OF POPULATION CHANGE

There have been divergent views on population situations which have contributed to formulation of important theories of population change. Important of them are: Contribution of the Ancient Greek and the Roman thinking about population, Pre-Malthusian Thinking on Population, Malthusian Theory, Optimum Population Theory, and Theory of Demographic Transition.

4.2.1 Ancient Greek and Roman Thinking about Population

In the Greek scheme of political life, the individual was only a part of the state and he/she had to play a subordinate role to it. In ancient Sparta, all Spartans were compelled to get married and celibacy was punishable by law and denounced in public. Procreation within marriage was emphasized, as the continual wars demanded a constant supply of able-bodied men. Deformed babies were invariably eliminated. Fathers who had sired three or four sons were publicly rewarded in Sparta. Plato and Aristotle considered the problem of population size not so much in economic terms, but more from the point of view of defense, security and government. Plato, in his laws held that if the so-called "highest good" was to be achieved the city-state should have 5,040 citizens. In the event of either excess or shortage of population he proposed measures to maintain desired size. In the case of under-population, he recommended rewards, advice or rebuke to the young in order to increase the birth rate and immigration. To remedy over-population he proposed birth control for large families, and if necessary, colonization. Aristotle in his "Politica" held that land and property could not be increased as rapidly as the population would grow and concluded that an excessive number of inhabitants would increase poverty and social ills (Miller, Fred D. 1995).

The Romans viewed population questions in the perspective of a great empire rather than a small city-state. They were less conscious than the Greeks of possible limits to population growth and more alert to its advantages for military and

related purposes. Roman writers encouraged procreation by granting certain privileges to married couples with children on the one hand, and by taxing and disinheriting those who did not get married or have children.

Early and mediaeval Christian writers considered questions of population almost entirely from a moral and ethical standpoint. On the one hand, they condemned polygamy, divorce, abortion, infanticide and child exposure, and on the other, they glorified virginity and continence and frowned upon second marriage. Some early Christian writers attributed the growth of world's population to want and poverty and cited pestilence, famine, war, etc., as nature's means of reducing excess population. Whereas, some others favoured high birth rates because of the constant threat of depopulation through famines, epidemics and wars.

The views of Muslim authors on population resemble those of Hebrew and Christian authors. The worth noting among Muslim writers was Ibn Khaldoun (1332-1460), an Arab author of the fourteenth century. In the first place, he held that a densely settled population was conducive to higher levels of living since it permitted a greater division of labour, a more effective use of resources, and military and political security. Secondly, he maintained that favourable economic conditions and political order stimulated population growth by increasing natality and checking mortality. He also sounded a note of warning stating that economic progress also encouraged luxurious living, led to higher taxation and brought about political instability, which in turn caused economic depression and depopulation.

4.2.2 Pre-Malthusian Thinking on Population

The period between the beginning of sixteenth century to the end of eighteenth century is known for rapid changes that took place in several aspects of human life. It was the beginning of modern age. During this period new routes to India were explored, America was discovered, gun-power and printing were invented and a new impetus was provided to arts and sciences as well as to trade and manufacturing. Old feudal system collapsed making way to capitalism.

Mercantilist, Physiocratic and Related Views: Mercantilist doctrine oriented towards economic policy did not develop a population theory in a strict sense, although views on population occupied a prominent place in the mercantilist system.

Mercantilist ideas dominated economic thinking in most of Europe during much of the seventeenth and part of the eighteenth century. They attached utmost importance to industry and foreign trade because these activities alone could earn precious metals like gold. As a result, they favored large population and large labor force.

According to Botero (1956) the strength of the state is to be found in its population and the predominance of industry over agriculture. However, he also noted that population tends to increase to the full extent made possible by human fecundity, while means of subsistence and their capacity to increase it were limited and, therefore, imposed a ceiling on population increase. This limit on population growth manifested itself through poverty which discouraged marriage, and through periodic calamities such as wars and pestilence. Botero advocated the establishment of colonies which could help to absorb a surplus population and

at the same time would strengthen the power of the state. Thus, the Mercantilist writers in general stressed the advantages of large and growing population and favoured policies of stimulating population growth including measures to encourage marriage and large families, to improve public health, to check emigration to other countries and to promote immigration especially of skilled workers. Some other mercantilists, like Child, Coke, Devenant argued that wealth itself consists in the largest possible population. Population was not only an important factor in the power of the state but also played a role in increasing the state's revenue and wealth. They asserted that the density of population is the basis of wealth. He argued that when population is scarce, people can easily obtain their livelihood and that, as a result, they would become lazy. On the contrary, under conditions of high density people would have to work hard to live which creates attitudes favouring economic activity and industry. According to most mercantilist writers, the benefits of a larger population and additional labour would be particularly great, if they served to develop manufacturing. Manufactured products could yield increasing returns as they could be exchanged abroad for precious metals.

The *physiocratic school of thought* was in part a reaction against the ideas and policies proposed by mercantilist writers, and consequently opposed state intervention, trade regulation and other aspects of mercantilist thinking. Unlike the mercantilist, the physiocrats found the agricultural sector to be most strategic: the growth of the entire economy was supposed to be governed by the increase in agricultural produce. The physiocrats did not agree with the mercantilist policy of increasing population even at the expense of levels of living. Nevertheless, they took a generally favourable view of population growth on the condition that it was possible to expand agricultural production to support the increasing population (Bhende and Kanitkar, 1993).

Some of the ideas of the physiocrats were shared by Cantillon who in other respects can be considered mercantilist writer. He believed that land was the main factor determining wealth, and that population would be limited by the amount of agricultural production. In his explanation of population trends, Cantillon (quoted in Bhende and Kanitkar, 1993) distinguished between maximum people living at subsistence level and the wealthier classes such as royalty, landowners, etc., who were willing to either give up or postpone marriage in order to maintain higher standard of living. Immediate predecessors of Malthus like Condorcet, Godwin were optimistic about the future due to the influence of the French Revolution and the ideas of liberty, equality and fraternity. Adam Smith (1776) the Father of Economics was influenced by the Industrial Revolution in England. He advocated naturalism in his book 'Wealth of Nations' (1776) and expressed optimism about the future of world.

4.2.3 Malthusian Theory

Thomas Robert Malthus was an English Clergyman, a Wrangler in Mathematics by education and a college professor of History and Political Economy. His views on population provided the first systematic approach to study of population. His views were published in 1798 in his first essay "An essay on the principle of population" which emphasizes that population affects the future improvement of society with remarks on the speculations of Mr. Godwin, Mr. Condorcet and other writers. William Godwin, a philosopher and social reformer, and Condorcet,

a mathematician and philosopher, had tremendous faith in science. According to them science would help to multiply the food supply, and men will be able to live with little work and more leisure. According to them men's will-power is sufficient to control procreation. Contrary to it, Malthus (1798, p.18) put forth the '*pessimistic view*' which stated that a large and growing population is a burden for the society and a cause of poverty, misery and all types of societal problems. He postulated that populations have a tendency to grow at a faster rate than the means of subsistence.

The basic assumption underlying Malthus population theory is that reproduction is faster than production. He expressed this in mathematical terms, as it was easy to convey the message. According to him population increased in geometric series (i.e. 1,2,4,8,16,32,...) while food production increased in arithmetic series (i.e., 1,2,3,4,5,...). That means, with every increase in population further increase becomes easier which is not exactly the same in the case of food production. However, he also stated that population is necessarily limited by the means of subsistence. Population invariably increases more than the means of subsistence increases, unless prevented by some very powerful and obvious check. These checks, according to him are in the form of *moral-restraint*, *vice* and *misery*. The former two he termed as preventive checks and the last as positive checks. Under moral restraint he considered late marriage, prostitution, extra-marital sexual relation and abortion, while under the umbrella of misery comes epidemics, wars, famines, etc. His theory is referred to as Malthusian dilemma or Malthusian trap. This is, of course, a different theory, which was stated by Ricardo later.

In general, Malthus appears to assume diminishing returns from land. Unrestrained population growth can be prevented by late marriage coupled with economical use of available resources. He substantiated his theory by reviewing the situations that prevailed in various countries. His theory was a landmark in the history of population theories. In recognition of this, the population theories were later referred to as *pre-Malthusian*, *Malthusian* and *post-Malthusian theories*. He also stated that if wages of labourers are increased, they will produce more children and poor people will multiply. It implied that he assumed positive relation between income and fertility.

Criticism of Malthusian Theory: The importance of Malthusian theory can be measured by the number of books/articles written favouring or criticizing him. There are three major aspects in his theory which are subjected to strong criticism. They are:

- 1) the assertion that food production cannot keep up with the population growth,
- 2) the belief that moral restraint was the only acceptable preventive check, and
- 3) the conclusion that poverty was an inevitable result of population growth.

Malthus's conclusion that population would double in a period of 25 years was based on the evidence of doubtful statistics. He placed undue emphasis on the limitation of the supply of land. David Glass criticized him as a poor prophet because his model did not consider the enormous impact of technological progress in offsetting the growth-inhibiting forces of rapid increase in population. The availability of food could be increased by improving production and productivity. All countries, therefore, have the potential of escaping the Malthusian Population Trap. The agricultural revolution of the nineteenth century brought rotation of

crops, chemical fertilizers, plant and animal breeding and improvements in the quality of livestock which tremendously increased the agricultural production. The gloomy predictions of Malthus, therefore, did not come true. Moreover, it is argued that the tendency for diminishing returns in agriculture will be more than compensated by improved productivity in manufacturing. The neo-Malthusians also believed that modern artificial contraceptives are better than moral restraint. He also could not visualize that with development more and more couples, even the poor, will accept contraception on their own. After industrial revolution one by one all the countries in Europe, America and Oceania experienced fertility decline. Further, the pessimistic attitude reflected in increased poverty was questioned in the light of technological development, which comes to the aid of mankind. It helps in improving the production, in discovering substitutes and in finding new sources of satisfying needs. Moreover, population pressure was eased by large-scale migration to the New World, a possibility which he did not foresee. It was also said that his ideas were not original and the usage of mathematical language was inappropriate. The use of arithmetic and geometric series was the weakest link in his theory.

The Classical and Neo-Classical School of Economics: The classical economists incorporated in their theory of wages the views of Malthus. They postulated that wages tend towards a level which is just sufficient for them to survive: If wages were above subsistence level production will be more and will bring the wage back to subsistence level. Let us examine how this could happen. As long as subsistence wage is the deciding factor, when population increases the wage will go below subsistence level which will lead to a decline in population because of poverty and starvation. Then, slowly there will be labour shortage and competition among producers to obtain labour resulting in wage increase. This in turn will lead to population increase and surplus labour and subsistence level equilibrium of wages will be restored. But, they also recognized that wages will be determined by the supply of labour and demand for labor and the demand will be determined by capital.

The law of diminishing returns supported by the Malthusian doctrine stated that population growth tends to depress per capita production meaning, thereby, that after the ratio of workers to resources reaches a certain point, any further increase in population would cause a fall in the average production per worker. Diminishing returns, however, were thought to be typical for agriculture only, whereas industry, with the possibilities it offered for increasing the division of labour and continued technological improvement was assumed to be working under either constant or increasing returns. Decreasing returns in agriculture were expected, at least beyond a certain point, because first, the quantity and quality of land was fixed and, secondly the opportunities for a far-reaching division of labour and technological progress were limited in agriculture.

J. S. Mill, one of the classical economists believed in Malthus's theory with qualifications. Mill (1848) was a strong advocate of birth control. His basic thesis is that standard of living is the major determinant of fertility levels. According to him, the rational thinking in man will help to restrain growth. Also, he was a strong advocate of women's cause. He was convinced that women, compared to men, desire less number of children and if they are allowed to pursue their desire the fertility will decline. He believed in equal rights for men and women and that the low status of women plays major role in high fertility.

According to Marx (1867), any society based on private ownership of means of production has two classes: haves and have-nots. In a capitalist society, labourers who are have-nots are exploited by haves, i.e. the class which owns means of production; it is built in this system that due to vested interests, haves will invest more and more in fixed assets, and will not be interested in creating more employment opportunities. This will gradually lead to unemployment, which will be perceived as over population.

4.2.4 Optimum Population Theory

Optimum population theory received attention in 1920s and 1930s even though an element of the theory was found in the writings of earlier scholars as well. The basis of the theory of optimum population is the relationship between population and resources. The basic elements of the optimum population theory can be found in the writings of Sidgwick (1874). He observed that as a result of factors such as population size and growth, division of labour and the onset of diminishing returns, the productivity of labour tended to diminish as the proportion of labourers to land increased after a certain degree of density had been reached; that there is a point of maximum return per head, and this depended on the state of arts, the capital accumulated and technical progress.

In fact, optimum population is a point at which the population is neither too large nor too small, but is just enough to secure a maximum return per head under the given conditions of production (Lionel Robbins, 1927). Thus, the optimum population is determined by i) the available natural resources; ii) the skill, knowledge and habits of the population; and iii) the capital and technological progress. Given these factors there is one "right population", that is 'optimum'. The basic assumption limiting the theory is that, the particular population size is optimum, means other things are constant, which is not possible.

The concept of optimum population has been interpreted in several ways, to mean: the size of the population which results in the highest per capita income, the highest productivity as measured in different manners, or the highest level of other less well-defined economic indicators such as economic welfare, level of living, real income and in some cases employment. Economic optimum being too restrictive, some writers tried to include the total well-being, health, longevity of a nation, ideal family size, etc, in the optimum population theory. However, the economic optimum was the main consideration in the optimum population theory, and gradually the idea of a population of optimum size for maximum production was accepted.

Criticism on Theory of Optimum Population: Critics viewed optimum population theory as not a theory but the description of a desirable situation. Further, its assumption of other things remaining constant is impractical. In this dynamic world, things are constantly changing making any optimum obsolete in few years. Another problem pointed out is, the "optimum" population for each sector will be different. For example, optimum population for total production, for employment, for health, for education, etc will be different from one another. The merit of the theory, however, is that it is dynamic, it emphasized that whatever is considered over population today can be optimum or even under population if the technology improves the capacity of the country to maintain larger size of population.

4.2.5 Ester Boserup Theory

Ester Boserup (1965) indicated that population growth and the pressure it exerts are important stimuli for increasing agricultural yields. Population increase, which expands food requirements, also tends to produce increased food supplies by bringing about a shift towards more intensive land use. The basic premise has been that the primitive society would be able to sustain itself better than a stagnant population when it comes to generating genuine economic development. Boserup's hypothesis linked population growth to shifting technology. The genuine drive behind the process of economic development is population increase. Population increase destroys land causing search for new land to cultivate. Population sustained on a piece of land will deplete food potentials. When a particular density of population is reached, food production switches over to intensive land use employing improved technology. Adoption of new technology may be difficult if there is no population pressure.

Until recently, the idea that it is desirable to slow down or stop the population growth rate of the world had been virtually unchallenged. Recently however, new views have emerged. The thesis of economist Julian Simon (1977; and 1981) is illustrative of this and opposes the pessimists' approach. He views people as the ultimate resource — a vast pool of imagination, skill and industry that should not be limited. Simon has vigorously challenged the widely held view that there are or will soon be too many people on Earth. Simon argues that the economic evidence coming from the past suggests that population growth leads to the improvement of the living conditions and not to their deterioration. The death rate has declined and life expectancy increased over the past 50 years, as has the population. He believed that there are two features of population dynamics. *First*, the very pressure produced by the needs of the population will stimulate activities to meet the pressure, e.g. advancement of agricultural technology. New technologies would offer alternatives to depleting resources thereby making them infinite, contrary to the general understanding. *Second*, with more people there are more minds available to apply themselves to relevant questions. Simon's views balance some extremists on the other side of population issues.

4.2.6 Theory of Demographic Transition

In Europe, with improvement in agricultural techniques like crop rotation, use of fertilizers, use of agricultural equipments, etc. food production increased. This released some persons from agriculture who migrated to cities. At the same time, industrial development resulted in improved standard of living of masses. General improvement in sanitation, changes in the habits of personal hygiene, medical improvement, immunization and so on helped to bring down death rates. All these changes had effect on fertility. People were motivated to obtain their desired family size through use of birth control methods. Thus, fertility also started declining slowly at first and rapidly later. This process of change from high birth and death rates to low birth and death rates has been called "*demographic transition*".

The demographers such as Landry (1909) and Warren Thompson (1929) had attempted to construct a typology to describe the transition from conditions of high mortality and high fertility to conditions of low mortality and low fertility. C. P. Blacker (1947) attempted to identify the following *five phases*.

- 1) The high stationary stage – characterized by high birth rates and high death rates;
- 2) The early expanding stage – characterized by high birth rates and high but decreasing mortality;
- 3) The late expanding stage – characterized by falling birth rates but more rapidly decreasing mortality;
- 4) The low stationary stage – characterized by low birth rates balanced by equally low mortality; and
- 5) The declining stage – characterized by low mortality and lower natality but deaths exceeding births.

Later on, Frank Notestein (1945) identified industrialization, urbanization and modernization as the casual mechanisms, which bring about decline in mortality and fertility. The reason for population growth during the transitional stage was also identified. It was stated that mortality always starts declining earlier and fertility declines after a lag. This time lag leads to population growth. Finally, when the transition is complete the new balance is established. According to him, the stages are:

- 1) *Old Balance* – both birth and death rates are high, growth rate near zero,
- 2) *Transitional stage* – High growth rate: a) Early transition, birth rate high and death rate declining, b) Mid-transition – both birth and death rates declining, c) *Late transition* – death rate almost constant at low level and birth rate still declining,
- 3) *New balance* – Both birth and death rates low, and growth rate near zero, and
- 4) *Post-transitional stage* – Negative growth rate, i.e. death rate greater than birth rate.

Limitations of the Demographic Transition Theory: It is only a narration of historical events of the present day developed countries and cannot explain the situation of present day developing countries. Today the term ‘demographic transition’ means simply a change in fertility and mortality from high to low rates. The assumption that fertility-decline in Less Developed Countries (LDCs) would require a typical sequence of economic development is no longer valid. The mortality-decline in LDCs at unprecedented rate was the result of ready-made technology borrowed from More Developed Countries (MDCs), thus experienced mortality-decline without substantial development. Similar argument cannot be made about fertility-decline in LDCs which is slow yet some LDCs started showing. The LDCs started showing decline of birth rates unaccompanied by urbanization, industrialization, and the like. For example, Bangladesh with \$160 per capita GNP had reduced its birth rate from 47 in 1960 to 41 in 1986. Similarly, India did bring down its birth rate from 48 in 1960 to 26 in 1999 – with a per capita income of about \$440 only. This situation has created doubts about the applicability of the theory to LDCs and the need to modify it. The theory is based purely on deductive logic. In traditional societies, fertility and mortality were high. In modern societies, fertility and mortality are low. In between there is demographic transition (Bhende and Kanitkar, 1993).

Kingsley Davis (1963, pp.345-366) in his demographic theory of change and response examined what happens when mortality declines. More children will survive and reach adulthood. This will put pressure on family resources. Thus, people being rational will respond to the declined mortality rate by reducing fertility and thereby reducing the population pressure.

Check Your Progress

Notes: a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under “Answers to ‘Check Your Progress’ Questions”.

1) i) What is the basic assumption behind Malthusian theory?

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ii) What are the basic determinants of an optimum population?

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iii) What are the different demographic stages explained in the theory of demographic transition?

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4.3 CONSEQUENCES OF POPULATION CHANGE

In the above section, we have discussed theories of population change which focused on the bases of population change. However, there are many important and essential aspects of life such as education, social development, environment, economic development and welfare measures which are affected by the changes in the population. We will discuss, in brief, the consequences of population change on these aspects.

4.3.1 Effects on Educational and Social Development

In MAE-001, you learned about formal, non-formal and informal education. These forms of education collectively and indisputably are the desirable and

most effective means to promote among people the desirable knowledge, values, attitudes, behavior and skills which enable the societies and nations to function effectively in an integrated global society. Education helps people in promoting their all round development and make the world a better place to live in. The goal of education is to make people wiser, knowledgeable, better informed, ethical, responsible, critical, and capable of continuing to learn. It provides a critical reflection on the world, especially on its failures and injustices to mankind, for greater consciousness and awareness, for exploring new visions and concepts, and for inventing new techniques and tools. All these get affected, quantitatively and qualitatively, by the large and fast growing population. The ultimate goal of peace and happiness to humankind and its liberation is possible essentially through proper education. But, adverse population changes inevitably affect effective realization of such goal.

Education is one of the most important indicators of social development and human prosperity. Education is an instrument not only of social and psychological change but also of scientific and technological knowledge in different fields of life. Now, it is well accepted fact that the level of prosperity of a nation depends upon the level and quality of education imparted to its citizens. It provides answers to many social, political, economic, and psychological problems of the society. Education is, no doubt, the panacea for most of the social evils. It has been one of the basic social forces for the formation of a desirable society. It has become an essential concern of every society and the nation to provide good education to all its citizens. Given such concern, rapid increase in population will seriously affect educational endeavours of the state in meeting the growing needs, demands and aspirations of diverse categories of people.

The outcomes of education have been most vigorously contextualized in terms of relationship between education, society and the economy. Most of the developing countries view education as a radical agent for social transformation and progress. The most striking feature of developing country is the migration of educated persons from villages to cities in search for higher education and/or employment which has brought both social change and development. Thus, education is firmly woven to the fabric of socio-economic life and seen as vital to the development and maintenance of advanced industrialised societies and the nations. Any significant change in population, calls for suitable changes in the educational effort of the state. Rapid growth in population means more additional efforts, both quantitative and qualitative, on the part of the Government and also the society. If such efforts of educational expansion are not proportionate to the growth of population, the growing educational needs and aspirations of the population cannot be met adequately, and eventually the system fails to give satisfactory results. It may lead to failures in achievement of universal enrolment, retention and achievement in education at different levels. As a result, the social development also gets affected. Disparities in education arise between and across various social groups based on gender, age, caste, religion, region, and so on resulting in social frictions affecting different groups, and thus, finally affecting their development and harmony in the society and in the national efforts as a whole.

In today's world, education plays paramount role in social, economic and technological development. It has a positive contribution to combating problems related to poverty, environmental degradation, population control, nutrition, health

and overall quality of life of people. Scientific or systematic education has a unique role to play in facilitating sustainable development by building people's capacities, especially in areas of eco-technology and development of renewable energy sources which can ensure the widespread availability of scientific information to them. It provides motivation, justification, and social support. It increases the capacities of people to transform their vision of society into operational realities. Improving the quality and coverage of education and reorienting its goals to recognize the importance of social and economic development must be among society's highest priorities. But, the pressure of growing population will have nullifying effect on the actual result in these fronts. Thus, the efforts of the government in the field of education in terms of providing equitable education, promoting equal opportunities for education with suitable teacher-pupil ratio, other facilities, etc at all the levels of education, and finally generating sustainable employment to utilize the trained-manpower will be adversely affected by undesirable changes in the population situation of a nation.

4.3.2 Effects on Economic Development: Environmental Degradation

Environmental degradation has been the global concern in recent times. Quality of land, water and air has increasingly been affected by the growing population. This has been due to expansion of economic activities as a consequence of growing population. Hence, in this sub-section, we will focus on how economic activities have diversified and intensified thereby causing increased degradation in environment.

4.3.2.1 Land Degradation: Erosion of Soil and Forests

India supports approximately 16 per cent of the world's human population and 20 per cent of the world's livestock population on merely 2.5 per cent of the world's geographical area. Decline in forest cover and depletion of soil nutrients are the two most important forms of land degradations. In fact, the land degradation is associated with the habitat alternation leading to the decline and disappearance of biodiversity. Human beings share this Earth with more than a million of plant and animal species linked with each other in the food-chain and complex system of food-web. Any disruption in this system is not free from the price that needs to be paid in terms of loss of support system for each one of us on this planet. Looked from this perspective land degradation ultimately degrades the biosphere (UNDP, FAO, and UNEP, 1993).

Increasing pressure for land is leading to deforestation. But, deforestation does a great harm to the biosphere. It is estimated that during the period 1700 to 1980, the forest and woodland declined by nearly 20 per cent, whereas the cropland increased by 460 per cent. However, globally, the pace of change has accelerated with more cropland expansion occurring in the 30-year span from 1950 to 1980 than in the 150-year span from 1700 to 1850. The process of decline of the forestland has, however, gone unchecked and the expansion of cropland is encroaching into the marginal area like the tropical forests, steep hillsides, and semiarid regions — that have fragile ecosystem. Further, the world commodity markets for the goods such as cotton, tea, bananas, coffee, sugar and beef have contributed significantly to forest conversion (World Resources, 1994-95).

The expansion of global agriculture has taken a heavy toll on soil health. Soil productivity depends on its organic matter and soil humus. It is estimated that agricultural activity has reduced the world supply of organic carbon in soil humus by about 15 per cent of its original pre-agricultural stock. The principal causes of such soil degradation are over grazing, deforestation and agricultural activities. Excessive irrigation has converted the fertile land into wastelands by increasing the salinity and alkalinity of soil in the irrigated land. The states of Punjab and Haryana are most sufferers of this menace affecting the thousands of farmers in these states. Salinity and alkalinity directly affect the productivity of soils by making the soil unfavourable for good crop growth. Indirectly, it lowers productivity through adverse effects on the availability of nutrients and on the beneficial activities of soil micro-flora. According to Brandon, Hommann and Kishor (1995), based on FAO data the loss in crop production due to salinity and alkalinity in India amounts to 6.2 million tonnes and 9.7 million tones respectively.

The land- and soil-degradation not only affects the productivity, but also disturbs the ecosystem ultimately, mainly by destroying the sources of sustenance for many plant and animal species. The decline in bio-diversity is also an important threat to the existence of mankind in the long run.

The pollution of soil with heavy metals due to improper disposal of industrial effluents and use of domestic and municipal wastes and pesticides is becoming a major concern. Though no reliable estimates are available of the extent and degree of this type of soil degradation, it is believed that the problem is extensive and its effects are significant. Some commercial fertilizers also contain appreciable quantities of heavy metals, which have undesirable effects on the environment. The indiscriminate use of chemical fertilizers and pesticides is often responsible for land degradation. Increasing incidence of landslides is another area of concern due to land degradation. In many parts of Himalayas due to degradation of lands resulting from deforestation, road construction and mining and quarrying, occurrence of landslides has posed a serious threat to the settlements on the slopes.

Recently the frequency of floods has increased in India. This is largely due to deforestation in the catchment areas, destruction of surface vegetation, changes in land-use, increased urbanization, and other developmental activities. Processes leading to flooding are becoming more common due to increased sedimentation and reduced capacity of drainage systems.

Land management has been largely unsystematic, arbitrary and, by no means, sustainable. So far the country has not implemented a well-defined integrated land use policy. This lacuna has largely been responsible for the current phase of land degradation.

To make things worse, there is no rural fuel-wood as well as grazing and fodder policy also at the national level; with the result, grazing is far beyond the carrying capacity and extraction of fuel and fodder from forests is also far beyond the sustainable limits, creating enormous negative impacts on the forests and land. Land management in conjunction with water management needs to be the core of any agenda for national development as the two resources are absolutely inter-dependent and cannot be dealt with independently (Govt. of India and UNEP, 2001).

4.3.2.2 Water Pollution

Comprising over 70 per cent of the Earth's surface, water is undoubtedly the most precious natural resource that exists on our planet. Water pollution occurs when a body of water is adversely affected due to the addition of large amounts of undesirable materials to the water. When it is unfit for its intended use, water is considered polluted. Two types of water pollutants exist; point source and non-point source. Point sources of pollution occur when harmful substances are emitted directly into a body of water. The Exxon Valdez oil-spill best illustrates point source water pollution. A non-point source delivers pollutants indirectly through environmental changes. An example of this type of water pollution is when fertilizer from a field is carried into a stream by rain, in the form of run-off, which in turn affects aquatic life. The technology exists for point sources of pollution to be monitored and regulated. Non-point sources are much more difficult to control. Pollution arising from non-point sources accounts for a majority of the contaminants in streams and lakes. The major sources of water pollution can be classified as municipal, industrial, and agricultural. Municipal water pollution consists of wastewater from homes and commercial establishments. Industries markedly differ in their potential of polluting water, however it is possible to treat the wastewater and reuse in the industry. Increasing use of fertilizer and pesticides in the agricultural activities pollute both the surface and ground water and make it unfit for drinking and its use for cultivation.

Exploitation of petroleum and radioactive substances for industrial and nuclear purposes poses serious threat to water bodies. These large-scale accidental discharges of petroleum are an important cause of pollution along shorelines. Besides the supertankers, offshore drilling operations contribute a large share of pollution. One estimate is that one ton of oil is spilled for every million tons of oil transported. Water bodies are exposed to the risk of wastes due to uranium and thorium mining and refining. Mines and mining wastes account for the major part of the discharges of heavy metals into water.

Nutrients, mainly nitrogen and phosphorus contribute to the eutrophication of lakes, rivers and marine waters. Approximately half of the nitrogen discharges are estimated to originate from agricultural land. Eutrophication is harmful for the growth and survival of aquatic life, as it does not allow the sunrays to go inside the water.

4.3.2.3 Air Pollution and Green-house Effect: Global Warming

The green-house gases play a crucial role in regulating the heat balance of the Earth. These gases allow the incoming short-wave solar radiation to pass through the atmosphere relatively unimpeded, but the long-wave terrestrial radiation emitted by the Earth's surface is partially absorbed and then re-emitted by a number of trace gases in the atmosphere. These gases known as GHGs (green-house gases) include: Water vapour, Carbon-dioxide, Methane, Nitrous oxide and Ozone in the troposphere and in the stratosphere.

The green-house gases (Carbon dioxide, Methane, etc.) prevent some of the heat radiation from the Earth from escaping into space. The concentration of green-house gases is increasing which is presumed to raise the temperature of the Earth in a long-term perspective. Eighty percent of the effect of the green-house gases is caused by carbon dioxide.

As a result of the green-house gases, the temperature of the Earth's surface is rising. This rise in the Earth's temperature is known as *global warming*. Global warming can have major physical, environmental and socio-economic consequences. This is also referred as climatic change. The global warming could cause changes in precipitation patterns, ocean circulation and marine systems, soil moisture, water availability and sea level rise. This would make an impact on agriculture, forestry and natural eco-systems. A rise in sea level threatens sections of all the coastal states of the country. A rise in sea level would inundate wetlands, erode shoreline, exacerbate coastal flooding, increase the salinity of estuaries and aquifers and impair water quality.

Vehicular pollution is major source of air pollution and increasing green-house gases in the atmosphere. Total number of vehicles in India has increased from about 11 million in 1986 to more than 33 million in 1996. A large number of them are concentrated in metropolitan cities. The important aspects of vehicular pollution that are affecting the air quality are types of engine used, age of the vehicles, poor road conditions and congested traffic. The principal vehicular pollutants are Carbon Monoxide, Oxides of Nitrogen, Hydrocarbons, suspended and particulate matters, a varying amount of Sulphur Dioxide depending on the Sulphur content of the fuel and lead compounds (Andrew, 1986).

Discharges and emissions of heavy metals are difficult to estimate. A large proportion of emissions/discharges of heavy metals into air originates from the iron and steel industry. Road traffic is the main source of lead emissions. Sulphur dioxide and nitrogen oxides emitted into the air are converted into acids. At their deposition they have an acidifying effect on soil and water. The emission of ammonia also contributes to the acidification. Main sources of sulphur dioxide are burning of sulphur containing fuel like coal power stations and oil by vehicles, and refining of oils in refineries (for more see Table 4.1).

Table 4.1: Some Major Air Pollutants and their Sources

Pollutant	Source
Carbon monoxide	Incomplete fuel combustion (e.g. two stroke engine)
Sulphur dioxide	Burning of sulphur containing fuel like coal in power plants and oil by vehicles
Suspended particulate matter	Smoke from domestic, industrial and vehicular sources
Oxides of nitrogen	Fuel combustion of motor vehicles, power stations and furnaces
Volatile hydrocarbons	Partial combustion of carbonaceous fuels by two stroke engines, industrial processes, disposal of solid wastes.
Oxidants and ozone	Emissions from motor vehicles, photochemical reactions of nitrogen oxides and reactive hydrocarbons
Lead	Emissions from motor vehicles

Source: Central Statistical Organization (1999).

Recently, environmental issues are also taken up actively by women. This is known as eco-feminism in the academic literature. They argue that plundering of Nature is the result of men's greed and amounts to the increased suffering of women as it depletes sources of day- to-day sustenance like food, water, fuel, and fodder for which women are put to more drudgery to acquire them in the event of their depletion in their vicinity.

Various impacts of development process on environmental degradation is presented in Table 4.2.

Table 4.2: Some Impacts of Development Activities on Environment

Development activities	Major impacts on environment
Forest clearing and land resettlements	Extinction of rare species of flora and fauna, creation of condition for mosquito breeding leading to infectious diseases such as malaria, dengue, etc.
Shifting cultivation in upland agriculture	Soil erosion in upland areas, soil fertility-declines due to shorter cultivation cycle, which is practiced due to population pressure, flooding of low land areas. (The problems could be resolved by terraced cultivation).
Agro industries	Air pollution due to burning of bagasse as fuel in sugar mills, large amount of highly polluting organic wastes, surface water pollution.
Introduction of new varieties of cereals	Reduction of genetic diversity of traditional monoculture resulting in instability, danger of multiplication of local strains of fungus, bacteria or virus on new variety.
Use of pesticides	The pesticides used in agriculture sometimes go into food chain or in water bodies and as such results in harmful health hazards.
Timber extraction	Degrades land, destroys surface soil, reduces production-potential of future forests.
Urbanisation and industrialization	Concentration of population in urban centers make huge demands on production in rural areas and put pressures on land, air and water pollution.
Water resource projects, e.g. Dam, extensive irrigation	Human settlement and resettlement, spread of water-borne diseases, reduction of fisheries, siltation, and physical changes e.g. temperature, humidity.

Source: Central Statistical Organisation (1999).

The different forms of environmental degradations are found to operate at different scale. The manifestation of environmental degradation at local, regional, continental and global scales is summarized in Table 4.3.

Table 4.3: Local, Regional and Global Effects of Pollution

Local effects	Regional	Over marine water and continents	Global
<ul style="list-style-type: none"> • Heavy metals in air, soil and plants, e.g. From industrial emissions and • Discharges. • Noise, smell, air pollution. 	<ul style="list-style-type: none"> • Eutrophication, • Contaminants in the soil, • Landscape changes due to mining or agriculture. 	<ul style="list-style-type: none"> • Eutrophication • Acidification • Environment Contaminants • Radioactivity 	<ul style="list-style-type: none"> • Change of the climate due to ozone depletion and the green-house effect.

Source: Central Statistical Organization (1999)

4.3.3 Effects on Welfare Measures

Adverse consequences of rapid growth of population have also diluted the effect of different welfare measures taken up by the government. This calls for additional welfare measures to increase the quality of people's welfare. In this sub-section (4.3.3) we present in brief the different welfare measures taken up by the government and how their effects were not so visible because of growing population.

4.3.3.1 Mid-day Meal Programme

The Mid-day Meal Programme was launched in 1995 to enhance enrolment, retention and participation of children in primary school and simultaneously improving their nutritional status. The number of children covered under this programme has risen from 3.34 crores in 1995 to 12 crores in 2006-2007 (Planning Commission of India, 2008). It is believed that Mid-day meal programme had a positive impact on school attendance and nutritional status of children. Rapid growth of population puts great pressure on the government and the public in meeting the growing demand in this regard. Thus, it will affect the programme, both qualitatively and quantitatively.

4.3.3.2 National Rural Health Mission (NRHM)

The National Rural Health Mission was launched to address the problems across primary health care and to bring about improvement in the health system in rural areas. The mission aims to provide universal access to equitable, affordable and quality health care, and accountable and responsive to the local needs. To achieve these goals, NRHM facilitates increased access and utilization of quality health services by forging partnership between central, state and local governments; and sets up a platform involving the Panchayati Raj Institutions (PRIs) and the community in the management of primary health programmes and infrastructure. However, the increasing population pressure on health facilities is causing a serious and ever growing concern.

4.3.3.3 Rashtriya Swasthya Bima Yojana (RSBY)

In order to provide accessible, affordable and accountable quality health services to households in rural areas, the government has launched NRHM. The RSBY

was launched to cover people BPL, unorganized sector workers and their families. The beneficiary will be required to pay Rs.30/= per annum as registration/renewal fee. The premium will be borne by the central and state governments. The package of benefits will include: i) cashless attendance to all covered ailments, ii) hospitalization expenses taking care of most common illnesses, iii) all existing diseases to be covered, and iv) transportation costs subject to prescribed limits payable to the beneficiary. Here also, the increasing number of population is adding to severity of the problems.

4.3.3.4 Sarva Shiksha Abhiyan (SSA)

The SSA has brought primary education to the doorstep of millions of children and enrolled them through successive fast-track initiatives to unserved and underserved habitations. Household survey, school-mapping, constitution of Village Education Committees (VECs), setting-up of Parent-Teacher Associations and a series of campaigns for enrolment were undertaken. The SSA intervention has brought down the number of out-of-school children from 32 million in 2001-2002 to seven million in 2007-2008 (Planning Commission of India, 2008). The SSA stipulates that 50% of additionally recruited teachers should be women. It has given the emphasis on improving girl’s enrolment, which is critically dependent upon increasing the proportion to 75% in educationally fragile states. To make SSA a success it is essential that additional pressure on it is avoided due to population growth and consequent non-schooling population and school drop-outs.

Check Your Progress

Notes: a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under “Answers to ‘Check Your Progress’ Questions”.

2) i) What are the various types of environmental degradation?

.....

ii) What is eco-feminism?

.....

4.4 LET US SUM UP

In this Unit, we have provided broader perspective of theories of population change such as pre-Malthusian thinking, Malthusian theory and post-Malthusian theories. It has highlighted the consequences of population change on education, social and economic development, environmental degradation and welfare measures.

4.5 ANSWER TO 'CHECK YOUR PROGRESS' QUESTIONS

- 1)
 - i) The basic assumption of Malthusian population theory is that reproduction is faster than production. According to Malthus, population increases in geometric progression while production increases by arithmetic progression.
 - ii) The supposed basic determinants of an optimum population are:
 - a) the available natural resources;
 - b) the skill, knowledge and habits of population; and
 - c) the capital and technological progress.Given these factors there is one "right population" that is the optimum population.
 - iii) Different demographic stages in the theory of demographic transition, according to C. P. Blacker (1947), are as given below.
 - a) The high stationary stage – characterized by high birth rates and high death rates;
 - b) The early expanding stage – characterized by high birth rates and high but decreasing mortality;
 - c) The late expanding stage – characterized by falling birth rates but more rapidly decreasing mortality;
 - d) The low stationary stage – characterized by low birth rates balanced by equally low mortality; and
 - e) The declining stage – characterized by low mortality and lower natality but deaths exceeding births.
- 2)
 - i) The various types of environmental degradations are: a) land degradation, b) water pollution, and c) air pollution.
 - ii) The environmental issues are also taken up actively by women. This is called as eco-feminism. They argue that plundering of Nature is the result of men's greed and amounts to the increased suffering of women as it depletes sources of day-to-day sustenance like food, water, fuel, and fodder for which women are put to more drudgery to acquire them in the event of their depletion in their vicinity.

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