



DIPLOMA IN RURAL DEVELOPMENT

DRD-05

Rural Resource Management

Block

2

RURAL ENVIRONMENT PROBLEMS

Unit – 1

Factors affecting the Ecological setting of Rural Environment

Unit – 2

Population Explosion

Unit – 3

Pollution – Air Pollution, Water Pollution & Soil Pollution

Unit – 4

Depletion of Natural Resources, Resource Crunch and their impact on Sustainable Development in Rural India



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DIPLOMA IN RURAL DEVELOPMENT

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Unit-1



Factor affecting the Ecological setting of rural environment

Learning Objectives:

After completion of this unit, you should be able to:

- *explain the concept of ecology*
- *list the major environmental or ecological factors affecting the rural environment*
- *list out the problems faced by rural people*
- *explain the laws and policies for protection of environment*
- *explain the factors responsible for disrupting ecological balance*

Structure:

- 1.1 Introduction
- 1.2 Environmental or Ecological factors affecting the rural environment
- 1.3 Problems faced by rural people
- 1.4 Laws and Policies
- 1.5 Maintenance of Ecological Balance
- 1.6 Let Us Sum Up
- 1.7 Key Words
- 1.8 References

1.1 Introduction

The Concept of Ecology and India's Social Ecology

India is a vast country spreading over an area of 33.67 million square kilometer, having 7.78 thousand kilometer of coastline. The large variation in climatic condition soil types, water bodies, vegetation types encountered in the countries endows with an endless variety of life between the snow-bound mountains of great Himalayas and the dark tropical forests. To the outsider, baffled by the heterogeneity of its races and their languages, beliefs and traditions, this country means little more than a geographical unit. To its people it is a vast



complex world whose organic unity is taken for granted. But, whether one tries to describe India in terms of its geography and natural resources, or explains it historically, the picture remains incomplete, and only a comprehensive view of the wide canvas of Indian life can lead to proper understanding of the country and its people.

The cultural unity of the Indian people springs largely from the agricultural character of the country. Even today, when industrialization is progressing and large scale migration taking place from rural areas to cities and towns, majority of the Indian people lives in villages and is dependent on land. Since time immemorial, agriculture has been a kind of religion in the country. The gods that are honored belong to the soil and are more or less the same all over the country. To understand India, one must, therefore, study its village life.

Indian Village Life

Rural people are often stereotyped and simple, but they usually know much more about their environment than many well-trained outsiders be they government officials or academic researchers. Farmers know the soils, the plants, the pests, the seasons, and the problems and risks, which they face. Farmers on their fields experience the sequence and conditions of their cultivation as a whole and have or good insight of the problems. Their adaptations are often skillful, sensitive, subtle and sophisticated. Of late, they are also-getting exposed to newer technologies that are relevant to rural setting.

Science and Technology for Rural Development

The principle that “simple is sophisticated” can apply in this scenario to choices made in research and development. Research and development decisions frequently lead to innovations, which are large-scale, costly, difficult to maintain and dependent on greater inputs, which have to come from outside the rural environment. The innovations may be profitable; but they tend to benefit those rural people, who are already better off, rather than the poorer marginal farmers and landless laborers. In contrast, innovations which are small-scale, cheap, easy to maintain and use locally available and renewable materials and inputs, are more likely to benefit the poor. At times, the formal research and development can miss opportunities or point them in the wrong directions. For example, for a rice



breeding concentrated heavily on responses to chemical nitrogen, which is often cornered by the larger farmers, to the neglect of improving nitrogen-fixation in the root zone of the rice plant, a biological technology which may be scale-neutral, cheap, renewable, and more readily available to many more of the smaller farmers. In this scenario, research and development need be directed towards those simple outcomes to which the poorer rural users will have better relative access.

The Indian subcontinent is one of the most fascinating ecological and geographical regions in the world. It lies at the confluence of the African, European and Southeast Asian biological systems. The variety of ecological systems sustains a huge amount of diverse forms. Among such ecological systems are the villages of rural India which support diverse forms of life with their vast natural resources. About 76% of India's population lives in about 5,76,000 villages. In the past, the villages were self sufficient. However, industrial transformation and population growth in the post-independence period accompanied by rising living expectations have resulted in tremendous pressure on the natural resources of the villages. The important life support systems such as cropland, wetland, woodland, grassland and rangeland/wasteland have been misused, overused and degraded. The system is no longer able to function properly.

Conservation and management of bio-productive systems and recycling of resources involve human labour as an important energy input. Sometimes a change in the physical environment disturbs the balance between men and natural resources of a village ecosystem leading to several changes in the socioeconomic and cultural life of the people. The aspect of culture that changes most radically is that linked to the environment. Several different methods have been employed to compute the human and animal energy used in work. The total food energy intake of a full-time farm worker (working 40 hours per week) can be used as a measure of the energy utilized in farm labor.

India is a land of villages. A large population of India belongs to rural areas. Some of these villages are sparsely populated, while others are densely populated. The physical structure of any rural society is an important aspect of rural sociology.



This is because it enables us to understand the patterns of settlement adopted by rural people, the spatial distribution of houses and the composition and density of rural population in a particular village. The size of the population and settlement patterns of villagers vary from one village to another, depending upon its ecological and environmental factors and the availability of natural resources.

Ecology is the study of interaction between organisms and their respective environments. It deals with the study of organisms in relation to the surroundings in which they live. The sum total of the surroundings in which organisms live is called environment of that organism. The environment' is made-up of different components, including other living organisms and their interactions, and pure physical features such as climate and soil type. The environment in which organisms live, thus, includes the physical environment (physical and geographical surroundings), and effects or influences exerted by other organisms or the biotic environment on an organism.

An environment includes circumstances, objects, and conditions by which a human, animal, plant, or object is surrounded. The study of ecology aims at understanding how an organism fits into its environment. The environment is of supreme importance to an organism, and its ability to exist in the environment will determine its success or failure as an individual. Ecology mostly studies the geographical factors, such as formation of land and surface, climate, natural wealth, population and regional imbalances. Social Ecology examines the relationship between human beings and natural environment in which they live. In short, social ecology studies both natural and social conditions. Sociologists view that the physical environment influences all institutions, social systems, economic conditions and way of living of people. Thus, geographical/physical and social factors are inter-dependent on each other and are inseparable.

Social Ecology, thus, study the social conditions of man, which include both the internal and external conditions of a society. External conditions refer to the geographic and economic factors, whereas internal conditions refer to social conditions, such as, traditions, customs, norms, values, way of living, etc. Thus, ecological factors include both geographical and social conditions.



Ecology is the scientific analysis and study of interactions among organisms and their environment. It is an interdisciplinary field that includes biology, geography, and Earth science. Ecology includes the study of interactions organisms have with each other, other organisms, and with abiotic components of their environment. Topics of interest to ecologists include the diversity, distribution, amount (biomass), and number (population) of particular organisms, as well as cooperation and competition between organisms, both within and among ecosystems. Ecosystems are composed of dynamically interacting parts including organisms, the communities they make up, and the non-living components of their environment. Ecosystem processes, such as primary production, pedogenesis, nutrient cycling, and various niche construction activities, regulate the flux of energy and matter through an environment. These processes are sustained by organisms with specific life history traits, and the variety of organisms is called biodiversity. Biodiversity, which refers to the varieties of species, genes, and ecosystems, enhances certain services. Ecology is not synonymous with environment, environmentalism, natural history, or environmental science. It is closely related to evolutionary biology, genetics, and ethology. An important focus for ecologists is to improve the understanding of how biodiversity affects ecological function. Ecologists seek to explain:

- Life processes, interactions, and adaptations
- The movement of materials and energy through living communities
- The successional development of ecosystems
- The abundance and distribution of organisms and biodiversity in the context of the environment.

Ecology is a human science as well. There are many practical applications of ecology in conservation biology, wetland management, natural resource management (agroecology, agriculture, forestry, agroforestry, fisheries), city planning (urban ecology), community health, economics, basic and applied science, and human social interaction (human ecology). For example, the *Circles of Sustainability* approach treats ecology as more than the environment 'out there'. It is not treated as separate from humans. Organisms (including humans) and



resources compose ecosystems which, in turn, maintain biophysical feedback mechanisms that moderate processes acting on living (biotic) and non-living (abiotic) components of the planet. Ecosystems sustain life-supporting functions and produce natural capital like biomass production (food, fuel, fiber, and medicine), the regulation of climate, global biogeochemical cycles, water filtration, soil formation, erosion control, flood protection, and many other natural features of scientific, historical, economic, or intrinsic value. The word "ecology" ("Okologie") was coined in 1866 by the German scientist Ernst Haeckel (1834–1919). Ecological thought is derivative of established currents in philosophy, particularly from ethics and politics. Ancient Greek philosophers such as Hippocrates and Aristotle laid the foundations of ecology in their studies on natural history. Modern ecology became a much more rigorous science in the late 19th century. Evolutionary concepts relating to adaptation and natural selection became the cornerstones of modern ecological theory. The scope of ecology contains a wide array of interacting levels of organization spanning micro-level (e.g., cells) to a planetary scale (e.g., biosphere) phenomena. Ecosystems, for example, contain abiotic resources and interacting life forms (i.e., individual organisms that aggregate into populations which aggregate into distinct ecological communities). Ecosystems are dynamic, they do not always follow a linear successional path, but they are always changing, sometimes rapidly and sometimes so slowly that it can take thousands of years for ecological processes to bring about certain successional stages of a forest. An ecosystem's area can vary greatly, from tiny to vast. A single tree is of little consequence to the classification of a forest ecosystem, but critically relevant to organisms living in and on it. Several generations of an aphid population can exist over the lifespan of a single leaf. Each of those aphids, in turn, support diverse bacterial communities. The nature of connections in ecological communities cannot be explained by knowing the details of each species in isolation, because the emergent pattern is neither revealed nor predicted until the ecosystem is studied as an integrated whole. Some ecological principles, however, do exhibit collective properties where the sum of the components explain the properties of the whole, such as birth rates of a population being equal to the sum of individual births over a designated time frame.



Human Ecology is an interdisciplinary and trans disciplinary study of the relationship between humans and their natural, social, and built environments. The philosophy and study of human ecology has a diffuse history with advancements in geography, sociology, psychology, anthropology, zoology, epidemiology, public health, home economics, and natural ecology, among others. Human ecology has been defined as a type of analysis applied to the relations in human beings that was traditionally applied to plants and animals in ecology. Toward this aim, human ecologists (which can include sociologists) integrate diverse perspectives from a broad spectrum of disciplines covering "wider points of view". In its 1972 premier edition, the editors of *Human Ecology: An Interdisciplinary Journal* gave an introductory statement on the scope of topics in human ecology. Their statement provides a broad overview on the interdisciplinary nature of the topic:

- Genetic, physiological, and social adaptation to the environment and to environmental change;
- The role of social, cultural, and psychological factors in the maintenance or disruption of ecosystems;
- Effects of population density on health, social organization, or environmental quality;
- New adaptive problems in urban environments;
- Interrelations of technological and environmental changes;
- The development of unifying principles in the study of biological and cultural adaptation;
- The genesis of maladaptions in human biological and cultural evolution;
- The relation of food quality and quantity to physical and intellectual performance and to demographic change;
- The application of computers, remote sensing devices, and other new tools and techniques

Forty years later in the same journal, Daniel G. Bates (2012) notes lines of continuity in the discipline and the way it has changed. Today there is greater emphasis on the problems facing individuals and how actors deal with them with



the consequence that there is much more attention to decision-making at the individual level as people strategize and optimize risk, costs and benefits within specific contexts. Rather than attempting to formulate a cultural ecology or even a specifically “human ecology” model, researchers more often draw on demographic, economic and evolutionary theory as well as upon models derived from field ecology.

While theoretical discussions continue, research published in *Human Ecology Review* suggests that recent discourse has shifted toward applying principles of human ecology. Some of these applications focus instead on addressing problems that cross disciplinary boundaries or transcend those boundaries altogether. Scholarship has increasingly tended away from Gerald L. Young's idea of a "unified theory" of human ecological knowledge—that human ecology may emerge as its own discipline—and more toward the pluralism best espoused by Paul Shepard: that human ecology is healthiest when "running out in all directions.” But human ecology is neither anti-discipline nor anti-theory, rather it is the ongoing attempt to formulate, synthesize, and apply theory to bridge the widening schism between man and nature. This new human ecology emphasizes complexity over reductionism, focuses on changes over stable states, and expands ecological concepts beyond plants and animals to include people. The ‘Environment’ is very important for us to understand because it constitutes our surroundings and affects our ability to live on the earth. It comprises of the air we breathe, the water that covers most of the earth’s surface, the plants and animals around us, and much more. It is therefore, very important to understand and appreciate the importance of ‘environment’ in our daily life. In recent years, scientists have been carefully examining the various ways by which people affect the ‘Environment’. They have found that we are causing air pollution, deforestation, acid rain, and other problems that are dangerous both to the earth and to ourselves. The word ‘environment’ is derived from the French word ‘Environner’, which means ‘to encircle’ or to surround. The most suitable definition of environment is as follows: It is the sum total of water, air and land and the interrelationships that exist among them with human beings, other living organisms and materials. The geographical meaning of environment is as follows:



It is a combination of living and non-living things and their mutual interaction with each other which leads to an ecosystem. The environment encompasses all living and non-living things occurring naturally on earth. The Honorable Supreme Court has the following definition of 'environment': "Environment" is a difficult word to define. Its normal meaning relates to the surroundings, but obviously, that is a concept which is related to whatever object it is, which is surrounded. Environment is a polycentric and multifaceted problem affecting the human existence. Today protection of 'environment' is a global issue as it concerns all countries irrespective of their size, stage or development or ideology. Today, the interaction between society and nature is so extensive that the question of environment has assumed large proportions, affecting humanity at large.

1.2 Environmental or Ecological factors affecting the rural environment

Ecological factors or Environmental factors have harmful effects of human activity on the biophysical environment. Environmental protection is a practice of protecting the natural environment on individual, organizational or governmental levels, for the benefit of both the environment and humans. Environmentalism, a social and environmental movement, addresses environmental issues through advocacy, education and activism. The carbon dioxide equivalent of greenhouse gases (GHG) in the atmosphere has already exceeded 400 parts per million (NOAA) (with total "long-term" GHG exceeding 455 parts per million). (Intergovernmental Panel on Climate Change Report) This level is considered a tipping point. "The amount of greenhouse gas in the atmosphere is already above the threshold that can potentially cause dangerous climate change. We are already at risk of many areas of pollution...It's not next year or next decade, it's now." Report from the UN Office for the Coordination of Humanitarian Affairs (OCHA): "Climate disasters are on the rise. Around 70 percent of disasters are now climate related – up from around 50 percent from two decades ago.

These disasters take a heavier human toll and come with a higher price tag. In the last decade, 2.4 billion people were affected by climate related disasters,



compared to 1.7 billion in the previous decade. The cost of responding to disasters has risen tenfold between 1992 and 2008. Destructive sudden heavy rains, intense tropical storms, repeated flooding and droughts are likely to increase, as will the vulnerability of local communities in the absence of strong concerted action." "Climate change is not just a distant future threat. It is the main driver behind rising humanitarian needs and we are seeing its impact. The number of people affected and the damages inflicted by extreme weather have been unprecedented."

Environment destruction caused by humans is a global problem, and this is a problem that is ongoing every day. By year 2050, the global human population is expected to grow by 2 billion people, thereby reaching a level of 9.6 billion people (Living Blue Planet 24). The human effects on Earth can be seen in many different ways. A main one is the temperature rise, and according to the report "Our Changing Climate", the global warming that has been going on for the past 50 years is primarily due to human activities (Walsh, et al. 20). Since 1895, the U.S. average temperature has increased from 1.3 °F to 1.9 °F, with most of the increase taken place since around year 1970 (Walsh, et al. 20). With a population of over 1.3 billion, India is soon set to dislodge China as the most populous country of the world. While India has one of the fastest growing populations in the world today, it's far behind most others when it comes to preserving the environment and the ecology. Today, our country is riddled with a number of environmental concerns which have only aggravated in the last few decades. It is high time we tackled these issues head on as turning a blind eye is no solution. Even as India races ahead to join the league of top economies internationally, it must stick to a growth path that is environmentally sustainable. Neglecting the environment can create havoc and the damage done may become irreparable. So we must wake up and smell the coffee before it's too late.

Following are some of the major environmental concerns India is grappling with today.

Air Pollution



Air pollution is one of the worst scourges to have affected India. According to a report from the International Energy Agency (IEA), by 2040 there are likely to be about 9 lakh premature deaths in the country due to the drastic rise in air pollution in the country. Average life expectancies are likely to go down by about 15 months because of air pollution. India is also home to 11 out of 20 of the most polluted (in terms of air pollution) cities in the entire world. According to the rankings of the 2016 Environmental Performance Index, India ranks 141 out of 180 countries in terms of air pollution.

Groundwater Depletion

Rapidly depleting levels of groundwater is one of the biggest threats to food security and livelihood in the country. Accessing the groundwater has become increasingly difficult over the decades. According to news reports, excessive exploitation of limited groundwater resources for irrigation of cash crops such as sugarcane has caused a 6 percentage point decline in the availability of water within 10 metres from ground level. Low rainfall and drought are also reasons for groundwater depletion. The north western and southeastern parts of the country are the worst hit. These are also the regions responsible for most of the country's agricultural production and food crisis is a natural corollary.

Climate Change

In May 2016, Phalodi in Rajasthan recorded a temperature of 51 degrees Celsius – the highest ever in the country. The increasingly tormenting heat waves in the past years are but an indication that global warming and climate change are real challenges that the country is facing now. With the Himalayan glaciers melting at an alarming rate, floods and other such natural disasters are occurring with increasing frequency. The number of forest fires, floods, earthquakes and such other calamities over the past five years has been unprecedented.

Use of Plastics

Unrestrained use of plastics is another major concern for the country. According to data from the Plastindia Foundation, India's demand for polymers is expected



to go up from 11 million tonnes in 2012-13 to about 16.5 million tons in 2016-17. India's per capita plastic consumption went up from about 4 kg in 2006 to some 8 kg in 2010. By 2020, this is likely to shoot up to about 27 kg. To understand the damage that this can cause to the environment, it is important to understand that plastics are one of the least biodegradable materials. An average plastic beverage bottle could take up to 500 years to decompose naturally.

Garbage Disposal and Sanitation

According to a 2014 report by The Economist, about 130 million households (and 600 million populations) in the country lack toilets. Over 72 percent of India's rural population defecates in the open. Ancient practices such as manual scavenging are still in vogue in the country. Lack of safe garbage disposal systems in the country make India one of the most unhygienic countries in the world. The rural regions of the country are worse off than urban tracts in this regard. This is one of the areas where the country's government and people need to work hard and improve the prevailing conditions.

Loss of Biodiversity

According to the International Union for Conservation of Nature's Red Data Book, some 47 species of plants and animals in India are listed as critically endangered. Loss of ecology and natural habitats have left many indigenous species, including important ones such as the Siberian crane, Himalayan wolf and Kashmir stag in grave danger of going extinct. Rapid urbanization, poaching and indiscriminate hunting for leather furs have rendered these animals critically endangered and the flora or herbal treasure of India in near-extinction conditions. Many of the plants commonly harvested for their medicinal properties are vanishing along with the legacy of Ayurvedic treatment. There are two main reasons India's environmental challenges are assuming gigantic proportions. Firstly, the exploding population and the needs of billions make environmental sustainability a very difficult issue. The other big challenge is lack of environmental awareness and conservation. Despite the efforts of government and environmental agencies, there is a lack of substantial efforts from the masses.



Unless this changes, there is little hope for improvement. We can only look forward to the youth and the younger generations of the nation to remain conscientious and act in the best interests of future generations.

Here are many environmental issues in India. Air pollution, water pollution, garbage, and pollution of the natural environment are all challenges for India. The situation was worse between 1947 through 1995. According to data collection and environment assessment studies of World Bank experts, between 1995 through 2010, India has made one of the fastest progress in the world, in addressing its environmental issues and improving its environmental quality. Still, India has a long way to go to reach environmental quality similar to those enjoyed in developed economies. Pollution remains a major challenge and opportunity for India. Environmental issues are one of the primary causes of disease, health issues and long term livelihood impact for India.

Check Your Progress I

Note: a) Use the space provided for your answers.

b) Check your answers with the possible answers provided at the end of this unit.

1) Define: Ecology and Human Ecology?

Ans.

2) What are the major environmental concerns India is grappling today ?

Ans.

1.3 Some environmental problems faced by rural peoples are outlined below:



1. **Poor sanitation:** Because of the illiteracy and poverty of the people in rural area, they do not know the importance of sanitation and hygiene. Such an ignorance causes environmental pollution leading to the break out of a number of epidemics like cholera, typhoid etc.

2. **Conversion of Farm land to housing land:** To provide shelter to the increased population in rural areas, more and more agricultural lands are being utilized for housing purposes by rural peoples. This results in decreased per capita availability of cultivated land which ultimately induces over cultivation.

3. **Lack of drainage facilities:** Lack of drainage facilities and open defecation make the rural areas Filthy and unhygienic which directly or indirectly help in spreading of a number of diseases.

4. **Indiscriminate use of pesticides and fertilizers:** To increase the crop productivity for providing food to increased population, the illiterate rural farmers used a number of pesticides and fertilizers, not in proper amount. The excess of pesticides and agrochemicals accumulate in water bodies and soil causing potential health hazards in humans and other aquatic and terrestrial living organisms (animals).

5. **Salination, desertification and degradation of Lands:** The over cultivation of farm lands in rural area and misuse of water meant for irrigation lead to salination, desertification and land degradation.

It is essential to make the public aware of the formidable consequences of the Environmental Degradation, if not retorted and reformative measures undertaken would result in the extinction of life.

We are facing various environmental challenges. It is essential to get the country acquainted with these challenges so that their acts may be eco-friendly. Some of these challenges are as under:



1. Growing Population: A population of over thousands of millions is growing at 2.11 per cent every year. It puts considerable pressure on its natural resources and reduces the gains of development. Hence, the greatest challenge before us is to limit the population growth. Although population control does automatically lead to development, yet the development leads to a decrease in population growth rates.

2. Poverty: India has often been described a rich land with poor people. The poverty and environmental degradation have a nexus between them. The vast majority of our people are directly dependent on the nature resources of the country for their basic needs of food, fuel shelter and fodder. About 40% of our people are still below the poverty line.

Environment degradation has adversely affected the poor who depend upon the resources of their immediate surroundings. Thus, the challenge of poverty and the challenge environment degradation are two facts of the same challenge. The population growth is essentially a function of poverty. Because, to the very poor, every child is an earner and helper and global concerns have little relevance for him.

3. Agricultural Growth: The people must be acquainted with the methods to sustain and increase agricultural growth with damaging the environment. High yielding varieties have caused soil salinity and damage to physical structure of soil.

4. Need to Ground Water: It is essential of rationalizing the use of groundwater. Factors like community wastes, industrial effluents and chemical fertilizers and pesticides have polluted our surface water and affected quality of the groundwater.

It is essential to restore the water quality of our rivers and other water body as lakes is an important challenge. It so finding our suitable strategies for consecration of water, provision of safe drinking water and keeping water bodies clean which are difficult challenges is essential.



5. Development and Forests: Forests serve catchments for the rivers. With increasing demand of water, plan to harness the mighty river through large irrigation projects were made. Certainly, these would submerge forests; displace local people, damage flora and fauna.

As such, the dams on the river Narmada, Bhagirathi and elsewhere have become areas of political and scientific debate. Forests in India have been shrinking for several centuries owing to pressures of agriculture and other uses. Vast areas that was once green, stands today as wastelands.

These areas are to be brought back under vegetative cover. The tribal communities inhabiting forests respect the trees and birds and animal that give them sustenance. We must recognize the role of these people in restoring and conserving forests.

The modern knowledge and skills of the forest dept. should be integrated with the traditional knowledge and experience of the local communities. The strategies for the joint management of forests should be evolved in a well planned way.

6. Degradation of Land: At present out of the total 329 mha of land, only 266 mha possess any potential for production. Of this, 143 mha is agricultural land nearly and 85 suffer from varying degrees of soil degradation. Of the remaining 123 mha, 40 are completely unproductive.

The remaining 83 mha is classified as forest land, of which over half is denuded to various degrees. Nearly 406 million head of livestock have to be supported on 13 mha, or less than 4 per cent of the land classified as pasture land, most of which is overgrazed. Thus, out of 226 mha, about 175 mha or 66 per cent is degraded to varying degrees. Water and wind erosion causes further degradation of almost 150 mha.

7. Reorientation of Institutions: The people should be roused to orient institutions, attitudes and infrastructures, to suit conditions and needs today. The change has to be brought in keeping in view India's traditions for resources use managements and education etc. Change should be brought in education, in

attitudes, in administrative procedures and in institutions. Because it affects way people view technology resources and development.



8. Reduction of Genetic Diversity: At present most wild genetic stocks have been disappearing from nature. Wilding including the Asiatic Lion are facing problem of loss of genetic diversity. The protected areas network like sanctuaries, national parks, biosphere reserves are isolating populations. So, they are decreasing changes of one group breeding with another. Remedial steps are to be taken to check decreasing genetic diversity.

9. Evil Consequences of Urbanization: Nearly 27 per cent Indians live in urban areas. Urbanization and industrialization has given birth to a great number of environmental problems that need urgent attention. Over 30 per cent of urban Indians live in slums. Out of India's 3,245 towns and cities, only 21 have partial or full sewerage and treatment facilities. Hence, coping with rapid urbanization is a major challenge.

10. Air and Water Pollution: Majority of our industrial plants are using outdated pollution technologies and makeshift facilities devoid of any provision of treating their wastes. Number of cities and industrial areas has been identified in the country as the worst in terms of air and water pollution management. Acts are enforced in the country, but their implement is not so easy. The reason is their implementation needs great resources, technical expertise, political and social will. Again the people are to be made aware of these rules. Their support is indispensable to implement these rules.

11. Indoor Air Pollution: Indoor air pollution caused by burning traditional fuels such as dung, wood and crop residues adversely affects to the health of the villagers, particularly the women and children. There is evidence associating the use of biomass fuel with acute respiratory tract infections chronic obstructive lung diseases in children. Lung cancer has been found to be associated with the use of coal, however, there is no evidence associating it with the use of biomass fuels. Cataract and adverse pregnancy outcome are the other conditions shown to be associated with the use of biomass fuels. Finally, there is enough evidence to

accept that indoor air pollution in India is responsible for a high degree of morbidity and mortality in the rural areas.



12. Change in Land-Use Pattern: Land-use change has important implications for sustainable livelihood of local communities where traditional crop livestock mixed farming is sustained with local inputs. Knowledge of recent changes in land use, driving forces and implications of changes within the context of sustainable development is limited. A study analyzed the changes in spatial patterns of agricultural land use, crop diversity, manure input, yield, soil loss and run-off from cropland, and dependence of agro-ecosystems on forests, during the 1963-1993 period in a small watershed in central Himalaya, India. Data obtained from existing maps, interpretation of satellite imagery, GIS-based land-use change analysis, participatory survey and field measurements were integrated to quantify changes at the landscape/ watershed scale. During the 1963-1993 period the same group found that, agricultural land use increased by 30% at the cost of loss of 5% of forestland. About 60% of agricultural expansion occurred in community forests compared to 35% in protected forests and 5% in reserve forests. Agricultural expansion was most conspicuous at higher elevations (2600m) and on medium slopes (10 -30°).

13. Waste Management in Rural Indian Villages: A micro-level study was carried out in a typical south Indian village to assess the quantity and type of wastes generated and its present mode of management. This information was used to identify the appropriate technologies, which could enhance the value of the waste produced, and at the same time, improve the economic conditions of rural people. The study indicated that nearly 2364 tons of rural wastes in the form of crop residues, animal manure and human excreta are produced annually in the village with a population of 510. About 77% of the waste generated in the village was used as domestic fuel, animal fodder and organic fertilizer for crop production. The rest (23%) was left out in open fields for natural decomposition. The energy balance sheet of the village indicated that the present consumption of biomass resources was 50% less than that actually required for various domestic



and agricultural applications. Anaerobic digestion of animal manure and human excreta produced in the village could yield 82% of the domestic energy required besides enriching the waste by 3-4 times as compared to conventional storage on the ground. If the traditional mud *chulha* (stove) were replaced by an improved *chulha*, each family unit could reduce its annual consumption of fuel wood.

The use of non-renewable energy in Indian villages is very low. In the agriculture it is minimal, as it is mostly based on human labor and animal power rather than oil and electricity. Cultivation in large areas is done by hoe and animal draught. The use of tractor for tilling the land is also common in some areas. Ground water is lifted variously by human power and by animal power. The tube well and water pumps are also becoming popular in many areas. Cooking and lighting use local energy sources such as biogas, solar energy, firewood, and dung. Part of the village's income comes from communal energy farming with *Eucalyptus* and different species of *Euphorbia* (a succulent) and other energy crops, which enable the village to be, by a small margin, a net exporter of energy. Even the tools and utensils used in the village are produced nearby in small regional centers using small quantities of non-renewable energy.

Means of transport, used in the villages utilize animal power as well as petrol or diesel. The villages produce little surplus for export to the rest of the economy and import little from several essential items nearby from the town. Most of the villagers do not often travel long distances, (except on the inter-village exchange program) partly because they are not able to afford to travel much.

Mahatma Gandhi, the Father of the Nation, said that "India lives in villages". "If villages perish, India will also perish". Therefore, village ecosystems need a closer study emphasizing on the interactions between societal needs and life support systems. A village, being a typical unit of rural India, can be considered as an ecosystem taking into accounts its distinctive structure and function.

The term village ecosystem reflects the totality of settlement and its activities as a dynamic and organic whole. The function of a village ecosystem mainly depends on the major bio-productive systems such as agricultural lands,



grasslands, forest and wetland, which together form important physical resource base. In developing countries like India, the rural sector with high population density and high level of poverty poses a serious threat to the environment. Impact of human activities on the resource base of an ecosystem sometimes leads to critical situations. Degradation of the environment is closely related to the pattern of resource use which is influenced by population level, migration pattern, market access and land use practices. Indeed, it is a bitter truth that despite having all the wealth, science and technology in our hands, our society can never escape its dependence, direct or indirect, on the earth's natural resources, and it is particularly true for Indian villages.

1.4 Law and policies:

British rule of India saw several laws related to environment. Amongst the earliest ones were Shore Nuisance (Bombay and Kolaba) Act of 1853 and the Oriental Gas Company Act of 1857. The Indian Penal Code of 1860, imposed a fine on anyone who voluntarily fouls the water of any public spring or reservoir. In addition, the Code penalised negligent acts. British India also enacted laws aimed at controlling air pollution. Prominent amongst these were the Bengal Smoke Nuisance Act of 1905 and the Bombay Smoke Nuisance Act of 1912. Whilst these laws failed in having the intended effect, British-enacted legislations pioneered the growth of environmental regulations in India.

The Constitution of India the 'Right to Life' contained in Article-21 of the Constitution of India includes the right to clean and human environment. It means you have the right to live in a clean and healthy environment. Article-38 of our Constitution requires State to ensure a social order for the welfare of people, which can be obtained by an unpolluted and clean environment only. Article-38 of our Constitution requires State to ensure a social order for the welfare of people, which can be obtained by an unpolluted and clean environment only. Article-48A of the Constitution requires the State to adopt the Protectionist policy as well as Improvinistic Policy. Protectionist policy imposes ban on those things which lead to environmental degradation, e.g. ban on use of leaded petrol, ban on use of



plastic bags etc. Improvinistic policy refers to alternatives that can be used for improvement of environment, e.g. use of CNG or low sulphur fuel, tree plantation in industrial areas etc. Article-48A of the Constitution declares “The State shall endeavour to protect and improve the environment and safeguard forests and wildlife of the country”.

Upon independence from Britain, India adopted a constitution and numerous British-enacted laws, without any specific constitutional provision on protecting the environment. India amended its constitution in 1976. Article 48(A) of Part IV of the amended constitution, read: The State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country. Article 51 A (g) imposed additional environmental mandates on the Indian state. Other Indian laws from recent history include the Water (Prevention and Control of Pollution) Act of 1974, the Forest (Conservation) Act of 1980, and the Air (Prevention and Control of Pollution) Act of 1981. The Air Act was inspired by the decisions made at Stockholm Conference. The Bhopal gas tragedy triggered the Government of India to enact the Environment (Protection) Act of 1986. India has also enacted a set of Noise Pollution (Regulation & Control) Rules in 2000. In 1985, Indian government created the Ministry of Environment and Forests. This ministry is the central administrative organization in India for regulating and ensuring environmental protection.

Despite active passage of laws by the central government of India, the reality of environmental quality mostly worsened between 1947 and 1990. Rural poor had no choice, but to sustain life in whatever way possible. Air emissions increased, water pollution worsened, forest cover decreased. Starting in the 1990s, reforms were introduced. Since then, for the first time in Indian history, major air pollutant concentrations have dropped in every 5-year period. Between 1992 and 2010, satellite data confirms India's forest coverage has increased for the first time by over 4 million hectares, a 7% increase. Rural people are safer than urban peoples from the detrimental effect of pollution.

However, they are also facing some environmental problems due to their ignorance, illiteracy, poverty and superstitions.



1. Providing basic environmental services in a way that most effectively protects health:

(a) Access to safe potable water, sanitation and drainage facilities.

(b) Proper management of solid waste collection and disposal.

(c) Reduction of pollution within the households by providing cleaner fuel for cooking and improved household ventilation.

2. Identification and implementing integrated approaches to urban environment so as to prevent and abate the impacts of pollution and degradation:

(a) Ambient air pollution.

(b) Surface water pollution.

(c) Ground water pollution and depletion.

(d) Land use and ecosystem degradation.

3. Proper dealing with accidents and environmental disasters deriving from both natural and man-made efforts. Some of the worst sites of ecological disaster are found in and around cities.

4. Urban poverty and environmental conditions are interrelated. This poverty is exacerbated by environmental threats that account for a large share of ill health, early death and hardships to human beings.

5. Urban environmental factors are affecting human health, particularly in the field of fertility. In some countries, sperm counts have drastically reduced.

6. Understanding the influence of urbanization on food system i.e., food supply, marketing and distribution because of adulterated food supply in urban areas.

7. Management of urban sprawl. The population is increasing in urban areas, leading to the decline in the amount of open space available and urban poor will

take up illegal residence on the periphery of the city. These settlements become slums of the most appalling nature and adversely affect the environment.



8. Urban consumption and production patterns are the root cause or main culprit of environmental deterioration. With this backdrop of urban environmental issues and challenges, globalization generates new challenges in preparing strategies for urban development. The effects of globalization will profoundly affect the future development of the urban centers and cities.

1.5 Maintenance of Ecological Balance:

Ecological balance denotes a system where a stable equilibrium has to be maintained in order to continue its original point of balance including the whole system. The organism of earth is inert-connected with the environment in flimsy balanced cycle. The sun is considered as the source of energy which is used by plants for the production of foods which is further used by other creatures. The next step towards the continuation of this cycle includes death of plants and other animals and consumption of those by microorganism. This ecological balance is in danger due to the over use of natural resources and pollution.

Management of Natural Resources

Efforts must be concerted in order to maintain sustainable manner to use the natural resources for maintenance of ecological balance. The expansion of civilization has put on burden over the ecosystem. Fossil fuels, minerals and different natural resources are at alarming rate. Therefore human beings have to shift their usage to other alternatives.

Controlling Population

The problem of over population has to be controlled despite of cultural, emotional or religious sensitivity. For example as excessive fishes in an aquarium will foul the water, over population on the planet is quite capable enough to destroy ecological balance. Therefore, the government of every state has to involve to

control population through family planning and contraception to reduce stress on ecosystem.



Protecting the Water

Marine ecosystem is at threat due to the effects of polluted water of manufacturing as well as agricultural runoffs. Alternative ways should be incorporated for the reduction and elimination of pollution which are coming from streets or farms so that ecological balance can be maintained.

Extensive usage of agricultural fertilizers has speeded up the growth of algae in streams and lakes which create an obstacle to the way of sunlight and oxygen. The final result is reduction of the amount of natural greenery in marine system. Consequently marine animals are on the way of death which hampers the eco system.

What to do

Recycling has been considered as the best way in your hand to prevent ecological imbalance. Through choosing energy saving appliance and automobiles, you will not only save your pocket but from a broad point of view you will help to protect ecological balance of Mother Earth. Spread awareness among your friend and family to be ecologically aware to protect the ecosystem. The media should play a very active role in maintaining the balance of environment.

Check Your Progress II

Note: a) Use the space provided for your answers.

b) Check your answers with the possible answers provided at the end of this unit.

Q1) What does the Article-38 of the Constitution of India states?

Ans.

Q2) What does the Article-48A of the Constitution of India states?

Ans.



1.6 Let Us Sum Up

The ecology or the environment is affected by several factors and which affects the life of ruralites. So there is an emergent need of awareness and sensitization among the ruralites and the government and the civil society should play a very significant role in maintenance of ecological balance and implement an ideology of sustainable development so that the development of ruralites can be achieved.

1.7 Key Words

Ecology is the scientific analysis and study of interactions among organisms and their environment.

Human Ecology is an interdisciplinary and trans disciplinary study of the relationship between humans and their natural, social, and built environments.

Protectionist policy imposes ban on those things which lead to environmental degradation, e.g. ban on use of leaded petrol, ban on use of plastic bags etc.

1.8 References

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Unit-2

Population Explosion



Learning Objectives:

After completion of this unit, you should be able to:

- *explain the meaning of population explosion*
- *explain the causes responsible for population explosion*
- *list out the effects of overpopulation*
- *mention the remedial measures to control overpopulation*

Structure:

- 2.1 Introduction
- 2.2 Meaning of Population Explosion
- 2.3 Causes of Population Explosion
- 2.4 Effects of Population Growth
- 2.5 Control Measures for Population Growth
- 2.6 Let Us Sum Up
- 2.7 Key Words
- 2.8 References

2.1 Introduction:

The word population comes from the Latin word 'populous'. This word means people or population. A population is thus the group of people or other organisms that live in a particular place. A population explosion happens when a certain population grows drastically in size. Often the implication is that the population has grown too much. In biology, population growth is the increase in the number of individuals in a population. Global human population growth amounts to around 75 million annually, or 1.1% per year. The global population has grown from 1 billion in 1800 to 7 billion in 2012. It is expected to keep growing, and estimates have put the total population at 8.4 billion by mid-2030, and 9.6 billion by mid-2050. Many nations with rapid population growth have low standards of living, whereas many nations with low rates of population growth have high standards of living.



Population explosion is not only a problem in India; it has reached a menacing proportion all over the world, especially in the poorer countries. The population of India was around 361 million during the census of 1951. It reached over 1.21 billion during the census of 2011. The developed countries in the West or in countries like Japan which are rich enough to employ all their people according to their abilities the growth of population may prove to be a boon, for the rapid growth of industries and national wealth always need greater workforce to implement the programs of development in ever-expanding spheres. However, a developing country like India, where the resources and employment opportunities are limited, and the rapid increase in population during the post-independent has negatively affected its economy. Our country has to come to terms with the highly competitive world economy. India will be looking for a leader who can be bold enough to take up the issue of controlling population explosion seriously. Unless India can find such a leader, its future cannot be bright. The post-World War in period (i.e., period after 1945) is generally referred to as a period of population explosion in demographic parlance. It is a period in which the world population including population in India experienced unprecedented and accelerated growth leading to Population explosion. For example, while India's population was estimated to be 100 million in 1600 A.D., it was 120 million in 1800, 238.4 million in 1901, 361.1 million in 1951, 846.3 million in 1991, and estimated to be 100 million in August 1999. This means that while it increased by 20 per cent in 200 years between 1600 and 1800 A.D and by about 100 per cent (exactly 98.66%) in next 100 years between 1800 and 1901, it increased by 319 per cent in the following 99 years (or say about 100 years between 1901 and 1999). Every nook and corner of India is a clear display of increasing population. Whether you are in a metro station, airport, railway station, road, highway, bus stop, hospital, shopping mall, market, temple, or even in a social/ religious gathering, we see all these places are overcrowded at any time of the day. This is a clear indication of overpopulation in the country.

According to the Indian census, carried out in 2011, the population of India was exactly 1,210,193,422, which means India has crossed the 1-billion mark. This is the second most populous country of the world after China and the various studies



have projected that India will be world's number-1 populous country, surpassing China, by 2025. In spite of the fact that the population policies, family planning and welfare programmes undertaken by the Govt. of India have led to a continuous decrease in the fertility rate, yet the actual stabilization of population can take place only by 2050.

2.2 Meaning of Population Explosion

Population Explosion refers to the sudden and rapid rise in the size of population, especially human population. It is an unchecked growth of human population caused as a result of:

- increased birth rate,
- decreased infant mortality rate, and
- Improved life expectancy.

A drastic growth in population beyond normal limits is called population explosion. It is more prominent in under-developed and developing countries than in developed countries. Population explosion mainly refers to the surge in population post-World War II. However, in context to India, it refers to the rapid increase in population in post-Independent era.

Increase in Population:

According to the National Population Policy draft prepared in 1997 by the Ministry of Health and Family Welfare, the goal of total fertility rate (TFR) of 2.1 will be achieved by the year 2010. But, according to the projections made by the Registrar General, the TFR of 2.1 would not be reached before the year 2026, if the existing demographic trends continued. This shows how lackadaisical the government and the nation have been in controlling the population growth.

The phenomenon of galloping population in India has the following aspects:

- i. Every sixth person on the globe today is an Indian, and by the turn of the century, every fifth living person will be an Indian.



- ii. India adds 46,500 persons to its population every day.
- iii. Addition to India's population is an equivalent of a Chandigarh (with 6, 40,725 population) in nine days, two Bhopal's a month, and an Australia (with 18.52 million population) every eight months. During 1981-91, addition to the population was to the tune of 163 million, equaling to little less than the combined population of France (58.683 million), Britain (58.649 million) and Italy (57.369 million).
- iv. By 2035, India would overtake China as the world's most populous nation. While the rate of annual population growth in India is 3.5 per cent, in China it is 2.1 per cent. Thus, while China's population would double in 60 years, India's population would double in 34 years.
- v. Around 49 per cent of the increase in India's population in one decade is in the five states of Bihar, Madhya Pradesh, Assam, Rajasthan and Uttar Pradesh (known as BIMARU states).
- vi. More than three times as many couples enter the reproductive span than those leaving it, with the fertility rate of the younger group being three times higher than that of those passing out of the reproductive range.
- vii. At the present rate of growth, life for most Indians would be unbearable—medical facilities would be difficult to provide, expenses on education, housing, etc., would be exorbitant, technical and professional education would become the exclusive prerogative of the elite, and the scarcity of food would once again plunge more than half of the nation below the poverty line.

In analyzing the growth of population or demographic transition, it may be averred that a country goes through three different phases, having different tendency in each stage. These three phases show a sequence of high birth – high death, high birth – low death, and low birth low death.

In the first 'stationary' phase, both fertility and mortality rates are high and uncontrolled, so that the growth of population is low. The second phase is



‘expansion’ phase because birth-rate is considerably high and death-rate keeps declining. The third phase is of ‘decline type’. India is still going through the second phase, where fertility remains above mortality.

Fertility will be lowered only when economic and social conditions are improved to a certain level. Some indices of economic and social change are urbanization, industrialization (both of which reduce the importance of the family and kinship ties for achieving goals), literacy, and infant mortality. There two main causes of high increase in population in India viz. High Birth Rate, and Low Death Rate. Birth rate refers to the number of children born per thousand persons in a year. Death rate refers to the number of persons who die per thousand persons in a year. Improvement in health and medical facilities and proper distribution of food grains in the country brought down the death rate and increased the birth rate.

Causes of High Birth Rate There are several causes of high birth rate in India. Firstly, poverty is main cause as poor people consider children as assets who help them to supplement family income even at the tender age. Secondly, illiteracy among the rural people has been traditionally an important reason. Due to high infant mortality rate, people were encouraged to have more children in last century. Thirdly, attitude towards having a male child resulted in high birth rate. Fourthly, early marriage results in long child bearing capacity and causes high birth rate. Universality of marriage in India also supplements this reason.

Causes of Decline in Death Rate The death rate in past used to be very high due to epidemics and famines. Most of the epidemics have been controlled and mass destruction of human life does not take place due to epidemics. The spread of medical facilities in rural areas has reduced the occurrence of epidemics and communicable diseases like cholera and smallpox. Easy availability of life-saving drugs have saved lives of millions of people. The spread of institutional delivery, female education, urbanization etc. have resulted in decline of the death rates.

The Overpopulation Debate There is no particular criterion to judge whether a country is over-populated or not. Economists in India have put forward the reasons for and against the question of whether India is over-populated. Argument against the perception that India is over populated some economists argue that there are



ample natural resources in the country. Output can be sufficiently increased by exploiting and utilizing the natural resources judiciously. There is also rising per-capita income which proved that India is not over-populated. Population density in India is low compared to many other countries. Argument favoring the perception that India is overpopulated the standard of living in India is very low. Further increase in the population of poor families will prove to be fatal. The economic growth of the country is not able to create enough employment opportunities for the rising population.

The current rate of population growth is now a significant burden to human well-being. Understanding the factors which affect population growth patterns can help us plan for the future.

2.3 Causes of Population Explosion

i. Decline in the Death Rate:

The fall in death rates that is decline in mortality rate is one fundamental causes of overpopulation. Owing to the advancements in medicine, man has found cures to the previously fatal diseases. The new inventions in medicine have brought in treatments for most of the dreadful diseases. This has resulted in an increase in the life expectancy of individuals. Mortality rate has declined leading to an increase in population.

Owing to modern medications and improved treatments to various illnesses, the overall death rate has gone down. The brighter side of it is that we have been able to fight many diseases and prevent deaths. On the other hand, the medical boon has brought with it, the curse of overpopulation.

ii. Rise in the Birth Rate:

Thanks to the new discoveries in nutritional science, we have been able to bring in increase in the fertility rates of human beings. Medicines of today can boost the reproductive rate in human beings. There are medicines and treatments, which can help in conception. Thus, science has led to an increase in birth rate. This is

certainly a reason to be proud and happy but advances in medicine have also become a cause of overpopulation.



iii. Migration:

Immigration is a problem in some parts of the world. If the inhabitants of various countries migrate to a particular part of the world and settle over there, the area is bound to suffer from the ill effects of overpopulation. If the rates of emigration from a certain nation do not match the rates of immigration to that country, overpopulation makes its way. The country becomes overly populated. Crowding of immigrants in certain parts of the world, results in an imbalance in the density of population.

iv. Lack of Education:

Illiteracy is another important cause of overpopulation. Those lacking education fail to understand the need to prevent excessive growth of population. They are unable to understand the harmful effects that overpopulation has.

They are unaware of the ways to control population. Lack of family planning is commonly seen in the illiterate lot of the world. This is one of the major factors leading to overpopulation. Due to ignorance, they do not take to family planning measures, thus contributing to a rise in population.

Viewing the issue of increasing population optimistically, one may say that overpopulation means the increase in human resources. The increase in the number of people is the increase in the number of productive hands and creative minds. But we cannot ignore the fact that the increase in the number producers implies an increase in the number of consumers. Greater number of people requires a greater number of resources. Not every nation is capable of providing its people with the adequate amount of resources. The ever-increasing population will eventually leave no nation capable of providing its people with the resources they need to thrive. When the environment fails to accommodate the living beings that inhabit it, overpopulation becomes a disaster.



2. Population Characteristics:

i. Exponential growth:

When a quantity increases by a constant amount per unit time e.g. 1, 3, 5, 7 etc. it is called linear growth. But, when it increases by a fixed percentage it is known as exponential growth e.g. 10, 10², 10³, 10⁴, or 2, 4, 8, 16, 32 etc. Population growth takes place exponentially and that explains the dramatic increase in global population in the past 150 years

ii. Doubling time:

The time needed for a population to double its size at a constant annual rate is known as doubling time. It is calculated as follows:

$$T_d = 70/r$$

Where T_d = Doubling time in years

r = annual growth rate

If a nation has 2% annual growth rate, its population will double in 35 years.

iii. Total Fertility Rates (TFR):

It is one of the key measures of a nation's population growth. TFR is defined as the average number of children that would be born to a woman in her lifetime if the age specific birth rates remain constant. The value of TFR varies from 1.9 in developed nations to 4.7 in developing nations. In 1950's the TFR has been 6.1. However, due to changes in cultural and technological set up of societies and government policies the TFR has come down which is a welcome change.

iv. Infant Mortality Rate (IMR):

It is an important parameter affecting future growth of a population. It is the percentage of infants died out of those born in a year. Although this rate has

declined in the last 50 years, but the pattern differs widely in developed and developing countries.



v. Zero population growth (ZPG):

When birth plus immigration in a population are just equal to deaths plus emigration, it is said to be zero population growth.

vi. Male-female ratio:

The ratio of boys and girls should be fairly balanced in a society to flourish. However, due to female infanticides and gender-based abortions, the ratio has been upset in many countries including India. In China, the ratio of boys to girls became 140: 100 in many regions which led to scarcity of brides.

vii. Life expectancy:

It is the average age that a new-born infant is expected to attain in a given country. The average life expectancy, over the globe, has risen from 40 to 65.5 years over the past century.

In India, life expectancy of males and females was only 22.6 years and 23.3 years, respectively in 1900. In the last 100 years improved medical facilities and technological advancement has increased the life expectancy to 60.3 years and 60.5 years, respectively for the Indian males and females. In Japan and Sweden, life expectancy is quite higher, being 82.1-84.2 for females and 77-77.4 for males, respectively.

viii. Demographic transition:

Population growth is usually related to economic development. There occurs a typical fall in death rates and birth rates due to improved living conditions leading to low population growth, a phenomenon called demographic transition. It is associated with urbanisation and growth and occurs in four phases:



(a) Pre-industrial phase characterized by high growth and death rates and net population growth is low.

(b) Transitional phase that occurs with the advent of industrialization providing better hygiene and medical facilities and adequate food, thereby reducing deaths. Birth rates, however, remain high and the population shows 2.5-3% growth rate.

(c) Industrial phase while there is a fall in birth rates thereby lowering growth rate.

(d) Post industrial phase during which zero population growth is achieved.

Demographic transition is already observed in most developing nations. As a result of demographic transition the developed nations are now growing at a rate of about 0.5% with a doubling time of 118 years. However, the matter of concern is that more than 90% of the global population is concentrated in developing nations which have a growth rate a little more than 2%, and a doubling time of less than 35 years.

3. Population Explosion (Theories):

There has been a dramatic reduction in the doubling time of the global human population, as we have already discussed. In the 20th century, human population has grown much faster than ever before. Between 1950-1990, in just 40 years the population crossed 5 billion marks with current addition of about 92 million every year, or so to say, adding a new Mexico every year. In the year 2000, the world population was 6.3 billion and it is predicted to grow four times in the next 100 years. This unprecedented growth of human population at an alarming rate is referred to as population explosion.

India is the second most populous country of the world with 1 billion people. If the current growth rates continue, it will have 1.63 billion people by 2050 and will become the most populous country surpassing China. So we are heading for very serious ramifications of the population explosion problem.



If we look at the population statistics of our country we find that in just 35 years after independence we added another India in terms of population. On 11th May, 2000 we became 1 billion and now we can say that every 6th person in this world is an Indian.

Population explosion is causing severe resource depletion and environmental degradation. Our resources like land, water, fossil fuels, minerals etc. are limited and due to over exploitation these resources are getting exhausted.

Even many of the renewable resources like forests, grasslands etc. are under tremendous pressure. Industrial and economic growth are raising our quality of life but adding toxic pollutants into the air, water and soil. As a result, the ecological life-support systems are getting jeopardized.

There is a fierce debate on this issue as to whether we should immediately reduce fertility rates through worldwide birth control programs in order to stabilize or even shrink the population or whether human beings will devise new technologies for alternate resources, so that the problem of crossing the carrying capacity of the earth will never actually come. There are two very important views on population growth :

i. Malthusian theory:

According to Malthus, human populations tend to grow at an exponential or compound rate whereas food production increases very slowly or remains stable. Therefore, starvation, poverty, disease, crime and misery are invariably associated with population explosion. He believes “positive checks” like famines, disease outbreak and violence as well as “preventive checks” like birth control stabilize population growth.

ii. Marxian theory:

According to Karl Marx, population growth is a symptom rather than the cause of poverty, resource depletion, pollution and other social ills. He believed that social exploitation and oppression of the less privileged people leads to poverty,



overcrowding, unemployment, environmental degradation that in turn, causes over population. A compromise between the two views is required because all these factors seem to be interdependent and interrelated. Equity and social justice to all, allowing everyone to enjoy a good standard of living is the need of the hour that can voluntarily help in achieving a stabilized global population.

The other causes of population explosion are as follows:

- **Accelerating birthrate:** Due to lack of awareness about the positive impact of using birth-control method, there has been a steady growth in birthrate.
- **Decrease in infant mortality rate:** An improvement in medical science and technology, wide usage of preventive drugs (vaccines), has reduced the infant mortality rate. There has been great improvement in medical and health-care facilities during the past few decades.
- **Increase in life expectancy:** Due to improved living conditions, better hygiene and sanitation habits, better nutrition, health education, etc. the average life expectancy of human population has improved significantly. Steady supply of good quality food makes sure that the population is well nourished. Populations grow when they are adequately nourished.
- **Increased immigration:** An increase in immigration often contributes towards population explosion, particularly in developed countries. It happens when a large number arrive at an already populated place with the intention to reside permanently.
- **Less space than required:** In urban cities, it is often found that there is very less scope for making available extra space to absorb the additional population. In such cases, a large population is seen packed into a smaller space.

Check Your Progress I

Note: a) Use the space provided for your answers.

b) Check your answers with the possible answers provided at the end of this unit.

Q1) Meaning of population explosion

Ans.

Q2) List the causes of population explosion

Ans.

Q3) What is the meaning of demographic transition

Ans

2.4 Effects of Population Growth

The effects of population explosion in India are as follows:

Persons are means as well as ends of economic development. They are an asset if in adequate strength and prove to be a liability if excess in strength. Population has crossed the optimum limit in India and has become a liability. So, problem of population explosion in India has proved to be a big hindrance in the success of economic planning and development.

Following are the main effects of population explosion:



1. **Problem of Investment Requirement:** Indian population is growing at a rate of 1.8 percent per annum. In order to achieve a given rate of increase in per capita income, larger investment is needed. This adversely affects the growth rate of the economy. In India, annual growth rate of population is 1.8 percent and capital output ratio is 4:1. It means that in order to stabilize the existing economic growth rate $(4 \times 1.8) = 7.2$ percent of national income must be invested.

2. **Problem of Capital Formation:** Composition of population in India hampers the increase in capital formation. High birth rate and low expectancy of life means large number of dependents in the total population. In India 35 percent of population is composed of persons less than 14 years of age. Most of these people depend on others for subsistence. They are unproductive consumers. The burden of dependents reduces the capacity of the people to save. So the rate of capital formation falls.

3. **Effect on per Capita Income:** Large size of population in India and its rapid rate of growth results into low per capita availability of capital. From 1950-51 to 1980-81. India's national income grew at an average annual rate of 3.6 percent per annum. But per capita income had risen around one percent. It is due the fact that population growth has increased by 2.5 percent.

4. **Effect on Food Problem:** Rapid rate of growth of population has been the root cause of food problem.

Shortage of food grains hampers economic development in two ways:

(a) People do not get sufficient quantity of food due low availability of food which affects their health and productivity. Low productivity causes low per capita income and thus poverty.

(b) Shortage of food-grains obliges the under-developed countries to import food grains from abroad. So a large part of foreign exchange is spent on it. So development work suffers. So rise in population causes food problem.



5. Problem of Unemployment: Large size of population results in large army of labour force. But due to shortage of capital resources it becomes difficult to provide gainful employment to the entire working population. Disguised unemployment in rural areas and open unemployment in urban areas are the normal features of an under developed country like India.

6. Low Standard of Living: Rapid growth of population accounts for low standard of living in India. Even the bare necessities of life are not available adequately. Increase of 1.5 crore population requires 121 lakh tonnes of food grains, 1.9 lakh metres of cloth and 2.6 lakh houses and 52 lakh additional jobs.

7. Poverty: Rising population increases poverty in India. People have to spend a large portion of their resources for bringing up of their wards. It results into less saving and low rate of capital formation. Hence improvement in production technique becomes impossible. It means low productivity of labour.

8. Burden of Unproductive Consumers: In India, a large number of children are dependent. Old persons above the age of 60 and many more in the age group of 15-59 do not find employment. In 2001, working population was 39.2 percent while 60.8 percent are unproductive workers. This high degree of dependency is due to high rate of dependent children. This dependency adversely affects effective saving.

9. Population and Social Problems: Population explosion gives rise to a number of social problems. It leads to migration of people from rural areas to the urban areas causing the growth of slum areas. People live in most unhygienic and insanitary conditions.

Unemployment and poverty lead to frustration and anger among the educated youth. This leads to robbery, beggary, prostitution and murder etc. The terrorist activities that we find today in various parts of the country are the reflection of frustration among educated unemployed youth. Overcrowding, traffic congestions, frequent accidents and pollution in big cities are the direct result of over-population.



10. More Pressure on Land: Rising rate of population growth exerts pressure on land. On the one hand, per capita availability of land goes on diminishing and on the other, the problem of sub-division and fragmentation of holdings goes on increasing. It adversely affects the economic development of the country.

11. Impact on Maternity Welfare: In India, population explosion is the result of high birth rate. High birth rate reduces health and welfare of women. Frequent pregnancy without having a gap is hazardous to the health of the mother and the child. This leads to high death rate among women in the reproductive age due to early marriage. Hence to improve the welfare and status of women in our society, we have to reduce the birth rate.

12. Pressure on Environment: Population explosion leads to environmental degradation. Higher birth rate brings more pollution, more toxic wastes and damage to biosphere. Briefly speaking, population explosion hinders the economic development. It should be controlled effectively.

13. Over-population: Population explosion may lead to overpopulation, i.e., a condition where population surges to a level that the earth cannot accommodate comfortably, and poses a threat to the environment.

14. Unemployment: In developing countries like India, with a backward economy and little scope for fruitful employment, millions of people find no work to do. The unemployed, having nothing to do and without an ensured living, are left frustrated and demoralize, losing their faith in life itself. As it happens in India and several underdeveloped countries in Asia and Africa, the unemployed threatens the very process of development and plunge the country in gloom. It is only natural. Those who are born with two hands consider it a curse when they are denied the simple right to work and earn a living. While their numbers go on multiplying and the growth rate becomes menacing, the fruits of development are found to be too inadequate to bridge the yawning gulf.

15. Poverty: High birth rate, both historically and statistically, is associated with poverty and low standard of living. It may be noted that poverty is both the



cause and effect of population explosion. Due to poverty, there has been massive growth of population. On the other hand, the large masses of people live in poverty due to overpopulation.

It may sound queer, but the law is that the poorer a country the greater is the growth rate of its population. India, caught in the morass of her age-old poverty, finds herself in the midst of a population explosion. The population that was less than 400 million in the forties was found to be about 1.21 billion in 2011 census. As a result of this even the six plans completed by now have so far failed to cope with the enormous problem of unemployment.

Whatever our plans might have achieved in some sixty-five years is found to be too little to eradicate poverty. More than seventy percent of Indians live in villages and most of them languish in their dark, dreary nooks; the fruits of our plans have not quite reached them. Many of them have no occupation. Due to lack of awareness, poor people fail to check population growth. In the towns too the poorer sections always have bigger families, while the rich and well-off sections live comfortably with small families. The poor in India are ignorant and superstitious, and so they do not see the advantages of planned family. Many of them never think of going against the law of nature and the will of their God; so they never refrain from breeding children, though they know that they cannot even feed them and keep them away from the curse of poverty and ignorance. Perhaps the sickening monotony of living in their world of despair leads them to torment their women with a vengeance and seek as much pleasure as they can. These poor people do not have the education necessary for planning their present with a view to ensuring a better future. This is why while their hope wears off they leap in the dark and break their neck, making things grimmer for their world. The millions of famished, under-nourished and naked children everywhere in India show the chaos this country is in.

16. Illiteracy: The resources available are fixed. In theory and in practice, the total available resources are shared by the people using them. Population explosion is the key reason for illiteracy in India. People prefer engage their children in economic activities, rather than providing them education.



17. Poor Health: If people do not get adequate food and nutrition, then they may suffer from poor health.

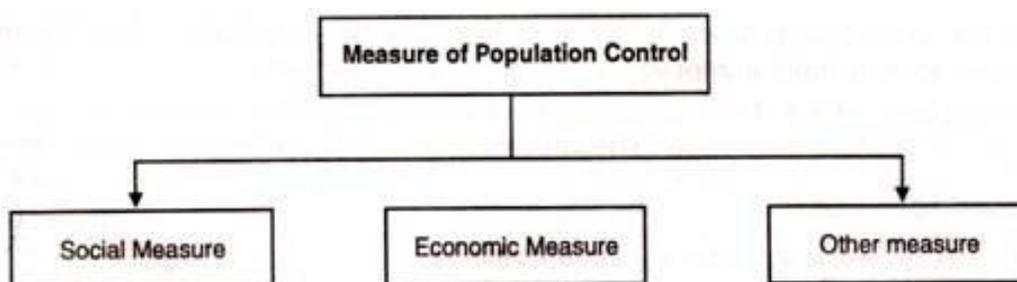
18. Economy: People need food, clothes, shelter, and occupation to make their living. The demand for consumption should never exceed the production or resource limit. The economy of any country is negatively impacted, if there is massive population explosion beyond the tolerance limit.

19. Pollution and Global warming: Too much population causes too much pressure on earth. There arises excessive demand for finished products leading to over-industrialization and over-utilization of resources. The industrial discharges and fumes are the chief causes for water and air pollution. Further, the poisonous gases released because of burning of fossil fuels in factories are widely responsible for Global warming.

2.5 Control Measures / Initiatives

Population of India is quite large and rapidly increasing. One percent growth rate means an addition of 1 crore people every year but actually around 2 crore persons are being added every year.

So, effective population control measure is the need of the hour. We know that birth rate is mainly responsible for rapid population growth. Hence measures which can reduce the birth rate should be adopted. These measures can be classified into 3 heads.





A. Social Measure:

Population explosion is a social problem and it is deeply rooted in the society. So efforts must be done to remove the social evils in the country.

- 1. Minimum age of Marriage:** Fertility depends on the age of an individual. So the minimum age of marriage should be raised. In India minimum age for marriage, 21 years for men and 18 years for women, has been fixed by law. This law should be firmly implemented and people should also be made aware of this through publicity.
- 2. Raising the Status of Women:** There is still discrimination to the women. They are confined to four walls of house. They are still confined to rearing and bearing of children. So women should be given opportunities to develop socially and economically. Free education should be given to them.
- 3. Spread of Education:** The spread of education changes the outlook of people. The educated men prefer to delay marriage and adopt small family norms. Educated women are health conscious and avoid frequent pregnancies and thus help in lowering birth rate.
- 4. Adoption:** Some parents do not have any child, despite costly medical treatment. It is advisable that they should adopt orphan children. It will be beneficial to orphan children and children couples.
- 5. Change in Social Outlook:** Social outlook of the people should undergo a change. Marriage should no longer be considered a social binding. Issueless women should not be looked down upon.
- 6. Social Security:** More and more people should be covered under-social security schemes. So that they do not depend upon others in the event of old age, sickness, unemployment etc. with these facilities they will have no desire for more children.



The following are the economic measures:

- 1. More employment opportunities:** The first and foremost measure is to raise, the employment avenues in rural as well as urban areas. Generally in rural areas there is disguised unemployment. So efforts should be made to migrate unemployed persons from rural side to urban side. This step can check the population growth.
- 2. Development of Agriculture and Industry:** If agriculture and industry are properly developed, large number of people will get employment. When their income is increased they would improve their standard of living and adopt small family norms.
- 3. Standard of Living:** Improved standard of living acts as a deterrent to large family norm. In order to maintain their higher standard of living people prefer to have a small family. According to A.K. Das Gupta those who earn less than Rs. 100 per month have on the average a reproduction rate of 3.4 children and those who earn more than Rs. 300 per month have a reproduction rate of 2.8 children.
- 4. Urbanisation:** It is on record that people in urban areas have low birth rate than those living in rural areas. Urbanisation should therefore be encouraged.

Other Measures:

The following are the other measures:

- 1. Late Marriage:** As far as possible, marriage should be solemnized at the age of 30 years. This will reduce the period of reproduction among the females bringing down the birth rate. The govt. has fixed the minimum marriage age at 21 yrs. for males and 18 yrs. for females.
- 2. Self Control:** According to some experts, self control is one of the powerful methods to control the population. It is an ideal and healthy approach and people should be provided to follow. It helps in reducing birth rate.



3. **Family Planning:** This method implies family by choice and not by chance. By applying preventive measures, people can regulate birth rate. This method is being used extensively; success of this method depends on the availability of cheap contraceptive devices for birth control. According to experts, “Hurry for the first child, Delay the second child and avoid the third.”

4. **Recreational Facilities:** Birth rate will likely to fall if there are different recreational facilities like cinema; theatre, sports and dance etc. are available to the people.

5. **Publicity:** The communication media like T.V., radio and newspaper are the good means to propagate the benefits of the planned family to the uneducated and illiterate persons especially in the rural and backward areas of country.

6. **Incentives:** The govt. can give various types of incentives to the people to adopt birth control measures. Monetary incentives and other facilities like leave and promotion can be extended to the working class which adopts small family norms.

7. **Employment to Woman:** Another method to check the population is to provide employment to women. Women should be given incentive to give services in different fields. Women are taking active part in competitive examinations. As a result their number in teaching, medical and banking etc. is increasing rapidly. In brief by taking, all there measures we can control the growth of population.

The government cannot ignore or shelve the problem of population explosion, for it is a rot and entire development of the country depends on how effectively it is stemmed. This awareness made our governments, both at the center and in the states, to think about the adopt official programme to educate public opinion and reduce the birth rate so that the population can fit in well with the evolving pattern of developing economy. The Family Planning as an official programme was launched with much fanfare in 1952. The government is still trying to educate the people. All government agencies and institutions mobilized all their resources to



attain the goal of planned families. The propaganda machinery was geared up with the help of public media. The people were reminded of the advantages of small families, of healthy and happy children and of the need for eradicating the age-old poverty. The parents were persuaded to go in for sterilization after the births of two children, for the contraceptive were not always found to be safe and full-proof. Many parents, especially the educated, came forward to see things in the new light and were amenable to persuasion. However, many others resisted, at places quite violently, and refused to see reason. The government was very serious about making the programme a success. The state governments also came forward to help the center in its bid to achieve success. Cheap contraceptives were distributed in even the remotest villages, sex education was popularized, vasectomy operations were conducted and abortion was legalized. However, even then family planning has a lot more to achieve, for the population in India has already become about 121 billion and at this rate of growth it may very soon become 150 billion and then 200 billion and so on. The problem of population can be solved only by creating awareness and educating the people to control birthrates. The advantages of adopting to various birth control methods should be properly explained to common people.



2.6 Let Us Sum Up

Population explosion has caused more pressure on earth. We should save energy so that the entire population can enjoy its benefit. We can control the global warming issues by curbing the usage of fossil fuels. Food security is another area that needs attention. The agricultural output should increase with growing population to make sure steady supply of food to all. We should use potable water carefully. With larger population, there is a need for harmony and peace among nations.

2.7 Key Words

Population Explosion: Population Explosion refers the sudden and rapid rise in the size of population, especially human population

Total Fertility Rates (TFR): TFR is defined as the average number of children that would be born to a woman in her lifetime if the age specific birth rates remain constant.

Infant mortality Rate: It is the percentage of infants died out of those born in a year

Life expectancy: It is the average age that a new-born infant is expected to attain in a given country.

2.8 References

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Unit-3

Pollution-Air Pollution, Water Pollution and Soil Pollution



Learning Objectives:

After completion of this unit, you should be able to:

- *define pollution*
- *enlist different forms of pollution,*
- *explain types and causes of pollution*
- *assess the effects of pollution*
- *list out different solutions to control pollution*

Structure:

- 3.1 Introduction
- 3.2 Forms of Pollution
- 3.3 Types and Causes of Pollution
 - 3.3.1 Air Pollution
 - 3.3.2 Water Pollution
 - 3.3.3 Soil Pollution
- 3.4 Effects of Pollution
- 3.5 Solutions to Control Pollution
- 3.6 Let Us Sum Up
- 3.7 Key Words
- 3.8 References

3.1 Introduction

Pollution is when something is added to the environment that is harmful or poisonous to living things. Smoke or dust in the air is a type of pollution as it is bad for the lungs when we breathe in. Sewage in drinking water is another type of pollution, as it can make people ill because it contains germs and viruses. People living next to a building site where there is too much noise can become sick as they cannot sleep. As pollution grows, ways to combat it has grown too. Solar energy and wind energy give people other ways



to power their homes. When people use these alternative forms of energy, they put less carbon dioxide into the environment.

Pollution is of four types;

- a) Air Pollution,
- b) Noise Pollution
- c) Water Pollution
- d) Soil or Land pollution.

Pollution is the process of making land, water, air or other parts of the environment dirty and unsafe or unsuitable to use. This can be done through the introduction of a contaminant into a natural environment, but the contaminant doesn't need to be tangible. Things as simple as light, sound and temperature can be considered pollutants when introduced artificially into an environment. Toxic pollution affects more than 200 million people worldwide, according to Pure Earth, a non-profit environmental organization. In some of the world's worst polluted places, babies are born with birth defects, children have lost 30 to 40 IQ points, and life expectancy may be as low as 45 years because of cancers and other diseases. The word, 'pollution' means to make dirty. Pollution causes imbalance in the environment. Environmental pollution is a serious problem. Nearly 35 percent of India's total land area is subject to serious environmental pollution. Pollution is the introduction of contaminants into the natural environment that causes adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. Pollution, we hear it every other day at school, college and read about it in newspapers. So what is it? Pollution occurs when pollutants contaminate the natural surroundings; which brings about changes that affect our normal lifestyles adversely. Pollutants are the key elements or components of pollution which are generally waste materials of different forms. Pollution disturbs our ecosystem and the balance in the environment. With modernization and development in our lives pollution has reached its peak; giving rise to global warming and human illness. Pollution occurs in



different forms; air, water, soil, radioactive, noise, heat/ thermal and light. Every form of pollution has two sources of occurrence; the point and the non-point sources. The point sources are easy to identify, monitor and control, whereas the non-point sources are hard to control. Pollution is the process of making land, water, air or other parts of the environment dirty and unsafe or unsuitable to use. This can be done through the introduction of a contaminant into a natural environment, but the contaminant doesn't need to be tangible. Things as simple as light, sound and temperature can be considered pollutants when introduced artificially into an environment. Toxic pollution affects more than 200 million people worldwide, according to Pure Earth, a non-profit environmental organization. In some of the world's worst polluted places, babies are born with birth defects, children have lost 30 to 40 IQ points, and life expectancy may be as low as 45 years because of cancers and other diseases. Read on to find out more about specific types of pollution. Pollution occurs in many forms ranging from chemicals in the form of gases or liquids, noise, energy sources such as light or heat, or even solids such as the types of waste that end up in landfills. Even substances that occur naturally can be considered pollution when additional quantities are added to the environment in unsafe amounts, such as is the case with carbon dioxide and mercury which although there can be some natural sources of these elements, elevated levels produced by industries can have catastrophic effects on the environment and all forms of life including humans.

Let us discuss the different types of pollutions, their causes and effects on mankind and the environment as a whole.

3.2 Forms of pollution

The major forms of pollution are listed below along with the particular contaminant relevant to each of them:

- **Air pollution:** The release of chemicals and particulates into the atmosphere. Common gaseous pollutants include carbon monoxide, sulfur dioxide, chlorofluorocarbons (CFCs) and nitrogen oxides



produced by industry and motor vehicles. Photochemical ozone and smog are created as nitrogen oxides and hydrocarbons react to sunlight. Particulate matter, or fine dust is characterized by their micrometer size PM_{10} to $PM_{2.5}$

- **Light pollution:** Includes light trespass, over-illumination and astronomical interference.
- **Nuclear pollution:** Pollution caused by the radioactive waste material due to nuclear explosion is known as nuclear pollution. It can give rise to diseases like skin cancer. Due to the increased numbers of nuclear plants the nuclear waste disposal has become a threat for the environment.
- **Littering:** the criminal throwing of inappropriate man-made objects, unremoved, onto public and private properties.
- **Noise pollution:** Which encompasses roadway noise, aircraft noise, industrial noise, etc.
- **Soil contamination** occurs when chemicals are released by spill or underground leakage. Among the most significant soil contaminants are hydrocarbons, heavy metals, herbicides, pesticides and chlorinated hydrocarbons.
- **Radioactive contamination** resulting from 20th century activities in atomic physics, such as nuclear power generation and nuclear weapons research, manufacture and deployment.
- **Thermal pollution** is a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant.
- **Visual pollution** which can refer to the presence of overhead power lines, motorway billboards, scarred landforms (as from strip mining), open storage of trash, municipal solid waste or space debris.
- **Water pollution** by the discharge of wastewater from commercial and industrial waste (intentionally or through spills) into surface waters; discharges of untreated domestic sewage, and chemical contaminants, such as chlorine, from treated sewage; release of waste and contaminants into surface runoff flowing to surface waters (including



urban runoff and agricultural runoff, which may contain chemical fertilizers and pesticides); waste disposal and leaching into groundwater; eutrophication and littering.

- **Plastic pollution:** involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat, or humans
- **Marine pollution:** Human being has polluted the oceans by adding the oil and waste disposal in it. The main causes of marine pollution are shore based industries, off-shore drilling, wrecked oil tankers and transport activities. Also the waste discharged into the rivers that flows to the ocean is the main reason of marine pollution. Marine pollution has adversely affected the sea life. Transport, oil tankers and industries.

3.3 Types and Causes of Pollution

3.3.1 Air Pollution

Air Pollution is the most prominent and dangerous form of pollution. It occurs due to many reasons. Excessive burning of fuel which is a necessity of our daily lives for cooking, driving and other industrial activities; releases a huge amount of chemical substances in the air every day; these pollute the air. Smoke from chimneys, factories, vehicles or burning of wood basically occurs due to coal burning; this releases sulphur dioxide into the air making it toxic. The effects of air pollution are evident too. Release of sulphur dioxide and hazardous gases into the air causes global warming and acid rain; which in turn have increased temperatures, erratic rains and droughts worldwide; making it tough for the animals to survive. We breathe in every polluted particle from the air; result is increase in asthma and cancer in the lungs. The main sources of air pollution in India and elsewhere are mineral dust and gases, automobiles, thermal power plants and industries. Any contamination in the air may not only cause many diseases and loss of vision but can also disturb the whole atmospheric system. Air pollution can also cause acid rain



which damages soil, vegetation and aquatic life of the region. The heavy use of automobiles causes pollution and smog from automobile emissions. This has become a serious problem in almost all the countries—developed and developing. The bad urban air burns the eyes, damages lung tissues and increases the levels of lead and other poisons in the human body and agricultural products. It is not known how many deaths occur nationally because of air pollution. Air pollution caused massive smog in London in 1952 killing some 4,000 people. . When some foreign particles enters the air and deteriorate its quality is known as air pollution. These particles can be produced naturally or manmade. Dust storms, Bacteria and gases of volcanic eruptions are examples of natural's sources of pollutants. Gases released from the automobile and the chimneys are the example of man-made pollutants.

Effects of Air Pollution

- Impact on Lung functioning
- Asthma
- Itching of eyes, mouth and throat
- Respiratory disorders
- Cough and wheezing
- Reduced energy levels
- Headache
- Negative impact on reproductive and immune systems
- Neurological disorders
- Cancer

Control of Air Pollution

- Maintaining a healthy distance between the industrial and residential areas
- The chimneys should be constructed tall in size so that the emissions must be released higher up in the environment
- The sulphur must be removed after burning
- The gasoline must have anti knocking agents
- The railway track must be electrified



- The mining area should be planted with trees
- The coal fuel should be replaced with gas fuel to control the air pollution
- The automobiles must be designed with emission control system
- The wastes must be removed and recycled in the industrial plants and refineries
- Plants like pinus and ribes need to be planted to metabolize the nitrogen oxides and other pollutants
- Timely servicing of the car helps to keep it in a good condition, and also minimizes fuel exhaustion
- Using public transportation helps to prevent the air pollution
- Using alternative energy sources like solar energy, hydroelectric energy, and wind energy

3.3.2 Water Pollution

Water Pollution has taken toll of all the surviving species of the earth. Almost 60% of the species live in water bodies. It occurs due to several factors; the industrial wastes dumped into the rivers and other water bodies cause an imbalance in the water leading to its severe contamination and death of aquatic species. If you suspect that nearby water sources have been contaminated by a corporation then it might be a good idea to hire an expert to see your options. Also spraying insecticides, pesticides like DDT on plants pollutes the ground water system and oil spills in the oceans have caused irreparable damage to the water bodies. Eutrophication is another big source; it occurs due to daily activities like washing clothes, utensils near lakes, ponds or rivers; this forces detergents to go into water which blocks sunlight from penetrating, thus reducing oxygen and making it inhabitable. Water pollution not only harms the aquatic beings but it also contaminates the entire food chain by severely affecting humans dependent on these. Water-borne diseases like cholera, diarrhea has also increased in all places. Contamination of water from any external source that makes it harmful to life is known as water pollution. With the fast industrial development and modern civilization, the problem of water pollution is increasing day by day. The major sources of water pollution



are domestic effluents, agricultural effluents, sewage disposal, industrial wastes, radioactive wastes and oil leakages, etc. All the Indian rivers, including the holy river Ganga, have become highly polluted today. Even, the Ganga Action Plan to control its water from pollution has not been proved successful. The impact of water pollution is widespread. It causes many severe water-borne diseases, such as diarrhea, trachoma, intestinal norms, hepatitis, jaundice, etc. According to WHO, 21 per cent of all communicable diseases in India are water-borne diseases. Oil is the major pollutant of the sea water. Huge tankers routinely dump oil into the sea. This act of dumping poisons smothers or coats sea plants and animals and kills them. When some foreign particle, organic, inorganic or biological impurities are added to the water so that it becomes unfit for use is known as water pollution.

Effects of Water Pollution

- Causes waterborne diseases like Typhoid, Amoebiasis, Giardiasis, Ascariasis and Hookworm diseases
- Rashes, earache and pink eye
- Hepatitis, encephalitis, gastroenteritis and vomiting, stomach aches and diarrhea
- Prostate cancer
- Lack of developmental growth
- Liver and kidney damage
- DNA damage
- Exposure to mercury causes Parkinson's disease

Control of Water pollution

- Water Pollution can be controlled by using non-toxic soaps, detergents and cleaning products
- Avoid chemical fertilizers and pesticides on your lawn and gardens
- Dispose of paints, motor oil, gasoline, antifreeze and other harmful chemicals in accordance with your local laws and safety regulations
- Protect groundwater, which is critical for drinking water, irrigation systems



and natural ecosystems

- Use chemicals in a proper way which may be harmful to the environment
- Use environment friendly washing powders, cleaning agents and toiletries to control water pollution
- Store chemicals in tightly sealed containers to avoid groundwater contamination
- Reduce the runoff that comes from your property
- Maintain your vehicle
- Replace your lawn and high maintenance plants with native plants
- Clean up pet waste
- Avoid using salt to de-ice walk ways
- Maintain your septic system

3.3.3 Soil pollution

Soil Pollution occurs due to incorporation of unwanted chemicals in the soil due to human activities. Use of insecticides and pesticides absorbs the nitrogen compounds from the soil making it unfit for plants to derive nutrition from. Release of industrial waste, mining and deforestation also exploits the soil. Since plants can't grow properly, they can't hold the soil and this leads to soil erosion. Oil pollution is the reduction in the productivity of soil due to the presence of soil pollutants. Soil pollutants have an adverse effect on the physical chemical and biological properties of the soil and reduce its productivity. Pesticides, fertilizers, organic manure, chemicals, radioactive wastes, discarded food, clothes, leather goods, plastics, paper, bottles, tins-cans and carcasses- all contribute towards causing soil pollution. Chemicals like iron lead mercury, copper, zinc, cadmium, aluminum, cyanides, acids and alkalies etc. are present in industrial wastes and reach the soil either directly with water or indirectly through air. (Eg. through acid rain). The improper and continuous use of herbicides, pesticides and fungicides to protect the crops from pests, fungi etc. alter the basic composition of the soils and make the soil toxic for plant growth. Organic insecticides like DDT, aldrin, benzene hex chloride etc. are used against soil borne pests. They accumulate in the soil as



they degrade very slowly by soil and water bacteria. Consequently, they have a very deleterious effect on the plant growth stunting their growth and reducing the yield and size of fruit. Their degradation products may be absorbed by the plants from where they reach the animals and man through the food chains. Radioactive wastes from mining and nuclear processes may reach the soil via water or as 'fall-out'. From the soil they reach the plants and then into the grazing animals (livestock) from where ultimately reach man through milk and meat etc. resulting in retarded and abnormal growth of man. Human and animal excreta used as organic manure to promote crop yield, pollute the soil by contaminating the soil and vegetable crops with the pathogens that may be present in the excreta. When the productivity of the soil reduces due to the presence of pollutants in it is known as soil pollution. Man has polluted the soil by the excess use of pesticides.

Effects of soil pollution

- Leukemia
- Effects children's brain and causes developmental damage
- Kidney damage
- Damage to central nervous system
- Headache, fatigue, skin rash and eye irritation
- Contamination of crop brings up problems like food security

Control of Soil Pollution

- Limit the use of fertilizers and pesticides
- Awareness about biological control methods and their implementation
- The grazing must be controlled and forest management should be done properly
- The afforestation and reforestation must take place
- Proper preventive methods like shields should be used in areas of wind erosion and wind breaks
- Remember to carry paper bags and minimize using plastic bags
- The soil binding grass must be planted and the large trees must be placed



along the banks

- The industrial wastes must be dumped in the low lying areas
- There should be a definite technique of cropping which does not allow the weeds to settle on the fields
- The mining ways must be improved along with their transportation
- The area must not be left barren and dry.

3.4 Effects of Pollution

1. **Environment Degradation:** Environment is the first casualty for increase in pollution weather in air or water. The increase in the amount of CO₂ in the atmosphere leads to smog which can restrict sunlight from reaching the earth. Thus, preventing plants in the process of photosynthesis. Gases like Sulfur dioxide and nitrogen oxide can cause acid rain. Water pollution in terms of Oil spill may lead to death of several wildlife species.

2. **Human Health:** The decrease in quality of air leads to several respiratory problems including asthma or lung cancer. Chest pain, congestion, throat inflammation, cardiovascular disease, respiratory disease is some of diseases that can be caused by air pollution. Water pollution occurs due to contamination of water and may pose skin related problems including skin irritations and rashes. Similarly, Noise pollution leads to hearing loss, stress and sleep disturbance.

3. **Global Warming:** The emission of greenhouse gases particularly CO₂ is leading to global warming. Every other day new industries are being set up, new vehicles come on roads and trees are cut to make way for new homes. All of them, in direct or indirect way lead to increase in CO₂ in the environment. The increase in CO₂ leads to melting of polar ice caps which increases the sea level and pose danger for the people living near coastal areas.

4. **Ozone Layer Depletion:** Ozone layer is the thin shield high up in the sky that stops ultra violet rays from reaching the earth. As a result of human



activities, chemicals, such as chlorofluorocarbons (CFCs), were released into to the atmosphere which contributed to the depletion of ozone layer.

5. Infertile Land: Due to constant use of insecticides and pesticides, the soil may become infertile. Plants may not be able to grow properly. Various forms of chemicals produced from industrial waste is released into the flowing water which also affects the quality of soil.

Pollution not only affect humans by destroying their respiratory, cardiovascular and neurological systems; it also affects the nature, plants, fruits, vegetables, rivers, ponds, forests, animals, etc, on which they are highly dependent for survival. It is crucial to control pollution as the nature, wildlife and human life are precious gifts to the mankind.

Nitrification, which is the process of forming soluble nitrates from the elemental atmospheric nitrogen or from originally harmless organic materials actually contribute towards water pollution when the nitrates leach out of the soil and accumulate to toxic levels in the water supply. Therefore, intensification of agricultural production by practices of irrigation (causes salination), excessive fertilizers, pesticides, insecticides etc. have created the problems of soil pollution. Soil pollution can be checked by restricting the use of above mentioned soil pollutants, resorting to organic farming, adopting better agriculture practices etc. The polluting gases mentioned above have an interesting effect on climate. Essentially, these gases form a veil around the planet which holds heat in, increasing the overall temperature of the planet. The rise in planetary temperature, or global warming, is not immediately noticeable. However, even a rise of a few degrees Centigrade causes catastrophic changes in weather. This is happening now.

- Pollen has increased. It is ironic, but even with fewer trees in the world; the increase of carbon dioxide emissions induces plants such as ragweed and many trees to produce more pollen than ever before. This has resulted in rampant allergies across the world, affecting the health of billions of people.



- One of the solutions to tamp out carbon monoxide emissions from coal burning power plants was and still is to use radioactive power plants. While this does cut down on gas emissions significantly, there is radioactive waste which causes various cancers to bloom in major cities and small towns all around while destroying ecosystems entirely.
- Global temperature has risen significantly over the years. The protective atmosphere is further being polluted by methane gas released from melting icecaps. This is causing rampant weather issues around the planet.

This all seems like a fairly bleak outlook for the planet and all the creatures on it. It is, in fact, a load of dark and very real truth. For much of it, there is little turning back. Being realistic, though solutions are in the works to combat global warming, the hope is dim. Radiation does not go away quickly either, especially in a technological age requiring more power, more gas, and intensified depletion of protective gases around the planet. We are on a significant downhill snowball ride to hell. There are things we can do. Let us take a look at some of the solutions which are currently being implemented to reduce pollution.

3.5 Solutions to Control Pollution

Pollution control is an approach to eliminate the release of pollutants into the environment. It is regulated by various environmental agencies that establish limits for the discharge of pollutants into the air, water, and land. A wide variety of devices and systems have been developed to control air and water pollution and solid wastes. Pollution is prevented by using the below strategies:

- Recycling
- Reusing
- Reducing
- Mitigating



Gas emission pollution is being mitigated in a variety of ways with car emission control, electric and hybrid vehicles and public transportation systems. Not all major cities have successful implementation and decent public transportation in place, but the world is working on this issue constantly and we have managed to reduce emissions profoundly over the last decade. There is much catching up to do.

- The cost of radioactive power plants is becoming apparent and the days of coal power plants are nearly dead. The radiation is a serious issue. Radioactive leakage from power plants and nuclear testing have already contaminated oceanic life to such a degree that it will take hundreds of years to return to normal. More radiation solutions are in the works with various ecologically friendly power technologies being built every day.
- Solar power is a fantastic solution. Now that solar radiation is at a climactic peak, we can reap power from the sun using solar panel systems. These range from home systems to larger scale systems powering entire communities and cities.
- Wind power is coming into play. This may not seem like much at first, but when you get about 100 feet off the ground, there is a great deal of wind up there. By building wind turbines to harvest natural wind energy, electricity is produced. Wind turbine power and solar power are both powerful forces against fossil fuel power and radioactive power. The one problem here is power companies. They want to stay with radioactive power plants because they actually can't be removed. It has become the crusades of many individuals and small corporations to make the switch and there are plenty of people following this as populations cry out for help.
- Electromagnetic radiation (ER) reduction. Once major manufacturers of computers and electronic devices realized the blatant potential for huge ER emissions directly into the eyes and brains of users, they

started to implement hardware protocols to minimize risks and reduce ER production significantly. Newer devices are in the lead to knock this problem out and, fortunately, this is working.



Also, the Environmental Protection Agency (EPA) is well aware of all leaks and tricks industries are using to dump wastes. This agency now has extremely strict protocols and testing procedures implemented against such facilities so populations are not affected. Additionally, the EPA is measuring air pollution and implementing regulatory procedures for vehicle emissions. They also monitor pollen issues and, with the help of the Centers for Disease Control (CDC), they implement solutions to reduce pollen in the air. Dropping pollen counts is a major focus for EPA and CDC activities. Asthma and other allergic conditions are flooding medical care facilities and pharmaceutical companies with serious public health problems. The response has been swift and various methods to control emissions and reduce pollen counts are in the works. Children and elderly people are at the highest risk for environmental pollution related health problems. The good news is we are directly on the horizon to cut down the causes and risks while providing practical health solutions for the general public throughout the world.

The recent growing concern for the quality of our environment has strengthened the concept of environmental monitoring which requires regular periodical measurements of environment followed by timely assessment and interpretation of data obtained. Reliable monitoring data are necessary to know pollution problem. Environment is deteriorating day by day due to industrial pollution, toxic chemicals, automobile emission and natural resource depletion. Pollution in its various forms is increasing tremendously. Environmental management aims at the study of all these problems and checking pollution so that the environment satisfies the basic human needs at the minimum and more, if possible, for an indefinite future. The main aim of environmental management is overall development of environment. Purpose of environmental management is to see whether air is fit for breathing, water is fit for drinking and soil and sea resources are fit to provide all needs. One also



expects that people are well fed, well housed, well educated and enjoying happy and healthy life.

Environmental problems are so diverse and diffused that virtually any activity of civilization interacts with the environment. Many environmental pollution problems are local in character and they can be controlled by creating environmental consciousness in each and every citizen. People should be told about the importance of clean atmosphere as well as about the consequences of different types of environmental pollutions. Besides, action is also needed at national level and guidelines may be established internationally by the United Nations Joint Committee of Experts.

Some of the effective and practical control measures for minimizing environmental pollution are outlined below:

1. Combustible solid wastes should be burnt in incinerators. This method does not solve the problem in a real sense because in this, solid waste is being converted into gaseous wastes causing air pollution. Unless it is properly controlled, incineration may cause more nuisance.
2. Solid organic wastes including faecal matter and wastes from tanneries should be converted into compost manure at the places far away from the cities and human dwellings. The composting should be done in pits or in heaps adequately covered with layers of soil at least 8-10 cm thick to prevent fly breeding and rat menace which are important carriers of various diseases.
3. Non-combustible solid waste materials like ash, rubbish, tins, glass pieces if not recoverable for usual purposes should be disposed of by landfill method in low-lying areas.
4. Anaerobic septic tank treatment can be used for individual houses or small communities. Besides, aerobic biological treatment systems including trickling filters, activated sludge treatment and oxidation ponds can also be used for liquid wastes or sewage disposal.



5. Automobiles must be either made to eliminate use of gasoline and diesel oil or complete combustion is obtained in the engine so that noxious compounds are not emitted. The automobiles, trucks and other transport systems must have an antismog device. In some countries factories are using devices like scrubbers, cyclone separators or electrostatic precipitators to minimize pollution.
6. There should be cut back in the use of fertilizers, herbicides, pesticides and other agrochemicals as far as possible.
7. Excessive and undesirable burning of vegetation should be stopped.
8. Sponges and towels should be used in place of paper towels and also the use of paper cups and plates and similar materials should be stopped.
9. Little use of electric appliances and motor-nm appliances will reduce thermal pollution.
10. Washing soda and scouring pad should be used instead of detergents.
11. Waste management is based on principle of '3Rs' i.e. Reduce, Recycle and Reuse. Used boxes, bags, plastics and bottles should be reused whenever possible.
12. Since about 40% of the phosphates in water pollution comes from detergent, it has been suggested that only detergents low in phosphates should be used.
13. Shampoos, lotions and similar products should not be bought in plastic bottles. It has recently been suggested that use of plastic containers and glasses may cause cancer.
14. Smoking should be stopped (there is 5, 00,000 tonnes tobacco pollution annually).



15. Proper attention should be given by the government to make people realize the implications of environmental problem,

16. Legislation against pollution should be strictly implemented.

17. International action is needed to deal with the problems presented by highly toxic pollutants like lead, mercury, organ chlorine pesticides released in to the atmosphere and carried far beyond the country of origin as well as carried down to the sea by rivers. Successful action to improve environmental qualities depends mainly on the acceptance by industry and local authorities of the need to reduce greatly both quantities and toxicity of certain wastes at present being discharged into the sea and the modernization and expansion of sewage disposal systems.

18. Environmental education is the best programme to deal with the environmental problems. It is most fundamental in our efforts to combat and control pollution, over-population and misuse of natural resources.

Environmental education includes the following objectives which are based on the major outcome of the various workshop on environmental education:

- (i) Awareness of the problems.
- (ii) Providing knowledge to deal with the problems.
- (iii) Developing new attitudes towards environmental problems.
- (iv) Developing skills for solving environmental problems.
- (v) Providing development or evaluation ability in these areas.
- (vi) Increasing participation and involvement of public.
- (vii) A broad recognition of the facts that we are all responsible for helping to solve environmental problems.



19. Recycling of wastes and sewage should be done.

The work on pollution control and abatement techniques is being carried out by Desalination and Effluent Engineering Division of Bhabha Atomic Research Centre (BARC). There is special Directorate for Radiation Protection (DRP), an all-India organization, which keeps watch on exposure of the users or public at large to irradiation and provides proper instructions to users for using radioactive materials.

Besides these, a National Environmental Engineering Institute (NEEI) is established at Nagpur to execute studies on different aspects of pollution. This institute has regional offices, one each in Tamil Nadu, Calcutta, Mumbai, Delhi, Hyderabad, Jaipur, Kanpur and Ahmedabad. One more all-India organization, Industrial Toxicological Research Centre (ITRC), has been established at Lucknow which is concerned mainly with the study of toxicological and environmental problems.

Action Committee of 68th session of Indian Science Congress held at Varanasi (1981) recommended the following points on environmental management:

1. Immediate implementation of acts against air pollution, water pollution and noise pollution. (Now these acts have been framed).
2. There should be specific standards for the use of agricultural chemicals such as insecticides, pesticides and fertilizers.
3. Action is necessary against food adulteration, drug control and against factories producing effluents.
4. Department of Environment should be empowered for initiating legislative measures by the Parliament. Department should have control of soil, air and water environment and should maintain a strict vigilance over metropolitan and industrial areas. There should be regular monitoring of air and water quality. Penalty should be imposed on offenders not adhering to set standards against air, water, noise and other sources of pollution.



5. Environmental protection should be included in the concurrent list of constitution.
6. Government and voluntary agencies should be provided special incentives for successful anti-pollution researches.
7. Department of Environment should carry out publications on health safety and set directive criteria for different pollutants.
8. Environmental education should be made compulsory in the curricula of schools, colleges and universities. This has already been recommended by the Supreme Court of India in 2005.
9. Mass communication media should be adopted for information related to environmental problems.
10. Scientific societies NGOs, Associations and Academies should create a temper of environmental problems in the rural and urban areas.
11. Plantation of trees suited to different climates should be adopted. Deforestation must be legally checked.
12. Wildlife board and Environment cell should be created in each state. Central and State Pollution boards have already been established.
13. Recycling plants for municipal wastes and sewage should be established. In many cities it has already been implemented.
14. Anti-pollution tax should be imposed on industries for discharging the effluents.
15. Reclamation of land to its original state should be the responsibility of the users. There should be legislation against violation for this.
16. Encouragements and incentives should be given to voluntary movements as “Chipko movement” for the protection of plants.



17. In agriculture, biological control of pests should be applied to replace wide use of insecticides, pesticides and fungicides. Biological nitrogen fixation should be adopted.

18. Several Biosphere Reserves containing endangered or rare or commercially important species should be established as early as possible.

19. Gene Pool Reserves and Gene Sanctuaries should be demarcated and protected in their natural environment to preserve wild germ-plasm from extinction and conservation.

20. For conservation of flora and fauna the list of endangered species should be continuously renewed.

21. Aero-biological centres should be established in different parts of India.

22. Brick fields should be prohibited by law near agricultural or populated areas.

23. Cleaning of choked lakes and rivers should be done regularly.

24. Different aspects of alternative energy resources should be created as biomass, energy plantation, fuel energy etc. Social forestry should be encouraged.

25. A suitable agency should be established for conservation and monitoring of marine resources and providing protection against pollution hazards.

26. Satellite and space technology may be adopted for weather forecasting, agriculture resource inventories and monitoring of air borne particles.

27. Airport areas should be separated to minimize pollution from noise.

28. Genetic counseling units should be established at different regions of India to monitor genetic disorders.

29. Scientific, administrative and social measures must be adopted to check pollution explosion.

30. At different levels of planning, the involvement of ecologists is essential. All programmes for development should be undertaken without or with the least disturbances to the natural ecosystem.



Pollution control measures by the Government of India:

- Water prevention and pollution Act, 1974
- Air prevention and control of pollution Act, 1871
- Cess Act, 1977 and Environment Act, 1986
- Public Liability Insurance Act, 1981
- National Environment Tribunal Act, 1995
- National Environment Appellate Act, 1997

Central pollution control Board provides assistance to the central government on below issues:

- Coordinate the state board activities
- Provide technical assistance to the state boards and conduct research related activities to control pollution
- Collection, compilation and publication of the manuals and code of conduct
- To lay down the standards.

Carbon dioxide, while vital for photosynthesis, is sometimes referred to as pollution, because raised levels of the gas in the atmosphere are affecting the Earth's climate. Disruption of the environment can also highlight the connection between areas of pollution that would normally be classified separately, such as those of water and air. Recent studies have investigated the potential for long-term rising levels of atmospheric carbon dioxide to cause slight but critical increases in the acidity of ocean waters, and the possible effects of this on marine ecosystems. The Blacksmith Institute, an international non-for-profit organization dedicated to eliminating life-threatening pollution in the developing world, issues an annual list of some of the world's worst polluted places.



Check Your Progress I

Note: a) Use the space provided for your answers.

b) Check your answers with the possible answers provided at the end of this unit.

Q 1) List different form of pollution.

Ans.

Q 2) Effects of Air pollution.

Ans.

Q3) Effects of water pollution?

Ans.

3.6 Let Us Sum Up

Environmental pollution is the biggest menace to the human race on this planet today. It means adding impurity to environment. The environment consists of earth, water, air, plants and animals. If we pollute them, then the existence of man and nature will be hampered. Reckless application of chemical fertilizers, insecticides and pesticides pollutes the soil. Vegetables and fruits are quite injurious today, because they contain the poison of insecticides and pesticides. If the air we breathe, the water we drink and the



soil which produces our crops, vegetables and fruits, all become more and more impure, then our chances of good health and longevity will be very less and less. Environment pollution is a serious menace to our existence. Realizing the danger, we must plant trees in large number to absorb impure air. Impure water from industries can be sent back for purification and then it can be used for irrigation purpose.

3.7 Key Words

Pollution is the process of making land, water, air or other parts of the environment dirty and unsafe or unsuitable to use.

Nuclear pollution: Pollution caused by the radioactive waste material due to nuclear explosion is known as nuclear pollution.

Global Warming: The emission of greenhouse gases particularly CO₂ is leading to global warming.

3.8 References

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Unit-4



Depletion of Natural Resources, Resource Crunch and their impact on Sustainable Development in Rural India.

Learning Objectives:

After completion of this unit, you should be able to:

- *explain the causes for depletion of natural resources*
- *list out the measures to adopt conservation of natural resources*
- *explain the importance resource for sustainable development in Rural India*

Structure:

- 4.1 Introduction
- 4.2 Causes for Depletion of Natural Resources
- 4.3 Different Types of Natural Resources and their Conservation
- 4.4 Resource Crunch and their Impact on Sustainable Development in Rural India.
- 4.5 Let Us Sum Up
- 4.6 Key Words
- 4.7 References
- 4.8 Check Your Progress – Possible Answers

4.1 Introduction

Resource depletion is the consumption of a resource faster than it can be replenished. Natural resources are commonly divided between renewable resources and non-renewable resources. Use of either of these forms of resources beyond their rate of replacement is considered to be resource depletion. Resource depletion is most commonly used in reference to farming, fishing, mining, water usage, and consumption of fossil fuels. Humans are depleting the earth's resources at an ever-increasing rate. This is the sum of an ever-increasing global population multiplied by an ever-increasing level of consumption per person. More people on the planet lead to more:

- Sewerage and stock effluent



- Fertilizers, herbicides and pesticides
- Fossil fuels extracted and burned
- Oil leaked and spilled
- Land deforested and developed
- Soil eroded and degraded
- Minerals mined
- Waste and toxic byproducts of manufacturing

All of these things deplete or degrade the earth's natural resources. It is estimated that humanities' eco-footprint (a measure of consumption) is one and a half times the earth's ability to sustainably provide the resources to meet that level of consumption. That shortfall is being met through the depletion (or degradation) of natural capital – things like fresh water, soil, forest land, wetlands and biodiversity. All the materials and energy essential for the survival and welfare of living beings including humans are provided by nature. They are called natural resources. A thing becomes resource only when it is used by humans to perform a function. Man lives in nature and depends on the resources of nature. The sustenance and welfare of mankind depends upon the exploitation of different natural resources. The utilization of soil, water minerals, coal, electricity, oil, gas and nuclear energy is very important for the development of nation These resources have changed the level of living standard of man. Of the world's total population of six billion, one billion in U.S.A. and Europe alone use 84% of world's total energy. Three billion people of India, China, Brazil and few other countries use only 15% India contains the world's second largest resource of coal and third and four largest resource of manganese and iron. Fossil fuels (coal, petrol, and natural gas) on which modern industrial centres are based are limited.

At present rate of consumption, the fossil may be drastically depleted leading to severe energy crisis. Coal reserves of the world are higher than petroleum and natural gas and they may last longer. The leading coal producing countries are China U.S.A. erstwhile U.S.S.R., Germany, U.K., Japan, India, Poland, France and Czechoslovakia. The major oil producing countries are U.S.A.,



U.S.S.R., Kuwait, Saudi Arabia, Iran, Iraq, Nigeria, Libya, Arab Republic and Indonesia. New discovery of oil has been made recently in the sea beds of Mumbai. India is facing an ecological crisis and is degrading her natural resources day by day. Now the shortage of natural resources is a matter of international concern. There is increasing deficiency of energy, metals, coal, non-fuel and non-metallic materials. With regard to fuels there is great concern over the huge outflow of foreign exchange and every year enough oil is purchased from the Middle-East countries which are major sources of petroleum. The developed nations of the world have created abundant resources but the developing nations are importing many of these from foreign countries.

We are aware of the fact that earlier the human being was essential part of the nature and human society had impact on the other components of the biosphere. However, with the advancement of social and Cultural Revolution the conflict between man and nature started. Due to its unending greed, man has destroyed the nature to the maximum for his little pm and made himself the master of nature. However, all efforts to have mastery over the nature have increased his further dependence on nature. On account of such un-thoughtful and ruthless exploitation the human society has vastly modified the ecosystems in different parts of the world and has brought undesirable changes in the natural habitats.

Consequently, some natural stocks of plants and animals have disappeared. About 1000 species are currently threatened with extinction or are dangerously rare. The human encroachment of nature has deprived the world civilization of 130 mammal species and has endangered more than 250 species. Out of the total approximately 0.3 million species of plants in the world, over 20,000 are in the category of either endangered or threatened with extinction. It is estimated that over 1000 animal species and 20,000 flowering plants are likely to be endangered globally. Food, shelter and clothing are the primary requirements of man. Early human society has used natural resources relatively in much less quantity to cover his wants. Among the most essential



requirements is a well cooked food. We know that cooking requires energy. The simplest source of energy available for cooking since the early human history is fuel wood. According to an estimate, about 60.5 per cent of Indian people's fuel wood consumption is fire wood and other agricultural wastes. According to Government of India's "Fuel Wood Policy Committee", the annual demand for fuel is roughly 133 million tonnes which is expected to increase in the next 50 years.

There is a great controversy over the sufficiency of the mineral resources to retain domestic and economic development all over the world. According to "Resources and Man" (1969), "true shortages exist or threaten for many substances that are considered essential for current industrial society." Mercury, tin, tungsten and helium, are known examples and the prospective resources of these substances will be nearly exhausted by the end of this century or early in the next, and new sources or substitutes to satisfy even the relatively short-term needs will have to be found out. One of the most serious aspects of the problem arises from the impact of economic efforts of mankind especially for the purpose of maintaining its existence, protection, survival and betterment of the standard of living. The basic needs which induced the human beings to spoil the natural resources for their welfare have finally led to a situation which threatens to be disastrous.

Now in almost every advanced country, the overpopulation has been a vital concern along with the atmospheric pollution. Every effort is being made to save mankind from self-destruction. The situation has become so serious that it is necessary to take some precautionary steps so that the complications may not become worse further. There are various problems which have arisen due to industrial and agricultural developmental activities. Many of these problems are due to mismanagement of natural resources and their impacts are not localized but are universal in nature. It has been estimated that the quantity of CO₂ will be doubled in 23 years and the oil and natural gas resources will be no more available after 50 years and coal will be almost consumed within 150 years.



Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems; habitat destruction; the extinction of wildlife; and pollution. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable. As indicated by the I=PAT equation, environmental impact (I) or degradation is caused by the combination of an already very large and increasing human population (P), continually increasing economic growth or per capita affluence (A), and the application of resource depleting and polluting technology (T). Environmental degradation is one of the ten threats officially cautioned by the High-level Panel on Threats, Challenges and Change of the United Nations. The United Nations International Strategy for Disaster Reduction defines environmental degradation as "The reduction of the capacity of the environment to meet social and ecological objectives, and needs". Environmental degradation is of many types. When natural habitats are destroyed or natural resources are depleted, the environment is degraded. Efforts to counteract this problem include environmental protection and environmental resources management.

If natural resources are misused or overused, they may not be available in the future. Non-renewable resources such as oil, minerals and coal, once exhausted, cannot be replenished. This is called depletion of Resources. This is called Depletion of Resources. Unfortunately, our technological society is consuming natural resources at a very fast speed and in an unchecked manner. So the natural resources are being depleted at a great speed at the earth.

4.2 Causes for Depletion of Natural Resources

- Aquifer depletion
- Habitat degradation leads to the loss of biodiversity (i.e. species and ecosystems with its ecosystem services)
- Irrigation
- Mining for fossil fuels and minerals
- Overconsumption, excessive or unnecessary use of resources



- Overpopulation
- Pollution or contamination of resources
- Slash-and-burn agricultural practices, currently occurring in many developing countries
- Soil Erosion
- Technological and industrial development
- Deforestation

Minerals are needed to provide food, clothing, and housing. A United States Geological Survey (USGS) study found a significant long-term trend over the 20th century for non-renewable resources such as minerals to supply a greater proportion of the raw material inputs to the non-fuel, non-food sector of the economy; an example is the greater consumption of crushed stone, sand, and gravel used in construction. Large-scale exploitation of minerals began in the Industrial Revolution around 1760 in England and has grown rapidly ever since. Technological improvements have allowed humans to dig deeper and access lower grades and different types of ore over that time. Virtually all basic industrial metals (copper, iron, bauxite, etc.), as well as rare earth minerals, face production output limitations from time to time because supply involves large up-front investments and is therefore slow to respond to rapid increases in demand

Minerals projected by some to enter production decline during the next 20 years:

- Gas (2023)
- Copper (2024). Data from the United States Geological Survey (USGS) suggest that it is very unlikely that copper production will peak before 2040.
- Zinc Developments in hydrometallurgy have transformed non-sulphide zinc deposits (largely ignored until now) into large low cost reserves.

Minerals projected by some to enter production decline during the present century:

- Aluminum (2057)
- Coal (2060)
- Iron (2068)



Such projections may change, as new discoveries are made and typically misinterpret available data on Mineral Resources and Mineral Reserves.

Peak oil is the period when the maximum rate of global petroleum extraction is reached, after which the rate of production enters terminal decline. It relates to a long-term decline in the available supply of petroleum. This, combined with increasing demand, will significantly increase the worldwide prices of petroleum derived products. Most significant will be the availability and price of liquid fuel for transportation.

The United States Department of Energy in the Hirsch report indicates that “The peaking of world oil production presents the U. S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated more than a decade in advance of peaking.”

Deforestation is the clearing of forests by logging or burning of trees and plants in a forested area. As a result of deforestation, presently about one half of the forests that once covered Earth have been destroyed. It occurs for many different reasons, and it has several negative implications on the atmosphere and the quality of the land in and surrounding the forest.

One of the main causes of deforestation is clearing forests for agricultural reasons. As the population of developing areas, especially near rainforests, increases, the need for land for farming becomes more and more important. For most people, a forest has no value when its resources aren't being used, so the incentives to deforest these areas outweigh the incentives to preserve the



forests. For this reason, the economic value of the forests is very important for the developing countries.

Because deforestation is so extensive, it has made several significant impacts on the environment, including carbon dioxide in the atmosphere, changing the water cycle, an increase in soil erosion, and a decrease in biodiversity. Deforestation is often cited as a cause of global warming. Because trees and plants remove carbon dioxide and emit oxygen into the atmosphere, the reduction of forests contributes to about 12% of anthropogenic carbon dioxide emissions. One of the most pressing issues that deforestation creates is soil erosion. The removal of trees causes higher rates of erosion, increasing risks of landslides, which is a direct threat to many people living close to deforested areas. As forests get destroyed, so does the habitat for millions of animals. It is estimated that 80% of the world's known biodiversity lives in the rainforests, and the destruction of these rainforests is accelerating extinction at an alarming rate.

The United Nations and the World Bank created programs such as Reducing Emissions from Deforestation and Forest Degradation (REDD), which works especially with developing countries to use subsidies or other incentives to encourage citizens to use the forest in a more sustainable way. In addition to making sure that emissions from deforestation are kept to a minimum, an effort to educate people on sustainability and helping them to focus on the long-term risks is key to the success of these programs. The New York Declaration on Forests and its associated actions promotes reforestation, which is being encouraged in many countries in an attempt to repair the damage that deforestation has done.

Wetlands are ecosystems that are often saturated by enough surface or groundwater to sustain vegetation that is usually adapted to saturated soil conditions, such as cattails, bulrushes, red maples, wild rice, blackberries, cranberries, and peat moss. Because some varieties of wetlands are rich in minerals and nutrients and provide many of the advantages of both land and



water environments they contain diverse species and provide a distinct basis for the food chain.

Traditionally, wetlands were assumed to be useless so it was not a large concern when they were being dug up for settlements, agricultural use etc. It is now believed that the wetland habitats contribute to an environmental health and biodiversity.

In the USA, less than half of the wetlands that still existed in the 1600s have vanished.

Wetlands provide environmental services for:

1. Food and habitat
2. Improving water quality
3. Commercial fishing
4. Floodwater reduction
5. Shoreline stabilization
6. Recreation

Some loss of wetlands resulted from natural causes such as erosion, sedimentation (the buildup of soil by the settling of fine particles over a long period of time), subsidence (the sinking of land because of diminishing underground water supplies), and a rise in the sea level.

Non-natural causes of wetland degradation and loss include:

- Hydrologic alteration
 - drainage
 - dredging
 - stream channelization
 - ditching
 - levees
 - deposition of fill material
 - stream diversion



- groundwater drainage
- impoundment
- Urbanization and urban development
- Marinas/boats
- Industrialization and industrial development
- Agriculture
- Silviculture/Timber harvest
- Mining
- Atmospheric deposition

There are various reasons for the depletion of natural resources:

1. Rapid population increase,
2. Pollution,
3. High consumption of resources, and
4. Deterioration of land.

1. Rapid population increase:

There has been a tremendous increase in India's population and it has now crossed 120 crores (1.2 billion). An increase in population will decrease all types of natural resources and result in environmental pollution. Ultimately, there will be short supply, as well as deterioration in quality of natural resources. This is because increase in population will increase the demand of natural resources and environment.

At present, the world population is increasing by two per cent every year. The industrialized countries have annual growth rate of 0.5 to 1 per cent and on the other hand the developing countries have the growth rate of 2 to 3 per cent. The per capita use of energy and mineral resources shows a difference between the developing and developed countries of the world. The developed countries consume less but their resources are enough. The population and per capita consumption have a considerable impact on the environment. The world cannot meet the continuously increasing demand for natural resources.



2. Pollution:

We are deteriorating our environment due to increasing population and industrial revolution. We are polluting atmosphere, lakes, and streams, rivers by sewage, industrial wastes, heat, radioactive materials, detergents, fertilizers and pesticides. Besides these, we are releasing a number of toxic materials into our surroundings. The uncontrolled and indiscriminate use of pesticides has disturbed the entire food chains by which animals including man are affected.

It has been estimated that average individual has about 7 parts per million (ppm) DDT in his body which affects in long-term. Recent researches have revealed that this proportion of DDT in our body has deleterious effects on heart and liver and higher concentration may cause several other diseases including cancer. Many gases, e.g., carbon monoxide, sulphur dioxide, carbon dioxide and nitrous oxide are known to cause respiratory troubles. The unplanned and uncontrolled industrial growth may adversely affect or destroy the health of the society.

3. Consumption of materials:

Due to tremendous increase of population, most of the natural resources are being rapidly consumed. This high rate of consumption has disturbed our ecosystems. But, on the other hand, many of the natural resources are essential basic human needs. Many industries require raw materials which are essential for the advancement of the country. However, their rapid consumption will affect adversely the quality of our environment either by unwise use of natural resources or by increasing pollution.

4. Deterioration of land:

Due to excessive consumption of minerals of the soil by cropping or soil erosion or other natural events, fertility of soil is lost and the land deteriorates gradually. Sometimes drought also results in deterioration of land and many nutrients of the top soil are destroyed and soil fertility is lost. As a result of cropping, the cycling of soil mineral nutrients is greatly reduced.



Erosion has also depleted soil fertility because most of the minerals remain in the upper part of the soil and they are easily removed by wind or washed away by water. Sometimes water erosion takes its toll of fertile soils.

Man has also deteriorated agricultural land and ultimately caused the loss of national economy. It is commonly seen that man cannot degrade one part of his environment without simultaneously affecting other parts. For proper economic development lands for cropping, forest, recreation, transportation and wildlife are needed but their availability is reducing day by day. Therefore, integrated policy of resource management should be practiced; otherwise unexpected future shortage might upset the national economy.

4.3 Different Types of Natural Resources and their Conservation:

Basically the Natural Resources are of two types:

1. Renewable natural resources:

These resources can be replenished and do not change the ecological balance. The cut trees can be grown again, soil forms again and animals reproduce themselves.

2. Non-renewable natural resources:

Resources which once used up will be exhausted forever. Overexploitation of natural resources that are limited in stock may cause scarcity and even renewable resources, such as, water, forests, if over-exploited, require long period of time for replenishment. It clear that if the man wants to survive on this planet he must conserve the natural resources rather than merely exploit them. It does not mean mere preservation of the sources without using them. We should use the resources wisely and judiciously without wasting them.

Different types of these natural resources and their conservation are discussed under the following heads:



Mineral resources:

Now it is known that the world's resources of minerals, oils, coal and natural gases are limited. Mineral resources are of several types metallic minerals and non-metallic minerals. Non-metallic or industrial minerals include a wide variety of substances which comprise the building materials such as rock, sand, gravels, cement and clay.

The non-metallic minerals are fertilizers which are essential to increase agricultural yield. Large amount of nitrogen in the form of nitrates is available in the natural deposits but now it is possible to fix nitrogen synthetically from air. Thus, the deficiency of nitrogen resources is compensated. Phosphorus is obtained from phosphate rocks. Although the phosphorus resources are abundant, yet not evenly distributed Potassium is also quite abundant in the world.

Among metals, iron, nonferrous metals, silver and gold are important. Among these, iron is the most important element because it is the main component of steel alloys. Chromium, cobalt, magnesium, molybdenum, nickel, tungsten and vanadium are included under ferroalloy elements.

So far as the causes of mineral loss from the soil are concerned, soil erosion and cropping are considered to be the most significant. Most of the soil nutrients remain in the upper part of soil and many minerals of upper soil are carried away by rapid winds or running water and thus the soil becomes deficient in fertile minerals. Soil is the most important resource of nature, it is essential for human existence and provides the basic requirements to man.

At present, there is a great loss of minerals all over the world which should be considered seriously Further, demands for mineral resources must be thought of seriously Although it is difficult to make exact estimate, yet there should be proper relation between demand and supply Sudden shortage of mineral resources results in poor economy It has been estimated that for a number of important minerals the resources are limited.



So the new resources must be supplied immediately otherwise the minerals will be exhausted within a few years. Due to excessive consumption new minerals should be added rapidly. Now it has become essential for resource-producing undeveloped countries to make some Act to maintain control over their own natural resources.

Even oil rich countries have formed an International Organisation of Petrol Exporting Countries (OPEC) which produces more than 50% oil of the world. It has been calculated that out of 19 important minerals 9 would be exhausted in 10 years and coal, iron and aluminum will be consumed by 2100. Therefore, entire quantity of world's mineral reserves should be replaced time to time.

There are three important conservation approaches which should be taken into consideration:

- (i) To reduce wastes and to minimize demand,
- (ii) To change the way of life, and
- (iii) To increase reclamation and recycling of materials.

Solid wastes should be reutilized for their energy content and it is possible to recycle the materials. The total demand can be met with a decrease in the consumption of new materials and increasing the amount of reclamation.

Forest Resources:

Forest is an important natural resource. It is the most important natural habitat for wildlife. It is also utilized by farmers for commercial and recreational purposes. Many herbivores find shelter and carnivores search their prey in the forest. Many wildlife store food supplies and breed in the forest.

Besides this, forest plays most important role from commercial point of view. It is the source for a large number of products useful to man. It provides raw materials for many products of daily use. It feeds several industries which depend on wood products. Turpentine oil, paints, resins and printing paper industries get raw material from the forest. Man not only benefits from forest, but also gets recreation.



Forest also provides sanctuary for the modern city dwellers. Large numbers of people visit the forest for peace, beauty and recreation. Forest based cottage industries, such as bee-keeping, bamboo mat and basket making provide means of livelihood to the tribal people. Sal is a most important source for timber industries. Forest also provides raw materials for pulp and plywood industry.

Green plants of the forest are food-producing organisms and are primary producers of the “food chain”. They trap energy from the sun and use it to transform CO₂ from the air, together with water and nutrients from the soil into food substances like starch, sugars, through the process of photosynthesis. These foods are stored in the fruits, nuts, seeds, nectar and wood.

Therefore, forest serves as an energy reservoir, trapping energy from sunlight and storing it in the form of a biochemical product. Forest plays a most important role in keeping the atmosphere balanced by consuming CO₂ and releasing O₂, the latter is essential for animal life. So removal of plants and trees would disturb the composition of natural air. An acre of forest absorbs 4 tonnes of carbon dioxide gas and releases 8 tonnes of oxygen into environment.

If a forest is cut down, energy stored in the wood is lost and also most of the nutrients of the system are lost. Such deforestation leaves a poor soil which can support agriculture for only a short time, because the harvesting of the first few crops removes the remaining nutrients and renders the soil useless. Deforestation shows other disastrous results also. Removal of trees exposes the surface of the land resulting into erosion.

Soil is then washed away. In many places soil erosion occurs ten times more rapidly than usual, once the trees are removed. Soil erosion is particularly more on hill slopes where heavy rain sweeps soil downhill to choke rivers. The reduction of forests later affects rainfall and thereby restricts the availability of a most important natural resource, the rain water.



In natural forests, the free roots bind the soil and about 90 per cent of the water falling on the forests is retained either in humus or in the plants tissue. The forest thus acts as a soaking device and plays a vital role in the hydrological cycle. The rain water thus soaked up is gradually released over the days and weeks which supply to streams and rivers even during dry seasons.

Hence, it is important to retain forest cover in upland catchment areas as an alternative to flooding the whole barren and uncultivable area. The washed away top soil silts river beds and reservoirs reduce the water holding capacity and flood in the surrounding area is a natural calamity. It has been estimated that in India 60,000 million tonnes of top soil is carried away annually by rain water from deforested area.

Now a day the tendency of deforestation is increasing. Man is cutting forest to get temporary benefits but there will be a tremendous loss in due course of time. Now, due to gradual destruction of forest, wildlife is disappearing and their number is becoming reduced for which government should consider various aspects of forest management. Forest management programmes should be motivated by forest employees and general public to increase yield, to avoid forest cutting and to prevent forest fires. Whenever plant or timber is cut, that area must be reforested. Similarly, any forest which has been destroyed by insects, diseases, hurricanes that area should be reforested. The primary aim of the forest service is to make the greatest number of forest resources available to the maximum number of people.

Shifting cultivation is another practice which destroys the forest. Many farmers destroy the forest for agricultural purpose and soil is exhausted. Therefore, farmers should use the same land for cultivation and they should apply better farming methods so that soil fertility remains restored and the soil can be used again.

Most severe damage of the forest is due to attack of insects, pests and fungi. Many destructive forest diseases are due to parasitic fungi, rusts, viruses and nematodes. Young seedlings are destroyed due to attack of nematodes. Many

diseases such as heart rot, blister rust, oak wilt, phloem necrosis and Dutch elm diseases are common in the forest.



The forest diseases can be controlled up to some extent by the following methods:

1. by eradication of alternative hosts
2. By using suitable antibiotics
3. By DDT spray
4. Sterilization, and
5. By using resistant varieties

Besides above, the following measures of forest management have been recommended:

1. Reforestation
2. By improving the quality of timber
3. By converting wasteful cutting into quality yield harvesting
4. By increasing forest protection
5. By increasing forest area
6. By developing fast growing trees
7. By controlling harmful forest agents
8. By developing the better tree varieties
9. By using disease resistant varieties



In India about 75 million hectares area is occupied by forest alone which is about 23 per cent of the total land. In India forests have not so far played a significant role in improvement of economic condition of the country. Proper scientific management, conservation and utilization of forest wealth are likely to increase their resource value and utility in the future.

At present there is an urgent need to conserve the existing forest resources and to expand the forest area. The most important task is to restore the vegetation cover which is destroyed through our false policies. New forests and wood lots should be created to meet the daily demand of fuel and fodder and to provide more habitat for the wildlife.

The National Commission on Agriculture is giving serious thought to the problem of deforestation and has recommended introduction of “Social Forestry”, i.e., to create multipurpose village wood lots in rural India. Social forestry may be defined as an additional aid to wildlife conservation. “Social forestry is a concept, a programme and a mission which aims at ensuring ecological, economic and social security to the people, particularly to the rural masses especially by involving the beneficiaries right from the planning stage to the harvesting stage. It aims at mixed production system of wood, fiber, fodder, grasses, fruits and other raw materials for self- consumption and cottage industry”.

Different components of social forestry programme are:

1. Protection and afforestation of degraded forests in the vicinity of human habitations.
2. Creation of village wood lots on community lands and government waste lands.
3. Block plantation.
4. Agricultural crops) on marginal and sub-marginal farm



5. Tree planting around habitation area, field boundaries and pasture development
6. Tree planting in Urban and Industrial areas for aesthetic purposes, purification of polluted air, absorption of CO₂, release of O₂, and control of noise pollution.
7. Control of soil erosion by planting trees or shrubs.
8. Strip plantation along road sides, canals and rail lines.

Joint Forest Management:

Participation of local public is needed in forest management programmes. Local people, farmers, students and women help in greening an area, if they get some economic benefit from forest conservation. There must be coordination and mutual cooperation between local communities and the Forest Department.

This joint venture of economic forest management may be said as:

Joint Forest Management (JFM):

This step started first, in 1972, in West Bengal. The concept of social forestry is also the same. In this programme, local population and Forest Department are involved in plantation. Joint Forest Management (JFM) programmes involve an agreement between the local people and the Forest Department.

The JFM programme cares more for the local population and their rights and benefits from the forest resources are safe. Under this programme, a committee is formed from the local public, called Forest Protection Committee. This committee helps in restoring the green cover and protects the area from being over-exploited.

Mining operations, dam construction and timber cutting, etc. are some of the requirements of a developed country. But in mining and over-exploitation of



timber, the ecological damage to forests is unimaginable. It has been seen that the forests are often found in the regions where there is rich mineral resources. Forests also cover the steep embankments of river valleys, which are more suitable to develop Hydel and Irrigation Projects.

Thus, there is a conflict between ecologists and the Mining and Irrigation Department. But it is to understand that long-term ecological benefits cannot be overlooked for short-term economic profits that lead to deforestation. In the forest areas, where development projects are approved, these dislocate and displace thousands of tribal population along with their houses and properties. The Joint Forest Management looks to resolve such sensitive issues.

If above programmes are carried out effectively the basic needs of rural people such as fuel, fodder, fibre and timber could be met easily and it will ensure ecological security like protection against wind, erosion, polluted water and air and availability of desired habitat for the wildlife. Social forestry can play a significant role to check flood and drought which affect 34 and 68 million hectares of land respectively in India.

Wildlife Resources:

Nature has gifted us a priceless biotic wealth, the wildlife which is a thing of beauty. It needs to be preserved rather than destroyed. In broad sense, the wildlife involves animals living in a natural, undomesticated state and uncultivated plants and microbial communities living within their natural environment.

In the modern sense, according to Dr. Mahajan (1961), wildlife means, life in any form (plant/animal) existing in natural surroundings. Wildlife as a natural resource is an essential component of ecosystem. It is of high importance to human society. It contributes to the cycling of matter, flow of energy and the soil forming processes. It has a significant role in the stabilization of ecosystems by natural control and regulation of populations (Bio indicator). It acts as gene reserve.



Wild fauna has a positive role in formation of ecosystem by pollination, seed and fruit dispersal and selective breeding etc. Wildlife provides recreational and economic benefits to man. Recreational and economic benefits are closely related to each other. For instance, fishing and hunting provide entertainment and economic benefit to man.

There is a mutual correlation between plants and animal communities. The composition of animal community is more or less constant and it is characterised and maintained by vegetation type which provides habitat and food for animals. Therefore, the maintenance and conservation of wild fauna depends largely on the conservation of habitat.

The developmental projects such as mining, agriculture, shifting cultivation, major water resources, major engineering activities, timber extraction have created special problems of habitat and wildlife management in the tropical forests and as a result, tropical forests are diminishing rapidly. Major canals and irrigation projects have created problems of wildlife management. Selective polycyclic logging in the forest is disturbing the wildlife in the same way as cyclones and destruction of natural forests disturb wildlife.

Red Data Book:

International Union for Conservation of Nature (IUCN) has published Red Data Book which maintains a collection of all the available data on the species threatened with extinction. Several criteria have been listed in the book to indicate the endangered state of the species, such as restricted distribution, narrow habitat tolerance, migration across international boundaries, behavioral non- adaptiveness to technical advances, over exploitation, habitat destruction, competition for food, accidental killings and so on.

Wildlife includes 850 species of mammals, 1200 species and 2,100 sub-species of birds and more than 20,000 species of insects. According to the Red Data Book, about 277 species of mammals and 321 spp. of birds are considered to be endangered or likely to become extinct. The World Wildlife



Fund (WWF) under International Union for Conservation of Nature (IUCN) is concerned with the conservation of wildlife and several projects have been launched for conservation of natural forests and wildlife. In its diversity of life forms India is the second largest country in the world.

It is absolutely necessary to protect and conserve all forms of life on this earth as they are all interdependent and form a chain. Nature has created them in such a balanced manner that if one form of life is disturbed it affects all the other lives also. The very existence of man depends upon the survival of other forms of life both plants and animals. So the destiny of humanity depends upon the survival of other forms of life.

The causes of decline of wildlife in India are many. Wild elephants were captured and trained for use in war. Rhinos were killed for making shield. Rulers of princely states indulged in killing of wild animals as their hobby. Forests were cleared for development of agriculture, industry and other developmental projects. Wild animals were mercilessly killed which resulted in decline in their number and they are facing extinction now.

The extinction of species is a general biological principle of evolution and the change of living conditions happened to be the main reason for extinction. The extinction of species is followed by replacement by the new species which are better adapted to changed conditions. This is how the species diversity and biological equilibrium is maintained in nature and the evolution continues.

The main factors for extinction of wildlife fauna are as follows:

1. Habitat distraction or contamination of the habitat which accounts for about 67% extinction
2. Over exploitation which accounts for about 37% extinction.
3. Introduction of exotic species which accounts for about 19% of the total extinction.

4. Competition for food may account for about 7% of extinction.

5. Accidental killing which accounts for about 2% of extinction.



These figures combined are well above 100 per cent because some time more than one factor affects a threatened species. Today wildlife species are gradually disappearing and their number is becoming reduced. Many species of wildlife have become extinct or are on the way to extinction Up till now 106 species of mammals and 139 species of birds have become extinct due to climatic and geographical changes or hunting by man. Today the lions are limited in number. The number is around 200 in the Gir forest of Gujarat. The rhino existed in Indus valley in the vicinity of Mohenjo-Daro some 5000 years ago. The rhinos are now found in certain parts of Nepal, West Bengal and Assam.

The number of tigers is also very limited. According to 1972 census, the tigers were 1827 in India. Conservation is an intelligent and judicious management of resources towards their optimum utilization without depleting the basic stock. The protection of wildlife from unwanted destruction is called wildlife conservation.

Through the Convention on International Trade in threatened and endangered species of wild Fauna and Flora, a number of species such as hispid hare, pigmy hog, lion, tiger, rhino, thamin and great Indian bustards have been saved. In 1973, a project for saving tiger was started which yielded very satisfactory results. The number of tigers increased considerably and it has become difficult to maintain them in their reserves. They have started killing rural population and their cattle outside the limits of Corbett and Dudhwa National Parks of U.P. All life forms created by nature are directly or indirectly dependent for their survival on other life forms.

4.4 Resource Crunch and their Impact on Sustainable Development in Rural India.



Resource Crunch refers to deficit of resources in rural areas. International development policy has come to a consensus that environment-poverty linkages are critical in determining development outcomes. Poor people in developing countries are particularly dependent on natural resources and ecosystem services for their livelihoods. Increasingly the poor live in areas of high ecological vulnerability and relatively low levels of resource productivity. The position of the poor at such ecological margins, as well as a low level of access and rights over productive natural resources, is a major factor contributing to rural poverty. Much of the extensive debate over poverty in the last decade has in fact turned around the question of how poverty, vulnerability, livelihoods and access to resources are linked. The following concepts and definitions have become widely accepted points of reference in these debates about development.

Poverty

There continues to be much debate about how poverty should be defined, but it is increasingly accepted that poverty is not just a lack of material necessities, assets and income. The notion of poverty has been broadened to include a deprivation in capabilities, voice and power that contribute towards a lack of well-being.

Livelihoods

'A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base' (Chambers and Conway, 1992).

Vulnerability

Vulnerability refers to the external environment in which people pursue their livelihoods and their exposure (risk) to the negative effects of the external

environment, as well as their resilience in resisting and recovering from external shocks and trends.



Access to resources

Vulnerability is closely linked to access to resources (capital assets) because these are a principal means by which people reduce their vulnerability. It is the access to resources, assets and entitlements that together give people the capabilities to pursue livelihood strategies that may have direct material as well as more individually subjective objectives.

Concerns over the sustainability of natural resource use are not new; however the last decade has seen significant changes in the approach to questions of access to resources and its links to poverty. Central to the changed approach - as the concepts described above suggest - is a people-centered focus and a dynamic view of well-being based on a recognition of the vulnerability dimension of deprivation and poverty. Both in theory and practice approaches to the issue of poverty-environment linkages now tend to start with a consideration of how people themselves define poverty and the assets they draw on in pursuing their livelihood strategies. Questions of what role access to natural capital plays in local livelihood strategies now tend to be seen in dynamic interrelation with how other capital assets, such as social, physical, human and financial assets are used.

This change in the conceptualization of poverty, vulnerability and livelihoods in relation to access to natural resources can be partly attributed to:

- Emerging empirical evidence on the nature of poverty-environment linkages and the types of livelihood strategies adopted by the poor.
- Related changes in theories on poverty-environment linkages
- The international policy environment and the new poverty reduction agenda

Sustainable development is defined as a process of meeting human development goals while sustaining the ability of natural systems to continue



to provide the natural resources and ecosystem services upon which the economy and society depends. While the modern concept of sustainable development is derived most strongly from the 1987 Brundtland Report, it is rooted in earlier ideas about sustainable forest management and twentieth century environmental concerns. As the concept developed, it has shifted to focus more on economic development, social development and environmental protection for future generations. Sustainable development is the organizing principle for sustaining finite resources necessary to provide for the needs of future generations of life on the planet. It is a process that envisions a desirable future state for human societies in which living conditions and resource-use continue to meet human needs without undermining the "integrity, stability and beauty" of natural biotic systems. It was suggested that "the term 'sustainability' should be viewed as humanity's target goal of human-ecosystem equilibrium (homeostasis), while 'sustainable development' refers to the holistic approach and temporal processes that lead us to the end point of sustainability."Improving the quality of life for the rural poor by developing capacities that promote community participation, health and education, food security, environmental protection and sustainable economic growth, thereby enabling community members to leave the cycle of poverty and achieve their full potential.

- Economic sustainability: sustainable livelihoods and improved well-being through growth and poverty reduction
- Environmental sustainability: Target agricultural land, forests, water resources, protected areas, and biodiversity, so that opportunities and options of future generations are not degraded
- Fiscal and institutional sustainability: must be realistic about cost and institutional requirements of instruments
- Establish projects and policies on appropriate levels -- community, watershed, national, regional, global – generally with corresponding implementation/ financing mechanisms
- Incorporate institutional development and new technologies
- Reduce risks and vulnerabilities of farming communities



- Diversify cropping systems for economic and environmental resilience

With the resource crunch posing a major challenge, India needs to find new and additional financing avenues as well as technology to ensure sustainable development, “More often, it is the resource crunch which is the stumbling block for developing countries like India. “While it takes effort to efficiently and expeditiously bring price signals and other policy instruments into play, India could do much more if new and additional finance and technology are made available through multilateral processes.

A host of issues including erratic weather and natural disasters along with poverty and hunger continue to be great concerns for policymakers, especially in the developing world. Noting that India is on the right track in achieving environmental sustainability, the Survey said the country has the right enabling environment besides a number of achievements to its credit.

“However, the challenge while India is growing is to identify the key drivers and enablers of growth, be it infrastructure, the transportation sector, housing, or agriculture and to make these sectors grow sustainably,” the Survey said. India has chalked out ambitious plans and policies to tackle climate change and environment issues.

“However, given the scarcity of resources and competing demands, finding the matching resources is a challenge,” it said. Further, the report said though multilateral efforts on sustainable development and climate change have led to several positive outcomes, there are still areas of concern in terms of safeguarding the interests of developing countries in future deliberations.

“Be it national or global, environmental decline and global warming occurred gradually over decades and centuries, picking up pace with time. We must remember that the clock is now ticking on the needed global action to combat and contain this decay. “This action should be fair, just and equitable for all countries so that the future we want will be a future in which there is ecological and economic space for sustainable development for all.



Check Your Progress I

Note: a) Use the space provided for your answers.

b) Check your answers with the possible answers provided at the end of this unit.

Q 1) What are the causes for depletion of natural resources ?

Ans.

Q 2) What are the main factors responsible for extinction of wildlife fauna from the earth ?

Ans.

4.5 Let Us Sum Up

There is a need of the hour is preservation of our natural resources and uses it in such way that it would contribute for sustainable development. There should be awareness and sensitization on the part of government and the civil society to reduce this resource crunch and give a way for sustainable development. The media should also play a pro-active role in this process.

4.6 Key Words

Renewable natural resources: These resources can be replenished and do not change the ecological balance. The cut trees can be grown again, soil forms again and animals reproduce themselves.

Non-renewable natural resources: Resources which once used up will be exhausted forever.

Sustainable development is defined as a process of meeting human development goals while sustaining the ability of natural systems to continue

to provide the natural resources and ecosystem services upon which the economy and society depends.



4.7 References

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4.8 Check Your Progress – Possible Answers

Unit - 1

Check Your Progress I

Q1) Ans:

Ecology is the scientific analysis and study of interactions among organisms and their environment. It is an interdisciplinary field that includes biology, geography, and Earth science.

Human Ecology is an interdisciplinary and trans disciplinary study of the relationship between humans and their natural, social, and built environments.

Q 2) Ans

What are the major environmental concerns India is grappling today ?

1. Air Pollution
2. Groundwater Depletion
3. Climate Change
4. Use of Plastics
5. Garbage Disposal and Sanitation
6. Loss of Biodiversity



Check Your Progress II

Q1) What does the Article-38 of the Constitution of India states?

Ans : Article-38 of our Constitution requires State to ensure a social order for the welfare of people, which can be obtained by an unpolluted and clean environment only. Article-38 of our Constitution requires State to ensure a social order for the welfare of people, which can be obtained by an unpolluted and clean environment only.

Q2) What does the Article-48A of the Constitution of India states?

Ans : Article-48A of the Constitution declares “The State shall endeavour to protect and improve the environment and safeguard forests and wildlife of the country”.

Unit - 2

Check Your Progress I

Q 1.) Meaning of Population Explosion :

Population Explosion refers the sudden and rapid rise in the size of population, especially human population

Q 2) List the Causes of Population Explosion:

- Decline in the Death Rate
- Rise in the Birth Rate
- Migration
- Lack of Education
- Increase life expectancy
- Increased immigration

Q3) What is the meaning of demographic transition?

Population growth is usually related to economic development. There occurs a typical fall in death rates and birth rates due to improved living conditions leading

to low population growth, a phenomenon called demographic transition. It is associated with urbanisation, growth and good life condition.



Check Your Progress II

Q1) List the main effects of population explosion .

1. Problem of Investment Requirement
2. Problem of Capital Formation
3. Effect on per Capita Income
4. Effect on Food Problem
5. Problem of Unemployment
6. Low Standard of Living
7. Poverty
8. Burden of Unproductive Consumers
9. Population and Social Problems
10. More Pressure on Land
11. Impact on Maternity Welfare
12. Pressure on Environment
13. Over-population
14. Unemployment
15. Poverty
16. Illiteracy
17. Poor Health
18. Economy
19. Pollution and Global warming

Q2) List the different control measures/ initiatives to be taken to control the population growth.

Social Measure

1. Minimum age of Marriage
2. Raising the Status of Women
3. Spread of Education
4. Adoption
5. Change in Social Outlook:
6. Social Security

Economic Measures

- a. More employment opportunities
- b. Development of Agriculture and Industry
- c. Standard of Living
- d. Urbanisation



Other Measures:

1. Late Marriage
2. Self Control
3. Family Planning
4. Recreational Facilities
5. Publicity
6. Incentives

Unit - 3

Check Your Progress I

Q 1) List different form of pollution.

- Air pollution
- Nuclear pollution
- Light pollution
- Littering:
- Noise pollution
- Soil contamination
- Radioactive contamination
- Thermal pollution
- Visual pollution
- Water pollution
- Plastic pollution
- Marine pollution

Q 2) Effects of Air pollution.

- Impact on Lung functioning
- Asthma
- Itching of eyes, mouth and throat
- Respiratory disorders
- Cough and wheezing
- Reduced energy levels
- Headache
- Negative impact on reproductive and immune systems
- Neurological disorders
- Cancer

Q3) Effects of water pollution ?



- Causes waterborne diseases like Typhoid, Amoebiasis, Giardiasis, Ascariasis and Hookworm diseases
- Rashes, earache and pink eye
- Hepatitis, encephalitis, gastroenteritis and vomiting, stomach aches and diarrhea
- Prostate cancer
- Lack of developmental growth
- Liver and kidney damage
- DNA damage
- Exposure to mercury causes Parkinson's disease

Unit – 4

Check Your Progress I

Q 1) What are the causes for depletion of natural resources ?

- Aquifer depletion
- Habitat degradation leads to the loss of biodiversity (i.e. species and ecosystems with its ecosystem services)
- Irrigation
- Mining for fossil fuels and minerals
- Overconsumption, excessive or unnecessary use of resources
- Overpopulation
- Pollution or contamination of resources
- Slash-and-burn agricultural practices, currently occurring in many developing countries
- Soil erosion
- Technological and industrial development
- Deforestation

Q 2) What are the main factors responsible for extinction of wildlife fauna from the earth?

1. Habitat distraction or contamination of the habitat
2. Over exploitation of wildlife fauna
3. Introduction of exotic species

4. Competition for food
5. Accidental killing



Q3) What is sustainable development?

Sustainable development is defined as a process of meeting human development goals while sustaining the ability of natural systems to continue to provide the natural resources and ecosystem services upon which the economy and society depends.