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M.A SOCIOLOGY SEMESTER -IV
PAPER - O 644,
ENVIRONMENTAL CRISES AND SUSTAINABLE DEVELOPMENT

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INTRODUCTORY NOTE

Dear Student

You are welcome to M.A. 4th Semester, Sociology. SOC O 644: ENVIRONMENTAL CRISIS AND SUSTAINABLE DEVELOPMENT is an optional paper. The paper focuses on the environment–society interface to familiarize you with the crisis of environmental degradation both at the global and national levels with special focus on the environmental problems in India. It also highlights the role of environmental movements in ecological protection and also discusses necessary measures for environmental preservation.

There are four units in the paper. Unit I familiarize you with basic concepts like Development and Environmental Degradation, Meaning of Environment and relation of Environment and Society. Unit 2 highlights Environment Situation in India. Unit 3 focuses on Environmental Movements, Role of voluntary organizations and public interest litigations. Unit 4 deals with Sound Environmental Policy with focus on Environmental Education; Social Forestry and Afforestation Program; Biogas and Renewable Energy Program; Efficient Water Management Programs. After going through study material you will have sound understanding of Environment and related issues.

All the lessons have been written in a well-structured manner. Reading material has been prepared with lot of authenticity to make you grasp the basic concepts. Additionally self assessment questions in the lessons and model questions in the end help you to prepare for examination. A list of suggested readings has also been provided at the end of most of the lessons for your in-depth understanding about the subject.

Like previous semesters theory question paper will be of 80 marks and 20 marks will be for internal assessment. USOL students have to submit assignment of 20 marks. Details of that will be informed to you subsequently. Duration of the paper will be 3 hours. There will be 9 questions in all. The first question is compulsory and shall be short answer type containing 10 short questions spread over the whole syllabus to be answered in about 30 to 35 words each, carrying 20 marks i.e. 2 marks each. Rest of the paper shall contain 4 units. Each unit shall have two long questions and the candidates shall be given internal choice of attempting one question from each Unit-4 in all. Each question will carry 15 marks.

Detailed syllabus is attached for your ready reference. In case you have any doubts you can reach us through email.

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Course Outline

Unit-I

Development and Environmental Degradation:

Meaning of Environment; Environment and Society;

Problems and Environmental Consequences

Unit-II

Environment Situation in India:

Environmental Problems in India – Extent, Causes and Solutions; Environmental Policy in India.

Unit-III

Environmental Movements:

Role of voluntary organizations and popular participation in environmental protection and preservation; The Chipko Movement, Movements against Narmada Valley and Tehri Dam projects, Sukhomajri Experiment, Protest against Mining in Doon Valley; Ecofeminism; Public Interest Litigation (PIL) and Judicial Activism.

Unit-IV

Sustainable Development: Towards a Sound Environmental Policy;

Environmental Education; Social Forestry and Afforestation Program; Biogas and Renewable Energy Program; Efficient Water Management Programs; Use of Appropriate Technology.

Suggested Readings

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Additional Readings

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5. Ehrlich, P. R. et al., (1973) *Human Ecology- Problems and Solutions*, San Francisco, W.H. Freeman and Co.
6. Kothari, Ashish et al. (eds.), (1998) *Communities and Conservation*, New Delhi, Sage Publications.
7. Mehta, Rani (2011) "Sustainable Development in Mauritius: Issues and Implications," New Delhi, Contributions to Indian Social Science, IASSI, Vol. 30, No. 2, April-June.
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Environment and Development

Structure

- 1.0 Objectives
- 1.1 Introduction
- 1.2 Meaning of Environment
- 1.3 Components of Environment
- 1.4 Notion of Development
- 1.5 Environment & Development
- 1.6 Facts and Figures on Environment
- 1.7 Ecosystem services are essential to safeguard livelihoods
- 1.8 Environmental Degradation affects the poor most
- 1.9 Relation between environment and development
- 1.10 International Conventions
- 1.11 Summary
- 1.12 References
- 1.13 Further readings
- 1.14 Model question

1.0 Objectives

After reading this lesson you will be able to

- explain the meaning of Environment
- define the term Development
- discuss the relationship between environment & development

1.1 Introduction

In this lesson an attempt has been made to explain how development in society results in environment degradation. The problems with environmental degradation are often linked with process of development and therefore have effects on local, regional, as well as global levels. These effects which are the result of human activities have devastating consequences on the environment and so are harmful on human beings, animals and plants and can be passed on to future generations.

There are many problems, challenges and opportunities associated with living in the environment today. The earth and its treasure base, is experiencing a siege from all aspects of human endeavours ranging from misuse, abuse and degradation of the environment. Consumerism and keen desire for progressive improvement leads to environmental degradation.

1.2 Meaning of Environment

The word Environment is derived from the French word “Environ” which means “surrounding”. Our surrounding includes biotic factors like human beings, Plants, animals, microbes, etc and abiotic factors such as light, air, water, soil, etc. Environment is a complex of many variables, which surrounds man as well as the living organisms. Environment includes water, air and land and the interrelationships which exist among and between water, air and land and human beings and other living creatures such as plants, animals and micro organisms.

The natural environment consist of four interlinking systems namely, the atmosphere, the hydrosphere, the lithosphere and the biosphere. These four systems are in constant change and such changes are affected by human activities and vice versa.

1.3 Components of Environment

Our environment has been classified into four major components:

1.Hydrosphere, 2.Lithosphere, 3.Atmosphere, 4.Biosphere.

Hydrosphere

Hydrosphere includes all water bodies such as lakes, ponds, rivers, streams and ocean etc. Hydrosphere functions in a cyclic nature, which is termed as hydrological cycle or water cycle.

Lithosphere

Lithosphere means the mantle of rocks constituting the earth’s crust. The earth is a cold spherical solid planet of the solar system, which spins in its axis and revolves around the sun at a certain constant distance. Lithosphere mainly, contains soil, earth rocks, mountain etc. Lithosphere is divided into three layers-crusts, mantle and core (outer and inner).

Atmosphere

The cover of the air, that envelope the earth is known as the atmosphere. Atmosphere is a thin layer which contains gases like oxygen, carbon dioxide etc. and which protects the solid earth and human beings from the harmful radiations of the sun.

Biosphere

It is otherwise known as the life layer, it refers to all organisms on the earth’s surface and their interaction with water and air. It consists of plants, animals and micro-organisms, ranging from the tiniest microscopic organism to the largest whales in the sea.

Environment literally means surrounding and everything that affect an organism during its lifetime is collectively known as its environment.

In another words “Environment is sum total of water, air and land interrelationships among themselves and also with the human being, other living organisms and property”. It includes all the physical and biological surrounding and their interactions.

Self-assessment Question
What do you understand by Environment?

1.4 Notion of Development

The concept of 'development' originated from the mercantilist's notion of accumulation to the basic needs approach during 1960s when economic development was redefined in terms of lessening of poverty, inequality and unemployment within the perspective of a growing economy. Nowadays the word 'development' means huge infrastructural development initiatives such as highways, industrial parks and irrigation projects. These initiatives meet several needs in the day to day life. They make production of goods possible, create markets for goods and services, provide livelihoods, and increase the economic wealth of the nation.

The World Bank defines the term development as "reaching an acceptable standard of living for all people by improving economic and social conditions". This includes giving everyone access to the basics such as, food, housing, jobs, health services, education, safety and security.

The United Nations Development Programme uses the concept of human development measured by life expectancy, adult literacy, access to all the three levels of education, and also people's average income. It states that 'human development is the end- economic growth a means'.

Some of the important elements of developments are

- Increase in real income per capita
- Opportunity to have a satisfying livelihood
- Improvement in health and nutritional status
- Improvement in educational status
- Wider access to resources
- A fairer distribution of income
- Assurance of basic human rights
- Conservation of nature and natural resources

A good number of measures are used as indicators of development. The important ones among them are life expectancy, Gross Domestic Product (GDP) per capita, literacy, education, health.

1.5 Environment and Development

Man and his environment are inseparable and the relationships between them are very intimate and dynamic. It is from the land, air, and water (the physical environment) that resources for human needs are derived. As man affects the quality of the environment, so the environment affects the quality of man's life. Human well-being is inextricably linked to continued availability of natural means of support and this implies that any threat to the security of these resources constitutes a direct threat to human survival and development.

Thus Water Rodney (1982:10) was not off the mark in defining development as follows:

"A society develops economically as its members increase jointly their capacity for dealing with the environment. This capacity for dealing with the environment is dependent on the extent to which they understand the laws of nature (science), on the extent to which they put that understanding into practice by devising tools (technology) and on the manner in which work is organized."

The environment provides the basis not only for the survival of human beings and other forms of life but to the developmental activities. It provides natural resources like minerals, plant and animal

products and services like climate regulation, precipitation, and nutrient recycling which make developmental activities like agriculture, industrial production, etc. possible.

Conventional thinking equalizes development with growth in production and consumption of goods and services. Focus of conventional development efforts are largely based on the physical capital including the structures and equipments used for production. Although it is true that economic growth places pressure on the natural environment, the question is whether there is a built-in conflict between output growth and environmental protection and improvement. As economic development progresses the production capacity and living Standards for people improve, leading to a higher demand for energy. While development has produced many benefits – raising standards of living and improving quality of life across the world – it has also resulted in the depletion of natural resources and the degradation of ecosystems. There has been much debate over whether or not it is possible to achieve development without unsustainably degrading the environment, and a growing realisation that development at the current rate of depletion and degradation of environmental assets cannot continue indefinitely.

Environmental degradation is taking a toll on human health. Over 3 lakhs Soviet citizens are being treated for radiation sickness, millions of children in India are suffering from water borne diseases, depletion of ozone in the stratosphere in northern hemisphere which will lead to about 2 lakh skin cancer incidences for the next 50 years in United States alone. Soil erosion and land degradation, deforestation, pollution etc are reducing the productivity. It is unfortunate that many still see the environment as a peripheral matter which can be dealt with minor changes in policy and practice. The impacts of environmental degradation are so much that now these issues can no longer be taken lightly. Continuing population explosion, rapidly spreading environmental degradation, impact of globalization and increasing external debt have led to the decline of living conditions in most of the developing countries.

There is a tremendous pressure to accelerate growth and sustain a rapidly growing population on a limited resource base. This has led to an apparent conflict between environment and development. The cost of development has been high in terms of natural resources used in the process of economic growth. The increasing pressure of population, livestock, and extension of agriculture, industrial growth and urbanization have resulted in the rapid depletion of natural resources, loss of biodiversity and pollution of resources. There is a need to provide employment and better standard of living. This has increased the pressure further on the available resources.

1.6 Facts and figures on environment

1. The global environment currently sustains 41.9 million square kilometres of forest, 35.3 million square kilometres of cultivated land, approximately 14 million species of flora and fauna and 6.46 billion people.
2. The state of the environment continues to deteriorate and this trend will worsen without additional protection measures in future. A third of the world's land surface (approx. 4 billion hectares) is impaired by desertification, already directly affecting 250 million people today. 24 billion tonnes of topsoil erode every year and ten per cent of arid regions are degraded worldwide. 14 million hectares of tropical forests are destroyed every year, particularly in developing countries.
3. Three-quarters of commercial fish populations are overexploited worldwide. Ten to thirty per cent of the mammal, bird and amphibian species is threatened with extinction.
4. Forecasts predict that the global temperature will rise in the course of the 21st century by between 1.4 and 5.8 degrees centigrade, with grave effects on water cycles, farming and

biodiversity and a heightened danger of natural disasters and the spread of disease.

5. Three million people die as a result of air pollution every year (primarily in buildings).
6. A billion people have no access to safe drinking water and two billion are short of water. Five million people, particularly children, die as a result of contaminated water every year.
7. The estimated 25 million environmental refugees in 1999 will have doubled by 2010 and risen to 150 to 200 million by 2050. The rising sea-level is likely to displace another ten million people in the next ten years.

1.7 Ecosystem services are essential to safeguard livelihoods

The environment and natural resources provide a number of services that are essential to secure human subsistence and quality of life, the supply of clean water, for example, or the preservation of soil fertility. The intrinsic value of the environment as a spiritual element also plays a major role. These functions are especially important in developing countries. Cultural values and identity have a close bearing on environmental aspects, especially in rural areas.

In addition, many people depend directly on ecosystem services as a basis for their subsistence and income. Especially in rural areas, agriculture and forestry are the only source of food security and livelihood. In many cases, there are no alternatives available.

Their heavy dependence makes the poor vulnerable to the adverse impacts of resource destruction and degradation. Desertification, deforestation and the loss of biodiversity have a direct effect on food security, income and livelihoods. More than a billion people today already live in areas impaired by soil erosion and degradation.

Women face particular difficulties. Both men and women consume, use and manage natural resources. The degradation of forests, water resources and land has direct effects on women's workload and available time, especially when division of labour by gender assigns the subsistence activities of household production to them, where they bear responsibility for water, food, fodder and energy. When ecosystem services are degraded, the time poverty or workload of women also increases, mostly at the expense of spare time for education, health and other activities.

1.8 Environmental Degradation affects the poor most

Developing countries and especially poor sections of their populations are particularly vulnerable to environmental risks and ecological disasters. On the one hand, the people often live in already degraded and polluted habitats and environmentally vulnerable areas and on the other, they lack capabilities and strategies to deal with ecological disasters. They have neither the means for preparedness nor for regaining their livelihoods after drought disasters or floods, for example, which often occur where environmental destruction has already impaired the resources and resilience of the ecosystems.

Environmental degradation and lack of access to ecosystem services, such as drinking water or clean air, contribute to the increasing spread of disease. According to the World Health Organisation (WHO), up to 20 per cent of illnesses worldwide are due to environmental influences.

In a developing country, the risk of falling ill due to environmental factors is ten times higher than in an industrialised nation. Illnesses caused by environmental hazards are still one of the most frequent causes of the high child mortality in many developing countries.

Self-assessment Question
Define development.

1.9 Relation between Environmental Degradation and Development

While economic growth has produced many benefits – raising standards of living and improving quality of life across the world – it has also resulted in the depletion of natural resources and the degradation of ecosystems. There has been much debate over whether or not it is possible to achieve economic growth without unsustainably degrading the environment, and a growing realization that economic growth at the current rate of depletion and degradation of environmental assets cannot continue indefinitely. For example, the increase in CO₂ levels in the atmosphere as a result of human activity means that the world is already locked into some climate change, and faces a major challenge to keep global temperature rises to below two degrees.

Economic Growth and Poverty

The enormous expansion in the global production of goods and services driven by technological and social and economic changes has allowed the world to sustain both much larger populations and vastly higher standards of living than ever before in history. The two most salient characteristics of economic growth in the latter half of the twentieth century have been its unprecedented pace and its uneven distribution between countries and regions. Between 1950 and 2000, world GDP at constant prices expanded eightfold (International Monetary Fund, 2000). The benefits accruing from the unprecedented growth of the world economy have been uneven. Although the per capita GDP of the wealthiest quarter of world population climbed six fold over the century, per capita income for the poorest quarter of world population grew less than threefold (International Monetary Fund, 2000). The percentage of the world's population living in absolute poverty (living on less than one United States dollar per day) declined from about 28 per cent in 1987 to 24 per cent in 1998. However, the absolute number of poor has changed little and in 1998 amounted to 1.2 billion people (World Bank, 2000). Poverty is related to a host of factors, including income, health and education. In recent years, development efforts have shifted from the traditional focus on per capita income to improvements in health, education and sanitation as characteristics of development. For example, many low-income countries have achieved substantial improvements in the quality and length of life. These achievements reflect successes at providing basic social services such as education and access to safe water and sanitation. These successes have in turn contributed to reducing infant and child mortality and illiteracy, and raising life expectancy and school enrolments.

Energy Consumption and Emissions

The importance of energy and raw materials derives from their dual role of providing the underpinnings for economic activity and human well-being, while acting as the driving force behind many environmental concerns, including climate change, acid rain and pollution. Because energy consumption is a function of economic growth and level of development, energy consumption is distributed unequally in the world. Although their share has been falling, developed market economies, constituting one fifth of the world's population, consume almost 60 per cent of the world's primary energy. As a consequence of development and the rapid replacement of traditional energy sources by commercial (mainly fossil) sources, some developing countries have consumption patterns similar to

those of developed market economies. Nevertheless, per capita consumption in developing countries as a group remains far below that of developed market economies. The use of fossil fuels has led to substantial growth in global emissions of carbon dioxide (CO₂) and the build-up of greenhouse effects, contributing to global warming. Since 1751, over 265 billion tons of carbon has been released to the atmosphere, one half of these emissions having been produced since the mid-1970s (Marland and others, 1999). Annual global emissions of CO₂ from the burning of fossil fuels have quadrupled since 1950. The highest per capita CO₂ emissions are in North America, which is followed by Europe where such emissions are less than one half those of North America. Continuation of these trends poses serious risks of global warming, inducing a possible rise in sea levels, flooding of low-lying coastal areas, spread of vector borne diseases and reductions in agricultural yields. The magnitude of future carbon emissions depends on many factors, including global energy demand, the pace of economic development, the introduction of energy-saving technologies and the degree of shift away from fossil fuels. Models suggest that immediate stabilization of atmospheric CO₂ concentrations at present levels can be achieved only if emissions are immediately slashed by at least 50 per cent and further reduced thereafter (United Nations Environment Programme, 1999). Because of the inertia of climate systems, even with stabilization of emissions, global warming and the rise of sea levels could continue for many years.

Agriculture, Food and Land Use

The persistence of under-nutrition and food insecurity in some areas of the world, and the increasing scarcity and unsustainable utilization of agricultural and other environmental resources, has dominated the global assessment of food and agriculture prospects. World agricultural production has outpaced population growth, and the real price of food has declined. The green revolution that began in the 1960s enabled some developing countries to boost food production dramatically by introducing modern agricultural techniques. Over the period 1961-1998, world food for human consumption, per capita, increased by 24 per cent. A sufficient amount of food is being produced to nourish the world's population adequately (Food and Agriculture Organization of the United Nations, 2000a). Yet, recent estimates show that some 790 million persons were undernourished as of 1995-1997, owing to poverty, political instability, economic inefficiency and social inequity (Food and Agriculture Organization of the United Nations, 1999). Although the number of undernourished people has decreased by 40 million since 1980, some countries are experiencing serious declines in food availability. More recently, world agricultural growth has been slowing down. Many attribute this slowdown to the declining growth of population and reduced economic demand for food; others discern signs of production constraints which may ultimately threaten world food security (Food and Agriculture Organization of the United Nations, 2000a; World Resources Institute, 1996; World watch Institute, 2000). While world food production is projected to meet consumption demands for the next two decades, long-term forecasts indicate persistent and possibly worsening food insecurity in many countries, especially in sub-Saharan Africa (United Nations, 1997; Food and Agriculture Organization of the United Nations, 2000). For most of history, food production has been increased mainly by expanding the area cultivated; but in the past few decades, rising crop yields have been the main factors and this trend is expected to continue. Constraints on expanding cultivated land include the scarcity of high-quality agricultural land, competition from alternative land uses, and the risk of environmental degradation of marginal cultivated lands and forests. Although direct human consumption of grain is the most efficient use of food supplies, more land in developing countries is now used for growing grain feed, fodder and forage for livestock, as dietary choices reflect a growing preference for meat and dairy products. Development and population growth are claiming increasing shares of land for housing, industry and infrastructure. The major cause of land loss, however, is degradation. Although estimates of the global extent of loss of land productivity range widely, serious erosion has often followed extension of farmland to slopes of hills, and salinization of soil is a serious problem in some areas. Long-term global warming and climate

change could also threaten the high-quality land of some countries through sea-level rise or deterioration in agro-ecological conditions.

Water

An adequate and dependable supply of fresh water is essential for health, food production and socio-economic development. Though more than two thirds of the planet is covered with water, less than 0.01 per cent is readily accessible for direct human use (United Nations, 1997). Moreover, no more of this renewable fresh water is available today than existed at the dawn of human civilization. As a result, the size of a country's population and the speed at which it grows help determine the onset and severity of water scarcity. Although recent declines in population growth have improved the outlook for future water availability, the problems associated with water scarcity will continue to mount as the size of the world's population increases. Currently, humans are using about half the fresh water that is readily available. Fresh water is distributed unevenly over the globe, and already nearly half a billion people are affected by water stress or serious water scarcity, while many more are experiencing moderate stress. Given current trends, as much as two thirds of world population in 2025 may be subject to moderate-to-high water stress (United Nations, 1997). Many countries facing water scarcity are low-income countries that have a rapidly growing population and are generally unable to make costly investments in water-saving technologies. About 300 major river basins and many groundwater aquifers cross national boundaries (United Nations, 1997). Therefore, the need for cooperative efforts will persist, particularly in areas facing water shortages, and wherever pollution is carried downstream across national boundaries. Estimates indicate that over 1 billion people lack access to safe drinking water and two and a half billion lack adequate sanitation, and these factors contribute to the deaths of more than 5 million people, of whom more than half are children (United Nations, 2000).

Forests and Biodiversity

The number of plant and animal species inhabiting the planet is not accurately known. Nearly 2 million species have been identified, but estimates of the number yet to be described range from 10 million to 30 million (United Nations Environment Programme, 1995). Ecosystems of all kinds are under pressure worldwide. Coastal and lowland areas, wetlands, native grasslands, and many types of forests and woodlands have been particularly affected or destroyed. While forests decreased by about 5 per cent between 1980 and 1995, the rate of deforestation has been declining slightly (Food and Agriculture Organization of the United Nations, 2000). Additional threats confront fragile aquatic habitats, including coral reefs and freshwater habitats, which face an array of assaults from dams to land-based pollution to destructive fishing techniques. Over the past 150 years, deforestation has contributed one third of the atmospheric build-up of CO₂, and it is a significant factor in the loss of species and critical ecosystem services (Intergovernmental Panel on Climate Change, 2000). Since the beginnings of agriculture 10,000 years ago, by some estimates, almost half of the earth's forests have been converted to farms, pastures and other uses, and only one fifth of original forest remains in large, relatively natural ecosystems. Forested areas, including forest plantations as well as natural forests, occupied about one fourth of the world's land area in 1995. Tropical rain forests are important for the quantity and diversity of life they support. They cover only 7 per cent of the earth's land area, but contain at least 50 per cent of terrestrial species (Food and Agriculture Organization of the United Nations, 1999). The influences of forests and biodiversity are global, reaching far beyond national borders, in both space and time. Therefore, international cooperation is essential in order to integrate environmental issues better into global, regional and national decision-making processes.

1.10 International Conventions

At the Conference on Environment and Development in 1992 in Rio de Janeiro, the international community pledged to promote sustainable development and took a number of steps towards an

international environmental regime. Besides the adoption of the Rio Declaration and Agenda 21, the three major, legally binding global environmental conventions on biodiversity, climate change and combating desertification were also negotiated, prepared or adopted. In addition to the general commitments of all signatories, each of these conventions along with a number of other international environmental accords also contains explicit demands on the industrialised countries to support developing countries in meeting their commitments. They therefore set an important binding framework for interventions in development cooperation.

Ten years after Rio (2002) the Plan of Implementation at the World Summit on Sustainable Development in Johannesburg reinforced the principles of sustainable development and specified them in more detail. The Millennium Declaration of the United Nations already adopted in 2000 also confirmed international commitments to poverty reduction and support for sustainable development. Poverty reduction and sustainable development can only succeed by consistently mainstreaming environmental issues.

1.11 Summary

With globalization, and new and emerging technologies and modes of production and consumption, the relationship between environment and development have become issues of heightened concern for Governments, the international community and the average citizen. When considering responses to environmental problems, it is necessary to recognize that social-institutional factors can be as important as, if not more important than, technological ones. The general problem of managing locally scarce or fragile resources is not new. Many examples can be found where traditional societies developed communal rules for managing a scarce resource. Successful adaptation may be possible—as, for instance, in the transition described by Boserup (1965) from shifting to settled agriculture—but it is important to note that changes in the social allocation of resources are likely to be required as part of such adaptation. Even though the overall social as well as environmental benefit to such organizational change may be large, the process may prove to be contentious and politically difficult.

1.12 References

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1.13 Further Readings

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1.14 Model question

What are the environmental consequences of Development?

ENVIRONMENT AND SOCIETY

Structure

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Definition of Environment Sociology
- 2.3 Different approaches
- 2.4 Impact of Environment Problems
- 2.5 Environmentalism
- 2.6 Views of various thinkers
- 2.7 Solutions to Environmental Problems
- 2.8 Summary
- 2.9 References
- 2.10 Further reading
- 2.11 Model Question

2.0 Objectives

After reading this lesson you will be able to

- understand the relationship between Environment and Society
- explain the meaning of Environmental Sociology
- highlight the approaches of different thinkers

2.1 Introduction

Environment literally means surrounding and everything that affect an organism during its lifetime is collectively known as its environment.

In another words “Environment is sum total of water, air and land interrelationships among themselves and also with the human being, other living organisms and property”. It includes all the physical and biological surrounding and their interactions.

Sociology of the environment is a new field of sociology that has developed in relation to people’s growing concern about environmental issues. It has a dual focus. On the one hand it deals with the ways in which people in society relate to the natural world. On the other hand it deals with ‘environmentalism’ as a social movement; the development of concern about the environment and the social context of actions about the environment.

It could be argued that the way people relate to the natural world has always been a concern of sociologists. When Karl Marx talks about ‘production’ he is talking about a relationship between workers and the natural objects they work up as products. Environmentalism emerged during the late 1960s and

the early 70s. Among the social sciences it was economics and Law that dealt with environmental issues ever since the beginnings. In sociology around 1975–80 there were two lines of research with a certain relevance to environmental issues. One of them was the empirical research the other one was the research on contemporary social movements.

2.2 Definitions

There is no universal definition. However, generally, “Environmental Sociology examines people’s beliefs about the environment, their behavior toward it, and the ways in which the structure of society influences them and contributes to the persistent abuse of the environment. Abuse of the environment does not just happen. People decide how to use the environment, but they do not decide simply on some objective basis of right and wrong, safe and unsafe. Instead, decisions on environmental use are reached in a social context: they are influenced by such factors as cultural values and attitudes toward the environment, social class, and our relationship to others” (Cable & Cable 1995)

Catton and Dunlap (1978) defined environmental sociology as the “study of interaction between the environment and society.”

Environmental sociology deals with the social and cultural aspects of environmental science. The area of research has developed concurrently with developments in environmental policy, and also along with a growing awareness that in order to solve environmental problems and prevent future problems, cultural and social aspects - and not just technical aspects - of the relationship between society and environment must be taken into account.

Environmental sociology expands our field of knowledge in the field of tension between environment and society, and looks at:

- actors' roles in environmental problems and how these can be dealt with
- our understanding of and practice in relation to nature and environment
- social changes and their underlying driving forces
- structural conditions, barriers and opportunities in relation to environment and nature
- different solution strategies, forms of organisation and methods

Environmental sociology has now become, however, a rapidly-developing field. This is largely a result of growing public recognition of deepening environmental problems being generated by human beings. But the growing awareness that human society is creating environmental problems raise a number of questions and debates for sociologists and sociological theory. Is an ever-increasing population the real problem? Or is it the kind of society in which people are located, one placing a premium on increasing levels of consumption, which is the main issue? Similarly, are resources ‘in general’ the problem? Or are they ‘scarce’ only because they are privately owned and being consumed by social elites? Is it misleading to talk of environmental problems as ‘global’ when we should be really asking about *whose* common future we should be concerned? These are appropriate questions in a society where social divides are becoming increasingly wide as a result of neo-liberal economic policies implemented in many societies in the last few decades.

In short, environmental issues are becoming increasingly ‘social’ and ‘political.’ Nevertheless, there is increasing debate *within* environmental sociology. One area concerns the compatibility, or otherwise, between society and environmental sustainability.

Self-assessment question
Define Environmental Sociology.

2.3 Different Approaches

There are different approaches in sociology how humans relate to the environment and the social factors that influence environment.

2.3.1 The realist approach

In the realist approach, the problems of the environment are quite real. Inevitably, **social scientists** will follow the lead of the **natural sciences** in identifying the problems. The task of sociology is to explain the social causes of environmental problems. Also, what social alternatives could produce a better environmental outcome? In this approach, sociologists are in the same boat as most other commentators on environmental problems.

Academics in many disciplines—for example environmental scientists, economists, and psychologists—argue about what the problems are and what can be done. If sociology has anything special to offer, it is a deeper and more systematic understanding of the social roots of environmental problems and the processes of social change.

2.3.2 The constructionist approach

A second approach attacks realism and argues that there is no one ‘reality’ of environmental problems. Different people have their own differently constructed and equally valid interpretations of the environment. This second perspective comes from a sociological tradition which says that society is not a real thing—it is socially constructed (Berger & Luckmann 1967). In this view social and other realities do not exist independently of the meanings people create about them. Applied to environmental issues, this approach maintains that ‘there is no singular “nature” as such, only a diversity of contested natures; and that each such nature is constituted through a variety of socio-cultural processes from which such natures cannot be plausibly separated’ (Macnaghten & Urry 1998). So sociologists should investigate how the environment is understood by different sections of the population, how environmental issues are constituted as social problems and how people respond to these discourses of environmental trouble.

2.3.3 The reformist approach

The reformist approach aims to make small reforms to the economic and political structures of current society to deal with environmental problems. In the reformist model economic growth continues. It is argued that this can take place at the same time as environmental damage is cut back. For example, according to Hawken et al., ‘even if the global economy expanded by 6- to 8-fold, the rate of releasing carbon by burning fossil fuel could simultaneously decrease’ (2000, p. 245). In fact, new environmental technology is a growth industry in this account and stimulates growth—‘reducing the economy’s dependence on fossil fuels can be seen as an investment and job creation *opportunity*’ (DeCanio, cited in Hawken et.al 2000, p. 256).

Environmental reforms come about because people lobby politicians for change—with the threat of voters turning away from parties that do not enact environmental reforms. Markets ‘demand . . . responsible citizenship to keep them functioning properly’ (Hawken, et.al 2002). This is what is expected to take place in rich countries; proponents of the reformist model never consider how the model could possibly work in poor and undemocratic countries. According to the reformist account, all these environmental reforms benefit the economy, first, because energy efficiency is cheaper; you are not wasting money on energy you don’t need. Second, environmental reforms create new industries and new jobs—for example new energy infrastructure such as wind energy plants or energy-efficient double-glazed windows.

Critics of the reformist approach think there are a number of problems with the economic structure of capitalist societies. First, in a capitalist economy people have to work for a wage and do not have much control over what they do at work; ‘each person’s lot is to labor at the direction of others for purposes set by others’ (McLaughlin 1993).

Second, the very structure of the capitalist economy makes growth inevitable. This is because firms compete to make profits. Less profitable firms are dumped by shareholders. This competition means that it makes sense to invest in technology which allows the firm to produce more with a lower cost in labour. So the same number of workers is producing more goods and services. The only way for firms to sell all these extra goods is to increase their markets. This is growth. ‘This cycle, in which an increased productivity on the part of labor requires increased consumption of the rest of nature, repeats itself again and again’ (McLaughlin 1993).

Third, in a market, a firm can always make the most money by selling more to people with more money to buy things. This means that ‘in a market scarce things go mostly to the rich’ (Trainer 1998). This can be a problem if allocation to the poor is necessary to prevent environmental damage or if what we need is more public spending (Trainer 1985).

Fourth, in a market economy, investment always goes to the places where the highest profit can be made. If a country sets up a tough regime of environmental regulation—which restricts economic choices and may impede profits—investors will take their money to other countries (Martin & Schumann 1997).

Finally, if growth was cut back to prevent environmental damage, the effect in a capitalist economy would be increasing unemployment. Because productivity always increases as a result of competition between firms, markets have to grow in order for the same number of people to be employed. In fact, in Australia, 3 per cent per annum is the minimum growth rate if the same numbers of people are to be employed year after year (Trainer 1995).

2.4 Impact of Environmental Problems

As noted earlier, environmental sociology was just emerging at the time of the 1973–1974 energy crisis, so it is not surprising that identifying real as well as potential social impacts of energy and other natural resources was emphasized in this early period. While diverse impacts—from regional migration to consumer lifestyles—were investigated, heavy emphasis was placed on investigating the “equity” impacts of both energy shortages and the policies designed to ameliorate them (Rosa et.al 1988). A general finding was that both the problems and policies often had regressive impacts, with the lower socioeconomic strata bearing a disproportionate cost due to rising energy costs (Schnaiberg, 1975).

Equity has been a persistent concern in environmental sociology, and researchers gradually shifted their attention to the distribution of exposure to environmental hazards (ranging from air and water pollution to hazardous wastes).

Numerous studies have generally found that both lower socioeconomic strata and minority populations are disproportionately exposed to environmental hazards and clarifying the relative importance of income and race-ethnicity has begun to receive attention. While these findings have played a key role in generating attention to “environmental racism” and stimulating efforts to achieve “environmental justice”, at a broader level, international equity is attracting the attention of environmental sociologists such as researchers investigating the export of hazardous wastes and polluting industries from wealthy to poor nations, the exploitation of Third World resources by multinational corporations, and the disproportionate contribution of wealthy nations to many global-level problems—while the consequent hurdles these phenomena pose for international cooperation has also received attention. Mounting evidence of the disproportionate impact of environmental problems on peripheral nations and the lower strata within most nations calls into question Beck’s (1992) “Risk Society” thesis that modern environmental risks transcend class boundaries.

Sociologists have not limited themselves to investigating the distributional impacts of environmental problems, and studies of communities exposed to technological or human-made hazards offer particularly rich portrayals of the diverse impacts caused by environmental and technological hazards. Whereas natural disasters—such as floods, hurricanes, and earthquakes—have been found to produce a therapeutic response in which communities unite in efforts to help victims, repair damage, and reestablish life as it was before the disaster struck, technologically induced disasters (particularly toxic releases) have a corrosive effect on community life. Although a putative hazard may appear obvious to some residents, the ambiguities involved in detecting and assessing such hazards often generate a pattern of intense conflict among different community groups. In many cases, such conflicts have resulted in a long-term erosion of community life as well as exacerbation of the victims’ personal traumas stemming from their exposure to the hazards.

More generally, the rising incidences of human exposure to environmental hazards and technological disasters, particularly as less-developed (semi-peripheral and peripheral) nations experience more industrial growth and/or resource exploitation, suggests that environmental sociologists paid increasing attention to the impacts (as well as the sources) of environmental degradation. The decade of the seventies saw the institution of the environmental movement, significant shifts in public attitude and perception, policy making process change and the firm establishment of environmental quality as a social problem. However, the 1980’s and the establishment of the Reagan Administration resulted in western society developing an intolerance to the notion of limited natural resources and an expectation of endless growth and prosperity pervaded America. Politically growth became synonymous with re-establishing America as “great again” (Dunlap and Catton, 2003). Individualism, free enterprise and abundance were essential life qualities and voluntary simplicity died an unnatural death.

This dramatic change in national mood continued until the late 1980’s and early 1990’s when a refocus on environmental issues was forced due to a significant change in their frequency, scale and seriousness with accidents like the Exxon Valdez oil spill, purposeful actions like the widespread destruction of tropical rainforest and events like the Earth Summit in Rio de Janeiro. The 20th anniversary of Earth Day was a huge success with the media being largely responsible for this, prompting policy makers to realise that society was actively passionate about their environment and a successful government would need to be reflexive to this rising public concern.

Human activity was causing deterioration in the global environmental quality which resulted in negative effects on humans. The loop was complete even with its complexity, it was inherently reciprocal and the effect was being felt in human well being all over the planet. However, there is also an argument that global environmental change is in itself a social construction.

2.5 Environmentalism

Environmentalism is a progressive force due to the environmental crisis which is primarily as a direct result of environmental destruction described by Schnaiberg as the treadmill of production (Buttel, 2003). This perspective has ecological-materialist ontology and is essentially exemptionalist and it represents the diversification and assimilation of divergent views that opens up theoretical innovations within the field of environmental sociology (Buttel, 2003).

The treadmill of production as a concept arose in 1980 from two observations: first was the obvious and increasing impact modern production processes were having on the environment; and second was the variability in the social and political responses to these impacts (Schnaiberg, et.al 2003). The opposing responses were either rebellion against the new systems due to the resulting degradation of landscapes or embracing them in the hope that the new technology would provide some solution to the environmental problems; which was further defined as ecological modernisation and concentrates on the environment-induced restructuring of processes of production and consumption (Mol, 1997).

As a theory, ecological modernisation was the concern of environmental sociologists as opposed to a political programme for change in western European environmental politics (Mol, 1997)). Two issues arise from this theory:

- 1: the belief that if we follow the prescriptive path determined by ecological modernisation we will eventually solve the ecological crisis;
- 2: by formulating such a theory based on ecological modernisation we limit ourselves to the domain of production, thus precluding the fundamental question of consumerism and need (Mol, 1997, p 139). Therefore the solution may not lie with this theory alone, however it does provide processes for analysis and critique and the proposition of new environmental reform.

Some political benefits to come from this theory include the creation of naturalised spaces in industrialised or urban areas; government departments with specific portfolios related to environmental legislation, planning and management; and the rapid rise and growth of environmental organisations (Mol, 1997).

Ultimately however, the fundamental flaw can be described via the treadmill of production model. Initially factories required greater material inputs for its capital intense, energy expensive production which resulted in technological development of machinery capable of vastly increasing production. This in turn, required more material inputs and greater levels of withdrawal of raw products from Environmentalism is a progressive force due to the environmental crisis which is primarily as a direct result of environmental destruction described by Schnaiberg as the treadmill of production (Buttel, 2003). This perspective has an ecological-materialist ontology and is essentially exemptionalist (as are social constructivism, risk society, Critical Theory and ecological modernization) and it represents the diversification and assimilation of divergent views that opens up theoretical innovations within the field of environmental sociology (Buttel, 2003).

Self-assessment question
Define Environmentalism.

2.6 Views of various thinkers

Cohen (1998) has summarized the theory of ecological modernization in terms of six general principles:

1. Super industrialization, a process that will correct the design flaws of industrial technology, involves a change to cleaner, less resource intensive technologies and production processes that will reduce the necessity for expensive, add-on, remedial technologies. The correlation between economic development and environmental degradation will be significantly reduced, thereby propelling modern industry onto a new developmental trajectory.
2. The implementation of strict (yet flexible) government regulations acknowledges the ineffectiveness of past corporate volunteerism. Such regulation should promote first-mover advantages, economically viable green products, and innovative production systems.
3. Integrated pollution management strategies will overcome problems associated with the transfer of pollutants within the biophysical environment. Such strategies would be part of the redesign of regulatory procedures and production processes.
4. Anticipatory planning practices would enable industry to be more timely and responsive to their generated health and environmental hazards. Based on the German notion of vorsorgeprinzip, or the precaution principle, this tenet argues that the lack of scientific certitude is insufficient reason to postpone the taking of prudent measures for reducing environmental risk .
5. Organizational internalization of environment responsibility is based on the Dutch principle of verinnerlijking which "requires all public and private entities to integrate a concern for environmental quality into all of their activities as a means of overcoming the standard approach of treating ecological considerations as add-on considerations" . Stand alone organizational components for assuring ecological responsibility should be dissolved and reembedded throughout all decision points in production systems.
6. The development of constructive relationships through a broader organizational network for decision making would minimize existing ecological antagonisms and conflict over environmental policy. The resulting discourse among industry, government, NGOs, and the public should be grounded in good faith and the free exchange of information.

Some political benefits to come from this theory include the creation of naturalised spaces in industrialised or urban areas; government departments with specific portfolios related to environmental legislation, planning and management; and the rapid rise and growth of environmental organisations (Mol, 1997). In addition, Mol (1999) felt the need to distinguish between the first-generation of ecological modernization literature and the second generation literature that has appeared in the late 1990s.

The first-generation literature was based on the overarching hypotheses that capitalist liberal democracy has the institutional capacity to reform its impact on the natural environment, and that one can predict that the further development ("modernization") of capitalist liberal democracy would tend to result in improvement in ecological outcomes. The second-generation ecological modernization literature, by contrast, has increasingly revolved around identifying the specific sociopolitical processes through which the further modernization of capitalist liberal democracies leads to beneficial ecological outcomes. The most recent ecological modernization literature has been more concerned with

comparative perspectives, including but not limited to the ways in which globalization processes might catalyze ecological modernization processes in countries in the South.

Ultimately however, the fundamental flaw can be described via the treadmill of production model. Initially factories required greater material inputs for its capital intense, energy expensive production which resulted in technological development of machinery capable of vastly increasing production. This in turn, required more material inputs and greater levels of withdrawal of raw products. O'Connor (2001) suggests that regardless of the region of the globe there is always a particular and unique pattern of nature destruction which needs to be analysed in an ungeneralised way to come to know the connections between depletion or exhaustion of natural resources and pollution (uneven and combined development) (O'Connor, 2001). There is a direct relationship between the amount of profit and the amount of destruction and therefore pollution and therefore further destruction; quite the vicious cycle.

Ulrich Beck

Ulrich Beck (1999) states that the problems resulting in nature are not of nature, but of society and that this society needs to become reflexive; hence he gave theory of "world risk society" (Beck, 1999). In Ulrich Beck's analysis environmental issues come to prominence as an aspect of the transformation of '**industrial society**' into 'risk society' through **modernization**— 'modernization today is dissolving industrial society' (Beck 1992). He argues that industrial society has been a mechanism set up to increase wealth and valued as such. Yet this increasing productivity has produced the environmental risks which are in this day and age calling that mechanism into question—the social production of *wealth* is systematically accompanied by the social production of *risks*'. Beck sees these processes as having a number of crucial social dimensions. One is the 'boomerang effect'—the risks of modernization also strike those who produce or profit from them'. The attempt to increase wealth also destroys wealth and property. For example, industrial effluent pumped into a river can wipe out industries such as tourism and fishing, affecting the same communities that are also involved in the polluting industries. The greenhouse effect comes about through ever-increasing global production and energy use. Pollutions produced in one country have problematic effects in other countries. The whole world suffers from the same environmental problems, which can only be resolved by global cooperation.

Manuel Castells

Manuel Castells treats environmentalism as a type of social identity, and relates the growth of the environmentalist movement to reactions to dominant tendencies of current society—what he refers to as the '**network society**'. He is unmistakably a realist about environmental problems, saying that while the movement has made a huge impact culturally and on society's institutions, 'most of our fundamental problems concerning the environment remain'. His perspective also fits with those that believe that a sustainable society requires radical restructuring of our economy, social institutions and culture, saying that the successful treatment of environmental problems 'requires a transformation of modes of production and consumption, as well as our social organisation and personal lives' .

He sees environmentalism as a new global social movement, taking off in the late 1960s and growing in influence since then. He points out that the movement is not based in any central organisation but is multi-faceted, organised through a range of types of social organisation, both local and international. Listing these, he creates a typology of different aspects of the movement.

He sees their identity as internationalist eco-warriors, their enemy as unfettered global development and their goal as sustainability. There is also the counter-culture of environmentalists

supporting deep ecology, the local activists defending their space from polluters, and the green party politics.

The environmentalist movement as a whole can be viewed in relation to the 'network society', which Castells characterizes in terms of 'global flows of wealth, power and information constructing real virtuality through media networks'.

Castells distinguishes the space of flows from the space of places. The space of flows dominates network society, linking actions at a distance through instant communication. But most human experience is still going on at the local level. This is a fundamental mechanism of the power structures of the network society. Key economic, political and cultural actions are carried out in the space of flows 'and away from the realm where social meaning can be constructed and political control can be exercised'. The environmental movement consistently challenges these priorities. It puts the local impact on particular people or the environment first; rather than bowing down to economic or technological rationality, as it is expressed through global decision-making processes.

Castells distinguishes three types of time—clock time, timeless time and **glacial time**. Clock time is that of the Industrial Revolution—life parcelled out into organized minutes set by the clock. Timeless time is the disruption of this by global instantaneous communication—decisions made in instant, disruptions of local sequences of events by sudden intrusions from afar.

Consciousness of 'glacial time' has been pioneered by environmentalism. Relationships between humans and nature take place over epochs and are connected into the slow pace of evolution and the development of species. The idea of only using 'renewable' resources relates to 'the notion that alteration of basic balances in the planet, and in the universe, may over time, undo a delicate ecological equilibrium, with catastrophic consequences'.

Castells sees these aspects of environmentalism as creating a new form of social identity—'a culture of the human species as a component of nature'. In other writings, Castells argues that the fundamentalist religious and nationalist identities of the present day are formed in reaction to the faceless power of the network society. Environmentalism is also like this but it 'supersedes the opposition between the culture of real virtuality, underlying the global flows of wealth and power, and the expression of fundamentalist cultural or religious identities'. This is because it calls on us to identify as members of the human species, not members of any particular historically formed ethnic, national or religious group. It affirms the connection of all humans with each other and with the web of life.

2.7 Solutions to Environmental Problems

Environmental sociologists have typically focused more attention on the causes and impacts of environmental problems than on their solutions, although the situation has changed in the past decade. Akin to their analyses of causes, early work by environmental sociologists often involved explications and critiques of predominant approaches to solving environmental problems. Heberlein (1974) noted the predilection of the United States for solving environmental problems via a "technological fix," and then analyzed the relative strengths and weaknesses of voluntary and regulatory approaches. Other sociologists (e.g., Dunlap et al. 1994) subsequently identified three broad types of "social fixes" implicit in policy approaches:

- (1) the cognitive (or knowledge) fix relying on information and persuasion to stimulate behavioral change;
- (2) a structural fix employing laws and regulations to mandate behavioral change; and
- (3) a behavioral fix using incentives and disincentives to encourage behavioral change.

In the 1970s and 1980s environmental sociologists, along with other behavioral scientists, conducted a variety of studies evaluating the efficacy of these differing strategies, particularly for energy conservation. Sociological analyses emphasized the degree to which energy (and other resource) consumption is affected by factors such as building construction and transportation systems, and thus the limitations of educational and information programs for achieving conservation. Nonetheless, the changing regulatory climate of recent decades has generated renewed interest in voluntaristic approaches to environmental policy.

By the 1990s sociological interest in environmental policy took a quantum leap forward as environmental sociologists in Northern Europe began to analyze what appeared to be significant environmental amelioration within their nations. Originally building on models of industrial ecology, which suggest that the modernization of industry can permit expanding production with decreasing levels of material input and pollution output, proponents of “ecological modernization” gradually moved beyond technologically driven explanations of environmental progress.

New forms of collaboration between government, industry, and civil society were seen as institutionalizing an “ecological rationality” that not only tempers the excesses of traditional economic decision making but also stimulates the development of a “green capitalism” that purportedly marries the pursuit of environmental protection with the power of the market. With currently hegemonic neoliberal economic ideology, ecological modernization theory (EMT) has become a leading perspective within environmental sociology—particularly in Europe. Not only do proponents of EMT view the relationship between capitalism and environmental quality quite differently than do adherents of political economy perspectives but also their efforts to theorize processes of environmental improvement have led to a major revision in environmental sociology’s traditional preoccupation with explaining environmental degradation (Buttel 2003). It is therefore not surprising that major debates have ensued over the validity of ecological modernization theory.

However, given the recent growth of cross-national empirical studies in environmental sociology, surely the best way to resolve theoretical debates and establish the generalizability of theoretical claims is for the contestants to reach agreement concerning key variables, appropriate measures, and reasonable samples and then to empirically test theoretically derived hypotheses.

2.8 Summary

The sociology of the environment is a complex field. Differences are so extreme that some authors hesitate to characterize works from rival approaches as ‘sociology’. A key division is between different approaches to the philosophy of knowledge of ‘nature’. If nature is a real object that scientists describe, then the task of sociologists is to understand why society is related to this very real environment. Within this approach, it is typical to regard the environmental crisis as quite real and to try to understand why society is so slow to do anything effective to prevent it. In the constructionist approach, these questions get the back stage. The issue for sociologists is to examine how people’s understandings of nature are formed by social processes. It is not seen as the sociologist’s task to assume that any particular understanding of nature is the correct one. They all have validity as different social constructions. Yet this is only the beginning of divisions. Within the realist understanding, there are also major differences of opinion about the social causes of environmental problems and what would have to happen in society to deal with the environmental crisis. These differences of opinion are certainly ‘political’—in the sense that different conclusions within sociology imply different strategies for effective political action.

While major theorists of sociology have tended to avoid environmental issues, Castells and Beck stand out as two current theorists of society who deal with the environment and environmentalism as key topics for their investigations. In both cases they relate environmental issues and the

environmentalist movement to their broader interpretation of global society today. Castells sees environmentalism as a kind of resistance to the network society and the apparatus of power associated with that. Beck looks at current environmental problems as aspects of 'risk society'—a new type of social order that is replacing earlier forms of industrial society. Both these theorists tend to treat environmental problems as quite real. Yet much that Beck says also contributes to the constructionist perspective—environmental problems do not become important socially unless they are socially constructed to be problems. This is an emerging field in sociology and there is no doubt that future developments can only increase interest in these topics and intensify the debate.

2.9 References

1. Dunlap, Riley. E & William Michelson (eds.) (2002) Handbook of Environmental Sociology, West port. CT: Greenwood Press.
2. Harper, Charles (2004) Environment and Society: Human Perspectives on Environmental Issues. Upper Saddle River, New Jersey.

2.10 Further reading

Robbins, Paul ; John Hintz; Sarah A. Moore(2014) Environment and Society: A Critical Introduction.Wiley,Blackwell.

2.11 Model question

Write a note on relation between Environment and society.

Problems and Environmental Consequences

Structure

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Problems
 - 3.2.1 Pollution
 - 3.2.2 Global warming
 - 3.2.3 Ozone Layer Depletion
 - 3.2.4 Deforestation
 - 3.2.5 Land degradation and wastelands
 - 3.2.6 Threats to Biodiversity
- 3.3 Consequences
 - 3.3.1 Impact on ecosystem
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 - 3.3.3 Impact on health
 - 3.3.4 Impact on habitat
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- 3.4 Summary
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- 3.6 Further reading
- 3.7 Model questions

3.0 Objectives

After reading this lesson you will be able to

- identify different problems due to environmental crisis
- explain consequences of degraded environment

3.1 Introduction

At the beginning of the human civilization, our environment was pure, uncontaminated and undisturbed; it was most supportive and hospitable to living organisms. The advancement of science and technology led to the exploitation of all types of natural resources. Progress in agriculture, followed by rapid industrialization has left us with barren lands, contaminated soil, depleted wildlife, polluted rivers and also exhausted our natural resources. Our environment has deteriorated. 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

3.2 Problems

Major problems related to environment degradation are

3.2.1 Pollution

Environmental pollution dates back to the time when man discovered the use of fire. The burning of fossil fuels (wood, coal, and oil gas) releases a number of poisonous gases into the atmosphere. Environmental pollution includes air, water, noise, and soil pollution. Today, environmental pollution is a serious problem. Air, water, and soil are essential for survival of life on earth but unfortunately pollution is causing them irreparable harm. Beyond certain limits air pollution can cause illness and even death. Environmental Pollution is a major problem in contemporary society. Any substance which causes Environmental pollution is called as environmental pollutant, environmental pollutants include any chemical or geochemical (dust, sediment, grit, etc) substance, biotic component or its product, or physical factor (heat) that is released into the environment in such a concentration that may have adverse or unpleasant effects on environment.

Types of Pollution

Air Pollution

Air pollution is one of the most dangerous forms of environmental pollution in current times. As a result of natural and man-made activities, gases such as CO₂, SO₂, H₂S and oxides of nitrogen, mist particulates and aerosol are continuously released into the atmosphere and get dispersed in the air through air currents. These gases exist up to 2,000 feet above ground level. This disturbs the dynamic equilibrium of the atmosphere and causes health hazards to all organisms.

Environmental air pollution arises from people economic and domestic activities such as modern agriculture, which requires pesticides that pollute the atmosphere or enter water systems via run-off and sewage. Industrial activities are responsible for a wide range of pollution. Thermal power stations, burning fossil fuel and moving vehicles emit harmful pollutants. In urban areas, about 75 per cent of the air pollution is caused by automobile emissions. Automobiles run mainly on petrol or diesel. They pollute the air not only with exhaust gases but also with tiny bits of lead from tetraethyl lead.

Water Pollution

Deviation of the properties of water in its pure condition as detected by the changes in its normal function and properties is known as water pollution. Water is used for washing, irrigation, flushing away waste, cooling and industrial use. In India, almost all the industries discharge the waste by-products from the manufacturing processes into rivers or other water bodies. So, most rivers and freshwater streams are badly polluted with industrial effluents from industries such as paper and pulp, refineries, textiles, tanneries, distilleries, coal washers and steel industries. With population explosion and advancement of science and technology, the demand for more crops from the same land leads to excessive use of fertilizers and pesticides. This injudicious use of chemicals results in water pollution as these are washed off the lands through irrigation, rainfall and drainage and carried into rivers and streams. All the uses of water

led to its pollution. Human beings use rivers and lakes as dumping grounds by pouring highly toxic sewage and industrial waste into them.

Soil Pollution

The degradation of soil (soil pollution) is the result of both natural and human activities. Major human activities that have accelerated the process of soil pollution include, exposure of the soil by deforestation, overgrazing, intensive cultivation, mining, different developmental activities (like construction of dams and industries) and solid waste disposal. With advancement in science and technology, our underground resources are now excavated through mining activities. The underground resources are excavated directly by removing the top soil. As a result, the total area is destroyed and loses its productivity. Further, faulty agricultural practices such as unskilled irrigation, shifting cultivation, injudicious use of chemical fertilizers and pesticides are also responsible for soil degradation.

Self-assessment question
Mention two causes of Air Pollution

Thermal Pollution

Different industries and nuclear plants use water for cooling purposes and discharge the heated water into nearby streams or water bodies. As a result, the nearby water body is heated up and this in turn, affects aquatic life. This phenomenon is known as thermal pollution. It is also caused by:

- (i) Random cutting down of shade-providing trees beside the water bodies.
- (ii) Soil erosion due to poor agricultural practices, overgrazing, increase in solid suspended particles in a water body due to excessive recreational practices.
- (iii) Natural phenomenon such as earthquakes can also cause thermal pollution.

Primarily, thermal pollution raises the temperature of the water body thereby decreasing dissolved oxygen levels. This results in suffocation of some of the aquatic life while accelerating the growth rate of others.

Secondly, with an increase in temperature most of the chemical and biochemical reactions proceed at an enhanced rate till the catalyst enzymes are denatured (enzymes can tolerate temperature change only up to a few degrees). In other words, from the ecological point of view, the increase in temperature will cause death of aquatic life by stopping essential biochemical reactions. For example, the mangrove forest density is decreasing day by day in the Sundarbans and in the Andaman bay areas in India. This loss of shade will accelerate the population of heat-tolerant species. This will upset the ecological balance of the water body.

3.2.2 Global Warming

Global warming is the rise in the average temperature of Earth's atmosphere and oceans. Earth's mean surface temperature has increased by about 0.8 °C (1.4 °F), with about two-thirds of the increase occurring since 1980. Warming of the climate system is unequivocal, and scientists are more than 90% certain that it is primarily caused by

increasing concentrations of greenhouse gases produced by human activities such as the burning of fossil fuels and deforestation. Increased atmospheric concentration of CO₂ has raised the average global temperature causing global warming. Consequences of global warming include melting of snow caps and rising of sea level, rising temperature of the earth will cause polar ice caps to melt leading rise in sea level. Excessive heat expands water. Sea level rise cause flooding of coastal cities and damage coastal ecosystems like marshes and swamps. Global warming may change rainfall pattern; lead to early maturation of crops and reduce grain size and yield of crop.

3.2.3 Ozone Layer Depletion

The ozone layer is basically found at a height of about 20 – 30km above sea level. The ozone layer provides a protective layer, which prevents the penetration of the sun harmful ultraviolet rays. The most important reason for ozone layer depletion is the production and emission of chlorofluorocarbons (CFCs). This is what which leads to almost 80 percent of the total ozone layer depletion. There are many other substances that lead to ozone layer depletion such as hydro chlorofluorocarbons (HCFCs) and volatile organic compounds (VOCs). Such substances are found in vehicular emissions, by-products of industrial processes, aerosols and refrigerants. All these ozone depleting substances remain stable in the lower atmospheric region, but as they reach the stratosphere, they get exposed to the ultra violet rays. This leads to their breakdown and releasing of free chlorine atoms which reacts with the ozone gas, thus leading to the depletion of the ozone layer. Most of the skin diseases and the low productivity in agriculture are caused by ultra- violet rays. Also an increase in ultra-violet radiation effects water bodies, disturbs aquatic life, which supports the food chain, and causes the death of fishes that feed us. It also causes the deterioration of synthetic materials such as paints, and other products used in the building industry, invariably causing deterioration delivery to our ever- increasing human population.

3.2.4 Deforestation

Forests produce vital oxygen and provide homes for people and wildlife. Many of the world's most threatened and endangered animals live in forests, and 1.6 billion people rely on benefits forests offer, including food, fresh water, clothing, traditional medicine and shelter. But forests around the world are under threat from deforestation, jeopardizing these benefits. Forests cover about 30 percent of the Earth's surface, but each year about 13 million hectares of forest (approximately 78,000 square miles) — are converted to agricultural land or cleared for other purposes. Deforestation refers to the loss or destruction of naturally occurring forests, primarily due to human activities such as logging, cutting trees for fuel, slash-and-burn agriculture, clearing land for livestock grazing, mining operations, oil extraction, dam building, and urban sprawl or other types of development and population expansion.

Deforestation wipes out critical habitat, disrupts ecosystems and leads to the potential extinction of many species, including irreplaceable species that could be used to make medicines, which might be essential for cures or effective treatments of the world's most devastating diseases. Deforestation also contributes to global warming—tropical deforestation accounts for about 20 percent of all greenhouse gases—and has a significant impact on the global economy.

3.2.5 Land degradation and waste lands

Land degradation has a direct bearing on the productivity of soil, its vulnerability to rainfall variations, scarcity of drinking water, fodder and fuel wood. Given the inter linkages of crop production, livestock economy and environment, land degradation has a major impact on the livelihoods of the people, especially in rural areas. Land degradation means reduction or loss of the biological or economic productivity and complexity of rain fed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as:

- (i) soil erosion caused by wind and/or water;
- (ii) deterioration of the physical, chemical and biological or economic properties of soil; and
- (iii) long-term loss of natural vegetation.”

Land degradation is a long-term loss of ecosystem function and services, caused by disturbances from which the system cannot recover unaided. It blights a significant proportion of the land surface, and as much as one-third of the world's population – poor people and poor countries suffer disproportionately from its effects. Further environment degradation also converts fertile land into wastelands.

Bhumbla & Khare (1984) have defined **Wastelands** as “those lands

- (a) Which are ecologically unstable?
- (b) Whose top soil has been nearly completely lost, and
- (c) Which have developed toxicity in root zones for growth of most plants, both annual crop and trees.”

Economic development, Urbanization and increasing populations, are driving unprecedented land-use change. In turn, unsustainable land use is driving land degradation – a long-term loss in ecosystem function and productivity which requires progressively greater inputs to recoup the situation. Its symptoms include soil erosion, nutrient depletion, salinity, water scarcity, pollution, disruption of biological cycles, and loss of biodiversity.

3.2.6 Threats to Biodiversity

Biological diversity or biodiversity - is a term we use to describe the variety of life on Earth. It refers to the wide variety of ecosystems and living organisms: animals, plants, their habitats and their genes. Biodiversity is important because it represents the almost infinite variety of plant and animal life, and the variety of the types of earth's ecosystems that support life as we know it. It enables humans to survive in what would otherwise result in adverse conditions. Biodiversity is the very stuff that supports the evolution and differentiation among the varying species. It's why cats are cats and horses are horses and humans are humans. And, further, it is responsible for the differences among groups within the larger species. For example: different types of humans, jungle cats or birds etc.

Without biodiversity we would be a homogeneous population, with each of us having the same vulnerabilities. This would mean that in case of an epidemic, we would all be killed since there would be no biologic differences that would enable some of us to survive and adapt.

Biodiversity is a fragile thing, susceptible to all sorts of threats. Threats to biodiversity come from many sources, most human but some natural. The main cause of the loss of biodiversity can be attributed to the influence of human beings on the world's ecosystem. In fact human beings have deeply altered the environment, and have modified the territory, exploiting the species directly, for example by fishing and hunting, changing the biogeochemical cycles and transferring species from one area to another of the Planet.

3.3 Consequences

3.3.1 Impact on ecosystem

Climate change is due primarily to the human use of fossil fuels, which releases carbon dioxide and other greenhouse gases into the air. The gases trap heat within the atmosphere, which can have a range of effects on ecosystems, including rising sea levels, severe weather events, and droughts that render landscapes more susceptible to wildfires. The primary cause of climate change is the burning of fossil fuels, such as oil and coal, which emits greenhouse gases into the atmosphere—primarily carbon dioxide. Other human activities, such as agriculture and deforestation, also contribute to the proliferation of greenhouse gases that cause climate change.

While some quantities of these gases are a naturally occurring and critical part of Earth's temperature control system, the atmospheric concentration of CO₂ did not rise above 300 parts per million between the advent of human civilization roughly 10,000 years ago and 1900. Today it is at about 400 ppm, a level not reached in more than 400,000 years.

Even small increases in Earth's temperature caused by climate change can have severe effects. The earth's average temperature has gone up 1.4° F over the past century and is expected to rise as much as 11.5° F over the next. That might not seem like a lot, but the average temperature during the last Ice Age was about 4° F lower than it is today.

Rising sea levels due to the melting of the polar ice caps (again, caused by climate change) contribute to greater storm damage; warming ocean temperatures are associated with stronger and more frequent storms; additional rainfall, particularly during severe weather events, leads to flooding and other damage; an increase in the incidence and severity of wildfires threatens habitats, homes, and lives; and heat waves contribute to human deaths and other consequences.

Sea levels are rising and oceans are becoming warmer. Longer, more intense droughts threaten crops, wildlife and freshwater supplies. From polar bears in the Arctic to marine turtles off the coast of Africa, our planet's diversity of life is at risk from the changing climate. Climate change poses a fundamental threat to the places, species and people's livelihoods.

3.3.2 Impact on Food and water sources

Food security

Soil degradation, therefore, poses a threat to food security, as it reduces yield, forces farmers to use more inputs, and may eventually lead to soil abandonment. Agriculture, the domestication of plants, animals, ecosystems and soils, is the practice by which we have produced our food and fueled our civilizations for more than ten thousand years. It is of crucial importance to realize that soil health and water supply are the cornerstones agriculture is based upon. So much so, that there cannot be agriculture without water, and we cannot have vegetation and agriculture without soil.

With “green revolution”, the productivity of the main agricultural crops doubled, on average, with some cereals reaching a staggering 4- to 5-fold increase. This has helped meet world food demand and save hundreds of millions of people from starvation. Asia, for example, which was threatened by hunger and mass starvation as late as the mid-1960s, became self-sufficient in staple foods. The productivity increased, it has been estimated that about 70% was due to the intensification of agriculture (e.g., new varieties, irrigation, use of inputs), and the remaining 30% was a result of new land being brought into production. It must be highlighted that the doubling of global food production during the past decades has been accompanied by a massive increase in the use of inputs, such as synthetic nitrogen, phosphorus, pesticide applications and extensive use of irrigation and energy. The intensification of agriculture has also led to the degradation and exhaustion of soil and land. Scientists are now arguing that some physical limits to yield productivity have already been reached for rice, wheat and maize. Due to the increase due to enhanced population growth and the changes in food consumption patterns, it has been estimated that global agricultural production levels for 2050 would need to increase by 70%–110% to meet demand in 2050. Over the coming decades, further annual yield increases of 1% to 1.5% are needed to meet the projected demand for wheat, rice and maize. Some experts argue that this is a challenge, because with the present yield trends, just meeting current demand already appears difficult. The arable area in developing countries will have to increase but people are building and expanding their cities on the most fertile soils. Continued urbanization will pose a further threat to agriculture production, along with the changing patterns of food consumption by the growing urban population.

Food scarcity is set to define food production in the coming decades, putting food security issues at the top of the global agenda. The demand for food is growing, due in particular to two factors: population and income growth. However, supply growth is likely to lag, because of, for example, slowing agricultural yields, limited land availability and the increasing demand for biofuels.

It is clear that, if there is to be enough food to feed the growing population, agricultural production has to increase.

Consumption patterns also need to change: the reduction of meat intake, for example, is to be encouraged. These political and social issues can lead to business opportunities in the domain of fertilizers, biotechnology and irrigation. In parallel, conventional intensive farming methods, which can cause environmental damage, should motivate the move towards more sustainable agricultural systems.

Water Scarcity

By 2025, about 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world population could be under conditions of water stress – the threshold for meeting the water requirements for agriculture, industry, domestic purposes, energy and the environment (UN Water 2007). Water withdrawals for irrigation have increased dramatically, to about 70 per cent of global water withdrawals. One-tenth of the world’s major rivers no longer reach the sea during some part of the year, because water is extracted upstream for irrigation.

In Punjab there has been a significant decline in the area under water logging due to rapid growth in the utilization of groundwater through tube wells but now the state is facing a serious problem of ground water depletion. The water table is reported to be falling annually by 30-45 cm in the districts of Ludhiana, Patiala and Sangrur, which together contribute 30 per cent of rice and wheat production in the state. There are evidences of increase in number of tube

wells in Haryana where the increase has been 18 fold during the last 25 years resulting in 328% increase in the total area irrigated by tube wells in this region. Due to this over exploitation of ground water in the North-eastern region of Haryana, there has been a lowering of water table at the rate of 12 to 33 cm per year.

Self-assessment question
Why there is scarcity of water on earth when 2/3rd of it has water?

3.3.3 Impact on Health

More than 70,000 new chemicals have been introduced to the planet since the industrial revolution, and many have never been tested for their harmful effects on health and the environment. Today there is no part of the planet that is free of man-made chemicals -- some of which accumulate and magnify as they go up the food chain. UNEP estimates accidental poisoning from exposure to pesticides causes 20,000 deaths and 1 million illnesses worldwide every year. Women farmers and workers are frequently exposed to dangerous pesticides directly when working as pesticide applicators – ILO reports show that agricultural workers run two times of the risk of dying on the job than other workers. Pesticides threaten not only women agricultural workers but also excessive domestic exposure can be widespread.

Studies in the US show 75% of homes contain the pesticide – Chlordane – in the breathable air. Impacts to women in terms of reproductive health include greater incidences of miscarriages, stillbirths and delayed pregnancy, increased incidence of birth defects. Other effects include potential carcinogenic effects – to breast, brain, prostate, testes and ovaries. One extreme example is DDT, once widely used for controlling insect pests on agricultural crops. DDT is highly persistent in the natural environment. It accumulates through the food chain and has been proven to cause cancer in laboratory animals. It also increases the risk of breast cancer and an infant feeding on breast milk can receive up to 12 times the acceptable limit of DDT. DDT is now illegal in many countries but it is still used in certain countries as it is a cheaper than less persistent alternatives.

Another alarming story is the migration of harmful chemicals such as pesticides and fertilizers via air and water currents to the Polar Regions. Indigenous Inuit women who live near the North Pole have been advised to stop breastfeeding their babies due to the high levels of harmful chemicals in their breast milk--chemicals which entered their bodies through the wild fish and game that make up their diet. Although the women never used or benefited from these chemicals, they are now being poisoned by them and forced to abandon the most basic life-sustaining practice of breastfeeding.

The greatest effects on the health of individuals and populations result from environmental degradation. Human health might be at the receiving end as a result of the environmental degradation. Areas exposed to toxic air pollutants can cause respiratory problems like pneumonia and asthma. Millions of people are known to have died of due to indirect effects of air pollution. Air pollution Indian cities are among the most polluted in the

world. Air in metropolitan cities has become highly polluted and pollutant concentrations exceeds limit considered safe by the World Health Organization (WHO). Suspended particulate levels in Delhi are many times higher than recommended by the World Health Organization (WHO). The urban air pollution has grown across India in the last decade are alarming. Some of the most important air pollutants are residual suspended particulate matter (RSPM), suspended particulate matter (SPM), nitrogen dioxides (NO₂), carbon monoxide (CO), lead, sulfur dioxide (SO₂) etc. The main factors account to urban air quality deterioration are growing industrialization and increasing vehicular pollution, industrial emissions, automobile exhaust and the burning of fossil fuels kills thousands and lives many more to suffer mainly from respiratory damage, heart and lung diseases. In the countryside, nitrates from animal waste and chemical fertilizers pollute the soil and water, and in the cities, the air is contaminated with lead from vehicle exhaust. In India's largest cities - Mumbai and Delhi - about one-half of children under age 3 show signs of harmful exposure to lead, defined as to or more micrograms of lead per deciliter of blood (IIPS and ORC Macro, 2000). The illness and pre-mature deaths due to ambient suspended particulate matter (SPM) in the air in mega cities of Calcutta, Chennai, Delhi and Mumbai have risen significantly in less than five years (Brandson and Honmon, 1992). The indoor air pollution may pose an even greater hazard for human health. Cooking and heating with wood, crop residues, animal dung, and low-quality coal produce smoke that contains dangerous particles and gases.

When fuels such as these are burned indoors, using inefficient stoves and poor ventilation, they can cause tuberculosis, other serious respiratory diseases, and blindness. In fact, indoor air pollution from cooking and heating with unsafe fuels has been designated by the World Bank as one of the four most critical environmental problems in developing countries.

3.3.4 Impact on Habitat

Wildlife species live in communities that depend on each other. Survival of these species can depend on soil conditions, local climate, altitude, and other features of the local habitat. Mining causes direct and indirect damage to wildlife. The impacts stem primarily from disturbing, removing, and redistributing the land surface. Some impacts are short-term and confined to the mine site; others may have far-reaching, long-term effects.

The most direct effect on wildlife is destruction or displacement of species in areas of excavation and piling of mine wastes. Mobile wildlife species, like game animals, birds, and predators, leave these areas. More sedentary animals, like invertebrates, many reptiles, burrowing rodents, and small mammals, may be more severely affected. If streams, lakes, ponds, or marshes are filled or drained, fish, aquatic invertebrates, and amphibians are severely impacted. Food supplies for predators are reduced by the disappearance of these land and water species.

Many wildlife species are highly dependent on vegetation growing in natural drainages. This vegetation provides essential food, nesting sites, and cover for escape from predators. Any activity that destroys vegetation near ponds, reservoirs, marshes, and wetlands reduces the quality and quantity of habitat essential for waterfowl, shore birds, and many terrestrial species.

The habitat requirements of many animal species do not permit them to adjust to changes created by land disturbance. These changes reduce living space. The degree to which animals tolerate human competition for space varies. Some species tolerate very little disturbance. In instances where a particularly critical habitat is restricted, such as a lake, pond, or primary breeding area, a species could be eliminated.

Habitat fragmentation occurs when large areas of land are broken up into smaller and smaller patches, making dispersal by native species from one patch to another difficult or impossible, and cutting off migratory routes. Isolation may lead to local decline of species, or genetic effects such as inbreeding. Species that require large patches of forest simply disappear.

3.3.5 Displacement of people:

The displacement of people refers to the forced movement of people from their locality or environment and occupational activities. It is caused by a number of factors, such as natural disasters, famine, development and economic changes. A growing number of environmentalists and social activists have misgivings about development projects such as dams, industries, mines, railways and roads which impact people's livelihood in different ways. Some of them are displaced away from their homes. Some others lose most of their land and other sustenance but are not physically displaced. Most of these people are tribals. Land is the center of tribal life. When it is lost both its owner and its other dependents lose their economic support, socio-cultural relations, food, work and income. These have compelled them to shift their occupation from cultivation to domestic workers, daily wage earners and so on and it ultimately reduced their income and therefore economic status. The impact of such development projects on the tribals is not limited to the economic field but impinges on the social and cultural aspects. The tribals who live in a different type of society are forced to interact with another culture and society to which they cannot always adopt themselves. While in the past most of the tribal communities had treated it as a renewable resource that had come down from their ancestors that they had to use according to their needs and environmental imperatives and preserve it for the future. Besides, as reported drunkenness has increased among the men and it subsequently led to more domestic violence. The development process pushes them from an informal to a formal economy that is new to them without any preparation. They had depended on agricultural land and forests, both of which they lose to the project. When they receive compensation it is monetary with which most communities living in the informal economy are not familiar.

One of the marked sources from which tribal have drawn their identity is in their mode of making a livelihood which is associated with land and forest. Any dislocation from their modes of livelihood and from the land and forest uproots them from their very existence and hence affects their identity in a very fundamental way. Displacement from their existing modes of living snaps them off from the core of their social and cultural lives. In the process an important marker of their identity gets eroded. Displacement dislocates them from their territory and homeland leading to erosion of their identity. Thus, dislocation from their territory and homeland and fragmentation of the community lead not only to loss of various aspects of their culture and ways of life but also to loss of their language and territorial identification from which they derive their identity of being a distinct people.

3.4 Summary

People have long been concerned with the health of the environment. It was not until the 1960s, however, that conceptual frameworks focusing on the environment and development began to emerge. The publication of Rachel Carson's *Silent Spring* in 1962 was a landmark event which has often been regarded as marking the beginning of the environmental movement. In the following decades, an increasing awareness of the need to balance human needs with the well-being of the natural world has grown. In the late 1980s scientists began to suggest that the earth's energy flux was no longer in balance. Earth's surface was getting warmer, affecting the elements of the climate system. The climate

itself was changing. By 1995, it became evident that the main culprit was carbon dioxide emissions produced by the burning of fossil fuels - coal, gas and oil, in factories, power stations and cars. When we burn coal, firewood and natural gas, huge amounts of carbon dioxide escapes to the atmosphere. If emissions continue to grow at current rates it is almost certain that atmospheric levels of carbon dioxide will double from pre-industrial levels during the current century and it is quite possible that levels will triple by the year 2100. The most affected will be none but the poorest on the planet. Poor developing countries, particularly small island nation states will be the worst hit. A 15-95 cm rise in sea level could turn these people into refugees. Moreover, poor countries are least prepared to face the wrath of floods and hurricanes. Life styles of future generations will be compromised. Plants and animals around the world will be drastically affected due to changing weather and some may even become extinct.

There is an urgent need for strong actions in this regard. International cooperation is essential in order to integrate environmental issues better into global, regional and national decision-making processes.

3.5 Glossary

Biodiversity

Biodiversity—short for biological diversity—means the diversity of life in all its forms—the diversity of species, of genetic variations within one species, and of ecosystems.

Conservation: The protection, preservation, management or restoration of wildlife and of natural resources

Deforestation: This is the unplanned removal of vegetation from an area. This is one of the major factors that poses a threat to Biodiversity.

Developing Country: A country is considered “developing” when it is experiencing expansion of its productive capacity. The GNP is an indicator of economic growth.

Endangered: An endangered plant or animal is one that is in danger of extinction in the near future and without protection is likely to become extinct.

Ecosystem: A community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same area or environment. Ecosystems have no fixed boundaries; a single lake, a watershed, or an entire region could be considered an ecosystem.

Endemic: found only in a specified geographic region.

Environment: Environment is a system which provides natural surroundings for the existence of organisms (including humans) and which is a prerequisite for their further evolution.

Extinct: no longer living.

Genetic Variability: the number and relative abundance of genes within a species or population.

Habitat: The place or type of site where an organism or population naturally occurs.

Habitat change: Change in the local environmental conditions in which a particular organism lives. Habitat change can occur naturally through droughts, disease, fire, hurricanes, mudslides, volcanoes, earthquakes, slight increases or decreases in seasonal temperature or precipitation, etc.

Mining: Mining is the process of extracting mineral resources from the earth. The mining method used depends on the physical and chemical properties of the mineral, the physical form in which it occurs, as well as the geometry and depth of the ore body.

Quarrying Quarrying is the open, or surface excavation of rock to be used for various purposes, including construction, ornamentation, road building or as an industrial raw material to provide additional methods in improving the mitigation process.

Species: in most living organisms, each species represents a complete, self-generating, unique ensemble of genetic variation, capable of interbreeding and producing fertile offspring.

Sustainable Development: Development that meets the needs and aspiration of the current generation without comprising that of the future generation.

Threatened Species: A species is said to be threatened if it likely to become endangered if not protected. Example: The Yellow-Billed Parrot (*Amazona collari*) is a species that is listed as threatened in Jamaica and is therefore protected by law.

3.6 References

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3.7 Further reading

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3.8 Model questions

1. Define Environmental Pollution and discuss its harmful effects.
2. Why Environment is degrading? What are its consequences?

ENVIRONMENTAL PROBLEMS IN INDIA – EXTENT, CAUSES AND SOLUTIONS

Structure

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Topography of India
- 4.3 Land Degradation Status
- 4.4 Air environment
- 4.5 Water environment
- 4.6 Solid waste management
- 4.7 Forest
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- 4.9 Key Environmental Issues
 - 4.9.1 Climate Change
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4.0 Objectives

After reading this lesson you will be able to

- determine the extent of environmental problems in India
- find out the causes of environmental problems in India
- highlight the solutions of environmental problems in India

4.1 Introduction

Environment is defined as the complex of physical, chemical and biotic factors affecting an organism and ultimately determining its form and survival. It is the sum total of all surroundings of a living organism, including natural forces and other living things, which provide conditions for development and growth as well as of danger and damage. Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife.

It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable. Environmental Degradation is the worsening of the environment through collapse of resources, such as air, water and soil that leads to damage of ecosystems and the disappearance of wildlife. When innate habitats are destroyed and natural resources are at a low level, the environment is considered to be degraded. 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.

All living beings depend on the environment for their needs. This is true of humans as well. Our environment provides us with food and clothing, as also materials that are modified into things that we use. However, India's rapidly growing population, along with a move toward urbanization and industrialization, has placed significant pressure on its natural resources.

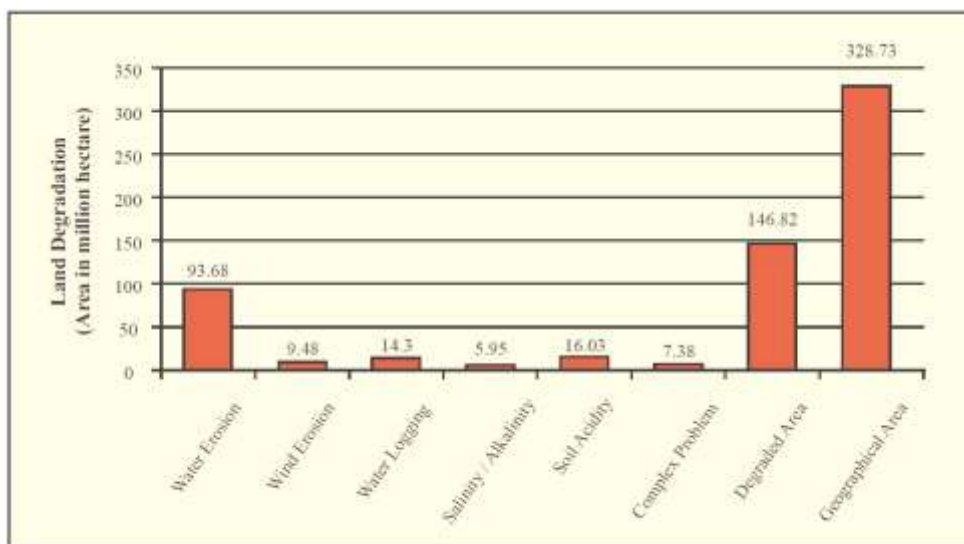
4.2 Topography of India

India occupies the south-central peninsula of the Asian continent. Besides the main land, there are two groups of islands, namely Lakshadweep in the Arabian Sea and Andaman & Nicobar Islands in the Bay of Bengal. The mainland of India lies between 8°4' N and 37°6' N latitude and 68°7' E and 97°25' E longitude. The Andaman and Nicobar islands lie to the south east of the mainland and Lakshadweep to the southwest. A world map showing the location of India is given here India is endowed with almost all the important topographical features, such as high mountains, extensive plateaus, and wide plains traversed by mighty rivers. The country is bounded by Himalayas in the North and has a large peninsular region tapering towards the Indian Ocean. The plateaus are another striking feature of topography in India. The arid and semi-arid region of India covers 127.3mha (38.8%) of India's geographical area and spreads over 10 states. The Indian desert fauna is extremely rich in species diversity of mammals and winter migratory birds.

This section presents an overview of different environmental components – viz. air, water, solid waste, land and forestry, and biodiversity and wildlife resources, particularly in the last ten years and highlights the issues and challenges faced by the country along with measures undertaken by the Ministry to address these challenges.

4.3 Land Degradation Status

In India, an estimated 146.82 Mha area suffers from various forms of land degradation due to water and wind erosion and other complex problems like alkalinity/salinity and soil acidity due to water logging.



Source: National Bureau of Soil Survey and Land Use Planning, 2005

The varying degrees and types of degradation, stem mainly from unstable use and inappropriate land management practices. Loss of vegetation occurs as a result of deforestation, cutting beyond the permissible limits, unsustainable fuel-wood and fodder extraction, shifting cultivation, encroachment into forest lands, forest fires and over-grazing, all of which subject the land to degradational forces. Other important factors responsible for large-scale degradation are the extension of cultivation to lands of low potential or high natural hazards, non-adoption of adequate soil conservation measures, improper crop rotation, indiscriminate use of agro-chemicals such as fertilizers and pesticides, improper planning and management of irrigation systems and extraction of groundwater in excess of the recharge capacity. In addition, there are a few underlying or indirect pressures such as land shortage, short-term or insecure land tenancy, open access resource, economic status and poverty of the agriculture dependent people which are also instrumental, to a significant extent, for the degradation of land.

4.3.1 Causes of Land degradation

1. Agricultural Practices

Direct consequences of agricultural development on the environment arise from intensive farming activities, which contribute to soil erosion, land salination and loss of nutrients. The introduction of Green Revolution in the country has been accompanied by over-exploitation of land and water resources and excessive usage of fertilizers and pesticides. The extent of agricultural intensification and extensification is characterized by an increase in cropping and irrigation intensity and the imbalanced use of chemical fertilizers, pesticides and insecticides. It has also led to land degradation, overexploitation of underground water resources and increased use of chemical fertilizers, leading to eutrophication and water pollution in some regions.

Shifting cultivation (or *Jhum* cultivation) has also been a major factor responsible for land degradation in hilly areas. According to a recent estimate, in the eastern and north-eastern regions of India an area of 18765.86 sq. km. (0.59 percent of the total geographical area) is under shifting cultivation. The effects of shifting cultivation are devastating and far-reaching in degrading the environment and ecology of these regions.

2. Agricultural Waste Residue Burning

Burning of wheat and rice straw and other agricultural residue has also contributed to loss of soil fertility, apart from causing air pollution. Punjab alone produces around 23 million tonnes of rice straw and 17 million tonnes of wheat straw, annually. This straw is rich in nitrogen, phosphorus and potassium. However, instead of recycling it back into the soil by mulching, it is burnt in the fields. This raises the temperature of the soil in the top three inches to such a high degree that the carbon: nitrogen equilibrium in soil changes rapidly. The carbon as CO₂ is lost to the atmosphere, while nitrogen is converted into a nitrate. This leads to a loss of about 0.824 million tonnes of NPK from the soil. This is about 50 per cent of the total fertilizer consumption in the state.

3. Soil Erosion

Soil is a unique non-renewable natural resource that supports life on planet Earth. It is estimated that one-sixth of the world's soil has already been degraded by water and wind erosion. In India, approximately 130 Mha. of land area (or 45 percent of the total geographical area) is affected by serious soil erosion through ravines and gullies, shifting cultivation, cultivated wastelands, sandy areas, deserts and water logging (Govt. of India, 1989). Excessive soil erosion with consequent high rate of sedimentation in the reservoirs and decreased fertility has created serious environmental problems with disastrous economic consequences. In India, erosion rates range from 5 to 20 tonnes per hectare, sometimes going up to 100 tonnes per hectare. Nearly 93.68 million hectares are affected by water erosion and another 9.48 million hectares are affected by wind erosion annually in India. Thus, erosion leads to impoverished soil on one hand, and silting up of reservoirs and water tanks on the other.

4. Mining

Land degradation is considered to be unavoidable by-product of mining and has reached alarming proportions, mainly due to over-exploitation and mismanagement of natural resources. Mining activity often leads to environmental problems like land degradation, particularly in opencast mining and land subsidence in underground mining. Open-cast mining in areas with forest cover causes deforestation. Mining complexes, as estimated recently, occupy around 0.06 per cent of the total land area of the country.

5. Pollution

Soil pollution from heavy metals due to improper disposal of industrial effluents, along with the excessive use of pesticides and mismanagement of domestic and municipal wastes, is becoming a major concern. Though no reliable estimates are available to depict the exact extent and degree of this type of land degradation, it is believed that the problem is extensive and its effects are significant. Some commercial fertilizers also contain appreciable quantities of heavy metals, which have undesirable effects on the environment. The indiscriminate use of agrochemicals, such as fertilizers and pesticides, is often responsible for land degradation.

Self-assessment Question
How does agricultural waste residue burning leads to air pollution?

Solutions

Land degradation problem can be tackled to an extent by suitable policies that would internalize degradation into proper decision-making, wherever possible. An integrated approach to the problem of degradation, linking agriculture and environment, has to be followed. The Farmers should made aware about the issue of balancing the external inputs usage and the internal sources of nutrients. More sustainable cropping patterns should be developed. There is an urgent need to develop and implement strategies for cleaning up toxic and hazardous waste dump legacies, particularly in industrial areas, and abandoned mines, and work towards reclamation of such lands for future sustainable use.

4.4 Air environment

In India, air pollution is proving to be an issue of concern. India's ongoing population explosion along with rapid urbanization and industrialization has placed significant pressure on its infrastructure and natural resources. Increased vehicular fleet, industrial expansion, and increase in use of diesel generator sets have contributed towards increase in air pollution levels in almost all Indian cities. While ambient air pollution is a concern in most of the urban centres of the country; the problem of indoor air pollution plagues the rural areas of the country. According to reports, India's urban air quality ranks amongst the world's worst. Of the three million premature deaths in the world that occur each year due to outdoor and indoor air pollution, the highest numbers are assessed to occur in India.

4.4.1 Causes of Air Pollution

1. Population Growth

India has witnessed an explosive growth of population. The total population of India is expected to exceed 1.6 billion by the year 2050 (Oldenburg 2005). This rapidly expanding population, especially in urban areas, is one of the main reasons for environmental concerns in the country. This problem can be narrowed down to many of the large cities in India. India sustains 16.7 per cent of the world's population on 2.4 per cent of its land area, exerting tremendous pressure on its natural resources. In fact, the growing air pollution menace is deadly for the urban poor in India, 50-60 per cent of whom live in slums. Following the trends of urbanization and population growth in Indian cities, people buying more vehicles for personal use have perpetuated an increase in vehicles that contribute to vehicular emissions containing pollutants such as sulfur dioxide, nitrogen oxides, carbon monoxide, lead, ozone, benzene, and hydrocarbons.

2. Vehicular Emission Load

As a result of urbanization in India, pressure on urban transport is likely to increase substantially in this new millennium. The increase in vehicles, as well as the presence of other motorized forms of transportation (taxis, autos, trains, buses, etc.), will contribute to the already existent large amount of vehicular emissions. The worst thing about vehicular pollution is that it cannot be avoided as the vehicular emissions are

emitted at near-ground level. However, there are several ways by which government, industry, and the public can significantly contribute to the twin goals of reducing our dependence on motor vehicles and consequently reducing harmful emissions. A vigilant, informed, and active citizenry will help ensure that air pollution concerns are factored into the way we plan our cities, towns, and transportation systems.

3. Industrial Sector Growth

Growth of India's economy is led by a robust performance of the industrial sector. The development of a diversified industrial structure, based on a combination of large and small-scale industries, along with growing population has contributed to the growing incidence of air pollution. Air borne emissions emitted from various industries are a cause of major concern. These emissions are of two forms, viz. solid particles (SPM) and gaseous emissions (SO, NO, CO, etc.). The Ministry of Environment and Forests has developed standards for regulating emissions for various industries including thermal power stations, iron and steel plants, cement plants, fertilizer plants, oil refineries, pulp and paper, petrochemicals, sugar, distilleries and tanneries. The industrial units in India are largely located in the states of Gujarat, Maharashtra, Uttar Pradesh, Bihar, West Bengal and Madhya Pradesh. The highest concentration of sulphur dioxide and oxides of nitrogen is, therefore, often found in cities located in these states. Some other industrial states in Delhi, Punjab, Rajasthan and Andhra Pradesh are also becoming critical.

4. Power Sector

The power sector is a major consumer of coal, using about 78 per cent of the country's coal production. Coal-fired thermal units account for around 62.2 per cent of total power generation in the country. Coal production through opencast mining, its supply to and consumption in power stations, and industrial boilers leads to particulate and gaseous pollution.

Radioactive emissions from nuclear power plants are of grave concern as they can cause serious impact both in terms of spatial and inter-generational effects.

5. Agricultural Waste Burning

Punjab alone produces around 23 million tonnes of rice straw and 17 million tonnes of wheat straw annually. More than 80 per cent of paddy straw (18.4 million tonnes) and almost 50 per cent wheat straw (8.5 million tonnes) produced in the state is being burnt in fields every year.

Apart from affecting the soil fertility, this also causes air pollution due to emission of large amounts of suspended particulate matter, besides gases like CH₄, CO, NO, SO₂, etc., leading to various health hazards like respiratory, skin and eye diseases. Intensive agriculture is also a contributor to greenhouse gases (GHG) like carbon dioxide, methane and nitrous oxide, causing climate change. At an all India level, emissions from the agriculture sector are reported to be 28 per cent of the aggregate national emissions.

6. Domestic Sector - Indoor Air Pollution

A considerable amount of air pollution results from burning of fossil fuels. The household sector is the second largest consumer of energy in India after the industrial sector. According to National Family Health Survey-3, more than 60 per cent of Indian households depend on traditional sources of energy like fuel-wood, dung and crop

residue for meeting their cooking and heating needs. Burning of traditional fuels introduces large quantities of CO in the atmosphere, when the combustion is complete, but if there is an incomplete combustion followed by oxidation, then CO is produced, in addition to hydrocarbons.

Ambient air quality

The Central Pollution Control Board (CPCB), which was constituted as the statutory organisation in 1974, has established the National Air Quality Monitoring Program (NAMP) to determine the air quality status and trends in various cities of the country. At present, three criteria air pollutants – sulphur dioxide (SO₂), nitrogen dioxide (NO₂), and fine particulate matter (PM 10) – are regularly monitored at 411 stations across 167 cities in the country. Apart from these pollutants, limited monitoring of other pollutants such as PM 2.5, ammonia, ozone, hydrocarbons (benzene, toluene, xylene), poly-aromatic hydrocarbons (PAHs), and heavy metals (e.g. lead), is carried out at select locations in some cities. It is seen that fine particulate matter (PM10) has been a major concern as more than 60% of cities have high and critical levels of pollution recorded for the year 2008. In recent years, the percentage of stations showing high PM10 levels has increased. The cities in Northern India have high PM10 levels not only because of human activities but also due to higher natural background dust level and meteorological influences.

In case of SO₂, cities falling under low pollution category have increased from 81% in 1997 to 95% in 2008. In case of NO₂, majority (>60%) of the cities lie in the low pollution category. According to the WHO report – the Global Urban Ambient Air Pollution Database 2016 – showed India's upcoming towns and cities were grappling with toxic air, possibly because of limited government intervention towards pollution and increasing vehicular congestion

4.4.2 Impact

Health Problems Air quality is deteriorating especially in metropolitan cities, mainly due to vehicular emissions. There is evidence that the health of over 900 million urban people around the world is deteriorating daily because of high levels of ambient air pollutants. The pollutants in air, damage the human respiratory and cardio-respiratory systems in various ways. The elderly, children, smokers and those with chronic respiratory diseases are the most vulnerable. It has been reported that high levels of pollution affect mental and emotional health too.

Climate Change India is a fast growing economy and has many future developmental targets, several of which are directly or indirectly linked to energy and therefore increased greenhouse gas emissions. Depending on climate sensitive sectors (agriculture, forests and fisheries) and natural resources for their subsistence and livelihoods. Further, the adaptive capacity of dry land farmers, forest dwellers, fisher folk and nomadic shepherds is very low.

Climate change is likely to impact all the natural ecosystems as well as socio-economic systems.

Acid Rain Acid rain is the direct consequence of air pollution caused by gaseous emissions (carbon monoxide, sulphur dioxide, nitrogen oxides) from industrial sources, burning of fuels (thermal plants, chimneys of brick-kilns or sugar mills.) and vehicular emissions.

The most important effects of acid rain are damage to freshwater aquatic life, vegetation and damage to buildings and material. In India, the main threat of an acid rain disaster springs

from our heavy dependence on coal as a major energy source. Even though Indian coal is relatively low in sulphur content, what threatens to cause acid rain in India is the concentrated quantity of consumption, which is expected to reach very high levels in some parts of the country by 2020.

4.4.3 Policy and legal measures

The Air (Prevention and Control of Pollution) Act, 1981, and the Environment (Protection) Act, 1986, lay down various emission standards. National Ambient Air Quality Standards (NAAQS) were adopted in 1982, and revised and notified in 1994 by the CPCB. India is a legislation rich country with reference to pollution. Eleven major laws exist to control pollution in India and many forums for their implementation in various ways. Under these laws, provisions are made to protect the environment from all kinds of pollution related to industrial and agricultural activities.

Self-assessment Question
What is Acid Rain?

4.5 Water environment

Clean and adequate good quality water is one of the most crucial inputs for human survival and sustainable development, thereby, necessitating its careful management and use. Increasing population, urbanization, and growing demand from agriculture and industry have brought the country's water resources under pressure.

Water pollution is a serious problem in India as almost 70 percent of its surface water resources and a growing percentage of its groundwater reserves are contaminated by biological, toxic, organic and inorganic pollutants (*MOWR 2000*). In many cases, these sources have been rendered unsafe for human consumption as well as for other activities such as irrigation and industrial needs. Besides rapidly depleting groundwater table, the country faces another major problem on the water front – groundwater contamination - a problem which has affected as many as 19 states, including Delhi. The geogenic contaminants, including salinity, iron, fluoride and arsenic have affected groundwater in over 200 districts spread across 19 states.

4.5.1 Causes of Water Pollution

1. Agriculture

The rapid increase in agro-chemical use in the past five decades, has contributed significantly to the pollution of both surface and groundwater resources. Pesticide consumption rose from less than one million tonne (technical grade) in 1948 to a maximum of 75 million tonnes in 1990 (CSE 1999). Fertilizers and pesticides enter the water supply through run-offs and leaching into the groundwater table and pose a hazard to human, animal and plant population. Some of these chemicals include several substances considered extremely hazardous by WHO and are banned or under strict control in developed countries. Studies on the Ganga River indicate the presence of

chemicals such as HCH, DDT etc in levels greater than those recommended by the international standards (*World Bank 1999*).

Some of these substances have been known to bio-accumulate in certain organisms, leading to an increased risk of contamination when used for human consumption and a persistence of the chemicals in the environment over long periods of time. Water enriched with nutrients leads to eutrophication. Decaying organic matter releases odourous gases and partially decomposed matter accumulates on the river or lakebed, thereby limiting water's suitability for human consumption and other uses. High levels of fertilizer use has been associated with increased incidence of eutrophication in rivers and lakes in several of India's most important water bodies, such as the Hussein Sagar in Hyderabad and Nainital in Uttar Pradesh(*MOWR 2000*).

2. Industries

Although the industrial sector only accounts for three per cent of the annual water withdrawals in India, its contribution to water pollution, particularly in urban areas, is considerable. Wastewater generation from this sector has been estimated to be 55,000 million m³ per day, of which 68.5 million m³ are dumped directly into local rivers and streams without prior treatment (*MOWR 2000*). The government has called for the establishment of Common Effluent Treatment Plants (CETP) in industrial areas but their implementation has been slow, and most industries either are not connected to CETPs or only partially treat their wastewater before disposal. The Central and State Pollution Control Boards have identified 1,532 'grossly polluting' industries in India, although almost none of the industries comply with the emission standards (*World Bank 1999*). Wastewater from industrial activities is often contaminated with highly toxic organic and inorganic substances, some of which are persistent pollutants and remain in the environment for many years. Water contamination from industrial areas is compounded usually due to the high concentration of industries over a small area. Increasing industrial development, coupled with inadequate zoning and emissions regulations, will only aggravate the problem in the coming years.

3. Domestic Usage

All of India's fourteen major river systems are heavily polluted, mostly from the 50 million cubic meters of untreated sewage discharged into them each year (*APCSS 1999*). The domestic sector is responsible for the majority of wastewater generation in India. Inadequate treatment of human and animal wastes also contributes to high incidence of water-related diseases in the country. Water contaminated by human waste is often discharged directly into watercourses or seeps into the groundwater table from faulty septic tanks or pit latrines. The level of faecal coliform bacteria in most rivers often exceeds WHO standards and is responsible for causing a number of gastro-intestinal ailments among the population. Improper disposal of solid waste also leads to surface and groundwater pollution. Runoff from garbage dumps and city streets carries litter, deposited particulate matter and chemicals to nearby streams and canals. Leaching from landfills and garbage pits transports toxic substances and heavy metals to the water table.

4.5.2 Impact of Water Pollution

Due to various factors, available water is deteriorating in quality. Tests indicate that the biological contamination of surface water sources, much of it due to untreated or partially

treated sewage, exceeds permissible limits at many locations. Similarly, overexploitation of groundwater, besides other human activities has led to contamination of groundwater in many parts of the country. While salinity (dissolved salts in water) and iron make the taste of water and vegetables cooked in it unappealing, long term usage of water with fluoride and arsenic can lead to several health hazards.

Around 85 per cent of the rural population of the country uses groundwater for drinking and domestic purposes. High concentrations of fluoride and arsenic in groundwater beyond the permissible limits of 1.5 mg/l and 0.05 mg/l, respectively poses health hazard. In all, 19 states in India have been identified as 'endemic' areas for fluorosis, with an estimated 44 million people impacted, and another 66 million at risk. The scenario is the worst in the hard rock terrain viz., granites. Arsenic is a known carcinogen and is highly toxic. It is perhaps the only human carcinogen for which there is adequate evidence of carcinogenic risk by both inhalation and ingestion (Centeno et al. 2002; Chen & Ahsan 2004). The occurrence of Arsenic in groundwater was first reported in 1980 in West Bengal in India. Apart from West Bengal, arsenic contamination in groundwater has been found in the states of Bihar, Chhattisgarh, Uttar Pradesh and Assam. Arsenic in groundwater has been reported in 15 districts in Bihar, 9 districts in Uttar Pradesh, 8 districts in West Bengal and one district each in Chhattisgarh and Assam.

Steps to check the problem

The CPCB (Central Pollution Control Board) has identified 150 polluted stretches of rivers in the country in five priority categories depending upon the risk, that is, degree/frequency of violation with respect to water quality criteria for drinking water sources.

Conservation of rivers

The launching of the Ganga Action Plan (GAP) Phase I as a centrally funded scheme, in 1985, was the beginning of the river cleaning programme, with the objective of improving the water quality of the Ganga to acceptable standards by intercepting, diverting, and treating the sewage. GAP Phase I was extended to GAP Phase II, which was approved in various stages during 1993-96. GAP Phase II was merged in late 1996, with the National River Conservation Plan (NRCP), a centrally sponsored scheme for pollution abatement in rivers. The major rivers are Ganga along with Yamuna, its major tributary. Pollution abatement works under the NRCP are implemented on a cost-sharing basis between the Centre and states through implementing agencies nominated by the states and functioning under their control.

Water quality monitoring of rivers Under the NRCP, water quality of rivers is regularly monitored to evaluate the impact of pollution abatement schemes under implementation in towns, located along identified polluted stretches of rivers.

Presently, Water Quality Monitoring (WQM) is carried out by scientific institutes/universities of repute, situated along the river, having necessary infrastructure facilities and capability to undertake this activity. Monthly monitoring of water quality is done for nine core parameters and site-specific heavy metals. Performance monitoring of sewage treatment plants, as third party evaluation, is also included under WQM, as and when the sewage treatment plants (STPs) are commissioned. A uniform protocol on WQM has been notified for guidance on sampling and analysis.

Besides Ganga, water quality monitoring has also been undertaken for rivers namely, Yamuna, Western Yamuna Canal, Gomti, Hindon, Satluj (Punjab), Cauvery (Tamil Nadu), Tunga, Bhadra and Tungbhadra in Karnataka, and the waterways in Chennai (Tamil Nadu). The present number of monitoring stations is 158 in 10 rivers and waterways in the country.

4.5.3 Policy and legal measures

The principle legislation on pollution of surface and groundwater resources is the Water (Prevention and Control of Pollution) Act 1974. State Pollution Control Boards (SPCBs) are also authorised to levy and collect a water cess under the Water (Prevention and Control of Pollution) Cess Act 1977 on water consumed by persons operating and carrying on certain types of industrial activities. This cess is collected with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution.

4.6 Solid waste management

Solid waste generation is predominantly an industrial and urban problem, which has exacerbated over the years due to changing lifestyles and increasing consumerism, resulting from rapid urbanization, and economic growth. There is a need to set up adequate waste collection, processing, and disposal facilities to cope with the rising levels of waste generation to protect human health and the environment.

Municipal solid waste

As per CPCB estimates, around 57 million tonnes per annum of municipal solid waste (MSW) is presently generated in the country. Since disposal of MSW is primarily through landfills, increasing quantities of waste will require more land for its disposal, rendering the limited resource out of productive use.

It is estimated that about 10 000 tonnes per day of plastic wastes are generated in India, which amount to about 9% of the total waste generation. Although nearly 60% of this waste is recycled, the management of certain types of plastics like thin polythene bags and PET bottles still remains a matter of concern due to low collection efficiency.

4.6.1 Types of Waste

1. Industrial solid wastes

According to recent estimates, 6.23 million tones of hazardous wastes are being generated by 36 135 industrial units in the country, as compared to 4.4 million tonnes from 26 566 units in 2006. In addition to hazardous waste, about 130 million tonnes of fly-ash is generated from thermal power plants.

2. Biomedical waste

Biomedical waste (BMW) comprises waste generated from hospitals, health care facilities, and health research laboratories. BMW is estimated to be only a small fraction of the MSW generation. About 80% of this waste – called 'general waste' – is non-infectious and if segregated can be managed as MSW. However, the remaining 20% is infectious and hazardous and hence is required to be treated in dedicated facilities.

3. E-waste

The IT industry in India has witnessed unprecedented growth in recent years, leading to a significant increase in e-waste generation. The city of Mumbai currently tops the list of major e-waste generating cities, at around 11 017 tonnes per annum, followed by Delhi at 9730 tonnes, Bangalore 4648 tonnes, Chennai 4132 tonnes, and Kolkata 4025 tonnes. Recycling of e-waste involves handling toxic materials such as lead, cadmium, mercury, brominated flame retardant, and polyvinyl chloride (PVC). All these result in environmental and health hazards if not properly handled. Though, there are 14 authorised e-waste recyclers, there is a need to enhance the recycling facilities.

4.6.2 Impacts and key issues

The indiscriminate littering and dumping of waste causes severe health risk to people, either through direct exposure or indirectly through contamination of surface and groundwater. The unsanitary disposal sites become prolific breeding grounds for insects and rodents, which act as disease vectors. Burning of garbage in open dumps causes air pollution leading to release of certain extremely hazardous persistent organic pollutants such as dioxins and furans.

Solid waste dumps also impact the global environment by releasing methane, which is a highly potent greenhouse gas. Besides environmental concerns, the social dimension of the problem also needs due attention. Solid waste disposal sites in India are often a source of livelihood for the urban poor, who locate their residences in proximity to these sites, making them highly susceptible to health disorders.

The mechanism of disposal of hazardous wastes lacks proper enforcement resulting in abandoned hazardous waste dumps. These abandoned disposal sites have the potential to cause soil and groundwater contamination due to heavy metals and other toxic compounds, some of which bio-accumulate through the food chain, thereby posing long-term health risks.

Self-assessment question.
What is E-waste?

4.6.3 Policy and legal measures

The Ministry notified the Municipal Solid Wastes (Management and Handling) Rules in 2000, making it mandatory for municipal authorities to set up waste processing and disposal facilities, identify sanitary landfill sites, and improve existing dumpsites. The compliance however remains low, mainly because of the inability of municipalities to implement waste segregation, and lack of institutional and financial means to implement waste processing and disposal schemes.

Efforts have been initiated for bringing the informal waste recycling sector into the formal stream for e-waste collection and segregation to form a cooperative/society and then get registered with the CPCB.

To address industrial waste issues, the Ministry notified the Hazardous Wastes (Management and Handling) Rules in 1989 (amended in 2000 and 2003) and Hazardous Wastes (Management, Handling and Transboundary Movement) Rules in 2008. The 1989 Rules were drafted to enable regulatory authorities to control the handling, movement, and disposal of hazardous wastes generated within the country.

The Biomedical Waste (Management and Handling) Rules were issued in 1998 (amended in 2000 and 2003). The Rules are based on the principle of segregation of

general waste from BMW. They lay out colour codes for containers, and treatment and disposal options for 10 categories of waste. The state governments have taken initiatives for setting up of Common Biomedical Waste Treatment Facilities (CBWTFs) for processing and disposal of waste.

Treatment/disposal facilities

Common treatment, storage, and disposal facilities (TSDFs) have been developed for the disposal of land disposable hazardous waste at 26 different places in 13 states—Gujarat (8), Maharashtra (4), Uttar Pradesh (3), Andhra Pradesh (2), and one each in Himachal Pradesh, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, West Bengal, Karnataka, Kerala, and Daman and Diu. There are 10 incinerators in these common facilities. In addition, there are 127 captive incinerators spread across 12 states in the country to treat incinerable waste.

Co-incineration of high calorific value waste

CPCB has carried out trial runs for co-incineration of high calorific value hazardous waste streams such as Effluent Treatment Plant (ETP) sludge, TDI (toluene di-isocyanate) tar waste, paint sludge, refinery sludge, and tyre chips in cement kilns. The CPCB has also issued guidelines on co-processing of waste in cement, power, and steel industry sectors in February 2010. In addition to identifying possible waste streams which can be co-processed, the CPCB also provides waste acceptance criteria and emission standards for facilities processing such wastes.

Hazardous waste recycling

The CPCB provides registration to facilities equipped to recycle hazardous waste. Registration is provided for waste processors in the following categories:

- Lead waste processing
- Non-ferrous metal processing
- Used/waste oil processing
- E-waste recycling
- Paint sludge processing

Clean technology initiatives

Clean technologies, minimize the generation of waste in the production processes and utilize waste from other processes, rather than treating the waste after generation. In general, clean technologies are less intensive in use of raw materials and energy than conventional technologies.

Waste minimisation circles

To reduce and utilize the waste generated by SMEs, waste minimization circles (WMCs) have been established. These aim to reduce both resource and energy intensity in the participating SME units in a holistic manner. A total 153 WMCs have been established till date in 41 industrial sectors, which benefit 6000 SME units. Operation of these WMCs have resulted in reduction in the use of resources such as water (10%-35%), electricity (15%-20%), fossil fuel (10%-20%), raw materials (10%-20%), wastewater generation (10%-30%), air emissions (5%-10%), and solid waste (5%-20%). Use of WMCs has also resulted in yield improvement of 2%-5% in participating units.

E-waste recycling facilities

According to the CPCB, fourteen e-waste recycling units, with annual installed capacity to handle 61 370 tonnes of waste have been set up in different parts of the country. These units are authorized by respective SPCBs to handle and recycle e-waste in an environmentally sound manner.

Fly ash utilization

In recent years, due to sustained efforts of various initiatives and fly ash use notifications in 1999 and 2009, the utilization of fly ash has gone up considerably (around 66.64 million tonnes per annum) and power plants are now getting revenues for giving fly ash to various users instead of having to pay for its pick-up.

Common biomedical waste treatment facilities

Common Biomedical Waste Treatment Facilities (CBWTFs) have been set up in various cities for treatment of bio-medical waste generated in various hospitals and nursing homes. At present there are 177 CBWTFs operational in India. The CPCB monitors the performance of these CBWTFs and provides guidelines to improve their compliance with the BMW rules.

The Ministry has a scheme for providing financial assistance to set up CBWTFs under the public-private partnership (PPP) mode. The scheme for providing financial assistance for setting up common treatment and disposal facilities for hazardous and biomedical wastes and for recycling of e-waste is being revamped, so as to make it more attractive to state governments.

4.7 Forest

India's forests support a rich collection of biological diversity, supply a range of products and ecosystem services, and provide the basis of livelihood for millions of forest communities in the country. The rising pressure for supply of goods and services is resulting in the over-utilization of the country's forests. In spite of relatively stabilized forest cover and marginal improvement since the 1990s, the quality of the resource remains a concern.

The forest and tree cover of the country is 78.37 million hectare (m ha), accounting for 23.84% of the geographic area of the country. Out of this, the forest cover is about 69.09 m ha, which constitutes 21.02% of the geographic area of the country. Of this 8.35 m ha (2.54%) is very dense forest, 31.90 m ha (9.71%) is moderately dense forest, and the rest 28.84 m ha (8.77%) is open forest, including 0.46 m ha of mangroves. The forest cover of India increased from 65.96 m ha in the 1997 assessment to 69.09 m ha in the current assessment, that is, an increase of 3.13 m ha (4.75%). India is one of the few developing countries in, which, despite biotic pressure and economic development, the forest cover continues to increase.

4.7.1 Impacts and key issues

Degradation of forests Degradation of forest is an important issue. It affects provision of various services by the forests. Some of the important factors responsible for degradation include demand and supply gap of forest products, encroachments, shifting cultivation, and forest fires.

Demand and supply gap of fuel-wood, fodder and timber There exists a substantial demand-supply gap of forest products such as fuelwood, fodder, and timber. This often leads to unsustainable utilisation, thereby, resulting in degradation of the forests.

Forest fires Fires affect a large area of forests in the country. Most of these fires are manmade and are created to facilitate extraction of a variety of Non-Timber Forests Products (NTFPs) like tendu leaves, sal seeds, and honey; to have a good yield of grass, and for clearing

the forests for shifting cultivation purposes. Forest fires result in loss of biodiversity and affect the productivity of the entire ecosystem.

Livelihoods of forest dependent communities More than 100 million rural people depend on the sale of NTFPs for their livelihoods. It is estimated that NTFP-based small-scale enterprises provide up to 50% income for 20%-30% of the rural labour force. However, in India the potential of the forests for provision of livelihoods and economic incentives is still under-achieved. Collection and trade in many of the revenue generating forest products like tendu leaves, some medicinal and aromatic plants and timber from valuable species like teak and deodar are controlled by the state. Communities are provided wage labour towards harvesting and other activities.

4.7.2 Policy and legal measures

Under the provisions of the Forest (Conservation) Act, 1980, prior approval of the Central Government is essential for diversion of forest land for nonforestry purposes. The basic objective of the Act is to regulate the indiscriminate diversion of forest land for non-forestry uses and to maintain a logical balance between the developmental needs of the country and the conservation of natural heritage. These guidelines have been issued under the Act, from time to time to simplify the procedures, cut down delays, and to make the Act more user-friendly. To ensure this, recently, new rules under this Act have been framed and notified in January 2003 by the Ministry.

The Ministry has been proactively involved in coordinating the implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 along with the Ministry of Tribal Affairs. For diversion of forest lands for non-forestry purposes such as developmental needs for drinking water projects, irrigation projects, power transmission lines, railway lines, roads, power projects, defence related projects, mining, and so on, compensatory afforestation is stipulated and catchment area treatment plan, wildlife habitat improvement plan, and rehabilitation plan are being implemented to mitigate the ill effects of diversion of such vast areas of green forests. To accelerate afforestation activities, an *ad hoc* Compensatory Afforestation Management and Planning Authority (CAMPA) had been established.

To create awareness about forestry and plantation issues among the people, World Forestry Day is being observed on 21 March by this Ministry. Efforts are being made by the Government to bring more area in the country under tree/forest cover to reach the target of 33% as mandated in the National Forest Policy, 1988, by afforestation on degraded wastelands.

Initiatives have also been undertaken, to enhance community participation through a new scheme of *Afforestation through PRIs* (Panchayat Van Yojna) being undertaken for afforestation on vacant public land involving PRIs. The scheme aims at bringing all unutilized/underutilized non-farming village land under tree cover with village institutions having decision-making authority on its management.

4.8 Biodiversity and wildlife

India is recognized as a mega-diverse country owing to its rich biodiversity, which has evolved over the millennia across its varied bio-geographic zones. It is home to over 91 200 species of animals and 45 500 species of plants and has four identified hotspots. India is home to about 7.6% of all mammalian species, 12.6% of avian species, 6.2% of reptilian species, and 6.0% of flowering plant species. Due to increasing anthropogenic pressures, many species are under threat.

4.8.1 Impacts and key issues

The key issues for biodiversity and wildlife conservation are 1) fragmentation and degradation of wildlife habitats which is adversely affecting the population of many wild animal species. Increase in man–animal conflict is also linked to this; 2) increase in demand for wildlife and wildlife products globally, resulting in poaching; 3) increase in livestock population in and around PAs. It is one of the reasons for decline in herbivore population and a constant threat for spread of disease in wild animals.

4.8.2 Policy and legal measures

India has enacted a national legislation titled the Biological Diversity Act, 2002 and Biological Diversity Rules, 2004 to give effect to the provisions of the Convention on Biological Diversity (CBD), to which, India is a party. The salient features of the Act include:

1. Ensure conservation and sustainable use of biodiversity;
2. Regulate access of biological resources, associated knowledge for fair and equitable benefit sharing;
3. Respect and safeguard the knowledge of local communities regarding biodiversity;
4. To secure sharing of benefits with local people as conservers of biological resources and associated knowledge;
5. Declare areas of conservational relevance as Biodiversity Heritage Sites; Protect and rehabilitate threatened species through a three-tier institutional structure in consonance with the Panchayati Raj system of India.

Some of the landmark initiatives taken to protect and conserve wildlife in the country are: the launch of Project Tiger (1973) and Project Elephant (1992) and the implementation of CSS of 'Assistance to National Park and Sanctuaries'. The Ministry has taken several measures to protect and conserve some of the ecologically rich and sensitive areas.

4.9 Key Environmental Issues

The key environmental issues i.e. *Climate Change, Food Security, Water Security, Energy Security and Urbanization* that threaten to cripple the efforts towards holistic development of India.

4.9.1 Climate Change

India is a large developing country with nearly 700 million rural population directly depending on climate-sensitive sectors (agriculture, forests and fisheries) and natural resources (such as water, biodiversity, mangroves, coastal zones, grasslands) for their subsistence and livelihoods. Further, the adaptive capacity of dry land farmers, forest dwellers, fisher folk and nomadic shepherds is very low. Climate change may alter the distribution and quality of India's natural resources and adversely affect the livelihoods of its people. With an economy closely linked to its natural resource base and climatically sensitive sectors such as agriculture, water and forestry, India may face a major threat because of the projected change in climate. With climate change, there would be increasing scarcity of water, reduction in yields of forest biomass, and increased risk to human health.

India released its National Action Plan on Climate Change(NAPCC) on 30th June, 2008 to outline its strategy to meet the Climate Change challenge. The National Action Plan advocates a strategy that promotes, firstly, the adaptation to Climate Change and secondly, further enhancement of the ecological sustainability of India's development path. India's

National Action Plan stresses that maintaining a high growth rate is essential for increasing the living standards of the vast majority of people of India and reducing their vulnerability to the impacts of climate change. Accordingly, the Action Plan identifies measures that promote the objectives of sustainable development of India while also yielding to benefits for addressing climate change. Eight National Missions, which form the core of the National Action Plan, represent multi-pronged, long term and integrated strategies for achieving key goals in the context of climate change. The focus is on promoting understanding of Climate Change, adaptation and mitigation, energy efficiency and natural resource conservation.

4.9.2 Food Security

Today, there are marketable surpluses of food grains in India; the prevalence of widespread hunger is not due to the nonavailability of food in the market but due to lack of adequate purchasing power among the rural and urban poor. Inadequate purchasing power, in turn, is due to insufficient opportunities for gainful employment. The famines of jobs and of purchasing power are becoming the primary causes for the famines of food in the households of the poor. Poverty, increased food consumption, land degradation, climate change are some of the pressures of food insecurity.

Some of the measures to secure food security are as follows:

1. The National Food Security Mission has been launched recently as a centrally sponsored scheme. The objective is to increase production and productivity of wheat, rice and pulses on a sustainable basis so as to ensure food security of the country.
2. Boosting agricultural science and technology.
3. Sustainable intensification and diversification of farming systems and value-addition.
4. Promotion of organic farming – a solution to ensure economically sustainable agriculture.

4.9.3 Water Security

Water security is emerging as an increasingly important and vital issue for India. Many Indian cities are beginning to experience moderate to severe water shortages, brought on by the simultaneous effects of agricultural growth, industrialization and urbanization. These shortages would be further aggravated by receding of glaciers and dwindling fresh water resources. Population stress, irrigation requirements and industrialization are the major pressures for water insecurity. The environmental challenges of water resource development and management in India are expected to manifest themselves more explicitly and rapidly in the coming years. These environmental challenges may be addressed through four broad approaches:

1. Improving efficiencies and minimizing losses
2. Recharging groundwater aquifers
3. Abatement and treatment of water pollution
4. Reuse and recycling of wastewater

4.9.4 Energy Security

India is a developing country facing the critical challenge of meeting its rapidly increasing demand for energy. With over a billion people, India ranks sixth in the world in terms of energy demands. India's economy is projected to grow seven to eight per cent over the next two decades, spurring a substantial increase in demand for oil to fuel land, sea, and air

transportation. While India has significant reserves of coal, it is relatively poor in oil and gas resources. India's oil reserves amount to 0.5 per cent of the global reserves. In recent years, India's energy consumption has been increasing at one of the fastest rates in the world owing to population growth and economic development.

In the recent years, the Government of India has recognized the energy security concerns and more importance is being placed on energy independence. Some of the strategies for energy security are as follows:

1. Power Generation Strategy will focus on low cost generation, optimization of capacity utilization, controlling the input cost, optimization of fuel mix, Technology upgradation and utilization of non-conventional energy sources.
2. Transmission strategy will focus on development of National Grid including Inter-state connections, technology upgradation and optimization of transmission cost.
3. Distribution strategy (to achieve distribution reforms) will focus on system upgradation, loss reduction, theft control, consumer service orientation, quality power supply commercialization, decentralized distributed generation and supply for rural areas.
4. Conservation strategy (to optimize the utilization of electricity) will focus on demand side management, load management and technology upgradation to provide energy efficient equipment / gadgets.

4.9.5 Managing Urbanization

Due to an uncontrolled urbanization in India, environmental degradation has been occurring very rapidly and causing shortages of housing, worsening of water quality, excessive air pollution, noise, dust and heat, and the problems of disposal of solid wastes and hazardous wastes. The situation in metropolises like Mumbai, Kolkata, Chennai, Delhi and Bangalore, is becoming worse year by year. Some of the strategies to manage urbanization are as follows:

1. Redirection of migration flow is required. Since the mega cities have reached the saturation level for employment generation and to avoid over-crowding into the over congested slums of mega cities like Mumbai, Kolkata, Delhi and Chennai, there is a dire need to build a strong economic sector (Kundu and Basu, 1998) in the urban economy. Growth efforts and investments should be directed towards small cities which have been neglected so far so that functional base of urban economy is strengthened. Then, the redirection of migration to this desirable destination will be possible.
2. Policy should also relate to proper urban planning where city planning will consist of operational, developmental and restorative planning.

4.10 Summary

To address these challenges, it is essential to focus on diverse response options and instruments for possible solutions. Emphasis must be placed on increasing stakeholders responsibility and accountability and promoting more cooperative efforts for ensuring a healthy environment.

Spreading awareness and empowering people to take decisions, at the local level, is an effective way of dealing with the environmental problems of India. Their decisions will enable initiatives that will benefit them as well as the local environment. It has been seen that solutions always emerge whenever governments involve people, using a participatory approach to solve problems.

Community-based natural resource management initiatives, coupled with policy reforms, can prove to be an effective mechanism for improving access to, and improving productivity of, natural resources.

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4.12 Further Readings

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4.13 Model Question

- Write a note on the extent and causes for environmental problems.

ENVIRONMENTAL POLICY IN INDIA

Structure

- 5.0 Objectives
- 5.1 Introduction
- 5.2 Objectives of the National Environment Policy
- 5.3 Principles
- 5.4 Strategies and Actions
- 5.5 Regulatory Reforms
- 5.6 Process Related Reforms
- 5.7 Substantive Reforms
- 5.8 Enhancing and Conserving Environmental Resources
- 5.9 Environmental Standards, Management Systems, Certification, and Indicators:
- 5.10 Environmental Awareness, Education and Information
- 5.11 Further Readings
- 5.12 Model question

5.0 Objectives

After reading this lesson you will be able to

- explain the environment Policy of India
- highlight the Strategies & Action plans of the Policy
- mention environmental Awareness and education

5.1 Introduction

The National Environment Policy, 2006 is the outcome of extensive consultations with experts in different disciplines, Central Ministries, Members of Parliament, State Governments, Industry Associations, Academic and Research Institutions, Civil Society, NGOs and the Public. The National Environment Policy is a response to our national commitment to a clean environment, mandated in the Constitution in Articles 48 A and 51 A (g), strengthened by judicial interpretation of Article 21. It is recognized that maintaining a healthy environment is not the state's responsibility alone, but also that of

every citizen. A spirit of partnership should thus be realized throughout the spectrum of environmental management in the country. While the state must galvanize its efforts, there should also be recognition by each individual - natural or institutional, of its responsibility towards maintaining and enhancing the quality of the environment. The National Environment Policy (NEP) is also intended to be a statement of India's commitment to making a positive contribution to international efforts.

The National Environment Policy is intended to be a guide to action: in regulatory reform, programmes and projects for environmental conservation; and review and enactment of legislation, by agencies of the Central, State, and Local Governments.

The dominant theme of this policy is that while conservation of environmental resources is necessary to secure livelihoods and well-being of all, the most secure basis for conservation is to ensure that people dependent on particular resources obtain better livelihoods from the fact of conservation, than from degradation of the resources.

5.2 Objectives of the National Environment Policy

The principal Objectives of this policy are enumerated below. These Objectives relate to current perceptions of key environmental challenges. They may, accordingly, evolve over time:

i. Conservation of Critical Environmental Resources:To protect and conserve critical ecological systems and resources, and invaluable natural and man-made heritage, which are essential for lifesupport, livelihoods, economic growth, and a broad conception of human well-being.

ii. Intra-generational Equity: Livelihood Security for the Poor:To ensure equitable access to environmental resources and quality for all sections of society, and in particular, to ensure that poor communities, which are most dependent on environmental resources for their livelihoods, are assured secure access to these resources.

iii. Inter-generational Equity:To ensure judicious use of environmental resources to meet the needs and aspirations of the present and future generations.

iv. Integration of Environmental Concerns in Economic and Social Development:To integrate environmental concerns into policies, plans, programmes, and projects for economic and social development.

v. Efficiency in Environmental Resource Use: To ensure efficient use of environmental resources in the sense of reduction in their use per unit of economic output, to minimize adverse environmental impacts.

vi. Environmental Governance: To apply the principles of good governance (transparency, rationality, accountability, reduction in time and costs, participation, and regulatory independence) to the management and regulation of use of environmental resources

vii. Enhancement of Resources for Environmental Conservation:To ensure higher resource flows, comprising finance, technology, management skills, traditional knowledge, and social capital, for environmental conservation through mutually beneficial multistakeholder partnerships between local communities, public agencies, the academic and research community, investors, and multilateral and bilateral development partners.

Self-assessment Question
Why do we need Environmental Policy?

5.3 Principles

This policy has evolved from the recognition that only such development is sustainable, which respects ecological constraints, and the imperatives of justice. The Objectives stated above are to be realized through various strategic interventions by different public authorities at Central, State, and Local Government levels. They would also be the basis of diverse partnerships. These strategic interventions, besides legislation and the evolution of legal doctrines for realization of the Objectives, may be premised on a set of unambiguously stated Principles depending upon their relevance, feasibility in relation to costs, and technical and administrative aspects of their application. The following Principles, may accordingly, guide the activities of different actors in relation to this policy. Each of these Principles has an established genealogy in policy pronouncements, jurisprudence, international environmental law, or international State practice:

i. Human Beings are at the Centre of Sustainable Development Concerns: Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

ii. The Right to Development: The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

iii. Environmental Protection is an Integral part of the Development Process: In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

iv. The Precautionary Approach Where there are credible threats of serious or irreversible damage to key environmental resources, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

In various public actions for environmental conservation, economic efficiency would be sought to be realized.

v. Economic Efficiency: This Principle requires that the services of environmental resources be given economic value, and such value to count equally with the economic values of other goods and services, in analysis of alternative courses of action.

5.4 Strategies and Actions

The foregoing statement of policy Objectives and Principles are to be realized by concrete actions in different areas relating to key environmental challenges. A large number of such actions are currently under way, and have been for several years, in some cases, for many decades. In some aspects new themes would need to be pursued to realize the Principles and Objectives. Action plans would need to be prepared on identified themes by the concerned agencies at all levels of Government Central, State/UT, and Local. In particular, the State and Local Governments would be encouraged to formulate their own strategies or action plans consistent with the National Environment Policy. Empowerment of Panchayats and the Urban Local Bodies, particularly, in terms of functions, functionaries, funds, and corresponding capacities, will require greater attention for operationalising some of the major provisions of this policy.

Integration of environmental concerns in all relevant development processes is among the Objectives of this policy. Further, inclusion of environmental considerations in sectoral policy making has also been recognized as among the Principles underpinning the policy. In order to operationalize these, a mechanism for ensuring necessary due diligence at all levels of government, will be institutionalized.

The following Strategic Themes, and outlines of actions to be taken in each, focus on ongoing activities, functions, and roles, as well as new initiatives that are necessary.

5.5 Regulatory Reforms

The regulatory regimes for environmental conservation comprise a legislative framework, and a set of regulatory institutions. Inadequacies in each have resulted in accelerated environmental degradation on the one hand, and long delays and high transactions costs in development projects on the other. Apart from legislation which is categorically premised on environmental conservation, a host of sectoral and cross-sectoral laws and policies, including fiscal regimes, also impact environmental quality.

Revisiting the Policy and Legislative Framework

The present legislative framework is broadly contained in the umbrella *Environment Protection Act 1986 Water (Prevention and Control of Pollution) Act, 1974 Water Cess Act, 1977 Air (Prevention and Control of Pollution) Act, 1981*. The law in respect of management of forests and biodiversity is contained in the *Indian Forest Act, 1927 Forest (Conservation) Act 1980 Wild Life (Protection) Act, 1972 and the Bio Diversity Act 2002*.

The following specific actions would be taken:

- a) Institutionalize a holistic and integrated approach to the management of environmental and natural resources, explicitly identifying and integrating environmental concerns in relevant sectoral and cross-sectoral policies, through review and consultation, in line with the National Environment Policy
- b) Identify emerging areas for new legislation, due to better scientific understanding, economic and social development, and development of multilateral environmental regimes, in line with the National Environment Policy.
- c) Review the body of existing legislation in order to develop synergies among relevant statutes and regulations, eliminate obsolescence, and amalgamate provisions with similar objectives, in line with the National Environment Policy. Further, encourage and facilitate review of legislation at the level of State and Local Governments with a view to ensuring their consistency with this policy.
- d) Take steps to adopt and institutionalize techniques for environmental assessment of sector policies and programmes to address any potential adverse impacts, and enhance potential favourable impacts.
- e) Ensure accountability of the concerned levels of Government (Centre, State, Local) in undertaking the necessary legislative changes in a defined time-frame, with due regard to the Objectives and Principles of National Environment Policy, in particular, ensuring the livelihoods and well-being of the poor by ensuring improved access to the necessary environmental resources.

5.6 Process Related Reforms

(i) Approach: The recommendations of the (The Govindarajan Committee) which identified delays in environment and forest clearances as the largest source of delays in development projects, will be followed for reviewing the existing procedures for granting clearances and other approvals under various statutes and rules. These include the *Environment Protection Act, Forest Conservation Act, the Water (Prevention and Control of Pollution) Act, the Air (Prevention and Control of Pollution) Act, the Wildlife (Protection) Act, and Genetic Engineering Approval Committee (GEAC) Rules under the Environment Protection Act.* The objective is to reduce delays and levels of decision-making, realize decentralization of environmental functions, and ensure greater transparency and accountability.

In addition, the following actions will be taken:

- a) In order to ensure faster decision making with greater transparency, and access to information, use of information technology based tools will be promoted, together with necessary capacity-building, under all action plans.
- b) In order to realize greater decentralization, State level agencies may be given greater responsibility for environmental regulation and management. Such empowerment must, however, be premised on increased transparency, accountability, scientific and managerial capacity, and independence in regulatory decision making and enforcement action. Accordingly, States would be encouraged to set up Environment Protection Authorities on this basis.
- c) Mechanisms and processes would be set up to identify entities of “Incomparable Value” in different regions. It would be ensured that all regulatory mechanisms are legally empowered to follow the principles of good governance

(ii) Framework for Legal Action: The present approach to dealing with environmentally unacceptable behaviour in India has been largely based on criminal processes and sanctions. Although criminal sanctions, if successful, may create a deterrent impact, in reality they are rarely fruitful for a number of reasons. On the other hand, giving unfettered powers to enforcement authorities may lead to rent-seeking.

Civil law, on the other hand, offers flexibility, and its sanctions can be more effectively tailored to particular situations. The evidentiary burdens of civil proceedings are less daunting than those of criminal law. It also allows for preventive policing through orders and injunctions.

Accordingly, a judicious mix of civil and criminal processes and sanctions will be employed in the legal regime for enforcement, through a review of the existing legislation. Civil liability law, civil sanctions, and processes, would govern most situations of non-compliance. Criminal processes and sanctions would be available for serious, and potentially provable, infringements of environmental law, and their initiation would be vested in responsible authorities. Recourse may also be had to the relevant provisions in the Indian Penal Code, and the Criminal Procedure Code. Both civil and criminal penalties would be graded according to the severity of the infraction.

5.7 Substantive Reforms

(i) Environment and Forests Clearances: Environmental Impact Assessment (EIA) will continue to be the principal methodology for appraising and reviewing new projects. The assessment processes are under major revision in line with the Govindarajan Committee recommendations. Under the new arrangements, there would be significant devolution of powers to the State/UT level. However, such devolution, to be effective, needs to be accompanied by adequate development of human and institutional capacities.

Further, in order to make the clearance processes more effective, the following actions will be taken:

- a) Encourage regulatory authorities, Central and State, to institutionalize regional and cumulative environmental impact assessments (R/CEIAs) to ensure that environmental concerns are identified and addressed at the planning stage itself.
- b) Specifically assess the potential for chemical accidents of relevant projects as part of the environmental appraisal process
- c) Give due consideration, to the quality and productivity of lands which are proposed to be converted for development activities, as part of the environmental clearance process. Projects involving large-scale diversion of prime agricultural land would require environmental appraisal.
- d) Encourage clustering of industries and other development activities to facilitate setting up of environmental management infrastructure, as well as monitoring and enforcing environmental compliance. Emphasize post project monitoring and implementation of environmental management plans through participatory processes, involving adequately empowered relevant levels of government, industry, and the potentially impacted community.
- e) Restrict the diversion of dense natural forests and areas of high endemism of genetic resources, to non-forest purposes, only to site-specific cases of vital national interest. No further regularisation of encroachment on forests should be permitted.
- f) Ensure that in all cases of diversion of forest, the essential minimum needed for the project or activity is diverted. The diverted area must not be cleared until the actual construction starts.
- g) Ensure provision for environmental restoration after decommissioning of industries, in particular mine closure in all approvals of mining plans, and institutionalise a system of post-monitoring of such projects.
- h) Formulate, and periodically update, codes of "good practices" for environmental management for different categories of regulated activities.

(ii) Coastal Areas

Development activities in the coastal areas are regulated by means of the Coastal Regulation Zone notifications and Integrated Coastal Zone Management (ICZM) plans made under them.

However, there is need to ensure that the regulations are firmly founded on scientific principles, including the physical, natural, and social sciences. This is necessary to ensure effective protection to valuable coastal environmental resources, without unnecessarily impeding livelihoods, or legitimate coastal economic activity, or settlements, or infrastructure development. Islands offer unique ecosystems and coastal planning and regulation in their case needs to take into account features such as their geological nature, settlement patterns, volcanic or coral nature of the island, size of the habitations, unique cultures, livelihood patterns, etc. Adequate environmental safeguards should be built into development projects in the islands, in particular those relating to tourism, high value agriculture, deep sea fishing, prospecting for oil and natural gas, etc. It is recognized that states will require both technical and financial resources for preparation of ICZM plans.

The following actions will be taken:

- a) Revisit the Coastal Regulation Zone (CRZ) notifications to make the approach to coastal environmental regulation more holistic, and thereby ensure protection to coastal ecological systems, coastal waters, and the vulnerability of some coastal areas to extreme natural events and potential sea level rise. The Integrated Coastal Zone Management (ICZM) plans need to be comprehensive, and prepared on strong scientific basis by experts with the participation of the local communities both in formulation and implementation. The ICZM plans should be reviewed at pre-determined intervals to take account of changes in geomorphology, economic activities, settlement patterns, and coastal and marine environmental conditions.
- b) Decentralize, to the extent feasible, the clearance of specific projects to State level environmental authorities, exempting activities, which do not cause significant environmental impacts, and are consistent with approved ICZM plans.

(iii) Living Modified Organisms (LMOs)

Biotechnology has immense potential to enhance livelihoods and contribute to the economic development of the country. On the other hand, LMOs may pose significant risks to ecological resources, and perhaps, human and animal health. In order to ensure that development of biotechnology does not lead to unforeseen adverse impacts, the following actions will be taken:

- a) Review the regulatory processes for LMOs so that all relevant scientific knowledge is taken into account, and ecological, health, and economic concerns are adequately addressed.
- b) Periodically review the National Bio-safety Guidelines, and Bio-safety Operations Manual to ensure that these are based on current scientific knowledge.
- c) Ensure the conservation of bio-diversity and human health when dealing with LMOs in transboundary movement in a manner consistent with the multilateral Bio-safety Protocol.

(iv) Environmentally Sensitive Zones

Environmentally Sensitive Zones may be defined as areas with identified environmental resources having “Incomparable Values” which require special attention for their conservation.

In order to conserve and enhance these resources, without impeding legitimate socio-economic development of these areas, the following actions will be taken:

- a) Identify and give legal status to Environmentally Sensitive Zones in the country having environmental entities with “Incomparable values” requiring special conservation efforts.
- b) Formulate area development plans for these zones on a scientific basis, with adequate participation by the local communities.
- c) Create local institutions with adequate participation for the environmental management of such areas, to ensure adherence to the approved area development plans, which should be prepared in consultation with the local communities.

Self –assessment Question
What is Environmentally sensitive Zone?

(v) Monitoring of Compliance

Weak enforcement of environmental compliance is attributed to inadequate technical capacities, monitoring infrastructure, and trained staff in enforcement institutions. In addition, there is insufficient involvement of the potentially impacted local communities in the monitoring of compliance, and absence of institutionalized public-private partnerships in enhancement of monitoring infrastructure.

The following actions will be taken:

- a) Take measures, including capacity development initiatives to enable Panchayati Raj Institutions and urban local bodies to undertake monitoring of compliance with environmental management plans. Measures will also be taken to encourage municipalities to annually report their environmental performance to their governing bodies.
- b) Develop feasible models of public-private partnerships to leverage financial, technical, and management resources of the private sector in setting up and operating infrastructure for monitoring of environmental compliance, with ironclad safeguards against possible conflict of interest or collusion with the monitored entities.

(vi) Use of Economic Principles in Environmental Decision-making

It is necessary that the costs associated with the degradation and depletion of natural resources be incorporated into the decisions of economic actors at various levels, to reverse the tendency to treat these resources as “free goods” and to pass the costs of degradation to other sections of society, or to future generations of the country.

The following actions will be taken:

- a) Strengthen, including through capacity building, the initiatives, taken by the Central Statistical Organization in the area of natural resource accounting, with a view to its adoption in the system of national income accounts. Further strengthen in all respects, the system of collection, collation and analysis of all significant and relevant environmental monitoring data.
- b) Develop and promote the use of standardized environmental accounting practices and norms in preparation of statutory financial statements for large industrial enterprises, in order to encourage greater environmental responsibility in investment decision-making, management practices, and public scrutiny.
- c) Encourage financial institutions to adopt appropriate appraisal practices, so that environmental risks are adequately considered in the financing of projects.
- d) Facilitate the integration of environmental values into cost-benefit analysis, to encourage more efficient allocation of resources while making public investment decisions.
- e) Prepare and implement an action plan on the use of economic instruments for environmental regulation in specified contexts, including those relating to unsustainable production and consumption.
- f) Consider creation of a National Environment Restoration Fund from the net proceeds of economic instruments, user fees for access to specified natural resources, and voluntary

contributions. The Fund may be used for restoration of environmental resources, including clean-up of toxic and hazardous waste legacies.

5.8 Enhancing and Conserving Environmental Resources

Perverse production and consumption practices are the immediate causes of environmental degradation, but an exclusive focus on these aspects alone is insufficient to prevent environmental harm. The causes of degradation of environmental resources lie ultimately in a broad range of policy, and institutional, including regulatory shortcomings, leading to the direct causes. However, the range of policies, and legal and institutional regimes, which impact the proximate factors, is extremely wide, comprising fiscal and pricing regimes, and sectoral and cross-sectoral policies, laws, and institutions. Accordingly, apart from programmatic approaches, review and reform of these regimes to account for their environmental consequences is essential. In addition, there is lack of awareness of the causes and effects of environmental degradation, and how they may be prevented, among both specialized practitioners of the relevant professions, including policymakers, as well as the general public, which needs to be redressed.

5.9 Environmental Standards, Management Systems, Certification, and Indicators:

Environmental Standards Environmental Standards refer both to the acceptable levels of specified environmental quality parameters at different categories of locations (“ambient standards”), as well as permissible levels of discharges of specified waste streams by different classes of activities (“emission standards”). Specific considerations for setting ambient standards in each category of location (residential, industrial, environmentally sensitive zones, etc.) include the reductions in potential aggregate health risks (morbidity and mortality combined in a single measure) to the exposed population; the risk to sensitive, valuable ecosystems and manmade assets; and the likely societal costs, of achieving the proposed ambient standard.

Similarly, emissions standards for each class of activity need to be set on the basis of general availability of the required technologies, the feasibility of achieving the applicable environmental quality standards at the location (specific or category) concerned with the proposed emissions standards, and the likely unit costs of meeting the proposed standard. It is also important that the standard is specified in terms of quantities of pollutants that may be emitted, and not only by concentration levels, since the latter can often be easily met through dilution, with no actual improvement in ambient quality. The tendency to prescribe specific abatement technologies should also be eschewed, since these may unnecessarily increase the unit and societal costs of achieving the ambient environmental quality, and in any case because a technology that is considered ideal for meeting a given emission standard may not be acceptable on other relevant parameters, including possibly other sources of societal risk.

Environmental Management Systems (EMS), such as ISO 14000, by requiring the adoption of standardized environmental management practices, documenting their actual use, and credible third party verification of the fact, may significantly ease the public burden of monitoring and enforcement of prescribed emissions standards.

The following actions will be taken:

- a) Encourage industry associations to promote the adoption of ISO 14000 among their members, through provision of technical and training support. Mainstream promotion of ISO 14000 in the small-scale sector in the various promotion schemes for the sector.
- b) Encourage adoption of EMS through purchase preference for ISO 14000 goods and services for Government procurement, except for items reserved for the small-scale

sector at any given time. Mandate ISO 14000 when a sufficient number of domestic suppliers for each good or service have ISO 14000 certification.

- c) Formulate “Good Practice Guidelines” for eco labels to enhance their scientific basis, transparency, and requirements of participation. Promote the mutual recognition of Indian and foreign eco labels, which adhere to the Good Practice Guidelines, to ensure that Indian exporters enhance their market access at lower costs.
- d) Promote “good practices” norms in all relevant sectors to conserve natural resources and reduce adverse environmental impacts, covering siting, choice of materials, use of appropriate energy efficiency and renewable energy options, and addressing solid wastes generation, effluents and sewage handling, gaseous emissions, and noise.

Clean Technologies and Innovation Clean technologies are less intensive in use of raw materials and energy, than conventional technologies, which rely on pollution abatement after generation. The following will comprise elements of an Action Plan:

- a) Encourage capacity building in the financial sector for appraising clean technology switchover project proposals.
- b) Set up a mechanism to network technology research institutions in the country, public and private, for cooperation in technology research and development and adaptation, information, and evaluation of clean technologies. Create a database of such technologies, and promote dissemination of new technologies developed both in India and abroad.
- c) Consider use of revenue enhancing fiscal instruments to promote shifts to clean technologies in both existing and new units.
- d) Promote adoption of clean technologies by industry, in particular in the small and medium sector, through regulatory and fiscal measures, and standards setting.

5.10 Environmental Awareness, Education, and Information

Enhancing environmental awareness is essential to harmonize patterns of individual behaviour with the requirements of environmental conservation. This would minimize the demands placed on the monitoring and enforcement regimes; in fact, largescale non-compliance would simply overwhelm any feasible regulatory machinery. Environmental education is the principal means of enhancing such awareness, both among the public at large, and among focused groups. Such education may be formal, or informal, or a combination of both. It may rely on educational institutions at different levels; the print, electronic, or live media; and various other formal and informal settings. Several steps to expand and enrich the content of the environment awareness and education programmes have been taken. The Supreme Court has also mandated that environmental education must be imparted at all levels, including higher education in the formal system.

Access to environmental information is the principal means by which environmentally conscious stakeholders may evaluate compliance by the concerned parties with environmental standards, legal requirements, and covenants. Access to information is also necessary to ensure effective, informed participation by potentially impacted publics in various consultation processes, such as for preparation of environmental impact assessments, and environment management plans of development projects.

The National Natural Resources Management System (NNRMS) was set up in 1983 for optimally managing the natural resources and environment of the country using an optimal mix of remote sensing and conventional techniques. Remote Sensing and data, both satellite and aerial, is

being used extensively in the country for mapping and managing the natural resources and environment, over the past three decades.

The following actions will be taken:

- a) Develop and operate an online, real time, publicly accessible environmental information system to provide all relevant information on key environmental resources and parameters, including ambient quality, as well as major point sources of pollution, and make archival data available in convenient format.
- b) Further promote the use of Remote Sensing data to provide valuable inputs on the extent and quality of forests, wildlife habitats, biodiversity, wastelands, wetlands, groundwater, deserts, rivers, etc., and monitor pollution and its impacts.
- c) Mainstream scientifically valid environment content in the curricula of formal education, at primary, secondary, tertiary, and professional levels, focusing on the content appropriate at each stage, and without increasing the course load overall, besides non-formal programmes, such as adult education. Special midcareer training programmes may be conducted for groups with special responsibilities, e.g. the judiciary, policy makers, legislators, industrial managers, city and regional planners, and voluntary and community based organizations.
- d) Prepare and implement a strategy for enhancing environmental awareness among the general public, and special groups, by professional production and airing of information products through diverse media catering to the different target groups. The media products should, as far as possible, eschew focusing on the achievements of public agencies, but instead document real world events of human interest. The production, as well as dissemination may involve public, private, and voluntary agencies. Ensure that adequate financial resources are available for the purpose.

5.11 Further Readings

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5.12 Model question

Explain the main features of environmental Policy in India.

ROLE OF VOLUNTARY ORGANIZATIONS AND POPULAR PARTICIPATION IN ENVIRONMENTAL PROTECTION AND PRESERVATION

Structure

- 6.0 Objectives
- 6.1 Introduction
- 6.2 Environmental movements and Environmental NGOs
- 6.3 Nature of Civil society organizations & NGOs working for Environment
- 6.4 Role & Activities of Voluntary Environmental Groups
- 6.5 Nature of Voluntary Action for Environment at National and International level
- 6.6 Limitations in the performance of environmental NGOs in India
- 6.7 Summary
- 6.8 Further Readings
- 6.9 Model question

6.0 Objectives

After reading this chapter, you will be able to

- understand the role of People's Participation in Environment movements
- explain nature of the environmental groups working at various levels
- appreciate the role of civil society in environmental protection and preservation

6.1 Introduction

Social movements are central actors in civil society, providing an autonomous site for social interaction and discussion about social problems, devising possible solutions and mobilizing to bring about social change. By interacting with other groups in the larger society, including opponents and supporters of specific changes, social movements help in enhancing the adaptive capacity of society by making it more flexible and capable of responding to underlying problems.

Environmentalism in all its manifestations finds its social origin in the social movements that grew from populist grassroots groups, dynamic and amorphous environment networks and institutionalized public pressure lobbies. Today Environment is everyone's concern. By the wrongful activities of human beings, nature has already been partly destroyed. Before the situation worsens further and the damage becomes permanent, it is our duty to preserve nature at least as it is now so that future generations will not accuse us of negligence. Realizing the gravity of the situation,

environmental movements have sprung up all over the world.

There have been some environmental movements in the past where unorganized and sometimes organized protests for the protection and conservation of environmental resources were held by people. e.g. Anti forest felling protests by women in Rajasthan in India in 1730s. However, the rapid rise of such popular movements in the last two centuries can be attributed to the growing realization of the ill effects of unplanned and resource intensive model of development followed by the European nations especially after industrial revolution.

Most of the environment movements are the result of the voluntary action of people due to the growing awareness and activism leading to organized and unorganized protests against environmental degradation and for the sake of justful use of natural resources. It is predicted that more the people are aware of the environment related problems in the country, especially in their localities; the more will be the number of environmental movements. The growing awareness is sometimes attributed to be generated through books and newspapers, especially with regard to spreading of the information on environmental issues. For example, in 1962, the book 'Silent Spring' written by Rachel Carson described in detail the pollution of air, water and wildlife from pesticides such as DDT. Her book was well received and it helped to increase the knowledge of people regarding the harmful effects of pesticides. From the 1960s onwards, many environmentalists have been writing articles on environment. These have inspired the formation of many environment movements all over the world.

Due to the growing awareness about issues concerning environmental protection and conservation, it is now widely accepted that the people should have rights and resources to make decision about their livelihood and environment. Only this will eventually lead towards sustainable society. Sustainability thus depends freedom of the people to relate development with environment. Further, there is clear cut relation between democracy and sustainability. The democracy provides for a variety of channels and multiple forums for negotiations and pressure. Ability of the government and people to cooperate and express them at all levels-federal, state and local/tribal is a basic precondition to build eco democracy. Eco democracy can be sustained and secured with recognition of the role of local communities, panchayats and the tribals. The western societies consider man as superior to nature. Such a view militates against the basis of sustainability. But the indigenous communities consider that development should not be equated with economic prosperity, rather, it is about living a life of self reliance, in harmony with nature. The lives of such communities are organically tied to the earth and their knowledge and experience with sustainable practices have however, been ridiculed and ignored by the White west. The people of the Third world must have deep concern for the retention of indigenous knowledge and culture and women's intimate have concept of eco democracy.

It is clear from the above discussion that people's participation is very important in all environmental movements. Pollution of air, water and soil, and mindless utilization of natural resources have raised environmental degradation to dangerous heights across the globe. One of the best methods to reverse this trend is to organize movements with people's participation for emphasizing importance of environment. In this context, it is important to understand the nature of environment movements by civil society, the extent, problems faced and scope of working of Environmental NGOs. In this chapter, a very passing refrence is made to the major environmental NGOs and environmental movements brought about by civil society in the west and in India.

6.2 Environment movements & Environment NGOs

There have been many formal and informal efforts by governments at both the national and international level to make and enforce laws for environmental protection. Various institutions and agencies have been created to help in the endeavor. However, the target of environmental protection cannot be successful without the voluntary participation of the people in the activities relating to

environmental conservation and dissemination of information relating to environment problems and solutions. Pollution of air, water and soil, and mindless utilization of natural resources have raised environmental degradation to dangerous heights across the globe. One of the best methods to reverse this trend is to organize movements with people's participation for emphasizing importance of environment. Realising this governments have accepted, though with varying degree of zeal the role of civil society in the form of voluntary action of the people and Non Government Organizations.

There have been three generations of environmental organizations. They work alongside each other much as houses built in different eras stand next to one another on a city street. Conservation organizations were founded to protect wildlife and natural areas. Many of them were started in the late 19th or early 20th centuries. The environmental movement that began around 1970 looked at the human environment as a system and saw a knot of interrelated problems. It was realized that air pollution, for example, could not be addressed without looking at patterns of urban growth and energy and transportation alternatives. The sustainability movement started around 1980. It revolves around the powerful idea of living within the limits of the earth's resources in "sustainability," that is, a state that can be maintained indefinitely. .

In the 1990s, a fourth wave emerged that links sustainability to social justice and reforms in governance. "Governance" refers not only to government, but to the whole set of institutions that steer society. There is growing awareness that the ultimate barriers to making real progress on environmental problems, as well as related challenges of population growth and poverty, have to do with unresponsive political institutions. Sustainability will not be achieved without more respect for human rights, more representative governments, more equitable economic systems, more effective ways of implementing public policies. This fourth wave has influenced existing groups more than it has led to creating new ones. For example, IUCN now states its goal as "A just world that values and conserves nature." The Sierra Club, one of North America's pioneering conservation organizations (it was founded in 1892) works closely with human rights organizations and environment NGOs on international environmental issues. It is the fourth wave of organizations which have played most important part in bringing about environment movements in all parts of the world. These kinds of organizations recognize the rights of people for peaceful protests against environmental degradation.

Activity 1
List some of the NGOs working for Environment Protection in your area?

6.3 Nature of Civil society organizations & NGOs working for Environment

The term civil society is generally used to classify persons, institutions, and organizations that have the goal of advancing or expressing a common purpose through ideas, actions, and demands on governments. The membership of civil society is quite diverse, ranging from individuals to religious and academic institutions to issue-focused groups such as not-for-profit or non-governmental organizations.

NGOs involved in environmental governance are highly diverse, including local, national, regional, and international groups with various missions dedicated to environmental protection, sustainable development, poverty alleviation, animal welfare, and other issues. The diversity of civil society and its value to official intergovernmental processes on the environment are acknowledged in

Agenda 21, the comprehensive sustainable development blueprint adopted at the 1992 Rio Earth Summit. The document does not make use of the term civil society, although it expressly recognizes the members of civil society as a major constituency. The Commission on Sustainable Development (CSD), responsible for implementing Agenda 21, classifies civil society into the following Major Groups:

- Women,
- children and Youth,
- indigenous people and communities,
- Non-governmental organisations,
- workers and Trade Unions,
- Scientific and Technological community
- Business and Industry Farmers

Participation of local people is essential for any such movement to be successful. While ensuring people's participation, the following issues are most important:

- As the people in charge of the programmes will be mostly outsiders, they will not have answers to all the questions. They should listen patiently to the local people.
- If there are any conflicts between individuals or groups of individuals in the locality, these conflicts should be removed so that people will interact a better-way.
- Some financial benefits must be there for the local people. Then only they will participate whole heartedly.
- The decision, makers should find out what issues are more important in the area from the local people themselves.
- The decision makers should always remember that their sole objective is to solve local environmental problems
- Success of NGOs depends upon the leadership skill of its organizers, extent of funding and degree of concern with the cause of environment welfare.

VOLUNTARY ENVIRONMENTAL GROUPS

There are many types of environmental groups working at the local, state, national, and international levels. These groups generally fall into two categories: mainstream and grass-roots.

Mainstream environmental groups are active mostly at the national level and to a lesser extent at the state level. Often they form coalitions to work together on issues. Many countries have influential broad-interest NGOs, which campaign on many separate environmental issues, as well as single-issue groups. Among the better renown are the Natural Resources Defense Council and Environmental Defense Fund in the United States, Sahabat Alam in Malaysia, Grupo do los Cien in Mexico, Bund in the Federal Republic of Germany, Italia Nostra, and the Danish Nature Protection Society. During the 1970s and 1980s, there has been increasing co-ordination among national NGOs (in some cases even the merging of NGOs or the creation of coalitions, such as Wildlife Link in the United Kingdom to tackle important national problems.

There is similar co-operation across international boundaries to deal with regional or global issues. This may be said to have begun in 1948 with the foundation of the International Union for the Protection of Nature (later the International Union for Conservation of Nature and Natural Resources

(IUCN), which is unique in having a membership comprising over 60 Governments, 130 government agencies and 350 national and international NGOs. Several NGOs, such as Friends of the Earth, Greenpeace, and World Wide Fund for Nature (WWF) comprise many national affiliates. The Nuclear Free Pacific Movement has been an umbrella under which many groups have met had taken steps to halt nuclear activities in the Pacific.

Mainstream groups do important work within the system and have been major forces in persuading the government to pass environmental laws. However, the base of the environmental movement in several countries consists of thousands of grass-roots groups of citizens who have organized to protect themselves from pollution and environment. The mottoes of such groups are “think globally and act locally”. They take to the streets, forests, oceans, and other frontline sites to stop environmental abuse, make harmful activities economically unattractive, and raise public awareness about environmental abuse and the need for change.

Many local grass-roots organizations are unwilling to compromise or negotiate. Instead of dealing with environmental goals and abstractions, they are fighting perceived threats to their lives, the lives of their children and grandchildren, and the value of their property. They want pollution and environmental degradation stopped and prevented rather than merely controlled.

There are many types of environmental groups. Small ones are organized locally to fight local problems, often environmental disruption—immediate or potential—from pollution or some apparently inappropriate form of development. Others deal with a special issue, but on a national scale. There are many examples in developed and developing countries. Some now enjoy great public credibility. Groups objecting to the construction of nuclear facilities in their neighborhoods or countries have been active in the United States of America, the United Kingdom, the Federal Republic of Germany, Austria, Sweden, and other countries.

Interest in environment now cuts across the entire range of relief and charity groups to development and action groups. Eco-development is of interest to many action and development groups because almost all such grassroots groups are in their own ways searching for an alternative to the present model of development.

6.4 Role & Activities of Voluntary Environmental Groups

The role of voluntary organizations in espousing the cause of the environment and playing a pro-active role in protection of the bio-diversity has become very important. In fact the voluntary sector has played a leading role in making environment a national issue. Environmental groups are generally engaged in three types of activity. The first is ecological restoration. The second is location-specific ecological conscientisation that can spark popular movements to restore ecological balance. The third is advocacy vis-a-vis the government or the corporate private sector.

NGO involvement in global environmental governance can take a variety of forms (Esty, 1998, 2002; Charnovitz, 1997): The following are key roles performed by civil society organizations in a strengthened global environmental governance system.

Environmental education & Information-Based Duties

NGOs have much to offer in the way of information collection, dissemination, and analysis. Numerous other examples exist in which NGOs serve a key information-based role. NGOs have been taking a number of steps to promote discussion and debate about environmental issues, outside the broad spheres of popular media and the educational system, data collection, analysis and information dissemination. By interrelating global and local concerns, NGOs find themselves able to not only emphasize important ecological issues, but also raise consciousness about the environment. In India,

Environmental Information System (ENVIS) network has been setup to disseminate information on environmental issues. India has a large network of NGO's, which are involved in spreading the message of sustainable development to the public.

Over the past few decades, NGOs in many countries have been **Advocacy for Environmental Justice and Representation of the voiceless** extremely effective in highlighting disparities in who bears environmental burdens and who gets the benefits of environmental investments. Some groups have issued reports. Others have brought public interest litigation to defend environmental rights as well as to clarify and enforce laws. Advocacy and awareness is especially crucial in promoting concepts such as sustainable development, natural resource conservation and the restoration of ecosystems. NGOs can help vocalize the interests of persons not well-represented in policymaking;

Assessment and Monitoring

Performance assessments and monitoring of environmental conditions undertaken by NGOs may hold decision makers in international arenas publicly accountable for decisions in ways that the intergovernmental system itself could never accomplish

Mobilization of public opinion.

NGOs can influence the public through campaigns and broad outreach; mobilising and organising the public directly or through courts and the press to oppose public or private sector policies and projects that could be harmful to the environment or to people dependent on the environment

Operational Functions

The UN system usefully engages civil society entities as operational partners in many circumstances. The role of NGOs in implementation of worldwide policy efforts has greatly increased since the mid-1980s, when NGOs began to fill gaps left in the provision of services by reduced roles for many development agencies (Simon and Dodds, 1998). Non-governmental organizations are particularly useful in an operational context, as they can provide implementation tailored to specific conditions. The success of India's environmental programmes depends greatly on the awareness and consciousness of the people. A National Environmental Awareness Campaign has been launched to sensitize people to the environmental problems through audio-visual programmes, seminars, symposia, training programmes etc. Paryavaran Vahinis have been constituted in 184 districts involving the local people to play an active role in preventing poaching, deforestation and environmental pollution. 4000 NGOs have been given financial assistance for creating environmental awareness.

Service provision.

NGOs can deliver technical expertise on particular topics as needed by government officials as well as participate directly in operational activities;

Monitoring and assessment.

NGOs can help strengthen international agreements by monitoring negotiation efforts and governmental compliance;

Legitimization of global-scale decision making mechanisms

NGOs could broaden the base of information for decision-making, improving the quality, authoritativeness, and legitimacy of the policy choices of international organizations.

Policy making

Environmental non-governmental organizations, in recent years, have grown in size and in number as a result of governmental negligence towards the environmental crisis. NGOs have grown in

importance to a point where they act as key arbitrating agents within the field of environmental policy. NGOs can sensitize policy makers about the local needs and priorities. They can often intimate the policy makers about the interests of both the poor and the ecosystem as a whole. NGOs “make the impossible possible by doing what governments cannot or will not do” (Simmons, 1998). This is especially true with regard to the management of natural resources, which is often best handled by community-based organizations who have a stake in local environmental conditions and are free from many of the conflicting demands experienced by governments. Intellectual competition to governments. NGOs often have much better analytical and technical skills and capacity to respond more quickly than government officials;

Expert advice and analysis.

NGOs can facilitate negotiations by giving politicians access to competing ideas from outside the normal bureaucratic channels

Training

In providing training facilities, both at community and government levels, NGOs can play a significant role. They can also contribute significantly by undertaking research and publication on environment and development related issues. They can be set up to advocate a particular cause, such as human rights, or to carry out programs on the ground, such as disaster relief

NGOs' Role in promoting sustainable development

The issue of sustainable development is now on the national agenda. The mainstream development paradigm of the government and international agencies such as the World Bank, has been challenged. The forceful and vibrant environment movement has successfully opposed many government and corporate sector projects in the field of irrigation, industry and mining that were thought to have a deleterious ecological impact. They are opposing the misuse of natural resources and the threat to the environment caused due to unplanned development.

It can be assessed by the above discussion that the very existence of NGOs and the role played by them in the protection of the environment is not only important but also necessary because no government alone with any amount of laws and acts can achieve the objectives of environment protection without individual and public participation which can be achieved only through a network of motivated and dedicated voluntary organizations, like the NGOs.

6.5 Nature of Voluntary Action for Environment at National and International level.

International Recognition to the Role Of NGOs

Over the past decade, environmental NGO activity within UN processes has intensified. Prior to the 1990s, while various social movements may have utilized the UN as a global forum to call attention to particular agendas, the focus was not on influencing the official UN deliberations. Through the process leading up to the 1992 United Nations Conference on Environment and Development (UNCED), environmental organizations began intense internal capacity building efforts to gain more sophisticated understanding of the international policymaking process (Conca, 1996). Some of the innovations at the time – most notably, parallel NGO fora held alongside UN conferences – are now a routine element of intergovernmental deliberations (Fomerand, 1996).

The first intergovernmental environmental summit, the 1972 UN Conference on the Human Environment, is cited as one factor behind the rise in NGOs (Conca, 1996).

Other intergovernmental bodies, such as the World Trade Organization, the International Monetary Fund, and the G-7 have no provisions for formal involvement of non-governmental

organizations, The UN Conference on Environment and Development was of particular significance to NGOs. Agenda 21 declared the need for new forms of participation: The United Nations system, including international finance and development agencies, and all intergovernmental organizations and forums should, in consultation with non-governmental organizations, take measures to . . . enhance existing or, where they do not exist, establish mechanisms and procedures within each agency to draw on the expertise and views of nongovernmental organizations in policy and program design, implementation and evaluation. (UN, 1994: Chapter 27)

The 1992 Earth Summit thus affirmed that the commitment and genuine involvement of non-state actors are critical to reaching sustainable development goals. In the preparatory process for the 1996 UN Conference on Human Settlements (Habitat II), for example, NGOs and local authorities participated in the informal drafting groups that drew up the Declaration and Programme of Action. Within the policymaking circle of the United Nations Economic Commission for Europe (UNECE), NGOs had a say in establishing the agenda and other aspects of the negotiations process for the 1998 Aarhus Convention on Public Access to Information, Participation in Decision making and Access to Environmental Justice. In both of these cases, a special, semi-official status was accorded to civil society representatives.

Some of the major NGOs working for environment protection are

- Intergovernmental Panel on Climate Change (IPCC)
- United Nations Environment Programme (UNEP)
- Earth System Governance Project
- Global Environment Facility (GEF)
- Greenpeace
- Earth Justice
- Earth Rights International
- Environmental Defense
- Environmental Working Group
- Friends of the Earth US | Friends of the Earth International
- GRACE - Global Resource Action Center for the Environment
- National Wildlife Federation
- Wilderness Society
- World Resources Institute
- World watch Institute
- World Wildlife Fund International | WWF US
- World Wildlife Fund (WWF)
- Environmental Defense
- Friends of the Earth
- The Center of Concern

It is said that Europeans first went to North America in the 15th century. They saw that the resources were unlimited and they began conquering the wilderness. They went on, with enormous wastage of resources. It was in 1832 and 1870 that some individuals became scared at the rate of loss and decided to spread environmental awareness. By late 1800, a clear conservation movement began in the United States. Environmentalism is the most popular social movement in the United States today. Five million American households contribute to national environmental organizations, which together receive over \$350 million in contributions from all sources. On the local level some 6,000 environmental groups are active. Seventy-five percent of Americans in 1989 identified themselves as environmentalists -- all the more remarkable given that twenty-five years before there were no "environmentalists" and ecology was an obscure branch of biological science. In 1965 there were no more than a half-dozen national conservation organizations with citizen members and some degree of influence, and most were on a shaky financial footing. Although conservationists were beginning to win important victories preserving wilderness and protecting air and water from pollution, no one anticipated the explosion of activism that was about to take place. .

Two distinct tendencies emerged among the early conservationists: a pragmatic "utilitarian" wing, by Gifford Pinchot (1865-1946), the first director of the U.S. Forest Service; and an idealistic "preservationist" wing, represented by naturalist John Muir (1838-1914).

The roots of the American environmental movement are nourished by New England transcendentalism. When Henry David Thoreau left Concord in 1845 to write and study nature for two years at Waldon Pond, he became the harbinger of twentieth century conservationists who would preserve the natural world for its beauty and potential for spiritual enlightenment, not merely for its practical value. In an era when vast portions of the country remained unsettled, few of Thoreau's fellow citizens embraced his vision. Only well after the Civil War, perhaps not until the figurative closing of the frontier in 1890, would any significant number of Americans share a sense that the bounty of the nation is not limitless, that progress threatens the very survival of native forests and wildlife, and that nature and wilderness contain an antidote to the ills of industrial civilization.

John Muir wanted land and nature set aside for its own sake, .John Muir founded the Sierra Club, one of the largest conservation organizations in the United States. Marsh was influential with regards to the need for resource conservation. Muir was instrumental in the creation of Yosemite national park in 1890. Muir was also personally involved in the creation of Sequoia, Mount Rainier, Petrified Forest and Grand Canyon national parks. Muir deservedly is often called the "Father of Our National Park System."

On the other hand, conservationists such as Gifford Pinchot wanted to manage natural resources for human use. Among the early protectionists that stood out as leaders in the movement were Henry David Thoreau, John Muir and George Perkins Marsh. Thoreau was concerned about the wildlife in Massachusetts; he wrote *Walden*; or, *Life in the Woods* as he studied the wildlife from a cabin

During the 1950s, 1960s, and 1970s, several events illustrated the magnitude of environmental damage caused by humans. In 1954, the 23 man crew of the Japanese fishing vessel *Lucky Dragon 5* was exposed to radioactive fallout from a hydrogen bomb test at Bikini Atoll. The publication of the book *Silent Spring* (1962) by Rachel Carson drew attention to the impact of chemicals on the natural environment. In 1967, the oil tanker *Torrey Canyon* went aground off the southwest coast of England, and in 1969 oil spilled from an offshore well in California's Santa Barbara Channel. In 1971, the conclusion of a law suit in Japan drew international attention to the effects of decades of mercury poisoning on the people of Minamata.

At the same time, emerging scientific research drew new attention to existing and hypothetical threats to the environment and humanity. Among them was Paul R. Ehrlich, whose book *The*

Population Bomb (1968) revived concerns about the impact of exponential population growth. Biologist Barry Commoner generated a debate about growth, affluence and "flawed technology." Additionally, an association of scientists and political leaders known as the Club of Rome published their report The Limits to Growth in 1972, and drew attention to the growing pressure on natural resources from human activities.

Meanwhile, technological accomplishments such as nuclear proliferation and photos of the Earth from outer space provided both new insights and new reasons for concern over Earth's seemingly small and unique place in the universe.

By the mid-1970s anti-nuclear activism had moved beyond local protests and politics to gain a wider appeal and influence. Although it lacked a single co-ordinating organization the anti-nuclear movement's efforts gained a great deal of attention. In the aftermath of the Three in 1979, many mass demonstrations took place. The largest one was held in New York City in September 1979 and involved 200,000 people; speeches were given by Jane Fonda and Ralph Nader.

Since the 1970s, public awareness, environmental sciences, ecology, and technology have advanced to include modern focus points like ozone depletion, global climate change, acid rain, and the potentially harmful genetically modified organisms (GMOs).

Activity 2
Can you give examples of some of the environment movements which were started by the civil society in India?

6.5.1 People's participation & Voluntary Organisations for Environment Protection in India

India has witnessed various movements for environment protection in the last century. The most popular ones have been for forest protection (Chipko movement), water conservation (sukhomajri project), anti dam construction movements (Narmada Bachao Andolan) and Movements against Quarrying in Doon Valley. The anti Nuclear plants movement and movements against forced land grabs by governments for development works are examples of such movements. All of these movements were the result of people's concern and involvement in issues related to the environmental protection and their own survival. The massive participation of the public in protests is ensured by resorting to appeal to religious, cultural and folk literature. The involvement of national leaders in such campaigns gives a boost to the environmental struggles in India. One of the important features of such movements in India is resorting to non violent means of protest. Fasting has been used as powerful means of protest by leaders like Medha Patker and Sunderlal Bahuguna. Inia Today group in its various editions has listed the following as most important environment movements based upon people's participation.

1. Chipko Movement, 1973

The 1980s saw the debate on environment move from just deforestation to the larger issues of depletion of natural resources. In the wake of reckless deforestation, a unique

movement has bubbled.. The 1980s saw the debate on environment move from just deforestation to the larger issues of depletion of natural resources. Chipko movement in the Garhwal Himalayas, shoved aside urban armchair naturalists. Led by Chandni Prasad Bhatt and Sunderlal Bahuguna, it was a people's revolt against mindless deforestation. And they did it simply. By hugging trees when the woodmen came to axe them

2. The Silent Valley Project, 1978

The Silent Valley hydroelectric project was to dam the Kunthipuzha River. It was a battlefield of personal agendas, between the then prime minister Morarji Desai, the Kerala government and the environmentalists. The Silent Valley hydroelectric project was to dam the Kunthipuzha River, submerging the entire biosphere reserve and destroying its four-million-year-old rainforests. In 1980, the M.G.K. Menon Committee set up to review the project, came out with a recommendation to scrap it. With 40 per cent of its so-called surplus power being supplied to other parts and many villages of Kerala waiting to be electrified, this grassroots movement became the bedrock of Indian environmental activism

3. Jungle Bachao Andolan, 1980s

"Most states exist in the bliss of ignorance," observed India Today in March 1982. It was this observation that led to the birth of the Jungle Bachao Andolan, that began in Bihar and later spread to states like Jharkhand and Orissa. The tribals of Singhbhum district of Bihar bubbled up a protest when the government decided to replace the natural sal forests with highly-priced teak, a move that was termed "a greed game, political populism".

4. Navdanya Movement, 1982

Whether it's about empowering women or anti-globalisation campaigns, environmental activist Vandana Shiva has always had an upper hand in her fights against the authorities. Her ecofeminist movement reinstated a farming system centred on engaging women, changing the current system. She founded Navdanya in 1982, an organisation promoting biodiversity conservation and organic farming. The organisation has not only helped create markets for farmers, but also promoted quality food for consumers, connecting the seed to the cooked food.

5. Development Alternatives, 1983

Labelled The Green Doer, Ashok Khosla empowered people by creating jobs. Through Development Alternatives, an NGO that he found in 1983, he began work towards financial, social and environmental sustainability at the grassroot level. Over the years, his 15 environmentally-sound and commercially-viable technologies have generated more than three lakh jobs across India.

6. Narmada Bachao Andolan, 1985

Medha Patkar Narmada Bachao Andolan announced the arrival of the India Greens, protesting against destructive development. It is one of the largest and most successful environmental campaigns, Narmada Bachao Andolan began with a wide developmental agenda, questioning the very rationale of large dam projects in India

Broadly speaking, most voluntary groups—in all, they must run into thousands—especially those working in rural areas, can be divided into four major groups: charity and relief groups, development groups, action groups—some more openly political than others—and support groups—lawyers' collective, alternative professional associations, groups publishing journals, documentation centres, theatre groups.

The number of voluntary groups in India actively interested or involved in environmental issues today is larger than in any other Third World country and probably matches the numbers found in Western countries, where the environmental movement had its beginning. Except for certain conservation-oriented groups and groups interested in protecting the urban environment, it would probably be accurate to say that most groups in India cannot strictly be called environmental groups in the Western sense. This is particularly true of grassroots voluntary groups in rural areas, whose existence and number lends a distinct character to the voluntary movement. Most rural grassroots groups have begun to take up environmental issues in addition to their long-standing concerns for rural and urban poverty, social justice, inequality, civil liberties, rural development, appropriate technology and health. Their perspective embraces not merely an understanding of the human impact on nature but sees this impact as arising out of the complex web of social and political relationships between human beings: what humans do to nature is essentially born out of what humans do to each other.

Some of NGOs working for environment protection in India are

CERE India

Conserve

Exnora International

Foundation for Ecological Security

Goa Foundation

Centre for Science and Environment

Siruthuli

Harsh Sethi of the Indian Council of Social Science Research says in an article published recently in the 'Economic and Political Weekly' that this increase in interest in micro-organisations has grown out of the failure of the established macro-organisations— political parties, kisan sabhas, trade unions and the government— to do anything about growing poverty, inequality, landlessness, unemployment and centralisation of power, and to bring about positive development and participative trends within society. On the other hand voluntary agencies often concentrate on these problems where the action is, from remote villages to urban slums, to solve local problems local participation

These organizations are definitely non-political in the sense that they do not participate in electoral processes. But most such groups do have a political perspective of the society and its growth, which is sometimes clearly articulated, but more often not.

6.5.2 Problems of Voluntary Groups

Voluntary environmental groups work with a series of constraints, most of which they share with the voluntary sector as a whole. Firstly, there is a lack of trained person power to carry out in-depth technical and economic analysis, though as far as social and political analysis are concerned voluntary groups are often better than even most academic and highly specialized institution. Certain individuals from support voluntary groups, universities and certain scientific and other specialized institutions do help the voluntary sector occasionally. But it is still very difficult for a voluntary group opposing a dam in a remote area to find an expert who can carry out an independent environmental impact analysis of the dam which would give their campaign a sharper edge.

Lack of access to authentic data from official sources on projects and programmes with environmental implications is a second important constraint and, once again, the gap is bridged

to some extent by smaller voluntary groups seeking the support of voluntary groups respected within government circles or of sympathetic government officials and journalists.

A third constraint is the lack of statutory support and judicial sympathy for efforts of non-official groups willing to fight against agents of environmental destruction. Judicial interests in environmental issues are definitely growing and are providing an avenue for environmental firefighting. But, definitely, there is still a long way to go before this interest percolates down to the lower courts.

6.6 Limitations in the performance of environmental NGOs in India

Shortage of trained personnel in the field of environment protection.

Lack of research and development facilities.

Financial constraints.

Lack of cooperation from the governmental agencies.

Difficulties in the mobility on account of lack of transport facilities.

Environmental NGOs are facing a credibility crisis with a number of cases of embezzlement and scandals involving some of them coming to the fore.

The relationship of the government with environment groups tends to vary with the groups. Generally, the more well-known ones amongst them tend to get more funds from the government than those opposing government policies and projects.

6.7 Summary

A cursory look at the wide spectrum of organizations working on environment issue reveals that many of them are involved in generating awareness, educating and sensitising people about environmental problems and bio-diversity; protesting against pollution from various sources like industries, vehicles etc.; protecting wildlife parks and sanctuaries from encroachment by industries, mining and tourists resorts; and protesting against forces leading to deforestation. Voluntary organizations have played an important role in carrying out research in environmental education and research, be it in academic sphere or on policy interventions. One important role of the voluntary organizations have been to involve other sectors of the society in the environmental movement.

In the realm of environmental governance, NGOs are the most prominent actors and are the most important form of civil society. NGOs are: Groups of individuals organized for the myriad of reasons that engage human imagination and aspiration. New forms of NGO participation have changed the nature of international environmental policymaking. The international community has begun to recognize that effective global action requires meaningful stakeholder involvement in international policymaking and implementation.

6.8 Further Readings

1. Doyle Timothy and Doug Mc Eachern 1998. Environment and politics London Routledge
2. <http://environment.research.yale.edu/documents/downloads/a-g/gemmill.pdf>
3. <http://www.pages.drexel.edu/~brullerj/NSF%20Grant%2008149423.pdf>

6.9 Model Questions

1. Describe the role of NGOs in Environment Protection.
2. Discuss the importance of people's participation in Environment movements.
3. Describe the role of voluntary organizations and people's participation in environment protection?

CHIPKO MOVEMENT

Structure

- 7.0 Objectives
- 7.1 Introduction
- 7.2 Nature, Philosophical roots and Leadership of the movement
- 7.3 History of Chipko movements in India
- 7.4 Important events during the movement
- 7.5 Ecological concerns of Chipko movement
- 7.6 Impact of the movement
- 7.7 Reason for success and Recognition of the movement
- 7.8 Summary
- 7.9 References
- 7.10 Further Readings
- 7.11 Model Questions

7.0 Objectives

After going through this lesson you will be able to

- define Chipko movement
- explain the ecological concerns of Chipko movement
- describe the spread of Chipko movement
- understand the impact of Chipko movement

7.1 Introduction

The forests of India are a critical resource for the subsistence of rural peoples throughout the country, but especially in hill and mountain areas, both because of their direct provision of food, fuel and fodder and because of their role in stabilizing soil and water resources. People have been dependent on trees and thus forests for 5 Fs i.e. Food, Fodder, Fuel, Fire and Fertilizers. Besides their utility, they have acquired special place in the cultural setting of the people. As these forests have been increasingly felled for commerce and industry, there have been several environment movements of different intensity against deforestation. Indian villagers have sought to protect their livelihoods through the Gandhian method of satyagraha non-violent resistance. In the 1970s and 1980s this resistance to the destruction of forests spread throughout India and led to an environment movement known as the Chipko Movement.

Chipko movement is one of the first environmental movements in independent India which happened in the central Himalayan region to protect the Himalayan forests from destruction in the early 1970 s. Chipko means to hug. Timber contractors were felling trees in large numbers in Uttarakhand hills. Under the leadership of Sunderlal Bahuguna, the movement started in Chamoli District in Garhwal region in U.P. The local women embraced (Chipko or hugged) the trees where contractors came to fell the trees.

The demands of the Chipko movement were as follows:

- i) complete stoppage of cutting trees for commercial purposes;
- ii) the traditional rights should be recognised on the basis of minimum needs of the people.;
- iii) making the arid forest green by increasing people's participation in tree cultivation;
- iv) formation of village committees to manage forests;
- v) development of-the forest related home based industries and making available the raw materials, money and technique for it; and
- vi) giving priority to afforestation in the light of local conditions, requirements and varieties.

Self-assessment question
What were the main demands of Chipko movement?

7.2 Nature, Philosophical roots and Leadership of the movement

The Chipko Movement is the result of hundreds of decentralized and locally autonomous initiatives. The Chipko movement itself was never an organised protest. It was largely a series of discrete protests by separate Himalayan villages like Reni, Gopeshwar and Dungari-Paitoli. In some cases it was villagers fighting the government and in some cases it was village women fighting their men who would rather cut the trees and see some money without worrying where the firewood would come from.

The Chipko movement is historically, philosophically and organizationally an extension of the traditional Gandhian satyagraha. Its special significance lies in the fact that it took place in post independent India. Its leaders and activists are village men and women, acting to save their means of subsistence and their communities. Prominent Chipko figures include: Sunderlal Bahuguna, a Gandhian activist and philosopher, whose appeal to Mrs. Gandhi results in the green-felling ban and whose 5,000 kilometre trans-Himalaya footmarch in 1981-83 was crucial in spreading the Chipko message. Chandi Prasad Bhatt, a resident of Gopeshwar was another important leader who entered the movement after seeing trees disappear, local village industries erode, and women's work burden go up.

The continuity between the pre independent and post independence forms of this satyagraha has been provided by Gandhians including Sri Dev Suman, Mira Behn and Sarala Behn.

Sri Dev Suman was initiated into Gandhian satyagraha at the time of the Salt satyagraha. He died as a martyr for the cause of the Garhwali people's right to survive with dignity and freedom. Both Mira Behn and Sarala Behn were close associates of Gandhiji. They settled in the interior of the Himalayas and established ashrams. Sarala Behn settled in Kumaon, and Mira Behn lived in Garhwal till the time she left for Vienna due to ill health. Equipped with the Gandhian world view of development based on justice and ecological stability, they contributed silently to the growth of women power and ecological consciousness in the hill areas of Uttar Pradesh.

In an article written in 1952, Mira Behn had stated that 'Year after year the floods in the North of India seem to be getting worse and this year they have been absolutely devastating. This means that there is something radically wrong in the Himalayas. That something is without doubt, connected with the forests. It is not, I believe, just a matter of deforestation as some people think, but largely a matter of change of species.' Mira Behn had thus identified not merely deforestation but change in species suitable to commercial forestry as the reason for ecological degradation in the Himalayas.

The influence of these two European disciples of Gandhiji on the heritage of struggle for social justice and ecological stability in the hills of Uttar Pradesh has been immense and they generated a new brand of Gandhian activists who provided the foundation for the Chipko movement.

Sunderlal Bahuguna is prominent among the new generation of workers deeply inspired by these Gandhians. Influenced by Sri Dev Suman, he joined the independence movement at the age of 13. Later, he worked with Mira Behn in Bhilangana Valley and was trained in her ecological vision. Inheriting the early lessons in ecology, Bahuguna was later able to transfer this ecological perspective to Chipko. The folk poets like Ghanshyam Raturi were instrumental in spread of awareness and thereby encouraging resistance to the efforts in deforestation.

In this movement the leader and activists were mostly women from rural villages as they were directly affected by the deforestation.

Self-assessment question
Name some of the prominent leaders of the Chipko movement?

7.3 History of Chipko movements in India

It is said that the first movement against indiscriminate tree felling was perhaps started in India in 1730 under the leadership of village woman Amrita Devi where at the cost of the lives of 363 courageous rural women, the movement was successful in that the King of Jodhpur banned illegal tree felling.

The Bisnoi people of the Thar Desert in Rajasthan are often credited for the first use of Chipko tactics in resistance to tree felling. The Bisnois (Rajathani for "twenty-niners") adhere to a sect of Vashnavite Hinduism that dictates a lifestyle of ecological awareness and militant conservationism based on the 29 principles of environmental preservation set forward by Guru Jameswarji in the 15th century. Among the 29 principles, the Guru specified that animals, trees and other wild vegetation were not to be destroyed. In particular, the indigenous desert tree khejari and antelope-like blackbuck were

specified as sacred and revered for their value as indicators of environmental health and quality. The Bisnoi first adopted the Chipko tactic in defense of the sacred khejari tree in 1730, when the Maharaja of Jodhpur sent axemen to the village of Khedjarli to collect wood to fire kilns at the Mehrangarh Fort. According to legend, the axemen failed to listen to the protests of the Bisnoi villagers until a local woman, Amrita Devi, wrapped her body in an embrace around a tree. When she refused to move, the Maharaja's men chopped through her body in order to fell the tree. Devi's actions inspired her three daughters and the men, women, and children from 49 surrounding Bisnoi communities to do the same. At the end of the protest, 363 trees were felled, surrounded by the 363 beheaded bodies of Bisnoi villagers (CIC 1987).

The story of the Bisnoi's protest led the Maharaja to declare that Bisnoi trees would never again be cut, and became legendary in northern India as an example of local people protecting their interests against external forces (CIC 1987). Although there are popular accounts of 19th century protests against forest felling in the Himalayas, they are poorly documented and seem confined to the period after the British occupied the Northern Hills District in 1815. At first, the British limited their use of forests to those lying in the lower foothills of the Himalayas. However, after the 1821 Tribal Forest Settlements in Kumaon, the forest area reserved for British use was expanded and resistance became widespread, including both violent and nonviolent methods of protest, such as marches, noncooperation and incendiarism (Karan 1994; Routledge 1993). These confrontations between villagers from the forests and the British Forestry Department exploded on May 30th 1930, when hundreds of protesters were injured and dozens killed at Tilarli village in Tehri Garhwal during mobilizations "against [the] reservation of forests for exclusive exploitation by commercial British interests" (Chakraborty 1999: 28). Thereafter, May 30th became "Tilari Martyrs' Day", on which many other similar protests were held in memoriam. Many future Chipko members were involved in these early struggles against British colonial policy, as well as in the national independence movement, but were sorely disappointed when no significant changes were made to national forest policies after India achieved independence in 1947. However, there was a great deal of attention being paid to the political and ecological situation in the Himalayan foothills, because of their importance to national economic development plans. As early as 1949, Mira Behn, a disciple of Mahatma Gandhi had written, "There is Something Wrong in the Himalayas", a paper describing the link between deforestation and contemporary water crises. At the time, Behn concluded, "unless the Ganga catchment area was replanted with broad-leaved trees, drought and floods would worsen". Still, few changes were made and intermittent protests against the sale of local timber rights to extra-local contractors continued.

7.4 Important Events during the movement

The 1970s decade saw the beginning of more frequent and more vocal popular protests on the rights of the people to protect and utilize local forests. In 1971, Swami Chidanandi of Rishikesh undertook a month long march to bless the people in their struggle. The year 1972 witnessed the most widespread organized protests against commercial exploitation of Himalayan forests by outside contractors in Uttarkashi on 12 December, and in Gopeshwar on 15 December.

In the early 1973 the forest department refused to allot ash trees to the Dashauli Gram Swarajya Sangha (DGSS), a local cooperative organisation based in Chamoli districts, for making agricultural implements. On the other hand, the forest department allotted ash trees to a private company, i.e., Symonds* Co. This incident provoked the DGSS to fight against this injustice through lying down in front of timber trucks and burning resin and timber depots as was done in Quit India movement.

In 1973, the tempo of the movement in two centers- Uttarkashi and Gopeshwar reached new heights. Raturi and Bhatt were the main organizers in these places. While a meeting of the sarvodya mandal was in progress in Gopeshwar in April 1973, the first popular action to chase contractors away

erupted spontaneously in the region, when the villagers demonstrated against the felling of ash trees in Mandal forest. Bahuguna immediately asked his colleagues to proceed on a footmarch in Chamoli district following the axemen and encouraging people to oppose them wherever they went. Later in December 1973, there was a militant nonviolent demonstration in Uttarkashi in which thousands of people participated.

When these methods were found unsatisfactory, Chandi Prasad Bhat - one of the leaders, suggested of embracing the tree and thus 'Chipko' was born. This form of protest was instrumental in driving away the private company from felling the ash trees. With its success the movement spread to other neighbouring areas and subsequently the movement came to be popularly known as Chipko movement internationally. From its beginning the Chipko movement concentrated on ecological issues such as depletion of forest cover and soil erosion.

In March 1974, 27 women under the leadership of Gaura Devi saved a large number of trees from a contractor's axe in Reni. Following this, the government was forced to abolish the private contract system of felling and in 1975 the Uttar Pradesh Forest Corporation was set up to perform this function. This was the major achievement of the movement and marks the end of a phase in itself.

During the next five years, Chipko resistance for forest protection spread to various parts of the Garhwal Himalayas. It is important to note that it was no longer the old demand for a supply of forest products for local small industries but the new demand for ecological control on the forest resource extraction to ensure a supply of water of fodder that was being aired. In May 1977, Chipko activists in Henwal valley organized themselves for future action. In June of the same year, Sarla Behn organized a meeting of all the activists in the hill areas of Uttar Pradesh which further strengthened movement and consolidated the resistance to commercial fellings as well as excessive tapping of resin from the Chir pine trees. In Gotars forests in the Tehri Range, the forest ranger was transferred because of his inability to curb illegal over-tapping of resin. Consciousness was so high that in the Jogidanda area of the Saklana range, the public sector corporation, Garwal mandal vikas nigram was asked to regulate its resin-tapping activity.

Among the numerous instances of Chipko's successes throughout the Garhwal Himalayas in the years to follow, are those in Adwani, Amarsar and Badiargarh. The auction of Adwani forests took place in Oct "1977 in Narender Nagar, the District Headquarters. Bahuguna undertook a fast against the auction and appealed to the forest contractors as well as the District Authorities to refrain from auctioning the forests. The auction was undertaken, despite the expression of popular discontent. In the first week of Dec 1977, the Advani forests were scheduled to be felled. Large groups of the women led by Bachhni Devi came forward to save the forests. Interestingly, Bachhni Devi was the wife of the local village head, who was himself a contractor. Chipko activist Dhoom Singh Negi supported the women's struggle by undertaking a fast in the forest itself. Women tied sacred threads to the trees as a symbol of a vow of protection. Between 13 and 20 Decemeber, a large number of women from 15 villages guarded the forests while discourses on the role of forests in the Indian life from ancient texts continued nonstop. It was here in Adwani that the ecological slogan: 'What does the forest bear? Soil, water and pure air' was born.

The axe men withdrew only to return on 1 Feb 1978 with two truck loads of armed police. The plan was to encircle the forest with the help of police in order to keep the people away during the felling operation. Even before the police could reach the area, the area volunteers of the movement entered the forest and explained their case to the forest labourers who had been brought in from distant places. By the time the contractors arrived with the police, each tree was being guarded by three volunteers who embraced the trees. The police, having been defeated in their own plan and seeing the level of awareness among the people, hastily withdrew before night fall.

In March- 1978, a new auction was planned in Narendranagar, a large popular demonstration was organized against it and the police arrested 23 Chipko volunteers, including women. In December 1978, a massive felling programme was planned by public sector Uttar Pradesh Development Corporation in the Badiyargarh region, the local people instantly informed Bahuguna, who started a fast onto death at the felling site, on 9 January, 1979. On the 11th day of his fast, Bahuguna was arrested in the middle of night. This act only served to further strengthen the commitment of the people. Folk poet Ghanshyam Raturi and priest Khima Shastri led the movement as thousands of men and women from the neighbouring village joined them in the Badiyargarh forest. The people remained in the forest and guarded the trees for eleven days, when the contractors finally withdrew. Bahuguna was released from jail on 31st Jan 1979

The late Prime minister, Mrs Indira Gandhi after a meeting with Bahuguna recommended a 15 year ban on commercial green felling in Himalayan forest of Uttar Pradesh. The moratorium on green felling gave the Chipko movement breathing time to expand the base of movement. Bahuguna undertook a 4780 kilometre arduous chipko foot march from Kashmir to Kohima to contact villagers in the long Himalayan range and to spread the message of Chipko At the same time, activists found it opportune to spread the movement to other mountain regions of the country.

7.5 Ecological foundation of the Chipko movement

Vandana Shiva believes that although both the earlier forest satyagrahas and the contemporary Chipko movement are rooted in the conflict over forest resources and similar cultural responses to forest destruction. Chipko movement is different from the earlier struggles due to its ecological basis, the new concern to save and protect forest. This movement did not arise from resentment against further encroachment on people's access to forest resources; it was infact a response to the alarming signals of rapid ecological destabilization in the hills. Villages that were once self sufficient in food ,were forced to import food as a result of declining food productivity. This, in turn, was related to the decrease in soil fertility in the forest. Water resources began to die up as forests disappear. The so called 'natural disasters' such as floods and landslides began to occur in river systems which had hitherto been stable^) The Alakanda disaster of July 1970 inundated 1,000 km of land in the hill and washed away many bridges and roads. In 1977 the Tawaghat tragedy took an even heavier toll. In 1978 the Bhagirathi blockade resulting from a big landslide above Uttarkashi led to massive floods across the entire Gangetic plains.

The over exploitation of forest resources and the resulting threat to the communities living in the forests have thus evolved from concerns for distribution of material benefits to concerns for distribution of ecologically generated material costs.

During the first stage, the growth of commercial interests resulted in efforts to exclude competing demands. The beginning of large scale commercial exploitation of India's forest resources led to the need for a forest legislation which denied village communities' access to forest resources. The forest satyagrahas of the thirties were the outcome of Forest Act of 1927 which denied people access to biomass for survival while increasing biomass production for industrial and commercial growth. The growth imperative however drove production for commercial purposes into the second stage of conflict which is at the ecological level. Scientific and technical knowledge of forestry included in the existing model of forest management, is limited to viewing forests only as sources of commercial timber. This gives rise to prescriptions for forest management which are basically manipulations to maximize immediate growth of commercial wood. This is achieved initially by the destruction of other biomass forms that have lowered commercial value but may be very important to the people or have tremendous ecological significance. The silvicultural system of modern forestry includes prescriptions for the destruction of non commercial biomass forms to ensure the increased production of commercial

biomass forms. The encouragement to substitute ecologically valuable oak forests by commercially valuable conifers is an example of this shift. Ultimately, this increase in production may be described as mining of the ecological capital of the forest ecosystems which have evolved over thousands of years.

The contemporary Chipko movement, which has become a national campaign, is the result of these multidimensional conflicts over forest resources at the scientific, technical, economic and ecological levels. It is not merely a conflict confined to local or nonlocal distribution of forest resources such as timber and resin. The Chipko demand, at one stage was for a larger share for the local people in the immediate commercial benefits of an ecologically destructive pattern of forest resource exploitation. It has now evolved to a demand for ecological rehabilitation. Since the chipko movement is based upon the perception of forests in their ecological context, it exposes the social and ecological costs of short-term growth-oriented forest management. This is clearly seen in the slogan of the Chipko movement which claims that the main products of the forests are not timber or resin but soil, water and oxygen. With proper social control, the basic biomass needs of food, fuel, fodder, small timber, and fertilizer can, in the Chipko vision and the Garhwal practice be satisfied as positive externalities of biomass production primarily aimed at soil and water conservation to stabilize the local agro-pastoral economy.

7.6 Impact of the movement

Chipko movement occurred at a time when there was hardly any environmental movement in the developing world, and its success meant that the world immediately took notice of this non-violent movement, which was to inspire in time many such eco-groups by helping to slow down the rapid deforestation, expose vested interests, increase ecological awareness, and demonstrate the viability of "people power". Above all, it stirred up the existing civil society in India, which began to address the issues of tribal and marginalized people. So much so that, a quarter of a century later, India Today mentioned the people behind the "forest satyagraha" of the Chipko movement as amongst "100 people who shaped India".

The chipko movement was successful in forcing a fifteen year ban on commercial green felling in the hills of Uttar Pradesh in stopping clear felling in the Western Ghats and the Vindhyas and in generating pressure for a national forest policy which is more sensitive to people's needs and to the ecological development of the country.

The cumulative impact of the sustained grassroots struggles to protect forests was a rethinking of the forest management strategy in the hill areas. The Chipko demand for the declaration of Himalayan forests as protection forests instead of production forests for commercial exploitation was recognized at the highest policy-making level.

What is distinctive about Chipko movement is that it was the forerunner as well "as direct inspiration for a series of popular movements in defense of community rights to natural resources. Sometimes these struggles revolved around forests, in other instances, around control and use of pasture, mineral or fish resources.

7.7 Reasons for success and Recognition of the movement

The movement soon became famous all over the world. Environmentalists from France, Germany, Switzerland and other countries came to India to visit Bahuguna to learn about the unique chipko movement. On April 29th, 1983, a group of school students assembled at the Union Square Park in New York and hugged a big tree to observe the Chipko Day. Chipko movement proved to be a mother of several environment movements. In early 1980, movements like Chipko spread to other fields, Movement against mining activities in Doon Valley. The local people started the chipko blockade at a mine at Natikhala which was not stopped despite the Supreme Court order against it. It inspired the

formidable popular upsurge against the big hydroelectric project at Vishnu Prayag near the valley of flowers and Tehri dam.

Appiko Movements: The Chipko has inspired the villagers of Uttara Kannada region of Karnataka in Western Ghat to start Appiko Chalewali movement. (Appiko means 'hug' in Kannada.) The destruction of forests was caused for obtaining timber. It led youth and women to launch chipko type of movement in south India, The villagers from Salkani village walked for five miles to a nearby forest and hugged trees. They stopped the axemen who were felling trees pursuing the order of the forest department of the state. The protest within the forest continued for thirty eight days which forced the government to finally withdraw the felling trees.

In October 1983, the movement also happened in Bengaon forest and forest of Husri and in November, it spread to Nidgob Siddapur taluka. Where the government tried to plant monoculture trees and wished to take the woods of fallen trees for use in nearby Siddapur town whereas the people wanted the forest for the fuel wood. The local people succeeded in stopping the felling of trees. In Kelagin Jaddi of Siddapur taluka, a plywood company damaged 542 trees for its commercial pursuits. The villagers realized that because of such an action they will be deprived on the traditional source which gave them fuelwood, green manure and fodder etc.

Appiko movement succeeded in its three fold objectives

- a) Protecting the existing forest cover
- b) Regeneration of trees in denuded land
- c) Utilizing forest wealth with proper consideration to conservation of natural resources.
- d) Reasons for Success and Recognition of the movement

The Chipko movement of India was one of the four recipients of the 1987 Right Livelihood Awards totaling \$ 100,000. The Right Livelihood Awards Foundation introduced the awards in 1980. Every year, it honours and supports 'those working on practicable and replicable solutions to the real problems facing us today". In a citation, the Foundation said, Chipko is honoured for its dedication to the conservation, restoration and ecologically responsible use of India's natural resources.

The following are some of the important aspects which are considered responsible for the success of Chipko movement.

- the close links between the livelihoods of the local people and the nature of the movement. The local people consider Chipko as a fight for basic subsistence which have been denied to them by the institutions and policies of the State.
- specificity of the area where Chipko movement took place;
- involvement of women in the contribution to households subsistence and the overwhelming support to anti-alcohol campaign have led to the overwhelming support of women which is unique to the Chipko movement.
- the nature of agitation is important aspect in this regard. Unlike other environmental movements Chipko has strictly adhered to the Gandhian tradition of freedom struggle, i.e., non-violence.
- the simplicity and sincerity of the leaders like Sunderlal Bahuguna and their access to national leaders like Mrs. Indira Gandhi, other politicians and officials also helped to the success of the movement to a large extent.

7.8 Summary

As there were hardly any environmental movements in the entire developing world in the '70s, the Chipko movement stood out, attracting worldwide attention. Unfortunately, the Chipko movement has often been presented by vested interests as a reflection of a conflict between development and ecological concern, implying that the development relates to material and objective bases of life whereas ecology is concerned with non-material and subjective factors such as scenic beauty. Gandhi and later his disciples, Mira Behn and Sarala Behn, clearly described how and why development is not necessarily contradictory to ecological stability. The conflict between exploitative economic growth and ecological development implies that by questioning the destructive process of growth, ecological movements like Chipko are not an obstacle to the process of providing material welfare. On the contrary, by constantly keeping ecological stability in focus, they provide the best guarantee for ensuring a stable material basis for life.

Chipko revived the Gandhian way of mobilization of people for a sustainable society in which neither man nor nature exploit/destroy each other. As Vandana Shiva observes, "it marked the beginning of the civilization response to the threat of human survival" Further, "Genuine development', according to Vandana Shiva 'can only be based on ecological stability which ensures sustainable supplies of vital resources.'

The solutions of present-day problems lie in the re-establishment of a harmonious relationship between man and nature. To keep this relationship permanent we will have to digest the definition of real development: development is synonymous with culture. When we sublimate nature in a way that we achieve peace, happiness, prosperity and, ultimately, fulfilment along with satisfying our basic needs, we march towards culture." Sunderlal Bahuguna.

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7.11 Model Questions

1. Discuss the objectives and nature of chipko movements in India.
2. 'Chipko movement is known as mother of several environment movements in India and abroad' Comment
3. Give a description of the important events during the Chipko movement in India
4. 'Chipko movement is not only a movement against deforestation but it has serious ecological concerns' Discuss

MOVEMENTS AGAINST DAMS AND MINING: NARMADA VALLEY, TEHRI DAM, DOON VALLEY

Structure

- 8.0 Objectives
- 8.1 Introduction
- 8.2 Background of the problem in Narmada Valley
- 8.3 Nature of protests & establishment of Narmada Bachao Andolan
- 8.4 Withdrawal of World Bank and Pronouncement of Judgement on NBA
- 8.5 Tehri Garhwal
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- 8.7 Protests against Tehri Dam
- 8.8 The Conflict Over Limestone Quarrying in the Doon Valley
- 8.9 The Ecological Crisis Generated by Quarrying
- 8.10 References
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8.0 Objectives

After reading this lesson you will be able to

- understand the ill effects of construction of dams on rivers and mining operations in valleys
- explain the nature, history and success of Narmada Bachao Andolan
- know the problems associated with Tehri Dam construction
- explain the protests against mining in Doon Valley

8.1 Introduction

The decade since the mid-1980s has seen the emergence of an international movement against current dam-building practices. The dams in India which were hailed as the "Temples of Resurgent India" by Pandit Jawaharlal Nehru believing that the country's dams will be able to provide water and electricity to the millions of people in India. However, there have been movements against construction of big dams on rivers by the local people in India as in various other parts of the world. People fear that the dams will cause ecological disturbance and may result in seismic activity. Besides, due to the construction of dams, a large number of people have to be displaced from their natural habitats. This

lesson describes the harmful effects of Multipurpose River Valley projects. We have included a study of Dams on Narmada valley as well the dams on Tehri region for this purpose.

The lesson also highlights the ill effects of mining on the environment. A brief description is of the effects of Limestone mining in the Doon valley is made. It shows how the mining operations have left permanent scars on the famous hill, destroying forests and permanent water sources.

8.2 Background of the problem in Narmada Valley

The Narmada River traverses three of India's northwestern states: Gujarat, Madhya Pradesh, and Maharashtra. The idea of building dams in the Narmada river basin predates independent India. Post-1947 investigations were carried out to evaluate mechanisms in utilizing water from the Narmada river, which flows into the Arabian Sea after passing through the states of Madhya Pradesh, Gujarat and Maharashtra. Fifteen years later, Prime Minister Nehru inaugurated the Narmada Valley Development Project.

Due to inter-state differences in implementing schemes and sharing of water, the Narmada Water Disputes Tribunal was constituted by the Government of India on 6 October 1969 to adjudicate over the water disputes between Madhya Pradesh, Gujarat, and the resettlement and rehabilitation of those displaced by the dams. On 12 December 1979, the decision as given by the Tribunal, with all the parties at dispute binding to it, was released by the Indian Government. As per the Tribunal's decision, 30 major, 135 medium, and 3000 small dams, were granted approval for construction including raising the height of the Sardar Sarovar dam.

In 1978, the Indian government sought the World Bank's assistance to build a complex of dams along the river as part of the Narmada Valley Development Project ("Narmada Project"). The Indian government promised that the dams would help provide potable water for almost forty million people, irrigation for over six million hectares of land, and hydroelectric power for the entire region. Central to the claim that the dams were essential for India's economic development was the assertion that these benefits, which would purportedly accrue to millions of people living in the Narmada River valley, outweighed any potential human or environmental costs. The narrative of the "common good" has been emblematic of the government's stance throughout the many controversies generated by the project and reflects the dominance of a "balancing" or "cost-benefit" approach to development over an approach that puts human rights at the center of the debate.

The Sardar Sarovar Project ("SSP") in the state of Gujarat includes the most controversial large dam. The government claimed that the Sardar Sarovar dam alone would irrigate almost 1.8 million hectares of land in Gujarat and an additional 73,000 hectares in the dry neighboring state of Rajasthan, in addition to providing potable water to over 8,000 Gujarati villages and 135 urban centers. The ostensible benefits, however, would come at a high cost, including the displacement of tens of thousands of individuals and considerable environmental damage. Despite these foreseeable consequences, and in the absence of consultation with indigenous communities that would experience the environmental impact and involuntary displacement, in 1985 the World Bank agreed to finance the Sardar Sarovar dam to the tune of \$450 million, approximately 10% of the total cost of the project.

Self-assessment Question
How many people and villages were to be displaced due to construction of dams on Narmada?

8.3 Nature of protests & establishment of Narmada Bachao Andolan

In 1985, after hearing about the Sardar Sarovar dam, Medha Patkar and her colleagues visited the project site. While World Bank, the financing agency for this project, came into the picture, Patkar approached the Ministry of Environment to seek clarifications. She realized, after seeking answers from the ministry, that the project was not sanctioned at all, and wondered as to how funds were even sanctioned by the World Bank. After several studies, they realized that the officials had overlooked the post-project problems.

Acting as channel of communication between the government and the residents, she provided critiques to the project authorities and the governments involved. Patkar started focusing entirely on the Narmada activity. What she noticed was that the people who were going to be affected were given no information, but for the offer for rehabilitation. Due to this, the villagers had many questions right from why their permission was not taken to whether a good assessment on the ensuing destruction was taken. Furthermore, the officials related to the project had no answers to their questions. At the same time, her group realized that all those displaced were only given compensation for the immediate standing crop and not for displacement and rehabilitation. Thereafter, she organized a 36-day long, solidarity march among the neighboring states of the Narmada valley from Madhya Pradesh to the Sardar Sarovar dam site. She said that the march was "a path symbolizing the long path of struggle (both immediate and long-term) that [they] really had". This march was resisted by the police, who according to Patkar were "caning the marchers and arresting them and tearing the clothes off women activists".

Formation of NBA

Since the early 1980s, the Narmada Project has faced mounting opposition from a variety of sources. Protest groups formed in all three affected states and included or were supported by individuals facing displacement, students, social activists, Indian environmental NGOs, international NGOs, and transnational networks. In Gujarat, nineteen villages, whose submersion the Sardar Sarovar dam ensured, formed the Chhatra Yuva Sangharsh Vahini, a youth protest group. The group engaged in protests and initiated court actions, ultimately forcing the government of Gujarat to offer a more generous resettlement package. In contrast, groups such as Narmada Ghati Navnirman Samiti in Madhya Pradesh and Narmada Ghati Dharangrashtra Samit Maharashtra opposed the dams altogether.

While Medha Patkar established Narmada Bachao Andolan in 1989, all these groups joined this national coalition of environmental and human rights activists, scientists, academics and project-affected people with a non-violent approach.

The main issue for critics and debate is the "Rehabilitation and Resettlement"- (R&R) policy. According to the Narmada Water Dispute Tribunal (NWDT), every project-affected family (PAF) should be given land one year prior to the submergence of their land and be rehabilitated completely. The latest official estimates from the three states add up to 41,500 PAFs, or 207,500 people, around 80% of them in Madhya Pradesh. Almost all the PAFs in Gujarat and Maharashtra and perhaps half of those in Madhya Pradesh are adivasis, or indigenous peoples. Large numbers of poor and underprivileged communities are being dispossessed of their livelihood to make way for dams being built on the basis of dubious claims of common benefit and "national interest". For no large dam in India has it been shown that the resettled people have been provided with just compensation and rehabilitation.

8.4 Withdrawal of World Bank and Pronouncement of Judgement on NBA

Within the focus of Narmada Bachao Andolan towards the stoppage of the Sardar Sarovar dam, Patkar advised addition of World Bank to their propaganda. Using the right to fasting, she undertook a 22-day fast that almost took her life. In 1991, Patkar's actions led to an unprecedented independent review by the World Bank. The Morse Commission, appointed in June 1991 at the recommendation of World Bank President Barber Conable, conducted its first independent review of a World Bank project.

The team of Morse commission included Mr Bradford Morse, Mr Justice Thomas Berger of Canada, Mr. Donald Gamble, an environmental engineer and Mr Hugh Bardy, a social scientist. They came to India in 1991 and travelled extensively for six months in the area affected. In June 1992, they handed over their report to the World Bank. The major findings in the 400 page document were that the SSP are fundamentally flawed and there is no plan to ensure just and proper rehabilitation for the austeers. Injustice has been done to those affected by SSP as they are still not considered as Project Affected People. They must be completely and justly rehabilitated and compensated. It also reported the environmental measures laid down are not working properly.

This independent review stated that "performance under these projects has fallen short of what is called for under Bank policies and guidelines and the policies of the Government of India." This resulted in the Indian Government pulling out of its loan agreement with the World Bank. In response and The World Bank's participation in these projects was cancelled in 1995.

NBA Developments Post-Bank Withdrawal

Three important developments occurred in the wake of the Bank's withdrawal. First, the withdrawal itself greatly reduced the international dimension of the Narmada struggle. Second, the NBA decided to pursue an additional avenue for change—appeal to the Supreme Court of India. Third, the government's continued construction raised the stakes of the struggle for both sides—more and more villages faced submergence, and the government's commitment to the Narmada Project deepened as the project progressed, and continues to this day

Medha Patkar undertook another fast in 1993 and resisted evacuation from the dam site. In 1994, the Bachao Andolan office was attacked reportedly by a couple of political parties, where Patkar and other activists were physically assaulted and verbally abused. In protest, a few NBA activists and she began a fast; 20 days later, they were arrested and forcibly fed intravenously.

Supreme Court's decision

The court initially ruled the decision in the Andolan's favor thereby effecting an immediate stoppage of work at the dam and directing the concerned states to first complete the rehabilitation and replacement process. However, the Court recognized the Narmada dam's benefits such as provision of drinking water, power generation and irrigation facilities.

It finally upheld the Tribunal Award and allowed the construction to proceed, subject to conditions. The court introduced a mechanism to monitor the progress of resettlement pari passu with the raising of the height of the dam through the Grievance Redressal Authorities (GRA) in each of the party states. The court's decision referred in this document, given in the year 2000 after seven years of deliberations, has paved the way for completing the project to attain full envisaged benefits.

Documentation of Narmada Bachao Andolan

Amongst the major celebrities who have shown their support for Narmada Bachao Andolan are Booker Prize winner Arundhati Roy and Aamir Khan. A film "Narmada: A Valley Rises" made by Ali Kazimi was released in 1994. It documents the five-week Sangharsh Yatra of 1991. The film went on

to win several awards and is considered by many to be a classic on the issue. In 1996, veteran documentary filmmaker, Anand Patwardhan, made an award-winning documentary: A Narmada Diary.

8.5 About Tehri Garhwal

The district of Tehri Garhwal is one of the largest district of state uttarakhand and which lies from the snow covering Himalayan peaks of Thalaya Sagar, Jonli and the Gangotri group all the way to the foothills near Rishikesh. Bhagirathi which runs through appears to divide the tehri district into two, while the Bhilangna, Alaknanda, Ganga and Yamuna rivers border it on the east and west. Tehri's neighbouring districts are Uttarkashi, Chamoli, Pauri, Rudraprayag and Dehradun. Tehri was a former princely state of British India, named after its capital; area 4180 sq. m.; population in (2001) 604608. It adjoined the district of Garhwal, and its topographical features are similar. It contained the sources of both the Ganges and the Yamuna, which are visited by thousands of Hindu pilgrims. The gross revenue in 1911 was about 28,000 rupees, of which nearly half was derived from forests. No tribute was paid to the British government.

8.6 Problem in Tehri Region

One of the most protracted and celebrated movement is going on around Tehri dam which is being built on the river Bhagirathi south of its meeting point with river Bhilangana in the Garhwal region of the Himalaya. The Tehri dam, partly funded by Russia is a major hydroelectric project. The dam is 260.5 metre (850 ft) high, more than three times the height of Qutab Minar. It is the highest rock-fill dam in the world. Its length is 575 metres (1,886 ft), crest width 20 metres (66 ft), and base width 1,128 metres (3,701 ft). Thus it is more than 1 km wide in the riverbed. The Tehri Dam is a multi-purpose rock and earth-fill embankment dam. It can generate 2000 MW of electricity and generate 346 mw of hydel power. The dam can fully irrigate 2, 70, 000 ha and complement irrigation on another 6 lac ha of agricultural land and impound 3.22 million cu m of water. It is the primary dam of the Tehri Hydro Development Corporation Ltd. and the Tehri hydroelectric complex.

The engineers are thus extremely proud of their achievement. Proponents of large dams find the meeting of two rivers in such a steep valley ideal for their mega projects, except that Tehri is also the site of high earthquake risk. The central Himalayan region is a seismically active region. The engineers who built it claim that the dam can withstand earthquakes of upto 7.2 on Richter scale. However, this magnitude is the same as that of the earthquake which rocked Kashmir in 2005 and this project is opposed on the ground of seismic data projecting earthquake disaster and displacement of the people of Tehri town and the villages in this region. It is feared that the dam will completely submerge Tehri town and 23 villages, while 72 other villages will be partially submerged. Nearly 5,200 hectares of land will also be lost to the reservoir. In addition, about 85,000 persons will be displaced by the dam.

8.7 Protests against Tehri Dam

The Tehri dam has witnessed continuous questioning and protest by various people, including the noted environmentalist Sunderlal Bahuguna who has virtually made it his life-long mission to stop the construction of the dam by living at the dam site and by going on periodic fasts. To marshal their case, the Tehri opposition has tried to establish connections between ecological, social and mythical values through scientific studies, environmental campaigns and cultural religious references, thus engaging in a wide gamut of environmental politics

Those opposed to the dam emphasise the economic life and structure of the dam, its geology and seismicity, displacement and rehabilitation, cost and benefit. They also talk about the cultural and religious values of the Ganga river and the Himalayan region. They attempt to use scientific knowledge

to explain their perceptions of imaginative and emotional truths. They go on fasts, dharnas, demonstrations, and other agitational programmes, to focus on their demands.

The veteran freedom fighters V D Saklani and Sunder Lal Bahuguna are active in the movement. They have founded Tehri Baandh Virodhi Sangrash Samiti (Committee for the struggle against Tehri Dam) which is opposing the construction of the dam for more than fifteen years. They have collected massive data related to the seismic sensitivity of the fragile mountain region which could lead to the possibility of the dam burst. Issues are the submergence of large areas of forests and agricultural land and submergence of the historic town Tehri and the threat to the life of reservoir owing to deforestation in the catchment area in the river. The right to life by the people to be displaced is also a recurrent issue. The seismic argument has been reinforced in the wake of devastating earthquake in upper Bhagirathi valley in October 1991. Sunder Lal Bahuguna, a celebrated Chipko environmentalist had resorted to fast, which forced the Government of Uttar Pradesh as well as Union Government to go into the review of project but on the whole, the Govt has gone on constructing the dam and trying to settle the people being affected by dam. Though the Anti Tehri dam protest movement has been widely supported nationally and internationally, the governments had argued that the points of criticism raised by environmentalists appear to have been resolved to proceed with the dam. It is neither a stalemate nor a draw, but a case of halting progress and interrupted development.

The anti-Tehri dam politics has been subject to a collaborative relationship between what is 'factual', 'scientific' and 'technical' and what is 'religious', 'faith', 'emotional' and 'mythical'. This collaboration seeks to heal the great environmental and cultural wound that development and the dam has inflicted on the region. Towards this end, they speak the language of ecological politics, as it was the universal language of the anti big-dam movement of the 1970s. They also invoke certain metaphors, and it is through many of these that the anti-dam forces, more especially Sunderlal Bahuguna, reach out to particular religious practices and mythical beliefs. In their use of these metaphors and myths, the environmentalists often come close to the beliefs of conservative Hindu forces and their chosen communal path. In effect, the metaphor and the myth is the Trojan horse through which communal politics enters and re-enters green politics.

Tearful eyes of the local people are bidding farewell to the centuries old Tehri town. The gigantic reservoir of the Tehri dam has started swallowing up the old town. Houses of more than 1 lakh people of Tehri and 112 villages will soon be lost forever. Relocation of the displaced people has been completed though on paper. Harsh reality is that many are yet to get compensation and are fighting a losing battle. The land and houses, however well constructed, up in the hill cannot replace the fertile lands in the valleys. It is never easy for the hill people to leave their houses where generations have lived. Commercial importance of the old town will also probably get shifted to Chamba.

Through an analysis of technical, social and environmental variables, it has been argued that the economic life of the dam will not exceed 61.4 years and the dam will not yield promised results within the next fifty years at least, by which time the reservoir would be substantially silted up.

Self-assessment question
Why did the local people oppose Tehri Dam?

8.8 The Conflict over Limestone Quarrying in the Doon Valley

The Doon valley in the district of Dehradun, situated in the himalayan foothills of the state of Uttar Pradesh (UP) has rich limestone deposits located in the Mussoorie Hills which form the northern boundary of the Valley. The operators of the limestone quarries and the scientific and technical agencies of the state government in charge of geology and mining, wish to extract the limestone deposits in the Valley for commercial and industrial use. The local communities, both rural and urban, however want to use the same limestone deposits lies in their in situ function in conserving the large volumes of rain water that falls in the Mussoorie Hills during the monsoon every year. The economic activities as well as the survival of the local communities depend almost exclusively on this vital water resource. It is clear that these two functions of the limestone deposits are antagonistic and mutually exclusive; utilisation based on one actually negates the other. This has resulted in conflict between the local groups on one side and the mining companies on the other.

This abundant precipitation on the southern slopes of the Mussoorie Hills infiltrates the fractured limestone belt which has a high degree of porosity and therefore high storage capacity. This capacity of fissured limestone gives rise to perennial springs and streams, such as those of Bhitarli, Kiarkuli, Arnigad and Baldi. The acquirers in this belt conserve large quantities of water for dry seasons, and reduce that part of the precipitation that is lost as seasonal run-off during the monsoons. The spring fed streams disappear underground when they meet the Doon gravels, and reappear as rivers such as the Suswa and Asan in the lower clay formations of the Valley.

The sources of the water resources of the Doon Valley are thus, in the final analysis, linked with the surface and sub-soil structure of the Lesser Himalayas. The vegetation supported by the thin top soil helps in the interception of the torrential rainfall by both the canopy and the leaf litter. This helps to reduce run-off and increase infiltration of water to the sub-surface, while the high porosity of the fractured limestone heft permits the storage of water for year around discharge.

For the people residing in the Valley, growth of the limestone industry in the Doon Valley During the last three decades, has threatened the material basis of survival through the destructive impact of the limestone industry on the hydrological balance of the Valley. It has been perceived by the people as a violation of their political and economic right to a decent though often minimal share of the vital resources that are needed for their biological and economic sustenance.

Self –assessment question
How did the limestone help in maintaining the hydrological balance of the Doon Valley?

Origin of the Lime Rush

Direct and major human interference in the limestone deposits began in 1900, when the railway line was brought to Dehradun and the forest department started selling quarrying rights to the limestone deposits at a royalty of Rs. 5 per 100 cubic feet (ca 2,832 dm³). An attempt by the government to assume full control of all limestone deposits was challenged in the court by the local landlords but the settlement of 1904 declared all quarries as government property. In 1911, four quarries were being worked in the Doon Valley, and by 1982 there were nearly 100 quarry leaseholders holding about 1,250

hectares of leased area. The limestone of the Doon Valley, being of high purity, has a ready market in the steel, chemicals, sugar, textile, and other industries.

8.9 The Ecological Crisis Generated by Quarrying

Quarrying in the Doon valley has disturbed the ecosystem drastically the limestone belt in the Mussoorie Hills lies in a tectonically active zone, and a geological thrust was created by the extension of the older pre-tertiary rocks of the Mussoorie Hills over the younger tertiary rocks of the Doon Valley. The thrust is disturbed by a series of faults, rendering the region geologically unstable.

The extraction of minerals by open cast mining first disturbs the land-soil-vegetation system by the removal of the vegetation, the top soil, and the overburden, for surface quarrying. This disturbance would be associated with surface mining anywhere. It is, however, accentuated locally by the precipitous slopes and high rainfall, which add to the land's instability caused by mining.

The actual process of extraction of limestone thereafter creates the second ecological impact on land resources, which is unique to the fragile and sensitive ecosystems that characterize the Doon Valley. The use of explosives to remove the rocks further weakens the already weak rock structure. Explosives also activate faults in the dislocation zone of the main boundary thrust, where the quarries in the Mussoorie area are located. The result is induced slope failure and landslides, which are increasing in the region since the mining operations began.

The steep gradient of the hills and the high rainfall in the Valley contribute further to this instability, as has already been indicated. Landslides raise the beds of streams and rivers, by piling up debris in these drainage channels. The combination of heavy monsoons, bare slopes, and silted river beds, leads to flood in a valley that was endowed by nature with excellent drainage. Floods, in turn, further destroy land resources downstream, because silted river beds lead to unpredictable changes in the course of rivers, which begin to cut their banks. The upper parts of the streams are thus intricately linked with the lower parts, forming a single ecological continuum in which manipulation of land resources upstream leads to the destruction of land resources downstream. These induced instabilities in land resources have been so large in magnitude that they are conspicuously visible.

Further impacts of quarrying

The impact of quarrying is also reflected in the flow characteristics of the springs and streams in the Doon Valley. As in the last few years, quarrying has led to the most drastic changes in the surface characteristics of the catchments-both in terms of extent and intensity-decline in the lean period base flow in the streams can be linked with it. The lean period flow in the Rajpur and Bijapur Canal systems, which tap the water from the Rispana and Tons rivers.

Moreover, the destruction of the internal hydrological system is reflected in the fact that the spring sources of all villages surveyed in the local catchments have registered an average decrease of nearly 50 per cent in their lean period discharges over the last two decades. Such disturbance of the hydrological cycle resulting from human intervention in the limestone belt in the processes of quarrying seems unavoidable and an expensive impact of quarrying.

This disturbance has been further accentuated by the impact of the disposal of overburdens and 'finest' on the hill slopes, and by the landslides induced by mining related activities in this sensitive region. The resulting debris covers large areas of the hill slopes Ludlow the limestone belt. As the debris deposited has little water infiltration capacity, there is a drastic decline in the effective catchment area in the Mussoorie Hills which in turn leads to surface run-off.

Devastating silting and flooding

The impact of three decades of quarrying became painfully evident through the deposition of materials carried down by the mountain torrents during each monsoon. As a result the boulder strewn beds of the rivers were transformed into ever rising depositories of debris.

In Rispana river bed, boulders disappeared about ten years ago, while in the Tons river bed a major inflow of debris about 6 feet (nearly 2 metres) in height was recorded after the 1982 monsoon. The Baldi river's bed has been rising constantly, threatening roads and bridges in the area of Sahastradhara, which lies about 1 km upstream of its confluence with the Song river. Buildings near the only bridge over the Baldi river have already been washed away, and the cumulative piling up of 'bajri' will, in the near future, pose a serious threat of floods in large parts of the Valley.

Such floods have already begun to affect villages on the banks of the Asan, the Baldi, and the Song rivers. Distance does not save these remote villages from the destructive impact of quarrying, as they are part of the overall ecobiome, being linked to one another by a common drainage channel, and to that extent belonging to a natural ecological unit. The upper parts of the streams have an impact on the lower parts, and quarrying upstream affects activities further downstream, sometimes quite drastically.

Besides damaging land and property along the river beds, the debris loaded flow in rivers has started choking canal works, thus heavily increasing their maintenance costs and the vulnerability of the water distribution system. Costs for removal of the debris in the canals, which were insignificant until the last decade, have risen to Rs. 5 lakhs in the last monsoon. The Irrigation Department, which looks after the Doon Canals, has to employ a large labour force to work around the clock throughout the monsoons, so that the canal head is not blocked by silt and other debris. The maintenance team is involved in such activities as not allowing the rivers to change their course in order to ensure that the water reaches the canal head, clearing out debris from the canal head and the canals.

At times the torrent is so: powerful and the load of silt is so heavy that it is physically impossible to remove the silt quickly. In mid August 1983, Dehradun city went without water for several days because the Rajpur Canal was entirely silted up. It is expected that within a period of ten years the entire canal works will be threatened by rising torrents and the concomitant destruction of flood protection works. Unfortunately, the cost associated with the destruction of this vital water conservation and distribution system has so far not been recognised as a negative externality of quarrying, because the processes by which quarrying threatens water resources have not been recognized.

The mining, since 1962, had scavenged its oak, rhododendron, ringal, deodar, chir, countless herbs and other plants bearing forests, destroyed its perennial water sources and deeply dislocated the village's life and sustenance. Damage to the stability of the hydrological balance of the Valley means damage to all other economic activities which, directly or indirectly, are dependent on the water resources in the Valley. These include agriculture, horticulture, tourism, animal husbandry, and knowledge-based industries etc. that together provide livelihood to the vast majority of the residents of the Valley.

Dehradun Valley Litigation

The Doon Valley has become the centre of major public-interest litigation in the Supreme Court of India. This issue of violation, through ecological destruction, of the people's rights, has been presented before the Supreme Court of India in an attempt to seek justice. Dehradun Valley Litigation is significant as a first case requiring Supreme Court to balance environmental and ecological integrity against industrial demand on forest resources. The case arose from haphazard and dangerous limestone quarrying practices in the Mussorie range of Himalayas. The miners blasted out the hills with

dynamites extracting limestone from thousands of acres. The miners also dug deep into the hill sides, an illegal practice which resulted in cave ins and slumping. As a result the hill sides were stripped off vegetation.

In 1983, treated a letter received from the Rural Litigation and Entitlement Kendra an NGO complaining against the environmental degradation as an Article 32 petition, the case developed into a complex litigation as leases of more than 100 mines joined the action engaging the country's top lawyers.

In the Dehradun Valley litigation, the court concluded in 1988 that the continued mining in the valley violated the forest (conservation) Act. Moreover, the court went beyond the requirements of the Act to merely conserve forests and issued orders to ensure that the valley be reforested. The court noted that a monitoring committee comprising of central, state and local officials and two public spirited citizens to oversee reforestation, mining activities and all other aspects necessary to bring about normalcy in the doon valley.

8.10 Summary

In this chapter protests & establishment of Narmada Bachao Andolan, Problem in Tehri Garhwal and Protests against Tehri Dam have been discussed. Further the conflict over limestone quarrying in the Doon Valley and the ecological crisis generated by Quarrying have explained to give you idea about movements related with environment crisis.

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8.13 Model Questions

- Describe the movements against Dams in Narmada valley and Tehri Dam?
- Write a note on the harmful effects of mining in the Doon Valley.

SUKHOMAJRI EXPERIMENT

Structure

- 9.0 Objectives
- 9.1 Introduction
- 9.2 The problem in Sukhomajri & Sukhna Lake
- 9.3 Intervention & Beginning of the Project
- 9.4 People's Participation
- 9.5 Results of the project
- 9.6 Remaining challenges
- 9.7 Reasons for Success of the Sukhomajri Project
- 9.8 Replication of Sukhomajri Model
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- 9.11 Further Readings
- 9.12 Model Questions

9.0 Objectives

After reading this lesson you will be able to

- Know about Sukhomajri experiment
- discuss the results of sukhomajri project
- understand the reasons for success of this experiment

9.1 Introduction

Sukhomajri Project is an example of forest and watershed management with the participation of the local public. In the 1970s, Payments for Ecosystem Services (PES) was practiced to carry out this project. It was reported that Agricultural land degradation led villagers in Sukhomajri to practice indiscriminate free-grazing, land-clearing and tree-felling – perpetuating a cycle of land degradation and poverty. These actions affected the water supply for communities downstream. In response, the Centre for Soil and Water Conservation Research and Training Institute (CSWCRTI), supported by the Ford Foundation, constructed soil conservation structures to reduce Lake Siltation and capture rainwater. As these soil conservation structures would only benefit landowners, an important element of the plan was to have better water sharing arrangements which could benefit all the villagers. In return for protecting vegetation, a water-users association constructed rainwater collection dams which improved village water supply and allocated tradable water rights to every household. Over time, the tradable water right system was replaced by a user fee and in return the villagers received the revenue from sale of forest

products. In addition, families with no land or marginal land were given land rights, and those who wish to, can sell water entitlement. An affiliated reforestation project was further expected to benefit the community through timber extraction from communal property. In this way the village Sukhomajri has become a model of community participatory management for the rest of the country.

9.2 The problem in Sukhomajri & Sukhna Lake

Sukhomajri village is located near the city of Chandigarh, in the Shiwalik hills in northwest India in the state of Haryana. The village is scarcely populated with only 455 inhabitants of having 71 families mostly gujjars. The village has 240 acres of land, half owned by individual families and the other half used as common land. The major portion of the catchment is owned by the forestry department who lease it to the villagers for grazing. Before the project the village had 411 animals consisting of goats, buffalos and bullocks. Like any other village in the sub-Himalayan Shiwalik foothills, the village was sparsely vegetated (barely 5 percent of the slopes had any vegetation cover), with poor agriculture. Not enough was produced either in agriculture or in the surrounding slopes to feed the people or their cattle. Many men found jobs in the nearby cement or machine tool factory or in Chandigarh.

The entire agricultural land of Sukhomajri village was under rain-fed single cropping and there was no source of irrigation up until 1975. Small land holdings suffered due to frequent crop failures due to erratic distribution of rainfall. There was a high levels of soil erosion and runoff in the 1970s. Though the annual average rainfall was about 1.137 mm, groundwater was not available at a reasonable depth. Soil erosion and gully formation was steadily leading to a decrease in farm area, forcing villagers to keep herds of livestock to minimise risk. The villagers cultivated about 50ha of non-irrigated land and kept about 411 heads of animals. The open grazing by the livestock suppressed regeneration and kept the surrounding hills and watersheds bare. The degradation of agricultural lands forced villagers to bring hill slopes under agriculture and soil erosion increased in the hills. Practices of free grazing of cattles, land clearance and tree-felling created various problems. Before the project the only water in the village came from a muddy rainfed pond in the middle of village and a rapid drinking water supply from a nearby spring. In short, the village had no irrigation water, no electricity, not even a bullock cart.

Sukhna Lake

It can be said that the Sukhomajri project was taken primarily to solve the problem of siltation of this famous artificial lake situated in the famous city of Chandigarh designed by Le Corbousier. The lake is one of the major beauty spots and the pride of Chandigarh people. The people of Chandigarh use the lake for boating and for other recreational purposes. The residential mansions of the Governors of Punjab and Haryana are located near the lake. The lake water recharges the aquifers which feed Chandigarh with its water supply. The Sukhna lake, was built in 1958 and was 445 acres (180 ha) in spread and 28 feet (8.4 m) deep. Since the lake was created more than 60% of it has been filled by silt from the Shivaliks. The deepest point of the lake which was 14 metres was little more than 4 metres deep at the start of the project.

The Chandigarh authorities had been spending lakhs of rupees each year in dredging and desilting the lake but each monsoon brought tons of silt back again. The forest catchment area of the lake amounts to 3214 ha, 76.3 % of the total catchment area. The surrounding villages graze their cattle in the forest catchment and have been doing so for centuries. Because of the large number of cattle grazing in this area it has led to severe soil erosion and consequently sedimentation in the lake. In an earlier attempt to conserve the soil the Forest Department had fenced the area and threatened to punish villagers for violations. These measures, as was to be expected did not succeed.

9.3 Intervention & Beginning of the Project

Around 1974 the Central Soil & Water Conservation Research and Training Institute (CSWCRTI) in Chandigarh was invited to discuss the problem of siltation and requested to do something about it. Shri P R Mishra and some of his colleagues surveyed the catchment area on foot. In 1975, it was found that over 68.5% of the lake was filled with silt. Further, their observations indicated that the major source of silt was in the higher catchment area which constituted 25% of the total catchment but contributed 80—90% of the total silt. Shri Mishra recommended a number of check dams near the Sukhomajri village and the planting of Acacia catechu and bhabbar grass on contour trenches in the catchment area, Dalbtrgia sissoo in the gullies and other soil conservation measures.

These were completed before the monsoon of 1976. A second check dam near Sukhomajri was built before the monsoon of 1977; However, in 1977, the monsoon failed and the farmers saw their kharif crop of maize withering before their eyes. There was water in the dam and the farmers realised there was life-saving irrigation in it, for their crops. It was during this crisis that the farmers realised that the soil conservation work meant for Sukhna lake could also mean supplemental irrigation for them. Instead of ere uncertain crop the farmers could have two assured crops. The mutuality of interest between the Chandigarh authorities, the CSWCRTI and its soil conservation work and the villagers became mutually reinforcing.

A scheme was launched in 1979 in response to growing water scarcity. Farmers in Sukhomajri were supported by the CSWCRTI and the Ford Foundation to undertake a programme of checking dam construction and watershed management to tackle heavy siltation and low dry seasonal flows. CSWCRTI applied soil conservation techniques developed by combing mechanical and vegetative measures. The mechanical measures reduced the runoff sediment from the highly eroded Shivaliks at a spectacular rate from eighty tonnes to less than one tonne per hectare, within a short span of a decade. The vegetative measures consisted of planting tree species like khair and shisham, in pits and bhabbar grass at mounds of trenches. They also planted Agave americana and Ipomea cornea.

The concept of social fencing gained wide recognition in the effort to control the grazing of cattle. As a result, forest areas were covered with grass and trees within a period of 10 to 15 years. Grass production more than doubled in the same period (from 3.82 t/ha to 7.72 t/ha) (ENVIS, 2005). A Water Users' Association was set up in 1982, charged with implementing watershed management, dam management and the collection of fees from water users. Two new earthen dams in the catchment of Sukhomajri village and Sukhna Lake benefited the Sukhna Lake downstream and the inhabitants of Chandigarh as well

Simultaneously, A joint forest management programme, developed by the Central Soil and water Conservation Research and Training Institute, was introduced in the village in 1976. The project began out of concern for the silting up of Sukhna Lake, which supplies water to the downstream city of Chandigarh. This problem was traced to the severe degradation of the catchment area in the hills near the village of Sukhomajri. Initially, attempts at regenerating the local environment and reducing free grazing failed because the villagers had little regard for Chandigarh's water concern. A change in attitude occurred after 1977 when four tanks were built by the villagers under guidance of environmentalist P.R. Mishra. These tanks successively created an increased storage capacity for rainwater which in turn, increased crop yields. In return for water, the villagers agreed to protect the watershed. This water availability, thus, became an immediate incentive for the villagers to stop grazing in the surrounding hills and initiate afforestation and watershed protection activities. Since then the villagers have built a few more tanks and have protected the heavily degraded forest that lies within and around the catchment of its minor irrigation tanks.

Self-assessment Question
What is the role played by (CSWCRTI) in starting the success of Sukhomajri project?

9.4 People's Participation

People's participation is viewed as a dynamic group process in which all members of a group contribute to the attainment of common objectives, share the benefits accruing from group activities, exchange information and experience of common interest, and follow the rules, regulations and their decisions made by the group. Need for people's participation is articulated in terms of efficiency and/or cost-effectiveness, equity in distribution of benefits, sustainability and empowerment of the people

Rights over impounded water in the dam area have been equally shared by both landholders and the landless in the village, so that benefits of rainwater harvesting are equally shared between community members. For the management and control of the reservoir water, a Water User's Association (WUA) was proposed and accepted. A young management specialist was hired by the Ford Foundation to assist in putting the W.U.A. on a sound footing. After many rounds of talking to the villagers, and after much discussion, a system was established in which every member would be given equal share regardless of the land owned, landless too could be members and claim a right to irrigation water.

Another consultant hired was with the objective of working with the women of Sukhomajri, listening to their problems and urging them to take a more active role in the W.U.A. and in conserving the watershed. The woman consultant also helped the village women build smokeless chulas for themselves. The women claim that their wood consumption was reduced by one third to half and that the inside of their huts has become more hygienic. The women of Harijan Nada have been providing 'technical assistance' in chula making to other villages as far distant as Himachal Pradesh. Because of easy availability of grass the women now have more time for growing vegetables, collecting babbar grass and making rope and other income generating activities.

Further more, the project ensured that a portion of the incremental gain is ploughed back to create social capital. The involvement of local people and the effort of CSWCRTI and Ford Foundation were important inputs for implementing the project. The local farmers were given some incentives to develop agriculture and protect soil. The fee on water was Rs. 16 per hour. The case of watershed protection in Sukhomajri village in Haryana is especially relevant from the point of view of developing market-based approaches for watershed protection services and improving livelihoods in India. Moreover, in this case, the potential for payments and market-like arrangements for watershed protection services can be observed at two levels simultaneously, one between the downstream city of Chandigarh and upstream villages like Sukhomajri, and secondly through an "embedded" market for water within Sukhomajri village itself.

Self-assessment question

What is the role of people's participation in watershed management?

9.5. Results of the Project

9.5.1 Water conservation

Today Sukhomajri has rainfed reservoirs varying between 200 and 400 ft. in diameter. Four earthen dams have been built between 1976 and 1985. These serve three main purposes; firstly, to check instantly the gully formation in agricultural fields and, thereby, effectively prevent silting through the erosion of soil; secondly, to store surplus rainwater from the catchment area to be used later for irrigation after the withdrawal of monsoon and thirdly, rehabilitation of the catchment. All the rainwater that falls on one side of the village is caught and channeled into the reservoirs and is then used for irrigating crops and for drinking water.

Details of rainwater harvesting dams at Sukhomajri

Dam No.	Year of construction	Catchment area (ha)	Storage capacity (m)	Command area (ha)	Cost (Rs.)
I	1976	4.3	8000	6.0	72,000
II	1978	9.2	55600	20.0	1,09,000
III	1980	1.5	9500	2.0	23,000
IV	1985	2.6	19300	5.0	1,50,000

9.5.2 Increase in Food crops

Prior to the availability of rain harvested water, villagers were able to raise only a kharif crop, whose success depended on the duration and strength of the monsoon. With the availability of supplemental irrigation, the number of crop rotations has increased varying from 2 to 4. In terms of production, in 1977, there was 250 quintals of wheat, 500 quintals of wheat straw and 196 quintals of maize. In 1981 the production was 1015 quintals of wheat, 2031 quintals of wheat straw, and 356 quintals of maize. The milk yield too has increased from 2196 litres in 1977 to 4405 litres in 1981. The grass production in the catchment areas has increased from 200 kgs. in 1977 to 2500 kgs. per year in 1981. With the availability of irrigation water mainly for rabi crops and introduction of improved agro-techniques, there was manifold increase in crop yields both for kharif and rabi. The yield rates of wheat and maize, the two main staples, increased by more than 50 per cent between 1977 and 1986. Yield of wheat crop had increased from 8.0 q/ha in 1975-76 to 27q/ha in 1999-2000 and 30.76 q/ha in 2007-08. The numbers of trees in 1980 were 64 trees per hectare and in 1992 it increased to 415 trees per hectare

The average crop yields obtained before the project and during 2000 are given in Table.

Cropped area and yield of crops

Crop	Pre-project (1975-76)			Post-Project (1999-2000)		
	Area (ha)	Average yield (q/ha)	Total yield (q)	Area (ha)	Average yield (q/ha)	Total yield (q)
Kharif						
Maize	8.73	6.0	52.0	26.73	19.5	521
Sorghum (Fodder)	4.70	80.0	376.0	12.86	140.0	1800
Pulses	0.56	3.0	1.68	--	--	--
Paddy	--	--	--	11.70	25.0	293
Rabi						
Wheat	8.60	8.0	69.00	46.1*	27.0	1245
Gram	2.26	4.0	9.04	--	--	--
Sugarcane	1.20	150.0	180.0	1.4	250	350

9.5.3 Benefits to the environment.

The villagers in Sukhomajri understood and adopted the concept of 'Social Security by Social Fencing' Thus a collective decision to stop any kind of grazing as well as deforestation was made. The village people agreed to keep their grazing animals out of the watershed areas. Since the grazing animals have been kept out, the area has sprung back to life and is now full of new grasses, shrubs and trees.

Protection of the watershed has led to ecological regeneration of the surrounding forests. The region suffered from substantial soil erosion and forest degradation before the project started. Vegetation was sparse and incomes from agricultural activities were low. Thanks to the soil protection efforts around Sukhomajri, soil productivity has increased considerably. The project also included reforestation efforts, which have benefited the 400 ha Sukhomajri forest. Tree density in the forest increased from 13 to 1292 trees/ha between 1977 and 1986.

9.5.4 Economic benefits of the project

The ecological benefits of increased tree density have also led to economic benefits. The forest now has over 0.3 million, highly valuable, 'khair' trees, each worth about Rs. 3,000 (US\$70). If the wood is converted into 'katha' it will be worth even more, as 'katha' is a highly valued condiment. The village has yet to earn anything from the wood because the forest department has not yet decided how it will share the proceeds with villagers.

A combination of public, private and community participation has produced a rate of return in the order of 19 per cent. One of the most impressive savings resulting from the project are the savings in desilting costs of the Sukhna Lake. The inflow of sediment has come down by over 90 percent. This saves the government Rs. 7,65 million (US\$0,2 million) each year in dredging and other costs. Tank construction and watershed protection led to an increase in the availability of irrigation water. The increase in irrigation water boosted wheat as well as maize production. Protection of the watershed has led to increased grass production which provides fodder for livestock. Increased availability of fodder led to a transformation in the livestock composition. The number of goats (a low value livestock) went down while the number of buffaloes (a high value livestock) went up. This led to increased milk production. Watershed protection has also resulted in increased production of 'bhabhar'. This is a highly fibrous grass that is used for fodder, pulping material for paper mills or ropes. As the society pays 10 percent sales tax on bhabhar, the increase in production generates income for the government as well.

9.5.5 Benefits for poverty reduction.

Sukhomajri watershed clearly emphasized the importance of the water resource development activities in the Watershed programme, through participatory approach. There is no self help group in village Sukhomajri. As the village has prospered and people have come to enjoy a surplus, women joined together to help each other financially. The village of Sukhomajri has seen many improvements in its economy since it undertook environmental reforms in the mid-1970s.

Sukhomajri is the first village in India to have tax levied on the income it earns from the ecological regeneration of its degraded watershed.

Women can obtain loans from the fund at 2% interest to start a business or attend other needs. The Departments of Forests, Agriculture and Soil Conservation, the World Bank aided Integrated Watershed Development Project (IWDP), in the North-West Shivalik States, have already implemented hundreds of projects like Sukhomajri in this region. To cite an example, as of 1996 the Forest Department in Haryana built approximately 93 rainwater harvesting dams covering 53 villages and about 70 such dams were built by the Department of Soil and Water Conservation, Punjab. The IWDP (Kandi Project) has adopted this model on a massive scale in the North-West Shivalik States (ENVIS, 2005). Based on the Sukhomajri model, the Forest Department of Haryana constructed 102 water harvesting structures in 61 villages. The success of the project led the Central Government to sponsor 440 integrated watershed-management projects to be developed on the lines of Sukhomajri.

The local economic growth has benefited the inhabitants of the village. Between 1979 and 1984, annual household incomes went up from about Rs. 2,000 to Rs. 3,000. The village now earns about Rs. 350,000 from collective sale of milk and another Rs. 100,000 or so from the sale of 'bhabhar'. The benefits to villagers are clearly visible by the replacement of thatch-arid-mud dwellings by birch-and-cement houses, many of them boasting with electronic devices like radios or television. Watershed protection programs can lead to substantial benefits for the communities involved in the project. However, impacts are usually greatest for poor and medium wealth households, with access to farming lands. Income increases are smallest for the poorest farmers, who are given access to the poorest quality land. Community programs should be targeted at benefiting the poorest groups as well. Sukhomajri provides an example of a project that includes the poorer households in the village in its economic growth. Villagers without land or with very small holdings were also allotted a share of the collected water. These property rights could be sold for cash or sharecropping. This market-like mechanism delinked

water rights from land rights and allowed the landless and the land-poor to benefit from their share of the water.

9.5.6 Policies and coalitions for change.

The villagers have achieved sustainable development with limited financial investment from outside. Economic benefits from watershed management have been substantial. By the mid-1980s, Sukhomajri had turned from a food –importing village to a food-exporting village. Tank construction and watershed protection led to an increased availability of irrigation water. This has helped to increase crop production by nearly three times, the protection of the forest area has greatly increased grass and tree fodder availability. Increased incomes from agriculture have allowed villagers to improve housing conditions.

The success of the village is due to the efforts of the people of the village. Nevertheless, instrumental in the success of the project has been the assurance of the Government Forestry Department that the village could dispose of the increased grass yields and collected rainwater. Villagers would not have agreed to protect the watershed, if water and grass rights would not have been disbursed to them. Equally important in the initiative of the villagers to protect their watershed was the establishment of a village society. This Hill Resources Management Society has played a crucial role in the watershed protection. It provided a soundboard for all villagers to discuss problems as well as supervised management of the local environment, the distribution of generated resources (like water, wood and grass) amongst the households and compliance with protective measures.

Another critical factor in establishing protection of the catchment was the equitable sharing of the resources that accrued as a result of the collective watershed protection work. The landless were also given an incentive to participate equally in protecting the surrounding forests and stop grazing the hills, by allotting them with an equal share of the water collected in the dam. This provided the small landowners/landless with a direct incentive to participate in watershed protection and financially compensated them for loss of access to traditional grazing lands.

9.6 Remaining challenges

Sukhomajri village provides an example of sustainably increasing local incomes through improved water management. A sound land care system, based on the principle of social fencing, was not only capable of triggering a range of farm and non-farm activities, but also regenerated biotic resources. Despite this great transformation, Sukhomajri stands in a precarious position today. As the land generates more wealth, all of the parties have a growing stake in obtaining their share. The village has regenerated the forest, but the Forest Department has refused to give more than 25% of timber to the community. Thus, the sustainability of this unique resource management programme is threatened by the arbitrarily division of the 400 ha hill tract between Sukhomajri and the neighbouring village of Dhamala by the Forestry Department in 1995.

Meanwhile, the neighboring town of Dhamala has sought to expand its rights to forest resources. The upper caste village of Dhamala was given a richer portion of the forest. Instead of sharing forest produce and grazing rights in the whole area, the two villages are now competing for forest products. This leads to social tensions and may cause a conflict in the area. Sukhomajri has thus been in prolonged struggles with both the forest department and Dhamala

9.7 Reasons for Success of the Sukhomajri Project

The measure failed initially because of the lack of concern amongst the villagers about the water woes of the Chandigarh city. The intervention was finally successful due to the efforts with regard to provision of technical expertise provided by Mr P. R. Mishra to build tanks for increasing water storage. The community received benefits in the form of increased water storage and increased yields which acted as an incentive for them to conserve the watershed benefits received. The community involvement, public, private and community participation and interaction and technical support can be considered as the major reasons for the success of this effort. Further, the existence of homogenous social set, particularly in terms of caste and ethnicity was important factor. The effective co-ordination between the different government departments and their coherent approach was also instrumental towards the sustainability of the project. Another positive point is that Sukhomajri could benefit most of the families in the village, which has minimized the grounds of conflicts.

Lessons from Sukhomajri Project

A important lesson that emerges from the Sukhomajri experience is that social and management systems appropriate to the new technology take time to evolve. All the key people involved in the project spent much time learning from the villagers, earning their confidence and respect before they could experiment and introduced new methods going against traditional ways of doing things. Without establishing mutuality of trust it would have been difficult to establish the new system of equitable water distribution and the management for its effective functioning and control.

Hence, Peoples' participation must be ensured right from the beginning. The needs and the problems of the people must be identified at the outset. Unless a project is aimed at meeting their needs, solving their problems and mitigating their hardship, it may not succeed. Constitution of a village society (HRMS) must be a pre-requisite before taking up such projects.

Further, Watershed Management Projects should have short gestation period. The benefits should available in shortest possible period. This shall keep the people hopeful and they will remain motivated for the water conservation.

However, the emphasis should be on sustainability and equity, i.e., all the common property resources must be available to all sections of the society.

9.8 Replication of Sukhomajri Model

An important challenge related to watershed protection initiatives is the question of scaling up the local example and replicate it on a larger scale. Sukhomajri village has become a model of community-based watershed management for the rest of the country. Following the successful example of Sukhomajri, several other eco-restoration projects have started. In Haryana, Bunga Project and Nada Projects have been started. Similarly, Punjab Irrigation Department has started project of watershed development in the Kandi Areas of Punjab.

In Madhya Pradesh, a state-wide watershed program of water and soil protection has generated considerable benefits. This program shows that watershed protection can be successfully replicated on a larger scale.

The Departments of Forests, Agriculture and Soil Conservation, the World Bank aided Integrated Watershed Development Project (IWDP), in the North-West Shivalik States, have already implemented hundreds of such projects in this region. To site an example, till 1996 the Forest Department Haryana built approximately 93 rainwater harvesting dams covering 53 villages and about 70 such dams were built by Department of Soil Conservation, Punjab. The IWDP (Kandi Project) has adopted this model on a massive scale in the North-West Shivalik States.

9.9 Summary

In mid-seventies, the Sukhna Lake in Chandigarh was found filled up with silts due to heavy erosion in the upper catchment area. The experts from Central Soil and Water Conservation Research and Training found out that the root causes of heavy soil erosion were deforestation and degradation of forests due to grazing pressure of domesticated cattle by the nearby villagers. The experts thought out that the problem could be solved by providing sustainable livelihood of nearby Gujjar families by providing them alternative source of irrigation. Thus the committee decided to construct earthen dams to provide irrigation to the villagers on the condition that none of villagers would go for grazing in the forest areas. The concept of 'Social Security by social fencing' was adopted by the villagers to stop any kind of grazing as well as deforestation. The collective decision of the people brought magical change in few years in regeneration of the forest. The regeneration of the forest checked the soil erosion and siltation in the Sukhna lake.

Thus Sukhomajri Water shed Management project has been acclaimed nationally and internationally as a model of Forest management and Watershed management with people's participation. The experiment has successfully been replicated in many nearby villages and other parts of India. However, it is important to see the success of this model in case of socially heterogeneous societies.

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9.12 Model Questions

1. What is the importance of Sukhomajri experiment in environment conservation?.
2. Explain the concept of
 - A) 'Social security by social fencing'
 - B) Participatory Watershed Management
 - C) Benefits of Sukhomajri Project for the villagers and environment

ECOFEMINISM

Structure

- 10.0 Objectives
- 10.1 Introduction
- 10.2 Major contributors to Eco-feminism
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10.0 Objectives

After going through this lesson you will be able to

- define the concept of ecofeminism
- highlight the major contributions of ecofeminism
- relate Development, Women and Environment
- describe the features and perspectives of Ecofeminism

10.1 Introduction

The term 'Ecofeminism' is believed to have been coined by the French writer Françoise d'Eaubonne in her book, *Le Féminisme ou la Mort* (Feminism or death) in 1974.

Ecofeminism is a social movement that regards the oppression of women and nature as inter-related. This movement states that environment is a feminine issue and that feminism is an environment issue. It, thus, describes movements and philosophies that link feminism with ecology. Ecofeminism connects the exploitation and domination of women with that of the environment, and argues that there is a connection between women and nature that comes from their shared history of oppression by a patriarchal Western society. The ecofeminists argue that the exploitation of nature is intimately linked to western man's attitude towards women, animals and indigenous culture. The association of women and nature has been used by the patriarchal society to legitimize the exploitation of the both. Nature, because it is associated with women and vice versa, is deemed a lower order which exists to serve man's physical needs. Thus,

The association of women and nature in patriarchy had tragic consequences for humans and rest of the nature. Ecofeminism goes further and challenges the presumed necessity of power relationships. It seeks to move from a morality based on power over one based on reciprocity and responsibility.

Ecofeminists believe that the exploitation of nature can not be put to end without ending human oppression and vice versa. The case of women who are the worst suffers of water scarcity is a telling reminder of this point. Eco democracy can remove such conditions. Ecofeminism asserts that all forms of oppression are connected and that structures of oppression must be addressed in their totality. Oppression of the natural world and of women by patriarchal power structures must be examined together or neither can be confronted fully. These socially constructed oppressions formed out of the power dynamics of patriarchal systems. In one of the first ecofeminist books, *New Woman/New Earth*, Ruether, states:

Women must see that there can be no liberation for them and no solution to the ecological crisis within a society whose fundamental model of relationships continues to be one of domination. They must unite the demands of the women’s movement with those of the ecological movement to envision a radical reshaping of the basic socioeconomic relations and the underlying values of this [modern industrial] society (204).

Ruether makes clear a central tenet of ecofeminism: earth and the other-than-human experience the tyranny of patriarchy along with women. Classism, racism, sexism, heterosexism, naturism (a term coined by Warren) and speciesism are all intertwined.

Ecofeminism is multi-faceted and multi-located, challenging structures rather than individuals.

Brief Definitions

Ecofeminism can be defined as a “value system, a social movement, and a practice... (which) also offers a political analysis that explores the links between androcentrism and environmental destruction. It is an “awareness” that begins with the realization that the exploitation of nature is intimately linked to Western Man’s attitude toward women and tribal cultures...” (Birkeland 1993, p. 18).

Within the patriarchal conceptual framework, all those attributes associated with masculinity are given higher status or prestige than those associated with femininity, resulting in ‘hierarchical dualisms’ (Warren 1987, pp. 6-8)

Ecofeminism emerged in the West as a product of the peace, feminist and ecology movements of the late 1970s and the early 1980s. All ecofeminists are of the view that it is the “logic of domination”, in association with value-hierarchical thinking and value-dualisms that sustains and justifies the twin domination of women and nature (Warren 1990).

Self-assessment question
How do ecofeminists relate oppression of women and nature?

10.2 Major contributors to Ecofeminism

Ecofeminism emerged in the 1970s and 1980s as myriad forms of feminist and environmental theories and activism intersected. Some theorists, such as Ynestra King, name it as a third wave of feminism, while others place it in the general category of deep ecology. Ecofeminism acts in both and neither of these broad movements, simultaneously serving as an environmental critique of feminism and a feminist critique of environmentalism. Ecofeminist trajectories are varied; there is no one accepted or orthodox “ecofeminism.”

Rosemary Radford Ruether, Ivone Gebara, Vandana Shiva, Susan Griffin, Alice Walker, Starhawk, Sallie McFague, Luisah Teish, Sun Ai Lee-Park, Paula Gunn Allen, Monica Sjöö, Greta Gaard, Karen Warren and Andy Smith are among the voices speaking from ecofeminist positions.

10.3 Ecofeminism : Features

The term ecofeminism has come to describe two related movements operating at somewhat different levels

- a) At the grassroot level, women-initiated activism aimed at eliminating the oppression of women and nature
- b) Secondly, a newly emerging branch of philosophy that takes as its subject matter the fundamental questions of meaning and justification in feminism and environmental ethics.

Ecofeminists believe that there are important connections – historical, experiential, symbolic and theoretical - between the domination of women and the domination of nature. In the broadest sense, ecofeminism is a distinct social movement that blends theory and practice to reveal and eliminate the course of the domination of women and of nature.

Ecofeminism asserts that all forms of oppression are connected and that structures of oppression must be addressed in their totality. Oppression of the natural world and of women by patriarchal power structures must be examined together or neither can be confronted fully. These socially constructed oppressions formed out of the power dynamics of patriarchal systems

Ruether makes clear a central tenet of ecofeminism: earth and the other-than-human experience the tyranny of patriarchy along with women. Classism, racism, sexism, heterosexism, naturism (a term coined by Warren) and specialism are all intertwined.

Ecofeminism is multi-faceted and multi-located, challenging structures rather than individuals. By confronting systems of patriarchy, ecofeminism broadens the scope of the cultural critique and incorporates seemingly disparate but, according to ecofeminism, radically connected elements. Combining feminist and deep ecological perspectives -- in and of themselves extremely varied ways of thinking about reality -- is a complex, transgressive process that is often in flux.

Ecofeminist positions reflect varied political stances that may be, and usually are, transformed through time and place. In other words, the political activism and alliances stemming from ecofeminism modify in relationship to the perceived justice issues being confronted in differing cultural and historical settings. Because of this constant morphing, ecofeminism simultaneously challenges patriarchy from different angles. This is one of the myriad strengths of the fluid and radically diverse positions assumed by ecofeminism.

Central to the patriarchal framework is a pattern of thinking that generates normative dualisms. Ecofeminism claims that patriarchal structures justify their dominance through categorical or dualistic hierarchies: heaven/earth, mind/body, male/female, human/animal, spirit/matter, culture/nature, white/non-white. Established oppressive systems continue to manifest their abusive powers by

reinforcing assumptions of these binaries, even making them sacred through religious and scientific constructs. As a result of socially entrenched gender bias, the more masculine member of each dualistic pair is identified as the superior one. Thus a value hierarchy is constructed which ranks the masculine characteristics above the feminine eg. culture above nature, man above woman, reason above emotion.

Ecofeminism posits that as long as any of the dualisms exist as an integral component of societal structuring and justification, they will all continue to serve as starting points to justify patriarchy. Therefore all dualisms and binary oppositional forms must be dismantled otherwise humanity remains “divided against” itself, a phrase that Griffin uses to describe the ideological impact of dualism. Ecofeminism’s constructive worldview replaces hierarchical dualisms with radical diversity and relationship, modeled on both biodiversity and the feminist emphasis on the strength of difference. As a justice advocate for the entire web of life, ecofeminism resists dividing culture into these imbedded separate or dualistic arenas.

In her introduction to “Ecofeminism: Women, Culture, Nature” editor Warren asserts: Some of the earliest articulations of ecofeminism analyzed the patriarchal underpinnings in religious and philosophical systems of the European and Mediterranean world. Such scholars as Anne Primavesi, Carol Christ, Merchant, Daly and Charlene Spretnak examined cultural and religious systems from such areas as ancient Mesopotamia and Greece, as well as religious systems such as Judaism and Christianity. They proposed that patriarchal cultural structures revolved around layers of symbol systems that justified domination. For example, they interpret the creation stories in the book of Genesis, foundational for Judaism, Christianity and Islam, as demonizing both woman (Eve) and animal (the snake).

Feminist historian Gerda Lerner’s historical reconstructions focus on the shift from small Neolithic villages to city-based states with the accompanying rise of patriarchal cultural systems. Both theorists posit pre-patriarchal Mediterranean world religious cultures in which fertility goddesses and other nature symbolism figured prominently. Gradually, patriarchal, militaristic sky gods replaced earth goddesses and gods. Most of the ancient symbols of power were subverted and demythologized as evil or chaotic. The mother goddess, whose body often birthed or constituted the earth, became the target of the powerful sky gods, as evidenced by such creation stories as the Babylonian Enuma Elish. The pattern of male deities killing female or animal deities in an effort to establish a patriarchal order and to control forces assumed to be chaotic repeats itself consistently. The snake, once a symbol of life, was trampled under the foot of the male deity and connected to evil. Hell was in the earth and Heaven was removed to the sky. Paradise lost its materiality and became a masculine, hierarchical projection.

Some ecofeminists reference these historical reconstructions as alternatives to the commonly accepted patriarchal constructions that project historical progress. In other words, the idea of civilizations advancing from pre-agricultural to agricultural to industrial to post-industrial/technological might also be construed as a mythological projection. Applying feminist historical methodology, some academic ecofeminists reevaluate the patriarchal myth of progress, particularly its detrimental effects on the human-nature relationship.

The practice of publishing anthologies with diverse voices rather than books representing just one voice exhibits the overall tendency among ecofeminists to value inclusivity and difference. Still these anthologies, while influential, were criticized for essentializing the woman/nature connection and for over-romanticizing or over-simplifying women in non-Western cultures.

Another area of focus concerned the relationship of scientific worldviews to religion and culture. Ecofeminism suggests that the antagonism sometimes existing between religious and scientific worldviews has been detrimental, used by both approaches to advance their own hierarchical

structures. The reductionist models of both Western theologies and many Western scientific ideologies project a material world that is not sacred, but mechanistic. This apparent disconnect between the material and the sacred, alleged by ecofeminists to be fostered by both religion and science, has been particularly detrimental when acted upon by European-American dominant cultures.

In *The Death of Nature* Merchant links this hierarchical, mechanistic approach to nature to the oppression of women. She argues that, whereas organic thinking and interdependence shaped European life through the Middle Ages, the “fathers” of the scientific revolution determined to dominate nature. What makes ecofeminism distinct is its insistence that nonhuman nature and naturism (i.e., the unjustified domination of nature) are feminist issues. Ecofeminist philosophy extends familiar feminist critiques of socialisms of domination to nature. Merchant thus emphasizes the new (and also old), organic model of the cosmos developing in some areas of science and religion.

Many of the modern scholars on ecofeminism focused on issues related to development, ecology and women. They believe that development by the use of machines, chemicals and polluting technologies are dangerous to the harmonious existence of women, nature and indigenous communities. The western scientific and reductionist knowledge also is causing extinction of indigenous knowledge and cultural systems which were justful and useful to the women. Vandana Shiva, a physicist and environmental researcher/activist in India, published *Staying Alive: Women, Ecology and Survival in India* (1988), which reflects the increasingly global nature of ecofeminism during the 1980s. Shiva connects the “death of the feminine principle” with “mal-development,” a term she uses to describe the introduction of Western, intensive agriculture to the “Third World.”

In her essay “Development, Ecology and Women” Shiva articulates the relationship clearly: Mal-development militates against this equality in diversity, and superimposes the ideologically constructed category of western technological man as a uniform measure of the worth of classes, cultures, and genders... Diversity, and unity and harmony in diversity, become epistemologically unattainable in the context of mal-development, which then becomes synonymous with women’s underdevelopment (increasing sexist domination), and nature’s depletion (deepening ecological crises)... (Healing the Wounds,).

Shiva also published, with Maria Mies, a German, Marxist sociologist, *Ecofeminist: Reconnecting a Divided World* (1993). In this book the authors connect the capitalist-patriarchal economic system with the oppression of women in both the northern and southern hemispheres. However Shiva, not unlike some other ecofeminists, has been criticized for essentializing women and nature in her work.

Vandana Shiva, thus, argues that the development is kind of violence to the nature. It is women’s work that protects and conserves nature’s life in forestry and in agriculture, and through such conservation work, sustains human life through ensuring the provision of food and water, the destruction of the integrity of forest ecosystems is most vividly and concretely experienced by peasant women. For them forestry is married to food production : it is essential for providing stable, perennial supplies of water for drinking and for irrigation and for providing the fertility directly as green manure or as organic matter cycled through farm animals.

Van Plumwood, an Australian ecofeminist philosopher, has traced the roots of development of the oppression of women and the exploitation of nature to three points, the first two points having historical origins, the third having its genesis in human psychology.

- a) In the first of these historical women-nature connections, dualism has identified higher and lower halves. The lower halves seen as possessing less or no intrinsic value relative to their polar opposites. Upper halves are instrumentalised and subjected to serve the needs

of the members of the higher groups. Thus, due to their historical association and supposedly shared traits women and nature have been systematically devalued and exploited to serve the needs of men and culture.

- b) The second of these historical women-nature connections is said to have originated with the rise of mechanistic science before and during the Enlightenment period. The rise of modern science and technology, reflecting the transition from an organic to a mechanical view of nature, gave credence to new logic of domination. Rationality and scientific method became the only socially sanctioned path to true knowledge and individual needs gained primacy over community. On this fertile soil were sown the seeds for an ethic of exploitation.
- c) A third representation of the connections between women and nature has its roots in human psychology. According to this account the features of masculine consciousness which allow men to objectify and dominate are the result of sexually differentiated personality development. As a result of women's roles in both creating and maintaining/naturing life, women develop 'softer' ego boundaries than do men, and thus they generally maintain their connectedness to other humans and to nature, a connection which is reaffirmed and recreated generationally.

Man, on the other hand, psychologically separate both from their human mother and from mother earth, a process which results in their desire to subdue both women and nature in a quest for individual potency and transcendence. Thus, sex differences in the development of self/other identity in childhood are said to account for women's connectedness with and men's alienation from both humanity and nature.

10.4 Perspectives on Ecofeminism

The different configurations of ecofeminism reflect the different ways of analyzing the connections between women and nature, as well as the differences in the nature of women's oppression and solutions to them, the theory of human nature, and the notions of freedom, equality and epistemology on which depend various feminist theories.

Some feminist scholars like Carolyn Merchant (1992) have categorized ecofeminist theory into liberal, radical or socialist frameworks. However, leading versions of feminism have not, in fact, articulated their position on ecology or on the nature of the connection between the twin oppressions of women and nature. In the 1960s, the feminist movement demanded equity for women in the workplace and in education as a method to achieve a fulfilling life. At around the same time, Rachel Carson's book, *Silent Spring* (1962) focused attention on the effects of pollution on the human and non-human world, making the question of life on earth a public issue.

For the ecofeminists of the liberal mode (as for liberal feminists in general), environmental problems are a result of the rapid exploitation of natural resources accompanied by the lack of regulation of pesticides and other environmental pollutants. This can be overcome by a social production that is environmentally sound. For this, one requires better science, conservation and laws. With equal educational opportunities, women can become scientists, natural resource conservators, lawyers, and so on, like men. Thus, these ecofeminists attempt to change human relations with nature through the passage of new laws and regulations. However, just training women to be lawyers and environmental scientists will not solve the increasing problem of environmental degradation. Those ecofeminists fail to question the whole development process, which is the primary cause of environmental destruction. As a rejoinder to the view that associated women with nature, both of which were devalued in western culture, ecofeminists with a radical bent analyzed environmental problems

from within their critique of patriarchy and offered alternatives that could liberate both women and nature (Merchant 1990, p. 93). This perspective draws from the now famous article by Sherry Ortner, *Is Female to Male as Nature is to Culture?* (1974). The ecofeminists celebrate the relationship between women and nature through the popularization of ancient rituals centered on the Mother Goddess, the moon, animals and the female reproductive system. This prehistoric era, centered on goddess worship, was dethroned by an emerging patriarchal culture with male gods to whom the female deities were subservient.

Nature was further degraded by the Scientific Revolution of the 17th century, that replaced the nurturing earth with the "metaphor of a machine to be controlled and repaired from outside...The earth is to be dominated by male developed and controlled technology, science and industry" (Merchant 1992, p. 191).

So these ecofeminists argue against the dominant view that women are restricted by being closer to nature, because of their ability to bear children. In fact, women's biology and nature are seen as sources of female power to be celebrated.

On the other hand, ecofeminists working within the socialist framework, look upon nature and human nature as "socially constructed, rooted in an analysis of race, class and gender" (Merchant 1992, p. 194). It has the potential for a more thorough critique of the domination issue. Going beyond the radicals, this ecofeminism puts forward a critique of capitalist patriarchy, focusing on the dialectical relationships between "production and reproduction, and between production and ecology" (Merchant 1992, pp. 195-197). Historically, women's intimate knowledge of nature has helped to sustain life. With colonial intervention and capitalist development, production in traditional societies was disrupted. It resulted in a capitalistic economy dominated by men in charge of production of exchange commodities, while women were pushed increasingly into the domestic sphere, responsible mainly for reproducing the work-force and social relations. Under the capitalistic system, reproduction is subordinate to production, and the sustainability of nature is ignored. Under socialism, however, production is to satisfy people's need, not people's greed.

In addition to these groupings within ecofeminism are ecowomanism, mentioned above, with a focus on race as the primary lens through which to view oppressions, and animal rights-oriented ecofeminism. There are also those who consider themselves spiritual ecofeminists, such as Starhawk, embracing the religious, Earth-goddess based components of the position. Deep ecology and ecofeminism also engage in ideological debates. Many ecofeminists count themselves as deep ecologists and many deep ecologists count themselves as ecofeminists, while others might designate themselves as one but not the other. The background to the differences between some deep ecologists and some ecofeminists grew from the feminist critique of the androcentric (male-centered) tendency of deep ecology in its earliest, and often militaristic or violent, expressions such as those expounded upon in Edward Abbey's *The Monkey Wrench Gang*. This approach has been dubbed eco-macho. Specific philosophical discussions took place under the auspices of the journal *Environmental Ethics*. Karen Warren and Michael Zimmerman published essays in this journal in 1987, both of which made explicit connections between feminism and deep ecology.

In 1989, Warwick Fox's essay "The Deep Ecology-Ecofeminism Debate and Its Parallels" was published in the journal and followed by a response by Deborah Slicer in 1995 entitled "Is there an ecofeminism-deep ecology 'debate'?" Though the intricacies of the discussion cannot be expanded here, recognition of this on-going tension (i.e. whether or not male-female dualism is the primary lens through which to analyze and critique destructive power relations) is requisite. One interpretation of ecofeminism that shifts this analysis is Val Plumwood's *Feminism and the Mastery of Nature*.

Plumwood's central relational model for abusive western power structures is master-slave rather than male-female.

Another area of ecofeminism that needs to be addressed is the connection with animal rights activism, as noted previously. Adams has made explicit links between androcentric, patriarchal treatment of other-than-human animals, particularly focusing on the meat producing industries of the United States, and the exploitation of women. Her study, *The Sexual Politics of Meat*, provides the foundation for this field of inquiry. Greta Gaard's anthology *Ecofeminism: Women, Animals, Nature* includes several essays that analyze the mutual oppressions of women and non-human animals in patriarchal societies. A prominent activist presence in this field is the organization *Feminists for Animal Rights* whose co-founder, Marti Kheel, is also recognized as a leading ecofeminist voice. Stange, however, suggests that the linkages between woman and other animals sometimes made by ecofeminists could justify continued essentialism and, therefore, continued domination of both women and other animals. Thus she claims that the woman-animal connection should be reevaluated.

Self-assessment question
Why is ecofeminism criticized as being essentialist in nature?

10.5 Women and Environment: Why Environment Makes a Special Concern for Women?

Environment is a macro concept that covers everything, living and non living objects, the interactions between these and the product of these interactions (Hassan, 1995). Environment is usually defined as the system of biological and physical resources and their processes of interaction that affect lives and livelihoods. However, these biophysical systems are also in constant interaction with human and social systems that live in them (Alam 1999, Ahmad, 1995). The concept of environment has numerous definitions. When the definitions of the environment were made there was a special emphasis on the relationship between people and environment.

The relationship between people and the environment is not gender-neutral became clear in the mid-1980s. Some organizations, focusing on the day-to-day lives of communities, argued that the position and concerns of women were invisible in environmental debates and programmes. The Centre for Science and Environment (CSE), based in New Delhi, India, in their *The State of India's Environment Report* – or the *Second Citizens Report of 1984-1985* argued that:

Probably no other group is more affected by environmental destruction than poor village women. Every dawn brings with it a long march in search of fuel, fodder and water. It does not matter if the women are old, young or pregnant: crucial household needs have to be met day after weary day. As ecological conditions worsen, the long march becomes even longer and more tiresome. Caught between poverty and environmental destruction, poor rural women in India could well be reaching the limits of physical endurance. (CSE 1985)

In that same year of 1985, the second UN Decade for Women Conference was held in Nairobi, Kenya. The Environment Liaison Centre (presently the Environment Liaison Centre International or ELCI) organized a series of workshops on women, environment and development at the NGO Forum. These workshops were aimed at developing a better understanding of the relationship between women

and the physical environment. More than 25 women leaders from all parts of the world – with an audience of women and men many times more – presented their local and regional case studies on women and the global environmental crisis, as well as on women and forests, energy, agriculture, and water management at local level.

One of the main conclusions from the workshops was that women bear the highest costs of the environmental crisis because of their roles in providing water, food and energy at family and community levels. On the other hand, it was shown that women could potentially also make a large contribution to the solution of the crisis, precisely due to their role in the management of those primary resources. The increase in women's power and the sustainability of development are ecologically tied. It is therefore imperative that women are enabled to participate and be involved at all levels of development planning throughout the industrialized and developing worlds, according to the ELC statement to the UN Women's Conference in 1985.

Considering the concept "Women and Environment" from a gender perspective, three main issues can be distinguished:

- i) Women as parties affecting environment;
- ii) Women as parties affected by environment;
- iii) Under-representation of women in policy development and decision-making processes pertaining to environment.

Women particularly those living in rural areas or mountain areas have special relationship with the environment. All women have relationship with environment but the approach is different from Urban Areas. They are more close to the nature than men and this very close relationship makes them perfect managers of an eco-system. The life of mountain women is so much intertwined with the environment that whole ecosystem revolves around her and she can't even think of her survival without it. For her forest is her mother's home as she is entirely dependent on the forest to meet her daily needs such as - water, fodder, fuels, minor forest product etc.

As users, women have direct contact with the natural environment as they collect essential items like fruits, vegetables, medicinal herbs, fuel wood, fodder, water etc. for their every day needs. As forest products provide the basic needs of the family, women have a close relationship with the forest and trees. Water collecting and carrying fall exclusively within the domain of women and girls. They are responsible for collecting water and for controlling its use. It is the women who have the knowledge of the location, reliability and quality of the local water resources. Women are in close contact with nature not only as users or consumers but also as producers and managers of environmental resources.

As farmers, women produce foods and agricultural products. Their tasks in agriculture and animal husbandry as well as in the household make them daily managers of the living environment (Ahmad, 1995:18). Women particularly rural and indigenous women play a major role in managing natural resources _ soil, water, forests and energy_ as they have profound knowledge of the plants, animals and ecological processes around them.

Women's work responsibilities include managing the most basic and natural of all resources— food, fuel and water. When natural resources were abundant, women did not have to work so hard. But now with the depletion of resources, women with limited access to resources are required to manage. Through management of natural resources women provide sustenance to their families and communities. So, they are more concerned about environmental degradation than men as they are responsible for the well — being of their families. Whereas men consider the forest in terms of commercial possibilities, women see it as a source of basic domestic needs. They are fully aware that their livelihood and family welfare is linked to the potential of sustainable resource base and therefore,

environment is to be conserved to meet their long — term needs (Khan, 1995). Poor women often have no choice but to exploit natural resources in order to survive, even though they may have knowledge to promote sustainability (Dankelman and Davidson, 1988, Ahmad, 1995).

10.6 Role of Women in Conservation of Environment

Traditionally, women have been responsible for subsistence and survival for water, food, fuel, fodder and habitat, though they rarely get the credit for nurturing these life support systems. Added to these environmental destruction, exacerbates women's problems in a way very difficult from that of men. The challenge is to re-establish the symbiosis between communities, women and natural resources and reverse the trend of the negative impact of existing developmental paradigms.

Women have always been the principal conservers of bio-diversity. Even today they perform duties such as seed selection, multiplication and conservation. The on-farm conservation traditions of rural and tribal women, with reference to agro-biodiversity are well known. Unfortunately, current food security systems depend on too few crops. It is important to expand the basis of food security by including large numbers of species and varieties of food plants still maintained by tribal and rural families.

Traditionally, women have dealt with non-monetized biomass based subsistence economy of the household i.e. firewood, cow dung, crop wastes, organic manure, etc. In comparison men tend to destroy nature to earn cash even if it means creating hardship in their own families for their womenfolk to collect fuel and fodder e.g. sale of herbs and wood. The upshot is that women work as unpaid labourers on family farms with a greater role than men in operational decision making. The population pressure has increased male migration, which in turn adds to the women's work load. In effect this means that women's responsibilities extend from the household duties to working in the fields as well .

In developing areas of the world, women are considered the primary users of natural resources (Land, Forest and water), because they are the ones who are responsible for gathering food, fuel and fodder. Although in these countries, women mostly can't own the land and farms outright, they are the ones who spend most of their time working on the farms to feed the household. Shouldering this responsibility leads them to learn more about soil, plants, and trees and not misuse them. Although, technological inputs increase male involvement with land, many of them leave the farm to go to cities to find jobs; so women become increasingly responsible for an increasing portion of farm tasks. These rural women tend to have a closer relationship with land and other natural resources, which promotes a new culture of respectful use and preservation of natural resources and the environment, ensuring that the following generations can meet their needs. Besides considering how to achieve appropriate agricultural production and human nutrition, women want to secure access to the land. Women's perspectives and values for the environment are somewhat different than men's. Women give greater priority to protection of and improving the capacity of nature, maintaining farming lands, and caring for nature and environment's future. Repeated studies have shown that women have a stake in environment and this stake is reflected in the degree to which they care about natural resources. Ecofeminism refers to women's and feminist perspectives on the environment - where the domination an exploitation of women, of poorly resourced peoples and of nature is at the heart of the ecofeminist movement.

Today, women struggle against alarming global trends, but they are working together to effect change. By establishing domestic and international non-governmental organizations, many women have recognized themselves and acknowledge to the world that they not only have the right to participate in environmental dilemmas but they have different relationship with environment including different needs, responsibilities, and knowledge about natural resources. This is why women are affected differently than men by environmental degradation, deforestation, pollution and over pollution.

Women are often the most directly affected by environmental issues, so they become more concerned about environmental problems.

The processes at international and national levels cause over-consumption, it is poor women in developing countries who bear the heaviest burden of environmental degradation (e.g. Dankelman & Davidson 1988). These women typically lack *access to essential resources* but at the same time they are responsible for food, fuel and safe water supply. Environmental loss and degradation considerably increase women's workloads in obtaining these essential resources. This increased pressure also places heavy emotional and psychological burdens on women and family relationships. The increase in time and energy required to carry out essential tasks further limits women's development opportunities means they can dedicate significantly less of resources toward educational and income generating activities. Lack of access to modern cooking and heating technologies can also force women into unsustainable use of natural resources.

In developing countries, women are responsible for supplying freshwater for the household and agricultural activities of their families and communities, as a result of traditional gender roles. The impact of increasing freshwater scarcity has obliged women and girls to travel longer distances and spend many hours waiting to fill their water buckets. Since reproductive tasks go hand in hand with family health care, women also take the necessary environmental control measures to deal with water-borne diseases (e.g. boiling or chlorinating water). Women deal with utilising and conserving water resources on a daily basis and have considerable expertise and experience regarding water management. Despite this, in many cases, women are not in control nor participate in decision-making structures relating to water systems. Environmental policies and programmes in areas such as freshwater resources management have differential gender impacts. In addition, contaminated water has resulted in reproductive health problems including birth defects and lack of food for women and their families, particularly affecting poor women living in under-serviced urban areas. UNICEF water-related programmes involving women have achieved positive health results. The neglect of the sanitation needs of young female students leads to girls dropping out from school.

Studies have shown the direct effects of chemicals and pesticides on human health. According to United Nations Chronicle journal researchers have found an association between breast cancer and the pesticide DDT and its derivative DDE; and also one study by the World Health Organization has found that women who are exposed to pesticides face a higher risk of abortion. Charkiewicz (1998) argues that because of the unequal gender division of labour, some policies that promote environmental sustainability may increase the already heavy workloads of women. The promotion of sustainable activities such as labour-intensive organic agriculture, reforestation, household recycling and segregation of waste create additional demands on the time of women. These kinds of health problems cause women to feel more responsible regarding environmental issues.

10.7 Involvement of Women in Environmental Sustainability

The environmental degradation caused while men have had dominance over women, and women's large investment in environmental sustainability, some have theorized that women would protect the Earth better than men if in power. It is maintained that women are the most affected by the energy crisis, and that they should therefore be considered as being the best placed to tackle and resolve this crisis (Dankelman, 1985). With this approach, the focus is on the special characteristics of women as "custodians of the environment", while at the same time they are regarded as the "most valuable resource, and the most neglected one" (Linggard and Moberg, 1990). It is this that provides the rationale for giving them particular consideration in environmental projects and programmes, since they are an important "instrument" of environmental protection in view of the different forms of

organization that they have developed to respond to environmental change, and of the successful experiments they have carried out (Dankelman and Davidson, 1989).

This way of looking at women, although it values the roles they play, reflects a viewpoint that takes account neither of the way social roles are determined in terms of gender and ideology, nor of the fact that “just as it is not they who are responsible for the world environmental crisis, so it is neither feasible nor realistic to expect them to resolve it on their own” (Sen and Grown, 1988). At the same time it ignores two realities:

- (i) Poor women in developing countries are too heavily exploited and overworked, with the negative impact on their health, the amount of time available to them and their powers of self-determination as people that this entails, for a new responsibility to be given to them without new opportunities to improve their quality of life,
- (ii) the subordinate position that women occupy in our society, because of the system of power that regulates gender relationships. Specifically, to focus exclusively on the roles that women play sidelines the issues of power, the way these roles are regulated and the value that society puts on them, in other words the obstacles that they face in seeking to participate actively in decision-making processes that relate to the handling and management of environmental resources.

This position also leads to the inclusion of a “women’s component” in environmental programmes, or to work being carried out exclusively with women, this being in keeping with the theory that the problems of women can be isolated and addressed in a particular way. Here are some examples which show how women could bring about change.

In 1989 in the United Kingdom, the Women's Environmental Network (WEN) launched its "Wrapping is a Rip Off!" campaign on food packaging and persuaded supermarkets to reduce, reuse and recycle packaging. WEN forced Stora, one of the biggest forest owners, to abandon plans to cut ancient forests in Sweden to make Pampers disposable diapers. WEN also works to expose companies that use false green claims to mislead consumers and is working to make the new European eco labelling scheme effective and honest.

In Russia, women recently led a national campaign to ban nuclear power. Pledging never again to have another Chernobyl, the women organized a referendum to ban the construction of new nuclear power plants throughout the country.

In Venezuela, a woman is leading the non-profit Volunteer Guardians of the Environment Association in Caracas to stop harmful mining practices that destroy the environment. In the United States, women are demanding nutritious food that is free of harmful pesticides, growth hormones and other chemicals. They are also researching and speaking out against the links between environmental pollution and cancer, especially breast cancer.

In Thailand, Tunjai Deetes helped found the Hill Area Development Foundation, which has initiated sustainable development efforts in 28 villages of five tribal groups. As a result of her leadership and dedication, many of the hill tribes have developed into self-reliant communities that now serve as national models in sustainable agriculture and resource conservation.

The Chipko movement is particularly known because of its actions to resist the destruction of their lands and livelihoods since 1974. In that year, the government of Uttar Pradesh (now: Uttarakhand region) in the Himalayan foothills diverted the men of Reni village to a fictional compensation payment site. At the same time labourers disembarked from trucks to start logging activities near the village. Under the leadership of Gaura Devi, a 50-year old illiterate woman, women rushed from their homes to hug the trees ('chipko' means hugging) and prevent them from being cut. A

four-day standoff ended in victory for the villagers. The actions of the women of Reni were repeated in several other places in the region, as hill women demonstrated their power as non-violent activists. (UNEP, GEO-Yearbook 2004/5, p.60; Rawat, 1996)

Another well-known example of women's long-lasting involvement in environment is the Greenbelt Movement, Kenya. Launched on Earth Day 1977 by the National Council of Women, this environmental campaign resulted in the mobilization of thousands of women planting indigenous trees. The Movement has created a national network of 6,000 village nurseries, designed to combat creeping desertification, restore soil health and protect water catchment areas. The 50,000 women members of the Movement have planted about 20 million trees. The movement has always sought to address issues of gender disparities, and food security in combination with environmental protection. The movement's work has spread to other countries through the Pan-African Green Network (Maathai, 2003). As Wangari Maathai, founder of the Green Belt Movement stated, "Implicit in the act of planting trees is a civic education, a strategy to empower people and to give them a sense of taking their destiny into their own hands, removing their fear..."

On the African continent, women are also active in community efforts to safeguard land and water resources. Professor Wangari Maathai, Kenya's first woman Ph.D., has achieved international fame as one of Africa's leading environmentalists. She is the founder and director of the Green Belt Movement in Kenya, a grass-roots organization which, since 1977, has expanded to more than 30 African countries and the United States. Through her organization, more than 20 million trees have been planted in Kenya to combat deforestation and desertification, and more than 1,500 plant nurseries have been established.

In Japan, in the 1950s, the Nakabaru Women's Society and Sanroku Women's Society protested loudly against pollution from industries and power plants in the Tobata region. While industrial development had made the society richer, the environmental destruction began to threaten the health of local citizens. Women started to raise their voices in opposition and organized an increasingly powerful movement. They discussed how to prevent pollution, while holding basic study meetings on pollution and conducting field surveys, collecting scientific knowledge through several years of action. From the authorities and companies, the women claimed the right to live in a safe and healthy environment. This resulted in major pollution prevention measures taken by the local government and corporations. (Kitakyushu Forum on Asian Women, 1995).

10.8 Criticism of Ecofeminism

Ecofeminism has not been without critics, from ecofeminists themselves as well as from others. Some of the most ardent critics question the woman/nature link that is sometimes placed at the core of ecofeminism, as evidenced in the title of such essays as Sherry Ortner's "Is Female to Male as Nature is to Culture?" (1974). Because of the strong woman-nature connection assumed and developed in some ecofeminist positions, various feminists distance themselves from ecofeminism and suggest that it is essentialist in nature. Essentialism claims that cross-culturally and cross-historically those of a particular race, gender or other category share the same traits. Various feminist scholars, such as Cecile Jackson (1993), Janet Biehl (1991), Meera Nanda (1991) and Bina Agarwal (1992) have pointed out, this ecofeminist perspective is "ethnocentric, essentialist, blind to class, ethnicity and other differentiating cleavages, ahistorical and neglects the material sphere" (Jackson 1993, p. 398).

What these arguments seem to overlook is that concepts of nature, culture and gender are "historically and socially constructed and vary across and within cultures and time periods" (Agarwal 1992, p. 123). This essentialism presents women as a homogeneous category, both within countries and across nations. It "fails to differentiate among women by class, race, ethnicity and so on" (Agarwal 1992, p. 122). Ecofeminist essentialism fails to put forward any account of historical change in society.

Critics like Susan Prentice (1998) argue that emphasizing the special relationship of women with nature and politics imply that what men do to the earth is bad, unlike women, thereby ignoring the fact that men too can develop an ethic of caring for nature. It also fails to analyse capitalism and its domination of nature. Hence, it cannot develop an effective strategy for change, since it ends in polarizing the worlds of men and women while essentializing the two categories.

Ecofeminist literature portrays the historical exploitation and domination of women and nature as going hand in hand, and both are seen as victims of development. It is taken as self-evident that any harm to nature harms women equally, since women are seen as closer to nature than men. None of the ecofeminist literature attempts to establish this linkage through concrete evidence or strong argument. It is very anecdotal and takes its position as self-evident. It locates the domination of women and nature mainly in ideology, thereby neglecting the “interrelated material sources of dominance based on economic advantage and political power” (Agarwal 1992, p. 122) as well as the gender division of labor and distribution of opportunity. These ecofeminist images of women, in fact “retain the patriarchal stereotypes of what men expect women to be. “(They)...freeze women as merely caring and nurturing beings instead of expanding the full range of women’s human potentialities and abilities” (Biehl 1991, p. 15). “The use of metaphors of women as ‘nurturing’ – like the earth, and of the earth as female abound are regressive rather than liberating women” (Biehl 1991, pp. 17-19). They only reinforce stereotypes.

According to this ecofeminist view, in the transition to socialist ecology, the priorities of capitalism would be reversed with emphasis on reproduction and nature, rather than production being central. Thus reproduction of life itself becomes the focus of these ecofeminists. This view deals mainly with environmental issues that affect working class women. However, these ecofeminists too tend to essentialize women and perceive them as being closer to nature. Furthermore, they tend to see women as one of the marginalized categories along with the different marginalized races and classes. But in doing so, they homogenize the category of women. They fail to see that the experiences of women differ on the basis of their caste, class, race, and ethnicity and so on. Despite these limitations, the ecofeminists working within the socialist framework have much more potential than the other two ecofeminist perspectives, in analyzing the link between gender and environment.

As ecofeminism continues to shift and grow, different positions will surely form and surface, while other positions and alliances will fade away or be replaced by more urgent connections. Diverse understandings regarding the nature of the web of relationships between various spiritual/religious traditions and ecofeminism could persist.

Ecofeminism and deep ecology may continue wrangling. Issues of racism, population growth and the valuing of some humans over others, or of all humans over other-than-human animals, will stir the thoughts and actions of ecofeminists on a global scale.

10.9 Summary

Ecofeminism is the social movement that regards the oppression of women and nature as interconnected. It is one of the few movements and analyses that actually connects two movements.

For ecofeminists, therefore, the domination of women and nature is basically rooted in ideology. In order to overcome this, one needs to reconstruct and reconceptualize the underlying patriarchal values and structural relations of one’s culture and promote equality, non-violence, non-hierarchical forms of organization to bring about new social forms. According to the ecofeminists, one also needs to realize the inter-connectedness of all life processes and hence revere nature and all life forms. Humans should not try to control nature, but work along with it and must try to move beyond power-based relationships.

This would mean integrating the dualisms on the polarization of the male and the female in one's conception of reality. Importance should also be given, the ecofeminists argue, to the process rather than only to the goal. The personal is political, and hence the female private sphere is just as important and applicable to the male public sphere. One needs to change the patriarchal nature of the system by withdrawing power and energy from patriarchy (Gaard 1993, pp. 16-20).

Ecofeminist theory has brought into sharp focus the links between developments and gender. It has highlighted the fact that the violence against nature and against women is built into the dominant development model.

More recently, ecofeminist theorists have extended their analyses to consider the interconnections between sexism, the domination of nature (including animals), and also racism and social inequalities. Consequently it is now better understood as a movement working against the interconnected oppressions of gender, race, class and nature

Movements all over the world that are dedicated to the continuation of life on earth, like the Chipko movement in India, Anti-Militarist movement in Europe and the US, movement against dumping of hazardous wastes in the US, and Green Belt movement in Kenya, are all labeled as "ecofeminist" movements.

However, the ecofeminists are sometimes criticized for their oversimplification of the process of domination of environment by humans. Because of the strong woman-nature connection assumed and developed in some ecofeminist positions, various feminists distance themselves from ecofeminism and suggest that it is essentialist in nature. Essentialism claims that cross-culturally and cross-historically those of a particular race, gender or other category share the same traits.

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10.12 Model questions

1. Describe the main features and perspectives on Ecofeminism?
2. "Most of the ecofeminists focus on the conquest of nature through development accompanying the exploitation of women" Explain.

PUBLIC INTEREST LITIGATION (PIL) AND JUDICIAL ACTIVISM

Structure

- 11.0 Objectives
- 11.1 Introduction
- 11.2 Concept of Environmental Justice
- 11.3 Environment rights in Constitution of India
- 11.4 Environmental legislation in India
- 11.5 Judicial Activism
- 11.6 Public Interest Litigations
- 11.7 Some cases of Judicial Activism for Environmental Protection
- 11.8 Summary
- 11.9 Further Readings
- 11.10 Model questions

11.0 Objectives

After going through this lesson, you will be able to

- define Judicial Activism, Public Interest Litigation and Environmental Justice,
- understand the significance of PIL by environmental groups
- highlight the role of judiciary in environmental issues

11.1 Introduction

Although numerous legislative steps have been taken to give significant rights to man to live in a sound environment and the corresponding duty has been bestowed on state to ensure environment preservation and conservation, in this lesson an effort has been made to analyze the steps taken by judiciary in this regard. The Indian Constitution is amongst the few in the world that contains specific provisions on environment protection which have been briefly highlighted.

11.2 Concept of Environmental Justice

The concept of Environmental Justice is gaining importance these days. In simple words it means to respect each of the culture, language and beliefs so as to promote economic alternatives which would contribute to the development of environmentally safe livelihood.

Some of the important Principles of Environmental Justice are

- Environmental Justice affirms the sacredness of the mother earth, ecological unity due interdependence of all species and right to be free from ecological destruction.

- Environmental Justice demands that public policy may be based on the mutual respect and justice for all people free from all forms of discrimination and bias.
- Environmental Justice mandates the right to ethical, balanced and responsible use of land and renewable resources in the interest of a sustainable planet for human and other living being.
- Environmental Justice affirms right to political, economic and cultural and environmental self determination of all people.
- Environmental Justice calls for universal protection from nuclear testing, extraction, production and disposal of toxic or hazardous wastes that threaten to fundamental right to clean air, water, land and food.
- Environmental Justice demands cessation of production of all toxics, hazardous waste and radio active materials.
- Environmental Justice affirms the right of all workers to a safe and healthy work environment.
- Environmental justice opposes the destructive operations of Multi National Corporation
- Environmental Justice calls for the present and future generation to take into account the appreciation of the diverse cultural perspectives while handling environmental issues.

11.3 Environmental rights in the Constitution of India

The framers of constitution of India were aware of the need for environmental justice. The constitution of India through its various articles and amendments gives the right to clean environment as well as confers upon the ordinary citizens, the duty to protect and preserve the environment. Some of the important articles in this regard are mentioned below.

Article 47 of Constitution of India reads as follows

The State shall regard the raising of the level of nutrition and standard of living of its people and improvement of public health as among its primary duties.

Article 48 A added to the chapter on Directive Principles of State Policy states

The State shall endeavor to protect and improve the environment and to safeguard the forest and wildlife of the country.

Article 51A (g) of Indian Constitution also lays down

It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures.

Besides the provisions contained in Article 47, 48 and 51A (g) there are provisions of which environmental laws can be enacted by the Indian Parliament. Such provision contained in Part XI of the constitution. Parliament can also enact laws in respect of environmental protection under Art 248, 252 and 253 of the constitution. Article 253 empowers the Parliament for exclusive legislation. Article 258 of the constitution empowers the Union to confer powers on the states in certain matters.

It may also be noticed that there are certain important constitutional provisions which give the citizens the right to approach the High Courts as well as the Supreme Court of India to protect their fundamental rights. Article 226 of the Constitution gives the right to citizens to approach the High Court to enforce their fundamental rights. Article 226 of the Constitution gives the right to citizens to approach the High Court to enforce their fundamental rights and the High Courts are given the power to issue

various writs. Article 32 of the Indian Constitution could be invoked by the citizens for enforcement of rights conferred by Part III of the Constitution, namely, the Fundamental Rights. It is also to be noted that Article 21 of the Constitution guarantees one of the important fundamental right to the citizens and says that no person shall be deprived of his life “right to life” contained in Article 21 has been given a very wide interpretation by the Supreme Court of India.

Self-assessment questions
List the articles in the constitution of India which give the citizens the right to clean environment?

11.4 Environmental Legislation in India

Apart from the rights conferred by the constitution, there are more than two hundred central and state legislations in India which directly or indirectly relate to environmental protection. The earliest being Shore Nuisance (Bombay and Colaba) Act, 1853.

Prior to 1974, the only recourse available to citizens against pollution of any nature was under the provision of the Indian Penal Code, Criminal Procedure Code and Civil Procedure Code. However there were nothing in the nature of regulatory or preventive enactments as far as environmental pollution was concerned. All that the law provided for was to proceed under civil or criminal law after the damage to environment took place. It was only in the year 1974 that the Water (Prevention and Control of Pollution) Act 1974 was enacted. Environment Protection Act, 1986 was the first comprehensive legislation with regard to control of environmental pollution

Some of the important environment protection acts in India are

- Wildlife (Protection) Act, 1972
- The Water Prevention and Control of Pollution Act 1974
- The Water Prevention and Control of Pollution Cess Act, 1977
- Forest (Conservation) Act 1980
- The Air (Prevention and Control of Pollution) Act, 1981
- Environment (Protection) Act 1986
- Public Liability Insurance Act, 1991
- National Environment Tribunal Act, 1995

11.5 Judicial Activism

The judicial activism is a moving spirit, which makes the judges more conscious and concerned about the unusual things taking place in society. Judicial Activism is nothing more than a description of performance of duty consistently with the needs of the time, by the time; by the judiciary and the judges who are active, and within the parameters of constitution and laws. While doing so they exercise to brim their constitutional jurisdiction in large public interest and with innovation as they are convince that

nothing lesser will serve the public purpose. It also can perhaps be described as a must for any court to be known as a court of justice, substantial justice and speedy justice.

'Judicial activism is the assumption of an active role on the part of the judiciary'. Justice J S Verma believes that judicial activism essentially mean the active process of implementation of the rule of law, necessary for the preservation of fundamental democracy. It is also explored as to how justice to the individual or group of individuals or to the society in general is ensured through active participation of court, particularly as against public agencies

The Judiciary is looked upon today, perhaps more than ever before, for removal of the maladies in public life. One reason may be the general disenchantment of people for the other limbs of government. While the Legislature and Executive in a parliamentary form of government are exposed to the pulls and pressures of the electoral forces, the judiciary well performs the given work of holding the scales of justice even and aloft.

The term 'judicial activism' as an ideology is also a matter to be considered in the domain of cultural matrix. The socio-legal imbrications generally come to suppress the voices and hence the retaliatory attitudes of people (who have been delayed or denied of justice) rupture the fabric of social system. Therefore addressing social justice is the demand of the hour which gets reflected in the form of judicial activism in order to strengthen the system.

Judicial Activism in India

Judiciary is the custodian of the Constitution of India. An independent judicial system is perhaps better than any other institution to maintain the perfect equilibrium between the liberty of the individual and the power of the State. The independence of the Judiciary is the "live wire" of our Judicial System. The judiciary under our Constitutional scheme has been performing creative and positive function in protecting and promoting human rights to the people.

Judicial activism has made a number of salutary, wholesome and beneficial effects on the public administration to make it effective and participative. But one must not be overenthusiastic in thinking that courts can remedy all the ills in public life.

The delayed justice, to some extent, goes hand in hand with growing sense of dissatisfaction. The growing sense of apathy becomes acute when the grievances are not redressed. This has imperceptibly been noticed not only in the Indian social life but also the common life of world civilization, at large. For example, 'the PIL bench of the AP High Court voiced dissatisfaction at the undue delay by the state government in constituting the AP Minorities Welfare Commission and appointing its chairman. The bench of Chief Justice Madan B Lokur and Justice PV Sanjay Kumar directed that the file relating to the appointment be placed before it.

Within the Supreme Court some judges started questioning the limited understanding of the spirit and philosophy of the Constitution. They expressed that along with fundamental rights, democracy and social justice were also the hallmarks of the Constitution. And if these principles are integrated parts of the Constitution, then the courts, which are the protectors of the Constitution, must also be the participants in the process of the implementation of the directive principles and democratic norms. This realization gave rise not only to a new judicial activism in its positive sense as also processes of reforms in the judicial system. The significant outcomes of these developments were the systems of Public Interest Litigation, Lok Adalats and Legal Aid.

In a series of path-breaking judgments, e.g. S.F. Gupta v. Union of India, the Supreme Court of India, through public interest litigation, has granted access to persons inspired by public interest to invite judicial intervention against abuse of power or misuse of power or inaction of the government. It was 'locus standi' liberalized to facilitate access.

Majority of the cases had witnessed gross and callous failure or neglect on the part of public functionaries or administrative authorities in the discharging of their public duties. The Supreme Court of India has come to the rescue of grossly under-paid workers, bonded labour, prisoners, pavement dwellers, under-trial detenues, inmates of protection homes, victims of Bhopal gas disaster and so on.

Thus, the Supreme Court recognizes the need for development and proper utilization of our natural resources for the betterment of our society. However, this cannot be done at the expense of the environment itself. The courts in India have played a dynamic role in preserving the environment and eco-system. In a series of cases, the superior courts of India issued various directions and orders to prevent the environmental degradation. To understand the role of the courts in this regard, the structure of the judicial system and also the constitutional and statutory provisions are to be taken note of.

Self-assessment Question
What do you understand by Judicial Activism?

11.6 The Public Interest Litigation

Public Interest Litigation seems to be that judicial therapy intended to achieve cure of several social evils which remained in the society in spite of efforts of social reformers, parliamentarians and the rulers. Since it is claimed that this therapy has worked well and has developed the judicial process as an arm of the social revolution, it is necessary to study the thrust of this therapy in this part.

The wide spectrum should also reveal that the judicial process is potent enough to redress wrongs not only of individual citizens, but also deal with those that affect the humanity, directly or indirectly. It should also show that judicial process has never been used for so many and varied social purposes and so successfully. Some of the operational areas easily identifiable are as follows: State of prisoners, Workers, Environmental concerns, judicial concern for public health, Political persecution and corruption in high offices, Improvement in railway facilities and safety, Inter-country adoption of children etc.

Why public interest litigation

Public interest litigation is important because of several factors. Important among these are:

In most developing countries, the legal regime of environmental laws is weak and the laws are difficult to enforce and sometimes ambiguous. Public interest litigation has helped bridge this gap.

Public interest litigation is important where the government is not willing to promote/protect the environment. The government may not be willing to prosecute those who violate environmental laws and at times the government is a violator of environmental laws. In some jurisdictions an injunction can be brought to compel or stop the government from degrading the environment.

In most developing countries governments lack resources to prosecute and investigate all the criminal cases that take place within its jurisdiction. Public interest litigation enables individuals to bring action on behalf of the community, a role the government may not play.

Where criminal remedies are not enough, e.g. a fine may be too small compared to the amount of environmental degradation. A civil suit is well suited for orders such as restitution and compensation which may not be provided for by criminal laws of a country.

Where criminal remedies are not enforceable, e.g. where a crime is committed by a company and yet the punishment for the crime is imprisonment, it becomes hard to punish the company.

Use of PIL in India

Prior to 1980s, only the aggrieved party could personally knock the doors of justice and seek remedy for his grievance and any other person who was not personally affected could not do so as a proxy for the victim or the aggrieved party. But around 1980, the Indian legal system, particularly the field of environmental law, underwent a sea change in terms of discarding its moribund approach and instead, charting out new horizons of social justice. This period was characterized by not only administrative and legislative activism but also judicial activism.

Till 1980, not much contribution was made by the courts in preserving the environment. One of the earliest cases which came to the Supreme Court of India was *Municipal Council, Ratlam, vs Vardhichand* AIR 1980 SC 1622. Ratlam is a city in the State of Madhya Pradesh in India. Some of the residents of the municipality filed a complaint before the Sub-Divisional Magistrate alleging that the municipality is not constructing proper drains and there is stench and stink caused by the exertion by nearby slum-dwellers and that there was nuisance to the petitioners. The Sub-Divisional Magistrate directed the municipality to prepare a plan with six months to remove the nuisance. The order passed by the SDM was approved by the High Court. The Municipality came in appeal before the Supreme Court of India and contended that it did not have sufficient funds to carry out the work directed by the SDM. The Supreme Court of India gave directions to the Municipality to comply with the directions and said that paucity of funds shall not be a defence to carry out the basic duties by the local authorities.

Thereafter, series of cases were filled before the Supreme Court and there was a dynamic change in the whole approach of the courts in matters concerning environment.

The Supreme Court of India interpreted Article 21 which guarantees the fundamental right to life and personal liberty, to include the right to a wholesome environment and held that a litigant may assert his or her right to a healthy environment against the State by a writ petition to the Supreme Court or a High Court. The powers of a High Court under Article 226 or those of the Supreme Court under Article 32 are not confined to the prerogative writs derived from English law, but extended to directions or orders or writs in the nature of habeas corpus, mandamus, prohibition, quo warranto and certiorari. The term "writs in the nature of" widened the court's discretionary powers in granting relief by releasing Indian courts from the procedural technicalities that govern procedures and rules in English law.

The courts are empowered to give declaratory relief, issue an injunction or quash an action without recourse to specific writs and this enabled the courts in choosing proper relief and the court can issue a writ, a mandamus to command action by a public authority when an authority is vested with power and wrongfully refuses to exercise, to undo what has been done in contravention of a statute. Writs could be issued against an administrative, judicial or quasi-judicial authority. An applicant seeking a mandamus must show the duty sought to be enforced is a public duty, a duty created under the constitution, a statute or some rule of common law and that duty is mandatory and not discretionary. The broad language used in Article 32 and 226 of the Constitution enables the courts to fashion relief and pass orders consistent with their own assessment of the public interest and principles of equity.

By the second half of 1970s, the public interest litigation become a model litigation relaxing the standard of standing. The public interest litigation altered the landscape and the role of the higher judiciary in India. The Supreme Court and the High Court dealt with series of public grievances or

flagrant human right violations by the State. In a public interest case, the subject matter of litigation is typically a grievance against the violation of basic human rights of the poor and helpless and the petitioner seeks to champion a public cause for the benefit of all society.

The above decisions enlarged the scope of the litigation and a large number of cases came to the Supreme Court of India to protect and preserve the ecology and environment. It is interesting to note some of the decisions of the Supreme Court of India which gave various directions to help protect the environment from further degradation. But for the directions by the Supreme Court in these cases, there would have been large scale deforestation and the air and water would have been polluted to such a role played by the Supreme Court of India in protecting the environment can be glanced through some of its decisions.

Mr. M.C. Mehta, a lawyer practicing in the Supreme Court filed series of public interest litigations. One such case concerned shifting of caustic chlorine and sulphuric acid plants located in a thickly populated area in Delhi. From that very plant, oleum gas leaked out and it caused some panic among the neighbourhood residents. The court expanded the scope of Article 32 and said that in appropriate cases the court can award compensation to the affected party. The court also said that where an enterprise is engaged in a hazardous or inherently dangerous activity and harm results to anyone on account of an accident in the operation of such hazardous or inherently dangerous activity, the enterprise is strictly and absolutely liable to compensate all those who are affected by the accident and such liability is not subject to any of the exceptions which operate vis-a-vis the tortious principles of strict liability under the Rylands vs Fletcher.

The very some petitioner file series of other public interest litigations concerning vehicular pollution, illegal mining, pollution of Ganga water, pollution of water by tanneries, Taj Mahal. In many of these cases, Expert Committee were constituted and the court acted on these Expert Reports and issued various directions. In the case of Taj Mahal, directions were issued to protect that monument from pollution by air. Vehicular traffic was restricted in that area and directions were issued to clean the structure.

Compensations from environmental damage and personal injury per se has been a mixed bag of results. Historically, compensations have ranged from no compensation or notoriously low compensation to high compensation for limited Implications for transnational corporations damage. There is therefore no thumb rule for deciding the nature of compensation, and expert committees so far are not prudent enough to assess the true value and nature of ecological damage (as in the case of P&O - Vadhavan Port case, 1997). Courts however, in absence of many provisions in the Environmental acts have accommodated these in other acts like Public Liability Insurance Act (1991), Factories Act (1995) and other acts like Town and Country planning acts, Urban development acts and industrial location policies.

Absolute liability is another direction that courts have followed in recent years. The Court may issue a writ of Mandamus compelling the State institutions and agencies to take prompt action. The Court may order the concerned Government agency to provide redressal measures, impose fines and deliver closure notices to polluting industries (as in the West Bengal case, Translocation of industries in Delhi, Kanpur tanneries, etc.) and order government agencies to follow-up on compensation to the aggrieved (as in the H-acid case, Rajasthan). In these cases, TNC affiliates (and their suppliers) also had to face closure or fine.

The National Environmental Tribunal Act, 1995, (NETA) introduced the rule of strict liability and addresses (unlike the Public Insurance Liability Act) large scale accidents and damage involving hazardous wastes and chemicals. NETA does not address everyday problems of pollution, natural

resource depletion, forest degradation, coastal and river zone area infringements and impact of industrial activities on rural communities.

A powerful legal instrument with the community for protecting their environment from projects is the public hearing process. Here the community is empowered to voice their opinion and choose from development options and then reject or accept the proposal. This is an excellent means of educating the public on enviro-legal issues and bring forth the initiative in the people to organise themselves to protect their rights and their environment. Unfortunately, the concept has not taken-off in India, primarily because the public is not sufficiently well informed before hand of such hearings. In January 1994, public hearings were made mandatory under the Environmental Impact Assessment (EIA) Notification (dated 27 January 1994), for the 29 different classes of (hazardous) industries. These industries, according to this notification are required to obtain clearance from the Central government (mainly the Ministry of Environment and Forests) prior to the commencement of work. Environmentalists allege that due to the powerful industry lobby, public hearing on EIAs was made optional in May 1994. Hence there were no public hearings on facing severe criticism; the government in April 1997 amended the EIA notification to make public hearing mandatory on all EIAs of projects.

However, only the Executive Summary report of the project is to be made available to the public. Under this SPCBs were made responsible to release a notice for environmental public hearing and entertain all grievances, comments and suggestions related to the project within thirty days of the notification and hearing conducted within 90 days of the notification. Since only Executive Summary is available to the public, this process is more of a formality as the public has nothing concrete and no meaningful suggestions, objections and comments can be filed.

Though the legal system offers citizens many options to judicial redress, it has done less to address the question of how environmental damage and degradation be identified, assessed, and remedied. The courts despite its often ambiguous decisions have supported the development of a strong public interest movement, often depending upon expert committees for assistance. This has received some flak from critics. According to one, 'some judges appear to be assuming the role of the police and administrator.... Judicial activism is not at all a shining virtue.

What is common with all the above court actions was that they were brought by individuals against a violation or a threat of environmental destruction. This has made public interest litigation part of and partial to environmental protection.

11.7 Some cases of Judicial Activism for Environmental Protection

Of late, the 'Green Bench' of the Supreme Court has delivered some landmark judgements on issues that concern the public at large. Though the immediate economic impacts are large (as in the Translocation of industries (various orders from 1994-1997), and case on Vehicular Pollution, Ganga Pollution or the Taj trapezium), the wide reaching environmental benefits out-run short term economic gains.

In a landmark decision in West Bengal, the Green Bench ordered the closure of 30 large industries, including 9 TNCs, wherein the court enforced the non-exercised Environmental (Protection) Act, 1986, to impose daily fines upon the defaulting companies till they installed pollution abatement equipment. One distinct advantage of injunctive relief is that it gives Courts the freedom to innovate upon their decision depending upon the gravity and specific nature of the case. This enables courts to order prompt remedial measures and suggest broad guidelines to future policy making.

Public interest litigation has been used as an effective tool to control acts of environmental degradation. For example, Smoking was held to be a violation of the right to life of non-smokers in Ramakrishnan and others Vs State of Kerala [AIR 1999 Kerala 385], while in Enviro-Legal Action Vs

Union of India [1996] 2 LRC 226, the Indian supreme court held that uncontrolled pollution of water sources and air by industrial wastes was a threat to right to life.

The Ganga Action Plan

Ganga Pollution Cases are the most significant water pollution cases to date. In 1985, MC Mehta, activists advocate and social worker filed a writ petition under Art 32 of the constitution of India. Among other things, the petition was directed against Kanpur Municipality's failure to prevent water waste from polluting the Ganga. Mehta asked the court to order the Governmental authorities and tanneries at Jajmau near Kanpur to stop polluting Ganga with sewage and trade effluent. The court ordered the tanneries to stop releasing their trade effluents into the river Ganga and directed Kanpur Nagar Mahapalika to construct sufficient number of public latrine and urinals for the use of poor people in order to prevent defecation by them on the open land.

The court also ordered the Kanpur Nagarpalika and police authorities to ensure that dead bodies are not thrown in the River Ganga.

Dehradun Valley Litigation

It is significant as a first case requiring Supreme Court to balance environmental and ecological integrity against industrial demand on forest resources. The case arose from haphazard and dangerous limestone quarrying practices in the Mussorie range of Himalayas. The miners blasted out the hills with dynamites extracting limestone from thousands of acres. The miners also dug deep into the hill sides, an illegal practice which resulted in cave ins and slumping. As a result the hill sides were stripped off vegetation.

In 1983, treated a letter received from the Rural Litigation and Entitlement Kendra an NGO complaining against the environmental degradation as an Article 32 petition, the case developed into a complex litigation as leases of more than 100 mines joined the action engaging the country's top lawyers. The Supreme Court played an activist role in this litigation, essentially conducting a comprehensive environmental review and analysis of the national need for mining operations in the Dehradun Valley. In addition the apex court provided for funding and administrative oversight of Reforesting of the region.

In the Dehradun Valley litigation the court concluded in 1988 that the continued mining in the valley violated the forest (conservation) Act. Moreover, the court went beyond the requirements of the Act to merely conserve forests and issued orders to ensure that the valley be reforested. The court noted that a monitoring committee comprising of central, state and local officials and two public spirited citizens to oversee reforestation, mining activities and all other aspects necessary to bring about normalacy in the doon valley.-

Judicial Activism in the field of environment has been supported in a big way by the lawyers who have worked for the NGOs resorting to public interest litigation. The combination of lawyers and environmental NGOs has succeeded in moving the court in a wide ranging spectrum of cases from closure to limestone quarries, deforestation of the Garhwal Hills, Sariska Sanctuary in Rajasthan and staying the implementation of Tehri Dam and Narmada dam project at some points of their progress.

Self-assessment Question
Give examples of cases where PIL were filed for the environmental protection?

11.8 Summary

The Government of India has developed a policy framework for environmental protection and adopted a number of environmental legislation to meet the challenge of environmental degradation including industrial pollution. But in the Indian political system, environmental laws are distorted or floated by the powerful interests like the industries. They manipulate the government, politicians and bureaucrats or sometimes, the governments and its agencies itself are either dithering or found wanting in taking stern or effective measures in fixing the culprits and stopping the damage caused to the health of the people and quality of environment as a result of neglect of environment laws

It is in this context that as an informed lawyer or citizen, the environmentalist or the aggrieved parties suffering from the non enforcement of such laws approach the courts for their redemption or forcing the non complying interests and the governments to enforce the law. The role of courts in this complex interplay of forces, in the process brings out the systematic aspects of the environmental politics.

The most important feature of the Indian environment law is the role played by public interest litigation (PIL), which has significantly helped redress several social, political and environmental malaises at the grassroots levels. PIL offers litigants with many procedural benefits - it has a wide locus standii, it has non-adversarial proceedings, the court can sponsor assistance in examinations and investigations, public hearing and reviews educate the people, rulings have wide implications on future judgements and policy, and direct and prompt action is taken on the decision.

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11.10 Model Questions

1. What is the role of Judicial Activism in protection of environment in India.
2. Describe the usefulness of Public Interest Litigation in raising the issues concerning environmental protection in India

SUSTAINABLE DEVELOPMENT: TOWARDS A SOUND ENVIRONMENTAL POLICY

Structure

- 12.0 Objectives
- 12.1 Introduction
- 12.2 Need for Sustainable Development
- 12.3 India: Towards a Sound Environmental Policy
- 12.4 Indian legal framework
- 12.5 Summary
- 12.6 Further Readings
- 12.7 Model Question

12.0 Objectives

After reading this lesson you will be able to:

- define sustainable development
- explain the need of sustainable development
- understand India's Stand with regard to environment

12.1 Introduction

There are many definitions of 'sustainable development', but what is most frequently quoted is that formulated by the Brundtland Commission in 1987. According to this definition, "sustainable development" is that pattern of development which "meets the needs of the present without compromising the ability of the future generations to meet their own needs." In addition to emphasizing the intergenerational (and intragenerational) equity, this broad definition also covered two other key concepts. The first is the concept of "needs", especially the needs of the world's poor which are seen to have overriding priority. The second concept is the idea of "limits" on the ability of the environment to meet the present and future needs. The Brundtland Commission also saw sustainable development as a process of change rather than a fixed state of harmony.

Subsequent global conferences on the themes of development and environment, elaborated the principles of sustainable development. Agenda 21 in particular emphasized that broad public participation in decision-making as a fundamental prerequisite for achieving sustainable development which involves integration of environmental and social concerns into all development processes.

The 2002 World Summit on Sustainable Development held in Johannesburg, South Africa further elaborated the definition through its inclusion of "economic development, social development

and environmental protection — at the local, regional and global levels” as the “interdependent and mutually reinforcing pillars of sustainable development”. The 2005 World Summit confirmed the formulation while reaffirming its commitment to achieve the goal of sustainable development to achieve down short-term development targets in areas such as eradication of extreme poverty, hunger and malnutrition, primary education and environmental sustainability. Since the Brundtland report (World Commission on Environment and Development, 1987) first defined ‘sustainable development’, many other definitions have been formulated by various proponents taking advantage of the ‘creative ambiguity’ of the original formulation.

Parris and Kates (2003) have used taxonomy (2x3) to describe the goals in these formulations (Table below)

Table 1.1: Taxonomy of sustainable development goals

What is to be sustained	What is to be developed
Nature <ul style="list-style-type: none"> • Earth • Biodiversity • Ecosystems 	People <ul style="list-style-type: none"> • Child survival • Life expectancy • Education • Equity • Equal opportunity
Life Support <ul style="list-style-type: none"> • Ecosystem Services • Resources • Environment 	Economy <ul style="list-style-type: none"> • Wealth • Productive Sectors • Consumption
Community <ul style="list-style-type: none"> • Culture • Groups • Places 	Society <ul style="list-style-type: none"> • Institutions • Social Capital • States • Regions

Source: T.M. Parris and R.W. Kates, (2003) “Characterizing and Measuring Sustainable Development”, Annual Review of Environment and Resources vol. 28

All these definitions have some combination of development and environment as well as equity; however, there are differences on the emphasis placed on what is to be developed, what is to be sustained and how to link environment with development. “In practice”, to quote Parris and Kates (2003), “groups and institutions tend to acknowledge the many multiple and conflicting objectives to be both sustained and developed but then adopt implicit objective functions that take the forms such as: sustain only, develop mostly, develop only but sustain somewhat, sustain or develop — for favoured objectives.” Similarly, the time period of concern, ambiguously described in the Brundtland definition as “now and in the future” has differed widely, from one generation (when almost everything is sustainable) to forever (when nothing may be sustainable).

The all-inclusiveness of the sustainability concept is both its strength and weakness. It has strength because it is elegant and accommodates all viewpoints in discussion about achieving sustainability. The weakness, on the other hand, arises from the fact that there are obvious contradictions which create difficulties in operationalizing the concept. For instance, when the present generation has difficulties in addressing effectively the more urgent problems of intra-generational equity and unfairness, how can it address the problem of intergenerational justice and equity through its

actions? Again, there are obvious difficulties in reconciling economic growth and sustainability with environmental and social integrity.

Though ambiguous, “sustainable development”, however, is a positive concept that calls for changes in the attitudes and values that are responsible for making the current trends unsustainable. In that sense it represents an ethical position designed for political or public action. In spite of the term’s somewhat oxymoron character (or perhaps because of it) there is a consensus or near-universal agreement that sustainability is a worthwhile goal to be pursued in this diverse and conflict-ridden social context. And it is also generally agreed that in broad terms, sustainable development means economic and social development that endures over the long run.

Increasingly, there is a focus on the multi-dimensional nature of the concept comprising the three pillars: economic, environmental and social. Striving for sustainable development will inevitably involve conflict among economic, environmental and social goals which have to be managed and balanced.

The Brundtland definition of ‘sustainable development’ has some implicit and explicit values; based on these values, a set of guiding principles have evolved over the years in order to meet the needs now and in the future for human, economic and social development within the life support systems of the planet. Although the concept of “needs” or its implications have not been explained in the definition, most discussions “have retained the core ethic of intergenerational equity, emphasizing the current generation’s moral obligation, to ensure that future generations enjoy at least as good a quality of life as the current generation has now” (World Development Report, 2003).

Self-assessment Question
What is Sustainable development?

12.2 Need for Sustainable Development

The (Western) view that nature exists for human use, primarily as a resource rather than as something only to be admired or contemplated for enjoyment, has underlined most of development thinking. In fact, modernisation and belief in progress are defined in terms of human capacities to harness and use nature for mankind’s benefit. At the same time there has been a nagging guilt about the consequences of this use. Even thinking in ancient India represented this approach (and the guilt) as may be seen from the following quotation from the Atharva Veda:

“Oh Earth, whatever we dig out from you must have to be filled up again, and restored as fast as possible. Oh Pure one we do not intend to hit you at your heart of hearts”

The tension, however, increased after intensified environmental damage that has accompanied universal development in the post-World War II years. It has been felt that the development strategies, often actively supported by international and national development institutions, with their focus on industrialization, urbanization and income growth, failed to screen out policies and programmes that harmed the environment, failed to address the problems of poverty and empowerment and failed to sustain local communities and indigenous people. There is increasing concern that by not acting

sustainably, economic progress is being achieved at the expense of such significant damage to natural resources, environment and social justice that future generation will be worse off than the present one.

These failings of traditional economic development served as the impetus for the sustainable development movement world-wide. At the international level, the growing concern about the undesirable effects of the traditional economic development policies started in the early 1970s and was reflected in the deliberations and outcomes of a series of international conferences starting with the United Nations Conference on the Human Settlement held in Stockholm in 1972. This was followed by the World Commission on Environment and Development (the Brundtland Commission) in 1982-1987, the United Nations Conference on Environment and Development (the Earth Summit) in Rio de Janeiro, Brazil in 1992 and the World Summit on Sustainable Development in Johannesburg, South Africa in 2002. These conferences and their reports, in particular the Brundtland Commission Report, the Earth Charter and Agenda 21 of the Rio Conference, defined and framed the imperatives of sustainable development and enunciated various principles and processes to be followed in operationalizing its objectives and principles including changes to be brought about in existing attitudes and values.

12.3 India : Towards a Sound Environmental Policy

In India, the movement in support of environmental concerns and sustainable development really started in the early 1980s, partly influenced by international developments but mainly due to the devastating effects of the Bhopal gas tragedy in 1984.

The Bhopal tragedy was followed by a number of policy statements and legislations in order to meet environmental challenges. Economic reforms and liberalisation introduced in 1991 along with the forces of globalization to which the country was now exposed, no doubt accelerated the pace of Gross Domestic Product (GDP) growth but also raised concerns about inequality, poverty, damage to the environment and natural resources.

India's engagement with the environment predates the Brundtland Report (1987) as evident in several policies and Acts. The National Environment Policy of 2006 acts as a key policy document that lays down the principles for sustainable development. This section discusses policies and programmes under broad categories of the environmental pillar—forestry, biodiversity, pollution control, land degradation, water management, climate change, marine and coastal environment, and clean energy.

Forestry

The forestry sector has seen the most progress in terms of policies initiated. The National Forest Policy (NFP), 1988 made environmental stability and maintenance of ecological balance as its principal aim, as it is vital for sustenance of all life forms. In 1990, the central government outlined and conveyed to state governments a Joint Forest Management (JFM) framework for creating a people's movement through involvement of village committees for the protection, regeneration and development of degraded forest lands. The National Afforestation and Eco-development Board (NAEB) set up in 1992 focuses on afforestation in forest and adjoining lands. A National Forestry Action Programme was launched in 1999, which was a comprehensive strategy and long-term work plan formulated for the next twenty years to address the issues underlying the major problems of the forestry sector in line with NFP. A National Afforestation Programme (NAfP) was launched in 2002, which involves plantation in degraded forests of the country. In February 2011, India's Prime Minister approved the

National Mission for a Green India, which aims to double India's afforested areas by 2020, adding an additional 10 million hectares. The objective of the mission is to enable forests to absorb 50–60 million tonnes of CO₂ annually, offsetting about six percent of India's annual emissions.

Biodiversity

India's huge and diverse bio geographic resource base supports a great wealth of flora and fauna and about 7–8 percent of the world's recorded plants and animal species are found in India (MoEF, 2010b). India, known for its rich heritage of biological diversity, has so far documented over 91,200 species of animals and 45,500 species of plants in its ten bio-geographic regions (MoEF, 2009). With four global biodiversity hot spots (Eastern Himalaya, Indo-Burma, Western Ghats and Sri Lanka, and Sundaland), India ranks among the top ten species-rich nations with high endemism and socio cultural diversity and uniqueness (ibid). However, the continual degradation of habitats due to degradation of forest, land and water quality has threatened India's biodiversity significantly and this makes India home to nine percent of the world's threatened species (in TERI, 2010). Government has initiated several policy measures and programmes to conserve its biodiversity. The enactment of Biological Diversity Act 2002 has facilitated the establishment of dedicated institutions like National Biodiversity Authority at the national level and the State Biodiversity Boards at state level. India also has a huge network of protected areas spread over different parts of the country to protect the biodiversity. The government has initiated tiger conservation programmes in 1973 and has a network of 39 tiger reserves located across 17 different states. The National Biodiversity Action Plan was formulated in 2008 that entails integration of in situ, on farm and ex-situ conservation along with other measures to augment the natural resource base (MoEF, 2008).

Pollution control

Air: The National Air Quality Monitoring Programme (NAMP) is undertaken in India

- (i) to determine status and trends of ambient air quality;
- (ii) to ascertain the compliance of NAAQS;
- (iii) to identify non-attainment cities;
- (iv) to understand the natural process of cleaning in the atmosphere; and
- (v) to undertake preventive and corrective measures.

Introduction of mass transport, such as the metro and CNG buses in cities is yet another initiative to address air quality concerns. The government has notified emission and effluent standards relevant for 102 categories of processes and industries, which include the 17 categories of highly polluting industries under the Environment (Protection) Act of 1986. The concerned State Pollution Control Boards/ Committees along with Central Pollution Control Board (CPCB) monitor the discharges from these industries.

Water: The National Ganga River Basin Authority (NGRBA) was constituted on 20 February 2009 under Section 3(3) of the Environment (Protection) Act, 1986.

The NGRBA is a planning, financing, monitoring and coordinating body of the centre and the states. In June 2011, Government of India signed an agreement with the World Bank for \$1 billion towards long-term support for cleaning the Ganga River.

Land degradation

The increasing population and competing demand for land has resulted in a significant decline in per-capita availability of land in India. The problem of scarcity is compounded by the widespread degradation of land. The government has initiated a host of measures for arresting further degradation and for development of degraded lands, which are implemented through different Ministries like Agriculture, Rural Development and Environment and Forest. Some of the major schemes are National Watershed Development Project for Rainfed Areas (NWDPA); Soil Conservation in the Catchments of

River Valley Project (RVP) and Flood Prone River (FPR); Reclamation and Development of Alkali and Acid Soil (RADAS), Watershed Development Project in Shifting Cultivation Areas (WDPSCA); Drought Prone Area Programme (DPAP); Integrated Wasteland Development Programme (IWDP); and National Afforestation and Eco-Development Project (NAEP). Apart from these programmes, the Ministry of Environment and Forests has recently notified the Wetlands (Conservation and Management) Rules, 2010 in order to ensure that there is no further degradation of wetlands.

Water management

Integrated Watershed Management Programme (IWMP) is being implemented by the Ministry of Rural Development. This is a comprehensive programme that brings together three different and long existing watershed programmes viz. Drought Prone Areas Programme—DPAP (started in 1973–1974), Desert Development Programme DDP (started in 1977–1978) and Integrated Wasteland Development Programme—IWDP (started in 1989–1990) to be implemented under Common Guidelines on Watershed Development, 2008. The main objectives of the IWMP are to restore the ecological balance at the watershed level by harnessing, conserving and developing degraded natural resources, such as soil, vegetative cover and water.

The National Project for Repair, Renovation and Restoration (RRR) of Water Bodies is implemented by the Ministry of Water Resources, since January 2005. It emphasizes de-silting in terms of quantum of silt to be removed, repair of conveyance system, strengthening of bund(s), repair of weirs and sluices, catchment treatment, command area development, soil erosion prevention works and, quality control measures. The major benefits under this project is creation of additional irrigation potential, increase in agriculture/horticulture/pisciculture production and productivity, increase in recharge of ground water, improvement in water use efficiency, increase in availability of drinking water, impact on water quality, and promotion of tourism and culture.

Climate change

Government has been actively engaged in initiatives that address the issue of global climate change. Twenty four initiatives have been put in place by the Government of India that address climate science and research, policy development and implementation, international cooperation and forest issues. The most significant of these is the National Action Plan on Climate Change (NAPCC) announced in June 2008, which links development and climate change frontally. Eight missions of NAPCC that focus on solar energy, energy efficiency, sustainable habitat, water, sustaining the

Himalayan eco-system, Green India, sustainable agriculture and strategic knowledge for climate care are being implemented by the nodal ministries to address vulnerability to climate change and enhance capacity at central and state levels.

The agriculture sector has seen some efforts to address climate change mitigation and adaptation. The broad mitigation measures include:

- (a) Standardization of fuel-efficient pump sets, rectification of existing pump sets.
- (b) Rationalization of power tariffs and better cultivation practices that would help to reduce emissions.

The broad adaptation measures include:

- (a) Crop improvement: Programmes address technical issues, such as development of arid-land crops and pest management, as well as capacity building of extension workers and NGOs to support better and vulnerability-reducing practices.

- (b) Drought proofing: Programmes seek to minimize the adverse effects of drought on production of crops and livestock, and on productivity of land, water and human resources, so as to ultimately lead to drought proofing of the affected areas. They also aim to promote overall economic development and improve the socio-economic conditions of the resource poor and disadvantaged sections inhabiting the programme areas.

Marine and coastal environment

India with a long coastline of more than 7500 km has marine resources that are spread in the Indian Ocean, which is the Arabian Sea and Bay of Bengal. The Exclusive Economic Zone (EEZ) of the country has an area of more than 2 million sq. km. part of which exists on the west coast, part on the east coast and around the Andaman and Nicobar islands. In order to protect its marine environment, a number of programmes were initiated prior to Rio, which acquired a new significance post 1992. Continuous monitoring of the ongoing projects, acquiring of new technology and implementation of already existing policies are being carried out actively, keeping in view the objectives of Agenda 21.

Clean energy

There have been policies and programmes targeted towards promotion of energy efficiency and renewable energy, which not only address environmental sustainability concerns, but also are able to promote sustainability of economic growth. Some of the specific policies include:

(i) Electricity from renewables: The Electricity Act, 2003, requires State Electricity Regulatory Commissions to specify a percentage of electricity that the electricity distribution companies must procure from renewable sources. Several commissions have operationalized this mandate, and also notified preferential prices for electricity from renewables. This has contributed to acceleration in renewable-electricity capacity addition bringing the total installed renewable capacity to over 11,000 MW. Of this, more than 7,000 MW is based on wind power and India has one of the largest installed wind capacities in the world. The National Hydro Energy Policy has resulted in the accelerated addition of hydropower in India. The Ministry of New and Renewable Energy has initiated several programmes focusing on the utilization of renewable energy sources in buildings.

(ii) Enhancing efficiency of power plants: Coal is the mainstay of India's energy economy, and coal-based power plants account for about two-thirds of the total electric generation installed capacity in the country. In addition, the Electricity Regulatory Commissions are also linking tariffs to efficiency enhancement, thus providing an incentive for renovation and modernization. New plants are being encouraged to adopt more efficient and clean coal technologies, and some plants under construction have adopted the more-efficient supercritical technology for power generation.

(iii) Introduction of labeling programme for appliances: An energy labeling programme for appliances was launched in 2006, and comparative star-based labeling has been introduced for fluorescent tube lights, air conditioners, and distribution transformers. Almost all fluorescent tube lights sold in India, and about two-thirds of the refrigerators and air conditioners are now covered by the labeling programme.

(iv) Energy Conservation Building Code: An Energy Conservation Building Code (ECBC) was launched in May 2007, which addresses the design of new, large commercial buildings to optimize the building's energy demand. The Ministry of Environment and Forests (MoEF) has also instituted the Environmental Impact Assessment (EIA) and clearance policy. This is a mandatory requirement for all buildings with a built up area above 20,000 sq. m. and such projects have to be appraised by the MoEF's Environmental Appraisal Committees (EACs) and the State Environmental Appraisal Committees (SEACs).

(v) Energy audits of large industrial consumers: In March 2007, the conduct of energy audits was made mandatory in large energy-consuming units in selected industrial sectors. These units, notified as 'designated consumers' are also required to employ 'certified energy managers', and report energy consumption and energy conservation data annually.

The Jawaharlal Nehru Solar Mission envisages establishing India as a global leader in solar energy. It sets an ambitious target of 20,000 MW of solar power by the year 2022 (Thirteenth Five-Year Plan) to promote generation of wind energy, generation based incentives are provided. A National Rating System—GRIHA (Green Rating for Integrated Habitat Assessment) has been developed, which is suitable for all types of buildings in different climatic zones of the country. All new government buildings would henceforth mandatorily conform to 3 star or 4 star GRIHA ratings.

12.4 The Indian legal framework

Sustainable development law principles are slowly, but surely, acquiring a certain persuasive force as reflected by the commitment of various nations to implement these in their own jurisdictions. In India, post Stockholm and particularly, post Rio, a plethora of laws has been enacted and implemented pertaining to the three pillars of sustainable development.

The Bhopal disaster of 1984 is a landmark in the evolution of jurisprudence in this regard. The Indian Supreme Court has in a number of cases held that environmental principles enshrined in international conventions and treaties (to which India has acceded) are an intrinsic part of the municipal laws of the country.

While earlier, Indian legal initiatives have focused more on the environment, of late, there have been a number of initiatives that address social and economic issues and a higher level of integration between the different pillars. The legal provisioning on sustainable development in the Indian context can be reviewed in four broad (often overlapping) phases; each characterized by distinct priorities and policy goals. These are as follows.

First phase (1972–1983)

The policy focus of this phase was largely the environment and its protection. Its key highlights are constitutional amendments to protect the environment and the enactment of legislation on wildlife and to arrest pollution of air and water.

The modern legal framework governing the environment in India came largely in the wake of the Stockholm Conference of 1972, which required states to adopt measures to protect and improve the environment. Post Stockholm, the 42nd amendment to the Constitution of India was made in 1976. Through this amendment, Article 48A was incorporated, whereby protection and improvement of the environment and the safeguarding of forests and wildlife became a part of the Directive Principles of State Policy. A Fundamental Duty was thrust upon citizens of the country to 'protect and improve the natural environment, including forest, lakes, rivers and the wildlife, and to have compassion for living. The Articles 48A and 51A (g) mentions that the state as well as the citizens are now under constitutional obligation to conserve, protect and improve the environment, with every generation owing a duty to all succeeding generations to develop and conserve the natural resources of the nation in the best possible way .

In the wake of the Stockholm Declaration, India also enacted primary environmental legislation across a number of important sectors, namely the Wildlife (Protection) Act of 1972, the Water (Prevention and Control of Pollution) Act of 1974, the Water (Prevention and Control of Pollution) Cess Act of 1977, the Forest Conservation Act of 1980, the Air (Prevention and Control of Pollution) Act of 1981. The Wildlife (Protection) Act of 1972 is a comprehensive legislation for the protection of wild

animals, birds and plants and also lays down the law for the setting up of protected areas—sanctuaries, national parks and closed areas.

The Water (Prevention and Control of Pollution) Act, 1974 has as its aim the prevention and control of water pollution and of restoring the wholesomeness of water quality. The Water (Prevention and Control of Pollution) Cess Act of 1997 sought to provide for the levy and collection of a cess on water consumed by persons operating and carrying on certain types of industrial activities.

The Forest Conservation Act 1980 strictly restricts and regulates the dereservation of forests or use of forest land for non-forest purposes without prior approval of central government. The Air (Prevention and Control of Pollution) Act, 1981 provides for the prevention, control and abatement of air pollution and explicitly states in its Preamble that the Act represents an implementation of the decisions taken at Stockholm.

Second phase (1984–1997)

In the aftermath of the Bhopal disaster of 1984, India entered a proactive phase of legal reform and initiatives, targeted towards prevention of recurrence of such an event and better preparedness. The focus still continued to be the environment, but increasingly oriented to issues of social justice and equity. As a response to the Bhopal disaster of 1984, environmental jurisprudence in India reached a new high, owing largely to judicial activism, new interpretation of existing legislation, amendments and procedural laws and new legislation. The Air (Prevention and Control of Pollution) Act, 1981 went through a major amendment in 1987.

A key legislation of this period is the Public Liability Insurance Act, 1991 that has been enacted to provide for immediate relief to persons affected by accidents from handling of notified hazardous substance, on a 'no fault basis'. It is mandatory for industries involved in operation or processes of hazardous substances in quantities notified under the Act to take Public Liability Insurance cover for immediate relief to victims or damage to property, on a scale prescribed in the Schedule to the Act. Also, the National Environment Tribunal Act, 1995 (Repealed) and the National Environment Appellate Authority Act, 1997 (Repealed) were enacted during this time to give effect to the Rio Declaration's call upon States to develop national laws regarding liability and compensation for the victims of pollution and other environmental damages.

These have been subsequently repealed and replaced by the new National Green Tribunal Act of 2010. The Environment (Protection) Act was enacted in 1986 as an umbrella legislation with three fold objectives—

- (i) protection of the environment
- (ii) improvement of environment and
- (iii) prevention of hazards to human beings, other living creatures, plants and property.

The sweep of the Act is very broad, and within the broad framework of this Act, a series of rules, notifications and other secondary legislation have been enacted in a number of areas. The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-Organisms Genetically Engineered Organisms or Cells Rules, 1989 were enacted under the Environment Protection Act. The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 were also notified under the Environment Protection Act, which sought to prevent the re-occurrence of a Bhopal-like disaster by putting rules in place for emergency planning, preparedness and response. Rules formulated under the Environment (Protection) Act also sought to arrest pollution at source, ensure that the polluter pays and involve the public in decision-making. Under the Environment (Protection) Act, the Central Government through a notification in 1991 declared coastal stretches as coastal regulation zone (CRZ) where activities connected with the setting up and expansion of industries, operations or

processes etc. are to be regulated. The Environmental Impact Assessment (EIA) Notification, 1994 under the EPA made an EIA mandatory for 29 different activities, which was earlier necessary only for mega projects undertaken by the government and PSUs. A major amendment to the EIA notification was made in 2006 making an EIA mandatory for environmental clearance for a number of activities and industries and lay down procedure that requires public participation in the process (giving effect to an important Rio principle). There have been a number of amendments to the EIA Notification, 2006 with the latest amendment in 2009. Other important legislation pertaining to the environment includes the Motor Vehicles Act, 1988, which recognizes the need to arrest vehicular pollution. The Bio-Medical Waste (Management and Handling) Rules were notified in 1998. Post Rio, environmental principles, such as precautionary principle, polluter pays principle, public trust law doctrine, inter-generational equity and absolute liability came to be accepted in India as part of Article 21 (Right to Life) in a number of judicial pronouncements by the Supreme Court. Though a large chunk of the legislation governing the environment in India has been enacted prior to Rio, the Supreme Court, in interpreting the provisions, has shown reliance upon the Rio Principles, as well as on the need for careful balancing of the different pillars of sustainable development.

Third phase (1998–2004)

The third phase, coinciding with India's membership of the WTO in 1998, has a strong focus on reconciling the economic with the environment and social imperatives. Legislation enacted post 1998 and amendments to existing legislation, done to achieve compliance with the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) have also sought to incorporate principles of the Convention on Biological Diversity (CBD), such as conservation of bio-resources, access and benefit sharing, rights of indigenous communities, local producers and farmers.

The Biological Diversity Act, 2002 and the Rules framed under it seeks to give effect to the two key principles of the Convention on Biological Diversity: the sovereign right of countries of origin over their genetic and biological resources and the acceptance of the need to share benefits flowing from commercial utilization of biological resources with holders of indigenous knowledge. The Patents (Amendment) Act of 2005 has a provision to prevent misappropriation of indigenous knowledge of communities by making it non patentable. It also mandates disclosure of the geographical origin of biological resources used in the invention. The Protection of Plant Varieties and Farmers' Rights Act, 2001, while seeking to protect the rights of plant breeders, as mandated under TRIPS has, in an innovative fashion, managed to provide 'rights' to the Indian farmer. In fact, it is the only legislation in the world, which accords comprehensive rights (as opposed to concessions or privileges) to the Indian farmer in recognition of his contribution to agro-diversity and plant breeding. The Geographical Indications of Goods (Registration and Protection) Act, 1999 facilitates protection of the collective rights of the rural and indigenous communities in their unique products.

A number of laws have also been enacted in the economic domain. Post liberalization of the Indian economy in the early 1990s, there was recognition of the need to regulate as well as develop foreign trade in India, leading to the Foreign Trade (Development and Regulation) Act, 1992. The Competition Act, 2002 seeks to prevent anti-competitive practices and to promote and sustain competition in markets, to protect the interests of consumers and to ensure freedom of trade carried on by other participants in markets. Reducing fiscal deficit is the goal of the Fiscal Responsibility and Budget Management Act, 2003. Equity and inclusiveness in economic development is the principle governing the Micro, Small and Medium Enterprises Development Act, 2006 designed with the objective to develop these industries as 'engines of inclusive growth and development'.

This phase also continued to be characterized by priority to environmental concerns and saw a number of secondary legislations being framed under the Environment Protection Act, including the

Municipal Solid Wastes (Management and Handling) Rules, 2000; the Recycled Plastics Manufacture and Usage Rules, 1999; the Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000; the Batteries (Management and Handling) Rules, 2001; the Ozone Depleting Substances (Regulation and Control) Rules, 2000; and a series of notifications delegating power to state River Conservation Authorities to deal with water pollution. The Noise Pollution (Regulation and Control) Rules, 2000 were notified under the Environment (Protection) Act.

Recognizing the need for efficient use of energy and its conservation, the Energy Conservation Act, 2001 was enacted, which provided for the setting up of the Bureau of Energy Efficiency, with the primary objective of reducing energy intensity of the Indian economy. The Electricity Act of 2003 has tried to ensure better coordinate development of the power sector in India, seeking, among other objectives, to promote efficient and environmentally benign policies. It also contains key provisions relating to renewable energy. This phase also saw a balancing of the needs of forests and development, with compensatory afforestation (CA) being an important mechanism to compensate for forests cleared for development purposes. The Compensatory Afforestation Fund comprises all the funds mentioned above, unspent balance of the same with state governments, net present value and other money recoverable pursuant to SC orders.

Fourth phase (2005 and beyond)

This phase is characterized by a marked pro-active rights based approach to social welfare, justice and equity and a high degree of integration between the different pillars of sustainable development. Post Rio, an active civil society and pro-active government has played a key role in the enactment of landmark legislation, which seeks to establish a legal regime that is socially just and equitable and in certain instances, has even gone beyond Rio principles. These rights based approach gained particular momentum with the enactment of the Right to Information Act in 2005. Even prior to it, commitment to human rights and to ensure justice for all is seen in legislation like the Human Rights Act of 1993, which provides for the constitution of a National Human Rights Commission, State Human Rights Commission in States and Human Rights Courts for better protection of Human Rights. A fairly recent legislation is the Gram Nyayalayas Act, 2009, which has been enacted to provide for the establishment of the Gram Nyayalayas at the grass roots level for the purpose of providing access to justice to the citizens at their doorstep.

Also, there have been a number of enactments, which have sought to provide legal rights to different sections of the society, particularly the marginalized and the disadvantaged and also reconcile the needs of these communities with the imperative for conservation.

The rights of the traditional forest dwellers have been codified in the Forest Rights Act, 2006. Through amendments in 1991, the Wildlife (Protection) Act, 1972, enacted with the objective of protecting wildlife through creation of inviolate protected areas, has sought to provide an exemption for the activities of the Scheduled Tribes dependent upon forests. The amended Wildlife (Protection) Act, 2002 seeks to provide for participatory management of the buffers around the National Parks and Sanctuaries and introduces the concept of 'Community Reserves'. The Panchayats Extension to Scheduled Areas Act, 1996, has sought to facilitate the establishment of a decentralized structure of governance in the Scheduled Areas, conferring radical governance powers to the tribal community. It acknowledges the competence of the Gram Sabha, the formal manifestation of a village community, to safeguard and preserve the traditions and customs of the people, their cultural identity, community resources and the customary mode of dispute resolution.

The Right to Information Act, 2005 enacted with the objective to promote transparency and accountability in the working of public authorities, empowers the ordinary citizen of the country to play an important role in establishing good governance and functional democracy in the country.

The National Rural Employment Guarantee Act, 2005 provides a legal guarantee of a minimum 100 days of wage employment in a financial year to every rural household, whose adult members volunteer to do unskilled manual work, at the minimum wage rate notified for agricultural labour prescribed in the state or else an unemployment allowance. It aims to enhance rural food security and give effect to the fundamental right of the rural poor to life and livelihood.

Commitment to the youth of the country has manifested in the form of legislation like the Right of Children to Free and Compulsory Education Act, 2009 and Commissions for the Protection of Child Rights Act, 2005. Legislation has been enacted to confer legal rights to the vulnerable members of society; the rights of the senior citizen to a dignified old age are the rationale for the Maintenance and Welfare of Parents and Senior Citizens Act, 2007. The rights of the disabled have been protected in India through legislation, primarily the People with Disabilities Act, 1995, which recognizes the right of the disabled to employment and the National Trust Act, 1999, which seeks to set up a national level body to ensure the welfare of the disabled.

This period has also seen a continued focus on the environment with the Environment Impact Assessment Notification of 2006, and the Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008 being notified under the Environment (Protection) Act. E-Waste (Management and Handling) Rules, 2011 have been framed under the EPA, with the objective of ensuring the environmentally sound management of all types of e-waste and to enable the recovery and/or reuse of useful material from e-waste. The National Green Tribunal Act of 2010 seeks to give effect to the promise made at Rio and to provide for the effective and expeditious disposal of cases related to environmental protection, forests and natural resources and provide relief and compensation for damages. The Act lays the framework for the setting up of a dedicated environmental dedicated adjudicatory forum – the National Green Tribunal for the same.

12.5 Summary

Prior to and since the Earth Summit in 1992, India has initiated many policies, schemes and programmes relating to economic growth, social progress and environmental conservation. This policy landscape is still evolving in response to felt needs. Programmes and schemes are revisited as and when required. There has been remarkable progress in Indian legal provisioning on sustainable development; a few challenges continue to exist particularly with respect to implementation. It is well recognized that key to improved implementation is the capacity building and improved financial and technical resourcing of executing agencies. Despite many efforts, India is keenly aware that much more is needed to address the welfare of the poor and increase the ecological sustainability of development activities.

12.6 Further Readings

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12.7 Model Question

Highlight the main features of sustainable development policy.

ENVIRONMENTAL EDUCATION

Structure

- 13.0 Objectives
- 13.1 Introduction
- 13.2 Meaning
- 13.3 History and philosophy of environmental education
- 13.4 Goals and objectives
- 13.5 Guiding principles
- 13.6 Critique
- 13.7 Environmental Education in India
- 13.8 Summary
- 13.9 Further Readings
- 13.10 Model Question

13.0 Objectives

After reading this lesson you will be able to

- describe the meaning of Environment education
- understand the philosophy behind Environment education
- explain the environment education program in India

13.1 Introduction

Environment is more than physical surroundings. It also includes the social environment. People do create as well as get moulded by the environment. Throughout history, mankind's most significant achievements have been gained from his struggle to adjust to his environment and modify it for his well-being. In this process, man has progressed no doubt but at the cost of social, biotic and physical environments because the self-healing character of nature is not infinitely tolerant.

In our present-day civilization, we have witnessed environmental problems arising out of over population, depletion of natural resources, food shortages, sprawling cities and metropolises and the resultant pollution. It is therefore required a holistic effort to solve these issues. Environmental education is one such step in this regard.

13.2 Meaning

Environmental education has been defined in a number of ways. However, since the early 1970s, they have all tended to emphasize similar points to those in the Nevada Conference of the International Union for the Conservation of Nature and National Resources in 1970. Environmental

education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulating of a code of behavior about issues concerning environmental quality.

In the seminar on environmental education organized by the Finnish National Commission for Unesco at Jammi in 1974, it was defined as ‘... a way of implementing the goal of environmental protection. Environmental education is not a separate branch of science or subject of study. It should be carried out according to the principle of lifelong integral education’.

Proceedings of the Organization of American States Conference on Education and Environment in the Americas, 1971, stated: Environmental education involves teaching about value judgements and the ability to think clearly about complex problems - about the environment which are as political, economical, and philosophical as they are technical.

In the United States Public Law 91-516 the Environmental Education Act states environmental education as:

The educational process dealing with man’s relationship with his natural and man-made surroundings, and including the relation of population, pollution, resources allocation and depletion, conservation, transportation, technology and urban and rural planning to the total human environment.

In summary environmental education is an action process related to the work of almost all subject areas. It is concerned with the dynamic relationships between man and nature. It aims at improving the environmental quality.

Self-assessment Question
Define Environment Education?

13.3 History and philosophy of environmental education

Man has been an inseparable part of the environment ever since his appearance on the earth, which was itself an outcome of environmental processes. In the beginning, limited needs of primitive men did not disturb the harmony of nature since the amount and quality of damages to the environment were insignificant. Growth of human population, its various needs and scientific and technological advancements, accelerated and the pace of environmental degradation. Diminishing forests, loss of fertile soil due to salinization, soil erosion and urbanization, industrialization, depletion of mineral and power resources, extinction of several living species, and growing pollution are some of the examples which have led to present-day environmental crises. This only suggests that man has a careless attitude towards the environment.

Environmental degradation if not checked in time, will endanger the existence of the human being itself. Need of the hour is to have environmentally conscious citizens, who are concerned for saving the environment from disasters. It might happen only when people are knowledgeable about their environment and associated problems; are aware of the solutions to these problems and are motivated to work for that. This naturally means change in the attitude and behaviour of the public.

Education has always played a crucial role in the society because it disseminates knowledge, provides necessary skills and helps in forming certain attitudes. Hence, the Stockholm Conference on Human Environment in 1972 emphasized the need for an environmentally oriented education system which would resolve the environmental crisis by preparing environmentally conscious citizens.

Hence, environmental education is not a new discipline but a new dimension in the education system. However, this concept emerged only in the 1970s. Earlier, environment formed part of formal and non-formal education no doubt but it was never treated as a whole. Different aspects of environment constituted parts of different disciplines e.g. biology, geography, economics and others and thus were dealt with in isolation. Gradually, man's intervention in the environment increased. This caused concern among some people who realized the changes therein.

A new movement concerning conservation of resources and ecological studies initiated some deep-rooted thinking on man-environment interrelationships. Environmental degradation in terms of undesirable impacts of technology and economic activity became a matter of international concern by the end of the 1960s. Developed countries had already started experiencing the results of human exploitation of the environment.

Developing countries were interested in making best possible use of the environment for their developmental activities.

The Stockholm Conference

Worldwide growing concern regarding the need to do something about the conservation and improvement of the environment for mankind, prompted the United Nations to convene a conference on human environment in Stockholm between 5 to 16 June 1972. It attracted a large number of participants. Besides the Secretary-General of the United Nations and representatives from Specialized Agencies of the United Nations and other interested organizations, representatives from 113 countries attended this conference. For the first time, countries of the world assembled together to work out a practical plan of action for the benefit of all mankind. The need for a common outlook towards environmental improvement and concerted efforts by all governments and peoples of the world to achieve the goal was stressed. The deliberations of the conference resulted in the Declaration of the United Nations Conference on the Human Environment. It emphasized that the conservation and improvement of the environment for present and future generations was the main goal of the conference. To meet this goal, 12 principles were formulated and new strategies were framed to be incorporated in developmental activities.

Experiences of the developed world helped developing nations in finding a new synthesis between environment and development. The nature of environmental problems is totally different from the developed to the developing world. As such, in any developmental strategy, all environmental factors, including the socio-economic aspects, must form an integral part. Environmental programmes and activities should be designed and implemented with due care.

The conference made 109 recommendations in all, which may broadly be grouped under five important themes:

- (a) environmental aspects of natural resources management;
- (b) planning and management of human settlements for environmental improvement;
- (c) identification of major pollutants and their control;
- (d) educational, socio-cultural and informational aspects of environmental issues; and
- (e) environment and development.

While formulating the action plan, all the recommendations of the conference were categorized under three sections - environmental assessment, environmental management and supporting measurements e.g. education and training programmes, financial and technical assistance.

As per the decision of the conference, the United Nations Environment Programme Headquarters was established in Nairobi. It was structured on the pattern worked out by the conference. An environment fund was started to assist the financing of environmental projects to which member countries contributed voluntarily.

The Stockholm Conference also initiated the idea of observing World Environment Day on 5 June every year. This was meant for creating awareness among people through organization of various activities concerning the environment.

As stated earlier, even the concept of environmental education emerged from this conference. United Nations agencies were requested to organize 'formal' and 'mass' environmental education programmes at the global level. Recommendations 95-101 of the conference emphasized the need for environmental education since it was realized that it would help every individual to acquire the essential knowledge and skills and would develop proper attitudes and commitment to improve the environmental quality. The United Nations Conference on the Human Environment thus provided an impetus for promoting interest in environmental education during the 1970s.

The Unesco-UNEP International Environmental Education Programme (IEEP)

In response to Recommendation 96 of the Stockholm Conference, Unesco and UNEP launched an International Environmental Education Programme (IEEP) in 1975 which aimed at promoting exchange of information and experiences, research and experimentation, training of personnel, curricula and materials development, and international co-operation in the field of environmental education.

-As a part of the activities of IEEP, an international workshop on environmental education was held at Belgrade in 1975. The Belgrade Charter proposed a number of guiding principles of environmental education programmes. The Charter also stressed that environmental education should:

- be a continuous lifelong process;
- be interdisciplinary in approach;
- consider the environment in its totality;
- emphasize active participation in preventing and solving environmental problems;
- examine major environmental issues from a world point of view
- giving due importance to regional differences; and
- promote the value of local, national and international co-operation in the solution of environmental problems (Holdgate, et al., 1982).

The IEEP followed up this workshop by several expert meetings on environmental education in Africa (Brazzaville, 1976), Arab countries (Kuwait, 1976), Asia (Bangkok, 1976), Europe (Helsinki, 1976), Latin America (Bogota, 1976) and North America (Saint Louis, 1976).

The Intergovernmental Conference on Environmental Education

Two years after the 'Belgrade Workshop' the first Intergovernmental Conference on Environmental Education organized by Unesco in co-operation with UNEP was held at Tbilisi, Union of Soviet Socialist Republics, in 1977. It brought together representatives from government as well as non-government agencies and organizations to discuss and recommend appropriate measures to promote environmental education at all levels.

The Tbilisi Conference emphasized the importance of environmental education in the preservation and improvement of the world's environment. Urgent need was felt to properly plan and manage human activities to check the accelerated rate of environmental degradation. For clarifying the role of education and measures to be adopted, the participants were given a common understanding of the nature and causes of environmental problems.

Environmental problems exist in all countries and at all stages of development, but they vary in nature, magnitude and complexity. Environmental problems of developing countries are mostly related to improper modes of development and underdevelopment e.g. poverty, hunger environmental problems rise due to fast development which results in depletion of resources, wastage of resources and pollution.

The Tbilisi Conference reinforced the major goals of environmental education which were to develop awareness and concern among the world population about the ecological, economic, political and social interaction and interdependence in the environment and their problems.

Opportunities were to be provided to the people to acquire the knowledge and skills and to develop proper values and attitudes towards the environment.

The objectives of environmental education, as established by the conference, were to develop the following qualities in individuals and social groups:

- (a) an awareness of the environment and its problems;
- (b) basic knowledge and understanding of the environment and its interrelationship with man;
- (c) social values and attitudes which are in harmony with the environmental quality;
- (d) skills to solve environmental problems.
- (e) ability to evaluate environmental measures and education programmes;
- (f) a sense of responsibility and urgency towards the environment so as to ensure appropriate actions to solve environmental problems.

To meet these objectives, a number of guiding principles were framed for environmental education curriculum developers. These were related to the design and structure of educational content, educational strategies and learning procedures. It was emphasized once again that environmental education should be a forward looking and a continuous lifelong process; consider the environment in its totality; follow a problem-solving interdisciplinary approach; and adopt a world outlook with due regard to regional differences. In acquisition and transfer of learning, practical activities and first-hand experience were to be given due stress.

It was clearly stated that environmental education was not a new discipline but a new dimension in the existing curricula cutting across different disciplines. It should, therefore, form an essential component of all programmes and courses of the existing education system. In content, environmental education should include ecological concept and natural as well as socio-economic aspects of the environment.

The conference outlined strategies for the promotion of environmental education at the national level. The target groups for environmental education included public, professional and scientific groups such as engineers, agriculturalists, administrators, planners and teachers.

The Tbilisi Conference emphasized the pre-service and in-service training of teachers in environmental education. It was further highlighted during the conference that pre-service and in-service training programmes for teachers and educational administrators would enable them to incorporate environmental dimensions effectively into their respective activities. It was necessary to prepare and develop teaching and learning materials which would form the basis of such training programmes. It was also stressed that training should help producing environmental integration skills in the use of interdisciplinary approach and methodology for achieving the objectives of environmental education effectively.

Besides teacher training programmes, dissemination of information through the mass media was also emphasized. For inculcating a sense of responsibility and a spirit of solidarity among nations, need was felt to increase international cooperation in environmental education.

Forty-one specific recommendations of the Tbilisi Conference provided a basic framework for planning, guiding and improving national efforts in environmental education at various levels. This conference was the culminating point of the first phase of the Unesco-UNEP International Environmental Education Programme which exemplifies the efforts being made to meet the objectives of environmental education.

Under this programme, an environmental education newsletter 'Connect' is published quarterly in five languages. In addition, a computerized data base has been established which contains a wide variety of information related to environmental education. A number of pilot projects in different parts of the world are being provided financial and technical assistance under the Unesco-UNEP programme

The decade after the first United Nations Conference on Human Environment in 1972 has witnessed several changes in the state of environmental education and public understanding. Courses were designed from primary levels to tertiary levels. Environmental issues being different in each country necessitated use of varied educational approaches. Environmental awareness and public participation increased especially in rich nations where media played an important role. Public organizations affected the decision-making process in a number of countries (Holdgate, et al., 1982).

13.4 Goals and objectives

The overall goal of environmental education is to generate environmental action so as 'to improve all ecological relationships including the relationship of humanity with nature and people with one another' (Belgrade Charter, 1975).

The Tbilisi Conference elaborated the goals of environmental education as the following:

- (a) to foster clear awareness of, and concern about economic, social, political and ecological interdependence in urban and rural areas;
- (b) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; and
- (c) to create new patterns of behaviour of individuals, groups and society as a whole towards the environment.

Environmental education objectives endorsed at Tbilisi are as follows:

- (a) **awareness:** to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems;

- (b) **knowledge:** to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems;
- (c) **attitude:** to help social groups and individuals acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection,
- (d) **skills:** to help social groups and individuals acquire the skills for identifying and solving environmental problems;
- (e) **participation:** to provide social groups and individuals with an opportunity to be actively involved at all levels in working towards resolution of environmental problems.

Self-assessment Question
What are main highlights Tbilisi Conference?

13.5 Guiding principles

The Tbilisi Conference also stated the guiding principles of environmental education which are as the following:

Environmental education should:

- consider the environment in its totality - natural and built, technological and social (economic political, technological, cultural historical, moral, aesthetic);
- be a continuous lifelong process, beginning at the pre-school level and continuing through all formal and non-formal stages;
- be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
- examine major environmental issues from local, national, regional and international points of view so that students receive insights into environmental conditions in other geographical areas;
- focus on current and potential environmental situations, while taking into account the historical perspective,
- promote the value and necessity of local, national and international cooperation in the prevention and solution of environmental problems;
- explicitly consider environmental aspects in plans for development and growth;
- enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;

- relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age but with special emphasis on environmental sensitivity to the learner's own community in early years;
- help learners discover the symptoms and real causes of environmental problems;
- emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
- utilize diverse learning environments and a broad array of educational approaches to teaching/learning about and from the environment with due stress on practical activities and first-hand experience.

13.6 Critique

Many writers have recognized that environmental education is not achieving its overall aims, let alone its ecopolitical action aims, and have proposed alternative strategies. Proposals have come from both the "red" and "dark green" ends of the ecopolitical green spectrum. The "red" end (so labeled for its neo-Marxist affiliations) includes supporters of a socially critical orientation for environmental education. The "dark green" end includes those whose vision of environmental education is informed by the values of deep ecology. A feminist perspective on environmental education has also been developed which spans the spectrum from "blue" (so named for its conservative affiliations) through "red" to "dark green".

Proponents of environmental education have seen it as a movement which seeks to establish a new social order and promote the values which will hasten this change. As such it is more aligned with the social re-constructionist debate which saw schooling as changing rather than reproducing society. Such a view has continued with the 1987 World Commission on Environment and Development report arguing that the world's teachers have a crucial role to play in helping to bring about the extensive social changes needed for sustainable development to be achieved. The ongoing issues and challenges for the future of environmental education are numerous, but some points are clear.

Firstly, the 'environmental crisis' won't go away. Survey after survey indicates that there is sustained, and generally increasing, community concern about the state of the environment. Environmental groups, industry conflicts and political confrontations over the environment are a constant feature of media reporting. And the scientific community continues to remind us that the environment is in a continuing state of degradation. Whether schools have as their curriculum focus social reproduction or reconstruction, the environment should be looming large in their agenda. There is some general agreement that confronting the environmental crisis requires dramatic changes in people's attitudes and behaviors towards the environment, and that education has a key role in achieving these changes.

Even though there is widespread concern about the state of the environment, and although environmental education has been on the political agenda in many countries. In addition, policies and practices of environmental education have overlooked women through gender blindness, and this is another aspect of its marginalization, as is the silencing of indigenous peoples in the discourses of environmental education. A further problem is the individualistic orientation of much environmental education, which has tended to marginalize the field through its focus on behaviourism and individual agency.

The shift from environmental education to education for sustainable development –2005-2014 is the United Nations Decade of Education for Sustainable Development –has even further confused the identity of environmental education and its placement in the curriculum. While most would argue that

we need 'it', many still argue about what it is and where it can fit into an already overcrowded curriculum.

13.7 Environmental Education in Schools: The Indian Scenario

In India, taking initiative from Stockholm summit 1972, it incorporated environmental concern in the constitution through 42nd Amendment in 1976. Environment has become a priority in policy statements, Plans and Strategies especially after 1980 with the establishment of a full-fledged Ministry of Environment and forests.

Increasing concern on Environmental Education (EE) in India gained its momentum while its importance was recognized by the Government and policy was planned subsequently to introduce EE in schools. It is by now every one's general perception, rightly that, increasing population, unplanned growth of urban areas, ill planned industrialization and misconceived development paradigm have given rise to the contemporary environmental crisis world over.

As most of the environmental problems are development induced as well as unavoidable consequences of livelihood extraction, a lot of phenomena are quite contradictory to the EE we impart in schools. There are certain situations to which we just cannot say "no" instead of the fact that though we know the potential harmful effect of the activity. Thus, a new paradigm of development and environment has to be the order of the day. Environmental education in one or the other form was existed in school curriculum prior to the Honourable Supreme Court of India's directive on 18th December, 2003, to impart EE in educational institutes as a compulsory subject. But the way of imparting EE in school was not similar throughout the country and there was no definite standard too. Several discussions and suggestions had been forwarded, Centre for Environment Education (CEE) was created in recognition of the importance of environmental education in India's overall environment and development strategy. The result of a unique partnership between government and a non-governmental institution, CEE was established as a Centre of Excellence in 1984 by the Ministry of Environment and Forests (MoEF). CEE now works in the field of environment education and action for a wide range of sectors, target groups and geographical areas.

Comprehensive scheme of 'Environmental Education, Awareness and Training' was launched in 1983-84.

Environmental Education, Awareness and Training Scheme

The scheme intends to enhance our understanding about the interactions between human beings and environment. Also, it aims to facilitate the development of skills for environmental protection. The objective of the schemes are as follow:

- To promote environmental awareness among all sections of the society;
- To spread environment education, especially in the non-formal system among different sections of the society;
- To facilitate development of education/training materials and aids in the formal education sector;
- To promote environment education through existing educational/scientific/research institutions;
- To ensure training and manpower development for environment education, awareness and training;
- To encourage non-governmental organizations, mass media and other concerned organizations for promoting awareness about environmental issues among the people at all levels;

- To use different media including films, audio, visual and print, theatre, drama, advertisements, hoarding, posters, seminars, workshops, competitions, meetings etc. for spreading messages concerning environment and awareness; and
- To mobilize people's participation for preservation and conservation of environment.

Central Government recognizes EE as a key to success of overall environmental strategy & decides to help in the setting up of a '**Centre of Excellence**'. These centres promote EE through developing resource material, organizing training/ awareness programmes, builds capacity in the field for sustainable development. These centres play the vital role in setting the pace & the agenda for EE. These centres are- Centre for Environment Education, C.P.R Environmental Education Centre, Centre for Ecological Sciences, Centre for Mining Environment, Salim Ali Centre for Ornithology and Natural History (SACON), Centre for Environmental Management of Degraded Ecosystems, Tropical Botanic Garden and Research Institute, Centre of Excellence in Environmental Economics, Foundation for Revitalisation of Local Health Traditions (FRLHT), Centre for Animals and Environment.

Key programmes/ activities launched under Environmental Education, Awareness and Training scheme over the years are:

National Environment Awareness Campaign (NEAC)

The Ministry of Environment and Forests (MoEF), Government of India started The National Environment Awareness Campaign (NEAC) in 1986 with the aim of creating environmental awareness at all levels of society. It is a multi-media campaign which utilises conventional and nonconventional methods of communication for disseminating environmental messages to a wide range of target groups. Under NEAC, the Ministry provides financial assistance to selected non governmental organizations, education and training institutes, community organizations, etc. to create massive awareness among citizens of India. Diverse target groups ranging from students/youth/teachers to rural and tribal population, women, professionals and the general public are covered under this campaign. The Campaign programmes are basically composed of a spectrum of short duration programmes. The programme is being implemented through 33 designated Regional Resource Agencies (RRAs) for specific states/regions of the country. During 2009-10 total 11,738 organisations have participated in the campaign across the country.

Eco Clubs & National Green Corps (NGC)

'**Eco Clubs**' were constituted by MoEF with objectives to educate school children about their immediate environment and impart knowledge about the eco-systems, their interdependence and their need for survival, by involving them in various environmental activities through visits and demonstrations and to mobilise youngsters by instilling in them the spirit of scientific inquiry into environmental problems and involving them in the efforts of environmental preservation.

Keeping in view the potential of this programme in sensitizing the school students, it was decided to intensify this programme to cover each and every district of the country. A programme of raising 'National Green Corps' through the Eco clubs was, therefore, launched during 2001-2002. This programme is being implemented in each State/UT through the Nodal agency appointed by the State/UT Govt. An Eco-club may be set up in a middle/high school and should consist of a minimum of 20 members and a maximum of 50 members, particularly interested in the conservation and protection of the environment, and willing to dedicate time and effort on a regular basis towards this end. The members may be drawn from students belonging to classes from VI to X. Each Eco-club will be in charge of an active teacher in the school concerned. MoEF provide some financial assistance for establishment of Eco clubs. It gives 2500/- per annum per Eco-club. It also provides teacher training

and distribution of resource materials. So far 1,12,844 Eco clubs have been established in NGC Schools across the country (Year 2010).

Global Learning & Observations to Benefit the Environment (GLOBE)

The GLOBE is an International Science and Education Programme, which emphasizes on hands-on participatory approach. India joined this programme in August, 2000. This programme unites students, teachers and scientists all over the world and targets school children. The students of GLOBE schools are required to collect data about various basic environmental parameters under the supervision of a GLOBE trained teacher. Through this they learn about scientific protocols and perform environmental learning activities, which have already been introduced as theory in the textbooks. The GLOBE programme not only helps the students to appreciate the contents of the textbooks through better understanding but also assists them in gaining complete knowledge of environment. It facilitates research through a worldwide research team comprising of students, teachers and scientists.

Strengthening Environment Education in School System and other courses at Graduate and Post-Graduate level including Professional Courses

- **Formal Environmental Education Program**The National Policy on Education, 1986 (NPE) states that the “protection of the environment is a value which must form an integral part of the curriculum at all stages of education”.

The NPE states: “There is a paramount need to create a consciousness of the environment. It must permeate all ages and all sections of society, beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process”.

- The programme obliges the Ministry of Human Resource Development (MHRD), the Ministry of Environment & Forests to ensure that environmental education is imparted adequately at the school levels. It mandates that environmental components are covered in the school curriculum at various levels.
- **Environmental Appreciation Course - Distance Education** In order to provide interested persons an opportunity to learn in detail about specific environmental issues, there is provision of a course module through a Indira Gandhi National Open University (IGNOU) for 'Environmental Appreciation'. Delivery of these courses is through distance education mode. The course module developed for appreciation courses is also being used by the IGNOU as compulsory component of its undergraduate courses. This is in pursuance of the directives of the Hon'ble Supreme Court of India.
- **Non-formal Environment Education and Awareness Project**The Ministry of Environment & forests, New Delhi accords high priority for the promotion of non-formal environment education and creation of awareness among all sections of the society through diverse activities. The project was launched to encourage and enhance public participation in activities that intended to conserve, protect, manage and sustain the environment. The government has undertaken various activities by using several traditional and modern media of communication, to create awareness among the people, such as seminars, workshops, training programs, rallies, public meetings, camps, exhibitions, puppet shows and street theatre.

Grants-in-Aid to Professional Societies and Institutions

The objective of this programme is to facilitate optimum utilization of expertise available with professional societies and institutions for promotion of environment education and awareness. The programme aims at utilizing the existing capacity while simultaneously providing for enhancing the capacities of such institutions. The projects such as development/extension of exhibition galleries, interpretation centres and education materials relating to ecology, wildlife and environment is financially supported.

Other Awareness Programmes

- India has a vast network of NGO's that are actively participating in the creation of awareness on development and environmental issues. Working on their own and with Governments they are the backbone of the strategy to create greater environmental awareness, especially that leading to environmental action.
- Despite great efforts to spread environmental awareness by the MoEF through several schemes, creation of awareness among large population especially in rural areas is difficult task. "Mass Awareness" through media, particularly the electronic media has therefore been identified as one of the thrust areas. It not only intensifies the efforts already being made in this direction but also launch new initiatives in this direction to encourage individual efforts in producing films/documentaries on environment/wildlife related themes in the country.
- Action Oriented Environmental Education- Environmental education is the process of developing environmentally conscious behavior of an individual. Education/ literacy alone do not guarantee that the learner will exhibit a specified set of behaviors. Rather, it guarantees only that the learner has the capacity for such behaviors. It involves a limited combination of awareness and action that encourages people to engage in immediate personal action that contributes to environmental improvements such as saving electricity, fuel and water, buying "Green" products, reducing solid waste, etc. Most of these actions are fairly simple and usually require just one step.

But most people hesitate to take an initiative and make the connection between an environmental issue and their own individual action.

13.8 Summary

This earth is one of God's greatest creation and a gift to all human being that has to be share together with animals and plants from many species. Human as the leaders at this earth surface should use their intelligence and wisdom to taking care of this lovely earth and avoid making chaos on it. With the existence of environment education at early stage in school, that knowledge are hoped to be use in protecting this world whole heartedly because damages that happen are caused by human themselves.

Environment problem can be overcome if education about environment is provided to every citizen. Education about the environment is not sufficient. Rather, rich learning experiences must also include learning in the environment and learning for the environment, or the taking of action to improve outcomes. Individuals should have the opportunity to actively resolve environmental issues in a democratic way at the local level, firstly so they understand how these issues relate to their own lives, and secondly so they are encouraged by the success of their actions. The rich people have the luxury of the "privilege of concern," because they have the financial ability to look beyond their own livelihood, explore global issues, and make the connections between the environmental and wealth generations. In contrast, people from lower socioeconomic groups do not have the option of such "luxury," and it is only when they are involved in a practical and direct way with their local environment that they too can

go on to make such connections. Thus a sound understanding of environmental issues needs to be addressed.

13.9 Further Readings

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13.10 Model Question

Discuss the need of Environment education to curb environmental crisis?

AFFORESTATION AND SOCIAL FORESTRY

Structure

- 14.0 Objectives
- 14.1 Introduction
- 14.2 Need for afforestation and social forestry
- 14.3 Afforestation and Social Forestry Programme
- 14.4 Objectives and Components of Social Forestry
- 14.5 Development of Social Forestry Programme
- 14.6 Types of Social Forestry
 - 14.6.1 Farm forestry
 - 14.6.2 Community forestry
 - 14.6.3 Extension forestry
 - 14.6.4 Agro-forestry
- 14.7 Hindrances related to Social Forestry
- 14.8 Case studies of Social Forestry Programme
- 14.9 Role of Voluntary Agencies in Social Forestry
- 14.10 Summary
- 14.11 Further Readings
- 14.12 Model questions

14.0 Objectives

After going through this lesson you will be able to

- explain the meaning of Afforestation and Social forestry
- identify the objectives and components of social forestry programme
- enlist the types of Social forestry
- mention case studies of Social Forestry
- explain the role of voluntary agencies in social forestry

14.1 Introduction

The forests of a country are a natural asset of great value, which, are renewable, can be productive and useful under proper management. Forests represent the largest, most complex and self generating of all ecosystems. They cover about one-third of the land area of the world and constitute

one-half of the total biomass. Forests have a direct and beneficial influence on various aspects like environment, flora, fauna and mankind. They act as buffer zones between natural and man-made ecosystems. Forests have been providing substantial support to the mankind through ages. Since long we have recognised the importance of forests that is why the constitution of India makes specific reference to forest protection. According to Article 48A, the State shall make an effort to protect and improve the environment and to safeguard the forests and wildlife of the country. Further, "to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures," is one of ten fundamental duties of every citizen, under Article 51A of the constitution. Under the constitution, both the central and the state governments may legislate on issues related to forests and protection of wild animals and birds. The seventy-third amendment of the constitution and its extension to the Scheduled Areas through an act in 1996 affirms commitment to decentralized decision making and devolution of authority to village institutions.

Historically, the local communities utilized their forests for the supply of fuel, fodder, fibre, timber, food and herbal medicines while maintaining an ecological balance. It was the traditional wisdom and joint responsibility of the communities that enforced necessary rules and regulations on the local people for sustainable management of their forests.

14.2 Need for afforestation and social forestry

The forests are the major provider of employment to 20 million people through collection of Non-Wood Forest Products (NWFP). For over 50-60 million people representing 250 tribal communities, forests formed a part of their culture and a natural way of life. India is the world's largest consumer of fuel wood. Around 80 percent of rural people and 48 percent of urban people use fuel wood. Forests are the major source of fuel wood, fodder, timber, tannin, gum and a wide range of medicinal herbs. Till the middle of this century, the entire demand for fuel wood was met from the forests. However, with the increasing human and livestock population, supply of essential commodities from forests was not adequate to meet the needs. Unable to meet their basic needs from agriculture, many unemployed and poor families turned to forests not only for fodder and fuel, but also to generate cash income through sale of wood and other forest products. Vested interests also took this opportunity to exploit forests for commercial purposes. As a result forests in India have depleted rapidly over the past five decades. The abuse of forests continued unchecked till mid 1970s, when the ill-effects of deforestation were prominent in the form of fodder and wood fuel scarcity, soil erosion, flash floods, water scarcity, loss of precious flora and fauna and climate change. Most of the natural forests around the villages had turned into wastelands reducing the area under forests to only 40 million hectares. Over 13 million hectares of community pastures were devoid of vegetation due to over-grazing by 450 million heads of livestock. Due to the non-availability of wood in village, rural women were compelled to spend 15-35 hours every week in walking long distances for collecting fuel wood from interior forests. As a result of deforestation, the damage from floods affected 58 million hectares of agricultural land and over 60 million people during the 1980s. The extent of damage had increased by four folds over the earlier two decades.

According to the government sources the forest covers in India is now only 22% of the total geographical area of 329 million hectares as against the 33.35 the minimum requirement prescribed by the government. According to the National Remote Sensing Agency many of the Indian forests are in highly degraded condition. Factually in India we have only 2% of the world's forests, with a severe pressure of serving 15% of the world's population. Thus afforestation and social forestry as projects were proposed with an objective to regenerate forests and human welfare.

14.3 Afforestation and Social Forestry Programme

Afforestation is the process of planting of trees to create a forest on non-forest land. It is different from reforestation, which is replanting trees where a forest has been depleted. The main purposes of afforestation are commercial forestry and environmental restoration or preservation. When afforestation is used for commercial purposes, it usually involves planting and harvesting of trees as agricultural crops. Areas where this is done are known as plantation forests. Harvesting trees from plantation forests helps to reduce deforestation in natural forests. India has been implementing an aggressive afforestation programme. The country initiated large-scale afforestation under the social forestry programme starting in the early 1980s. This includes Farm forestry, Community forestry, Extension forestry and Agro-forestry. Afforestation in India is being carried out under various programmes, namely social forestry initiated in the early 1980s, Joint Forest Management Programme initiated in 1990, afforestation under National Afforestation and Eco-development Board (NAEB) programmes since 1992, and private farmer and industry initiated plantation forestry.

The term '**Social Forestry**', for the first time was used by the Forest Scientist Westoby, at the 9th Common Wealth Forestry congress held in 1968 in New Delhi. He defined that, "Social Forestry, is a forestry which aims at producing flow of protection and recreational benefits for the Community".

The term Social Forestry is made up of two words social and forestry. 'Social' means living together in communities, while the term 'Forestry' is related with the theory and practice of raising tree crops, their conservation, scientific management and the utilisation of the resulting resources.

In 1976 the National Commission on Agriculture the Government of India started upon a social forestry project with the aim of taking the pressure off from currently existing forests by planting trees on all unused and fallow land. It is an activity designed for the benefit of the villagers in general and the poor or disadvantaged in particular. Social forestry is a programme "of the people by the people and for the people." Social forestry is one such programme which seeks people's participation in formulating and implementing the afforestation schemes based on local needs, potential and availability of inputs. Hence, strictly speaking, it refers to a collective management and utilization of under or unutilized common land to meet the requirements of the local people especially by the underprivileged. Thus underlying principle of social forestry is that the programs should improve the quality of life and economic conditions of those who are dependent on local trees for fuel wood, lumber, medicines, and other biomass products.

14.4 Major Objectives of Social Forestry

The main objectives of the social forestry programme as conceived by the government are:

- (i) Ensuring availability of adequate firewood, fodder and timber wood for domestic use.
- (ii) Motivating individual farmers, panchayats and other organisations for utilising marginal and degraded land.
- (iii) Planting tree crops for ecological and environmental balance and purity.
- (iv) Generation of productive employment and infrastructure.
- (v) Establishment of agro-based industries particularly for the benefit of rural areas.

Components of Social Forestry Programme

The chief components of the Social Forestry can be classified into two aspects; environmental regeneration and human welfare. It aims at providing ecological, economic and social security to the people particularly to the rural masses.

Environmental Regeneration Components are:

1. Protection and afforestation of degraded forests in the vicinity of habitations
2. Creation of village woodlands on community lands and government wastelands.
3. Block plantations in tank beds and foreshore lands.
4. Agro-forestry on marginal and sub-marginal farm lands
5. Tree planting along field boundaries or diffused planting within the fields particularly in arid and semi-arid zone.
6. Pasture and silvi-pasture development.
7. Tree planting in urban and industrial areas for aesthetic purposes, purification of polluted air and control of noise Pollution
8. Control of water and wind erosion by tree and shrub-planting, planting of shelter belts, green belts etc.
9. Strip plantations along road sides' canal banks and rail lines.
10. Establishment of in built mechanism for recycling of organic matter and waste of the area.

Human welfare components are:

1. To fulfil the basic requirements of the people such as fuel, fodder, timber, and supplementary food.
2. Collaboration by the government, panchayat and voluntary agencies in the supply of inputs (funds, seedlings, materials and labour)
3. To generate income from surplus forest products for poverty alleviation and to provide employment opportunities.
4. To tap the hidden energies and skills of the villagers for their own development by enabling them to manage their own natural resources. It aims at involvement of the beneficiary from the planning to consumption stage
5. To popularize economic tree farming along with crop farming,
6. To develop integrated system for the distribution of economic gains and other benefits among socially and economically poor people.
7. To provide congenial environment to the tribes and to help them to preserve their cultural identity as their life and culture is intimately related to forest.
8. To inculcate the value of village level self-sufficiency and self management in the production as well as distribution of forest products with social justice. In other words, minimal government control in production, management and distribution of forest benefits.
9. To foster the spirit of co-operation and to encourage cooperative enterprises.

Thus from above discussion we can say that for the success of social forestry, it is essential to have a joint and collaborative effort of the Government and people. In the absence of assured support from the political, bureaucratic, panchayat and the local people social forestry cannot achieve its objective. However, direct economic benefit is the key to people's participation in social forestry

programmes. There is no substitute for people's participation to make social forestry programme a success.

14.5 Development of Social Forestry programme

Though the word social forestry was first coined by the National Commission on agriculture as far back as in 1976 but this programme received tremendous impetus in the sixth five year plan.

Sixth five year plan (1980-85) - During the Sixth plan the social forestry programme had three segments

1. Centrally sponsored schemes for social forestry including plantation of fuel wood with allocation of Rs. 500 million in 157 fuel deficit districts spread all over the country.
2. Externally assisted projects in eleven states with fund provision of Rs. 1600 million.
3. State Sector Schemes with a projected expenditure of Rs 14.18 million.

During Sixth Plan' the Forest (Conservation) Act 1980 was enacted. Through enforcement of this Act it has been possible to reduce the diversion to about 4600 hectares per year from 0.15 million hectares during the period 1951-62 to 1979-80. Not only this, the programme of social forestry received a great momentum when it was included in the new 20 point programme. Ambitious social forestry programmes had been launched in the Sixth Plan period, by several State Governments with the fund from foreign aid agencies like World Bank, U. S. Agency for International Development, Canadian International Development Agency and the Swedish International Development Authority.

Seventh Five Year Plan (85-90) - The Seventh Plan has observed that the monetary cost of social forestry programme could be reduced by:

- (i) Decentralising the nurseries so that seedlings are not transported over long distances;
- (ii) Involving people in school nurseries, Kisan nurseries and other nurseries run on a co-operative basis
- (iii) Minimising the cost of watch and ward by involving the community and by developing the sustained interest of the people in the plantations through the grant of tree pattas etc

Eighth Five Year Plan (1990-95) - The Eighth Five Year Plan has also stressed for maintaining a proper environmental balance and conservation of natural resources etc. The social forestry programmes attained a new height with the involvement of Panchayats, which were directly implementing social forestry works under NREP (National Rural Employment Programme) and RLEGP (Rural-Landless Employment Guarantee Programme).

Ninth Five-year Plan - The government supported four main plantation-related schemes during the Ninth Five-year Plan:

1. The Integrated Afforestation and Eco-development Projects Scheme targeted afforestation activities with people's participation.
2. The Area-oriented Fuel wood and Fodder Projects Scheme (started in 1988/89) aimed at augmenting fuel wood and fodder supplies in the 242 districts identified as fuel wood deficient. The scheme also promoted efficient use of fuel wood, and encouraged people's participation in project management.
3. The Conservation and Development of Non-Timber Forest Products including Medicinal Plants Scheme was also initiated during 1988/89. Focusing on tribal populations, the scheme aimed at improving North-West Frontier provinces, as well as increasing their

production to provide additional income for tribals and the rural poor living in and around forests.

4. The Tree and Pasture Seed Development Scheme provided financial assistance to state governments for developing facilities for the collection, storage, testing, certification and distribution of quality seeds including those of pasture grasses, legumes and superior stands of endemic grasses.

Self Assessment Questions.

Q1. What is 'Social Forestry'?

Q2. What are the objectives of 'Social Forestry'?

14.6 Types of social Forestry

Social forestry programme has been categorized into four groups; farm-forestry, community forestry, extension forestry and agro-forestry.

14.6.1 Farm forestry

Under farm forestry individual farmers are encouraged to plant trees on their own farmland to meet their needs. Farm forestry can be classified into commercial and non-commercial types.

Non-commercial farm forestry involves growing of trees on the fields in place of agricultural crops. It involves tree planting by farmers on their own land for their own use and not for sale. The land mainly used for this purpose includes boundaries of agricultural fields, wastelands and marginal lands which are not usually cultivated. Farmers grow trees without any economic motive, just to provide shade to crops, as wind shelters, soil conservation or to use wasteland. This type of practice is done in Gujarat, Haryana, and Kerala, Karnataka etc. for obtaining fuel, fodder and fruits.

Commercial farm forestry refers to the system under which farmers grow trees on commercial basis. This type of practice is usually taken up in areas where there is an established market for wood or other forest based products. This form of forestry is adopted by individuals or organisational entrepreneurs for economic incentives. In this type of forestry, the original land use for agricultural crops is altered, once the market for fuel wood and other forest products rises and ensures better return. There are various factors which affect the economic viability of this type of forestry like cost of labour, market prices, rate of growth of the species being raised and prevailing capability of the farmer to wait for the full rotation of crop and material,

14.6.2 Community forestry

It is also called as Rural Forestry. Under this system trees are planted on community land and not on private land, as in the case of farm forestry. All these programmes aim to provide for the entire community and not for any individual. The government takes the responsibility of providing inputs in the form of seedlings, fertilizer etc, while the community and panchayats takes the responsibility of protecting the trees. But common land being everyone's land is very often exploited by people. Some communities have managed the plantations sensibly and in a sustainable manner, while some others took advantage and sold the timber for short-term individual profits. Remarkable success has been achieved in community forestry in some states like Haryana, Punjab, Gujarat, Tamil Nadu, Rajasthan, Kerala, Karnataka, Himachal Pradesh etc. Over the last 20 years, large-scale planting of Eucalyptus, as a fast growing exotic, has occurred in India, making it a part of the drive to reforest the subcontinent, and create an adequate supply of timber for rural communities under 'social forestry'.

14.6.3 Extension forestry

Planting of trees on the sides of roads, canals and railways, along with planting on wastelands is known as 'extension' forestry, increasing the greenery of the country. Under this project trees have been planted in the village common lands, government wastelands and Panchayat lands.

14.6.4 Agro- forestry

Agro-forestry, involves integrating agriculture with forestry, like leguminous crop, orchard farming and live stock ranching are done on the same piece of land. In other words, agro-forestry means growing of trees along with agricultural crops on the same piece of land. Agro-forestry is a sustainable land use system that maintains or increases the total yield by combining different agricultural practices. This may range from active participation to total indifference. This has become fairly popular in India in recent times. But the success of this system depends on the co-operation rendered by the local people. The various forms of agro-forestry are:

- a) Sylvo-pastoral system- the utilization of the forest for both the production of wood and rearing of domestic animals.
- b) Agri-silviculture- the intentional use of land for the simultaneous production of agriculture crops and forest crops.
- c) Agro-sylvo-pastoral system- the utilization of land for simultaneous production of agriculture crops, forest crops and rearing of domestic animals.
- d) Multiple use system- different species of tree are raised and managed for wood, leaves, fruits, fibre and fodder

14.7 Hindrances in the success of Social Forestry

Gradually towards the beginning of 1990s, the constraints associated with social forestry became evident and since then social forestry interventions started to encompass a more 'people-oriented approach. Several constrains faced by social forestry programmes are:

1. **Scattered Areas of Plantation-** Most of the plantations under this programme are scattered in different areas like community wastelands, roadside and canal margins, where it is very difficult to grow and protect the saplings. This makes management and protection of trees impractical.

2. **Lack of technical education-** social forestry is a technical procedure which necessarily requires technical expertise. Contrarily, in general, there is a strong feeling among people that planting and caring of trees does not require any technical know-how. People say, "Just dig a small hole in the soil, plant the seedlings or sow the seeds and they will grow by themselves. You see, in the forest no one cares for the trees and yet they come up." Speculatively this argument sounds convincing, but practically it is not true. Social forestry is a planned plantation utilizing land, labour, capital and plant and animal resources. Hence the planning has to be scientific and technically viable.
3. **Lack of adequate targets-** Most of the social forestry programmes are implemented as social events once a year. Every year 'Vana mahotsava" (festival of forests) is celebrated mobilizing people to plant trees. It is celebrated with pomp and this occasion is used to politicize and socially organize people. The actual implementation part of social forestry is completely neglected. The result is that the social forestry area is left with empty pits.
4. **Lack of inclusive research findings** – lack of research on various aspects of forestry is a major hurdle for social forestry. For example lack of information on the suitability of certain tree species for various agro-climatic regions, optimum spacing of trees, subsequent management and harvesting practices etc. There is also lack of two-way communication between researchers and people. Exchange of new ideas between researchers and people is necessary for the expansion of social forestry.
5. **Lack of satisfactory marketing facilities-** There is lack of adequate marketing facilities for the trees grown by the beneficiaries. Instead the middlemen involved take away most of the profit. It is obvious that people will not work for social forestry unless it is rewarding to them. Adequate remuneration for the work and products is necessary. Unless marketing is organized and prices are stabilized it will be difficult to obtain desired results under social forestry programmes.
6. **Indiscriminate grazing-** another constraint related with social forestry is over-grazing .To ensure the success of social forestry, cattle should not be allowed to graze the trees till they have grown beyond their reach. Cattles can browse even a one-year-old sapling. That means the time, labour and capital spent during one year is wasted.
7. **Stringent state control** - Stringent state control is another reason which obstructs the success of this programme. Rules and regulations regarding the harvesting, transporting and marketing of tree crops are so stringent that people are reluctant to grow tree crops. For example, sandalwood production in Karnataka has been steadily decreasing, despite the increasing demand. One reason for low production is absolute state control over sandal trees even on private lands. Similarly most of the trees except eucalyptus, babool, saijana and few others are prohibited to be cut and transported outside the state even by the producer himself.
8. **Harassment and corrupt practices** - Harassment and corrupt practices by government officials and influential people is another problem in the execution of social forestry programmes. Government officials demand illegal gratification from villagers for transporting and trading forest products. Hence people are not interested in social forestry programmes. Generally the wealthy and the influential people encroach or take control of social forestry plantations and the poor are marginalized. As a result, poor people are deprived of their due share and they become mere workforce. It is a people's movement and they should be involved at every stage with real conviction and understanding.
9. **Lack of legal protection** - People who are involved in social forestry should get their share in the yield. Sufficient legal safeguards are not there to ensure the rights of the beneficiaries of

social forestry programmes. Illegal occupation of land, misappropriation of social forestry products needs prevention by legislation.

10. **Lack of proper distribution system-** Lack of proper distribution system for the sharing of the social forestry products is yet another constraint. Neither government nor voluntary agencies have evolved an acceptable and equitable system of product distribution.

14.8 Case studies of social forestry

A few case studies of social forestry programmes are presented here. These case studies provide some insights into the way they have been planned and implemented.

- A. **Bharatiya Agro-Industries Foundation, Urulikanchan, Maharashtra:** in 1950 the Mahatma Gandhi Vidyalay, started, promoting afforestation. Around 2,750 students planted one lakh subabul trees for fodder and other uses in 1981. Eighty per of these have survived. Encouraged by this, they planted about 2 lakh saplings more in and around their farms and farmstead in 1982. The experiment demonstrates the potential, the education systems hold in strengthening social forestry programmes.
- B. **Experimental social forestry in Garadgaon, Maharashtra:** Dr. Arvind G. Raddi and his colleagues prepared a social forestry scheme to make Garadgaon self sufficient in its fuel and fodder requirements. For this they utilized the funds available under the employment guarantee scheme of the state government. Through an informal survey they identified the total length of the boundary of the village land, village stream and road sides. They decided to plant trees in these under-cultivated areas. They also planned a nursery near the perennial stream. The total budget of the scheme was about Rs.4.25 lakh. He also established a fuel wood depot and a fodder bank in the village which is managed by the gram panchayat. The programme was implemented in 1979. By and large, the results were quite encouraging. This experiment successfully combined private initiative, proper use of the government wasteland and administrative resources for the community benefits.
- C. **Government of Orissa:** Orissa has a forest area of 38.44% of the total geographic area of the state. Although this is higher than the average forest area of the country, but the rate of deforestation is also higher. In 1983, Orissa Government in collaboration with Swedish International development authority adopted the social forestry programme for the state. The aims of the programme were to meet the fuel, fodder and other domestic needs of the rural population, to restore the ecological balance, to check soil erosion, to increase the soil fertility and to meet the needs of forest based industries. Initially this programme was started in four districts in 1984-85, and extended to another five districts in 1985-86. The evaluation of the project shows that the achievements were much higher than the targets.
- D. **Gram Vikas, Kolar, Karnataka:** Gram Vikas is a voluntary organization set up by Dr. Arentha Iyer in the Kolar district of Karnataka. He motivated the children to plant trees adjacent to the school or Balwadi. Gram Vikas extended help to the people in the form of initial capital, technical guidance, organizational support, and introduction to various government officials. Initially the organization had to face several constraints such as lack of support and co-operation from the forest department, lengthy government procedures involved in the land distribution to people for afforestation, scarcity and poor quality seeds. But gradually it picked up and following its success, men and women were urged to join the afforestation programme and nursery rising in a big way. In the final analysis the success or failure of a project depends on its economic viability

14.9 Role of Voluntary Agencies in afforestation and Social Forestry

The Indian National Afforestation and Eco-Development board has recognized the constraints and hurdles in the implementation of afforestation and social forestry projects. The board decided to provide assistance to Voluntary agencies for tree planting under the scheme named "Grants in aid for Greening India." The role of voluntary agencies may be described as follows:

1. Voluntary agencies can play a pivotal role in the social forestry programme. First of all, they can educate people by providing an analysis of socio-economic aspect and technical knowledge to manage this project. They can make the people realize the need to reproduce minor forest products themselves instead of gathering them. They can take up social forestry programmes in one or two places to demonstrate the ways and methods, which people can follow easily.
2. Voluntary agencies can become the real representatives of the locality. In the beginning, they should take initiative and help the people to build up leadership among themselves. But for this the voluntary agencies should have a thorough knowledge about the people, the needs and resources of the area before starting social forestry programmes.
3. Voluntary agencies can act as mediators between the people and government departments. Voluntary agencies should make them articulate their demands to the government officials and whenever there is any communication gap they should help both the people as well as the officials.
4. Voluntary agencies should be familiar with details of the various government-aided schemes for social forestry programmes. Besides they should be familiar with all the legal rights and duties of the people in relation to social forestry and they should explain these to the people.
5. Voluntary organizations should involve the people from the beginning till the end. Let the people hear, see, reflect and understand. Let the results speak for themselves and allow the people learn at their own pace. Nothing should be forced on them but every step must be explained. Understanding and conviction takes its own time to develop.
6. Voluntary agencies should help people to procure all the inputs for social forestry at reasonable prices without sacrificing quality. This project requires various inputs such as seeds, seedlings, implants, polythene containers, capital, organization and planning. Often people are cheated in the procurement of various inputs.
7. Voluntary agencies should allow the people to become self sufficient and self- competent at every stage in the execution of the programme. Their dependency on government officials and various technicians should be minimized and finally eliminated.
8. Voluntary agencies can use social forestry programmes as a means to organize the people into a community, enhancing collective participation in this project.
9. People are mostly cheated in the marketing of the products. Either they are given a very low price or duped in measurement and weighing. The main reason for this is the lack of organized marketing facilities. Hence voluntary agencies should emphasize on the organization of marketing of products to eliminate the middlemen. They should influence the government to fix a fair and steady price for each commodity.
10. Often the products are sold as raw material at very low prices. After the primary processing, prices can be enhanced. Voluntary agencies should arrange facilities for primary and secondary processing at the producers level itself. This will not only fetch a handsome price but also generate employment for the people.

14.10 Summary

This lesson has elaborated the problem of forest depletion and the afforestation drive started by the government of India to improve this situation. This lesson explains the Social Forestry programme, its need, objectives, major components, development, and hindrances in its implementation. The chapter also highlights the case studies and role of voluntary organisations in the execution of afforestation and social forestry programmes. It can be stated that Afforestation and Social forestry projects are meant to bring about environmental and social change in the society. A well implemented and managed social forestry programme can meet the requirements of people, besides generating additional income from the sale of the surplus products.

14.11 Further Readings

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14.12 Model Questions

- Q.1 What is the importance of Afforestation programme in India. What are the hindrances in the success of 'Social Forestry'?
- Q.2 Describe the concept of Social Forestry and explain the afforestation Programme in India?

RENEWABLE ENERGY PROGRAM & BIO GAS

Structure

- 15.0 Objectives
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15.0 Objectives

After reading this lesson you will be able to

- know the energy distribution between Developed and Developing Countries
- explain India's energy status
- define renewable resources
- identify different types of renewable resources
- define biogas
- recognize the need of renewable energy program

15.1 Introduction

Energy is the prime mover of economic growth, and is vital to sustaining a modern economy and society. Future economic growth significantly depends on the long term availability of energy from sources that are affordable, accessible and secure. Energy is an indispensable part of our living. The

standard of living of people across countries is gauged by many factors, one of which is the energy consumption. Access to various energy resources is the cause behind the growing disparity from country to country. We use many different energy sources to do work for us. Energy sources are classified into two groups nonrenewable and renewable. Coal, petroleum, natural gas, propane, and uranium are nonrenewable energy sources. They are used to make electricity, to heat our homes, to move our cars, and to manufacture all kinds of products. These energy sources are called nonrenewable because their supplies are limited. Petroleum, for example, was formed millions of years ago from the remains of ancient sea plants and animals. We cannot make more petroleum in a short time. Renewable energy sources include biomass, geothermal energy, hydropower, solar energy, and wind energy. They are called renewable energy sources because they are replenished in a short time. Day after day the sun shines, the wind blows, and the rivers flow. We use renewable energy sources mainly to make electricity.

15.2 Energy distribution between Developed and Developing Countries

Although 80 percent of the world's population lies in the developing countries (a four fold population increase in the past 25 years), their energy consumption amounts to only 40 percent of the world total energy consumption. The high standards of living in the developed countries are attributable to high-energy consumption levels. Also, the rapid population growth in the developing Countries has kept the per capita energy consumption low compared with that of highly industrialized developed countries. The world average energy consumption per person is equivalent to 2.2 tonnes of coal. In industrialized countries, people use four to five times more than the world average and nine times more than the average for the developing countries. An American uses 32 times more commercial energy than an Indian.

15.3 India Energy Status

India faces formidable challenges in meeting its energy needs and in providing adequate energy of desired quality in various forms in a sustainable manner and at competitive prices. India needs to sustain an 8% to 10% economic growth rate, over the next 25 years, if it is to eradicate poverty and meet its human development goals. To deliver a sustained growth rate of 8% through 2031-32 and to meet the lifeline energy needs of all citizens, India needs, at the very least, to increase its primary energy supply by 3 to 4 times and, its electricity generation capacity/supply by 5 to 6 times of their 2003-04 levels. With 2003-04 as the base, India's commercial energy supply would need to grow from 5.2% to 6.1% per annum while its total primary energy supply would need to grow at 4.3% to 5.1% annually. By 2031-32 power generation capacity must increase to nearly 8,00,000 MW from the current capacity of around 1,60,000 MW inclusive of all captive plants. Meeting the energy challenge is of fundamental importance to India's economic growth imperatives and its efforts to raise its level of human development.

India is a large consumer of coal, which makes up more than 57% of its total consumption. However, more than 1/3 of energy consumed comes from renewable resources, predominantly from large hydropower. India relies heavily on coal energy to produce electricity. A strong second is hydro power, followed by natural gas. The consumption of all renewable energies represents fully one third of the total consumption.

India is, however, poorly endowed with oil assets and has to depend on crude imports to meet a major share of its needs (around 70 percent). India's primary energy mix has been changing over a period of time. Despite increasing dependency on commercial fuels, a sizeable quantum of energy requirements (40% of total energy requirements), especially in the rural household sector, is met by non-commercial and traditional energy sources, which includes fuel wood, crop residue, biomass and animal waste, including human and draught animal power.

15.4 Emergence of Renewable Energy

The scenario of dominant energy sources in world as a whole is not different from that of India's. The world's energy supply is largely based on fossil fuels. It is estimated that by 2030, 80% of primary energy mix will be dominated by fossil fuels, where in oil will remain the dominant fuel and demand for coal will rise more than that of any other fuel in absolute terms. In such a scenario, the realization that these sources of energy will not last forever and are also contributing to environmental problems is what has made renewable a lucrative and sustainable option. This has also led the governments around the globe, along with industries, thinking seriously about alternative sources of energy.

Countries all over the world fully recognize the need to promote wide spread adoption of renewable energy into their country's energy sources, with the intention of promoting sustained economic growth, social development and environmental stewardship. It is also presumed that with increasing scope, scale, research and development, the cost of renewable energy technologies will come down; making them affordable and able to make a major contribution to electricity generation, heating, cooling and transport. Estimates highlight that renewable energy could contribute at least half of all the electric power in each of the large economies by 2050; even in countries where electricity demand is significantly high.

Keeping up with the trend, Indian government focus is also on exploitation and development of various forms of energy and making energy available at affordable rates. The country's energy supply comes from different sources: coal, hydropower, oil and gas and various forms of non-conventional energy. Government of India has recently brought out an Integrated Energy Policy³⁴ linked with sustainable development that covers all sources of energy and addresses all aspects of energy use and supply including energy security, access and availability, affordability and pricing, as well as efficiency and environmental concerns. This policy also underlines the importance of renewables in India's energy sector. The Policy states that solar power in particular could play an important role in helping country attain energy independence in the long run. With an increasingly favourable regulatory and policy environment, along with a growing number of enterprising entrepreneurs and project developers; India is ranked the third most attractive country to invest in renewable energy after USA and Germany.

15.5 Renewable resources

They are imperishable and we can have unlimited amounts without distressing over their exhaustion. They have the ability of being replaced by natural and biological processes. There are several types of renewable resources. The abundant availability of renewable resources in India keeps it at an advantageous position vis-à-vis other countries and it can use the resources for its own betterment and can also cater to the energy security concerns at the same time. Government of India is performing quite well in initiating programmes and implementing projects in this regard.

The availability, installed capacity and achievement of the programmes in promoting the use of renewable resources, is what follows now.

15.5.1 Wind Energy

The terms "**wind energy**" or "**wind power**" describe the process by which the wind is used to generate **mechanical power or electricity**. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity to power homes, businesses, schools, and the like.

Advantages of Wind Power:

- It is one of the most environment friendly, clean and safe energy resources.
- It has the lowest gestation period as compared to conventional energy.
- Equipment erection and commissioning involve only a few months.
- There is no fuel consumption, hence low operating costs.
- Maintenance costs are low.

Wind energy has been one of humanity's primary energy sources for transporting goods, milling grain, and pumping water for several millennia. From windmills used in China, India and Persia over 2000 years ago to the generation of electricity in the early 20th century in Europe and North America wind energy has played an important part in our recorded history. As industrialization took place in Europe and then in America, wind power generation declined, first gradually as the use of petroleum and coal, both cheaper and more reliable energy sources, became widespread, and then more sharply as power transmission lines were extended into most rural areas of industrialized countries.

The development of wind power in India recently began in the 1990s, and has progressed steadily in the last few years. The short gestation periods for installing wind turbines, and the increasing reliability and performance of wind energy machines have made wind power a favoured choice for capacity addition in India. Currently, India has the fifth largest installed capacity of 14158 MW till the end of March 2011. Wind mills are established mainly in Tamil Nadu, Gujarat, Maharashtra, Madhya Pradesh, Kerala, Karnataka and Rajasthan. Currently, wind power accounts for about 8% of India's total installed power capacity but it generates only about 2% of the country's power. This shows that India's wind energy endeavours need to increase by leaps and bounds in order to have a real contribution towards power generation.

15.5.2 Hydro power

The hydroelectric power refers to the energy produced from water (rainfall flowing into rivers, etc). It plays an essential role in many regions of the world with more than 150 countries generating hydroelectric power. Hydropower continues to be the most efficient way to generate electricity. Modern hydro turbines can convert as much as 90 percent of the available energy into electricity.

In India, small hydro is the most utilized renewable energy source for energy production.

Some key figures concerning small hydro in India:

- Less than 25 MW is in the "small hydro" designation
- There is a potential of 15,000 MW
- Installed is 1,520 MW to date
- 4,096 potential sites have been identified
- Technology is mature and reliable
- Two types of technology are used:
 - o High-head systems
 - o Low-head systems
- Ministry of Non-conventional Energy Sources is focused on:
 - nation-wide resource assessment

- setting up of commercial projects
- renovation and modernization
- development and up-gradation of water mills
- industry based research and development.

15.5.3 Solar Power

Due to geographical location India has many of the abundantly gifted sunny regions of the world. While, the highest annual radiation is received in western Rajasthan, the north-eastern region receives the lowest annual radiation. Most parts of India receive 4–7 kWh of solar radiation per square meter per day with 250–300 sunny days in a year. India receives solar energy approximately 5000 trillion kWh/year equivalent, which is far more than India's total energy consumption of about 848 billion kWh in FY 2010, as projected by Central Electricity Authority in its 17th Electric Power Survey.

Solar energy has several applications: photovoltaic (PV) cells are placed on the roof top of houses or commercial buildings, and collectors such as mirrors or parabolic dishes that can move and track the sun throughout the day are also used. This mechanism is being used for concentrated lighting in buildings. India has Solar Photovoltaic power generation potential of 20 MW per sq. km while Solar Thermal power generation potential of 35 MW per sq. km. The grid connected installed capacity at the end of 10th five year national plan was about 3 MW. It is targeted to add 50 MW during the 11th plan.

15.5.4 Biomass energy

Biomass includes solid biomass (organic, non-fossil material of biological origins), biogas (principally methane and carbon dioxide produced by anaerobic digestion of biomass and combusted to produce heat and/or power), liquid biofuels (bio-based liquid fuel from biomass transformation, mainly used in transportation applications), and municipal waste (wastes produced by the residential, commercial and public services sectors and incinerated in specific installations to produce heat and/or power).

The most successful forms of biomass are sugar cane bagasse in agriculture, pulp and paper residues in forestry and manure in livestock residues. It is argued that biomass can directly substitute fossil fuels, as more effective in decreasing atmospheric CO₂ than carbon sequestration in trees. Biomass may be used in a number of ways to produce energy. The most common methods are:

- Combustion
- Gasification
- Fermentation
- Anaerobic digestion

India is very rich in biomass. It has a potential of 19,500 MW (3,500 MW from bagasse based cogeneration and 16,000 MW from surplus biomass). Currently, India has 537 MW commissioned and 536 MW under construction. The facts reinforce the idea of a commitment by India to develop these resources of power production.

Following is a list of some States with most potential for biomass production:

- Andhra Pradesh (200 MW)
- Bihar (200 MW)

- Gujarat (200 MW)
- Karnataka (300 MW)
- Maharashtra (1,000 MW)
- Punjab (150 MW)
- Tamil Nadu (350 MW)
- Uttar Pradesh (1,000 MW)

15.5.5 Ocean Energy

The vast potential of energy of the seas and oceans, which cover about 3/4th of our planet, can make a significant contribution to meet our energy requirements. The various forms of energy from the seas and oceans which are receiving attention at present are Tidal Power, Ocean Thermal Energy Conversion (OTEC), Waves and Ocean Currents. The realization of power from oceans is limited due to large technological gaps and limited resources. At the present level of technological advancement only tides can be harnessed for power generation. In India, the Gulf of Kutchh and Gulf of Cambay in Gujarat and the delta of the Ganga in Sunder bans in West Bengal are potential sites for generating tidal power. The technology required for harnessing tidal power has been demonstrated in other countries. The main barrier in its introduction in India so far is that the technology is not commercially viable.

OTEC has a potential installed capacity of 180,000 MW in India and that of wave energy along the 6000 Km is 40000 MW. MNRE, however, has been supporting the deployment of tidal power generation in India and in this context has sponsored the preparation of a feasibility report by the West Bengal Renewable Energy Development Agency (WBREDA) to set up a 3.6 MW capacity tidal power plant at Durgaduani Creek in the Sunder bans area of West Bengal.

15.5.6 Geothermal Energy

Geothermal energy, which is derived from the high temperature geothermal fluids, can be utilized for power generation and thermal applications like greenhouse cultivation, space heating and cooking. Geothermal energy has been commercially exploited by as many as 20 countries to generate approximately 9000 MW of electricity. However, for further utilization of geothermal energy, adequate infrastructure needs to be created and training needs to be undertaken.

Geothermal energy, the natural heat within the earth, arises from the ancient heat remaining in the Earth's core, from friction where continental plates slide beneath each other, and from the decay of radioactive elements that occur naturally in small amounts in all rocks. For thousands of years, people have benefited from hot springs and steam vents, using them for bathing, cooking, and heating. During this century, technological advances have made it possible and economic to locate and drill into hydrothermal reservoirs, pipe the steam or hot water to the surface, and use the heat directly (for space heating, aquaculture, and industrial processes) or to convert the heat into electricity.

The amount of geothermal energy is enormous. Scientists estimate that just 1 percent of the heat contained in just the uppermost 10 kilometers of the earth's crust is equivalent to 500 times the energy contained in all of the earth's oil and gas resources. Yet, despite the fact that this heat is present in practically inexhaustible quantities, it is unevenly distributed, seldom concentrated and often at depths too great to be exploited industrially and economically.

Over the years various agencies like the Geological Survey of India (GSI), Oil & Natural Gas Corporation (ONGC), National Geophysical Research Institute (NGRI), and Central

Electricity Authority (CEA) have conducted studies to assess the geothermal potential in India. Valuable data has been generated through these studies for the exploitation of geothermal potential at some fields in India. As a result of systematic geothermal exploration down to depths of up to 400 meters, preliminary data has been generated for nearly 340 hot springs in India. The use of geothermal energy has earlier been demonstrated in India for small scale power generation and thermal applications. Assessing the suitability of sites through magneto-telluric investigations and other studies are also planned.

15.6 Importance of Renewable Energy

The positive attributes of generating electricity from renewable energy sources are widely accepted, although some of these technologies may not be currently competitive commercially with conventional fuels. Renewable energy technologies can help solve energy issues related to electricity generation, namely, environmental concern, energy security, rural electrification and applications in niche markets where conventional electricity supply is not feasible. In case of India, all the above mentioned issues are important, however, the most critical issue is that of energy shortages. Almost all the states in India are facing energy shortages in the range of 3% to 21% with national average energy shortage of about 10%.

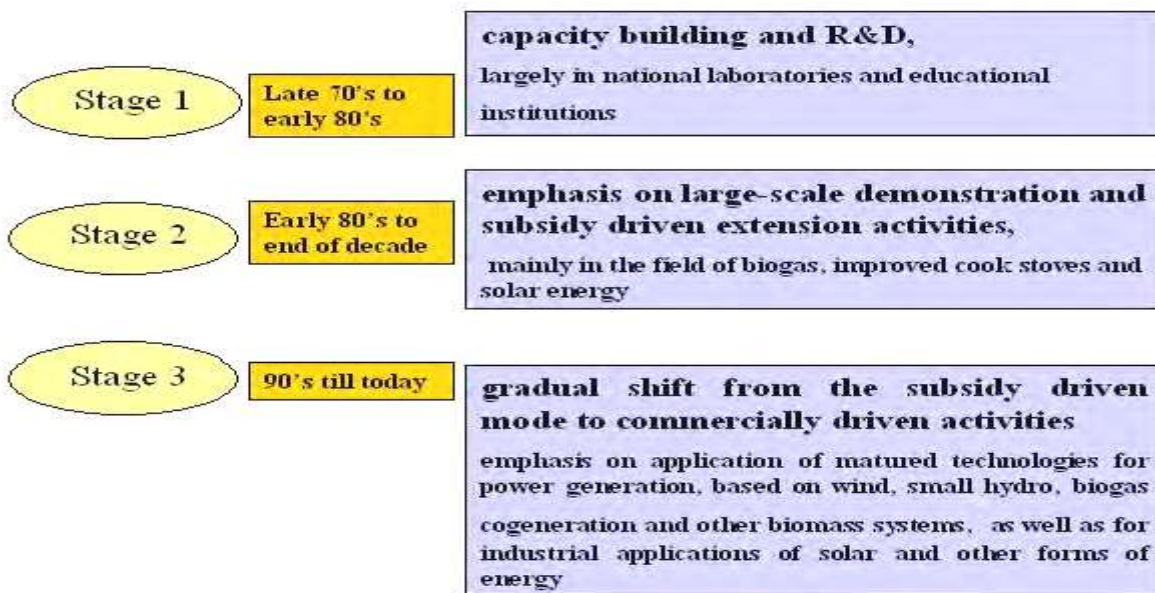
Renewable energy sources can supplement the present power generation and at the same time address the environmental and energy security issues. Renewable energy technologies have a good potential in India and considerable progress has been achieved.

15.7 Renewable Energy Programme in India

Over the last three decades, the renewable energy Programme in India has evolved in three distinctive stages. In the first stage, from about the late '70s to the early '80s, the thrust of the national effort in this field was directed towards capacity building and R&D, largely in national laboratories and educational institutions.

Stages of evolution of Renewable Energy Programme in India

Source: MNRE website



The second stage, from early '80s to the end of the decade, witnessed a major expansion with accent on large-scale demonstration and subsidy driven extension activities mainly in the field of biogas, improved cook stoves and solar energy.

These Programme created awareness and also generated field experience. The extension Programme, particularly in the areas of biogas and improved woodstoves (chulhas), generated a vast network of institutions and non-government organizations, right down to the level of self-employed workers and organizations at the grassroots levels. In the third and current stage, extending from the beginning of the last decade, the emphasis has been more on application of matured technologies for power generation, based on wind, small hydro, biogas cogeneration and other biomass systems, as well as for industrial applications of solar and other forms of energy. There is also a gradual shift from the subsidy driven mode to commercially driven activity in the area.

Renewable energy applications have brought about significant changes in the Indian energy scenario. Apart from electricity generation, the application of these technologies has benefited millions of rural folk by meeting their cooking and other energy requirements in an environmentally benign way. The social and economic benefits include reduction in drudgery among rural women and girls engaged in the collection of fuel wood from long distances and cooking in smoky kitchens, minimization of the risks of contracting lung and eye ailments, reduction in deforestation, employment generation at village level and ultimately the improvement in the standard of living and creation of opportunity for economic activities at village level.

There is a large potential for renewable energy in India, an estimated aggregate of over 100,000 MW. As against the estimated 84776 MWe renewable energy based grid connected power generation potential in the country, so far only about 9372.5 MW installed capacity has been achieved. The renewable energy based power generation capacity presently constitutes 7% of the total installed capacity in the country for power generation from all sources. The country is aiming to achieve up to 10% of additional installed capacity to be set up till 2012 to come from renewable energy sources.

15.8 Institutional Framework

Ministry of New and Renewable Energy (MNRE)

Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The Ministry of New and Renewable Energy (MNRE) is the administrative ministry for policies and

Programme in this area. The extension Programme of the ministry is largely implemented through State Nodal Agencies. All major States have set up energy agencies exclusively for nonconventional energy Programme. These agencies, in turn, mobilize participation of local institutions, non-governmental organizations (NGOs) and village-level organizations for implementation of Programme.

Policies and Incentives

Policies

The current focus in the Renewable Energy sector is to reduce the costs and to accelerate commercialization of various technologies. The Ministry of Nonconventional

Energy Sources (MNRE) initiated this shift in 1992, when it announced a new strategy and action plan to replace subsidy-driven Programme with commercialization. Financial incentives were trimmed and fiscal incentives, such as concessional tax and duties, along with soft loans, were introduced to encourage enterprise. Several renewable energy technologies (RETs) such as wind, solar

thermal, solar photovoltaic, and small hydro are now promoted on a commercial scale. Today, India has the largest decentralized solar energy Programme, the second largest biogas and improved stove

Programme, and the fifth largest wind power Programme in the world. A substantial manufacturing base has been created in a variety of RETs, placing India in a position not only to export technologies but also offer technical expertise to other countries.

National Level Policy

New and Renewable Energy Policy Statement 2005

A comprehensive Renewable Energy Policy for all round development of the Renewable sector, encompassing all the key aspects, has been formulated by MNRE. Through this Energy policy statement, it is proposed to send appropriate signals to industry, scientific and technical community, business and investors to indigenously develop new and renewable energy technologies, products & services, at par with international standards, specifications, and performance parameters for deployment in a manner so as to arrive at an optimal fuel-mix that most effectively meets the overall concerns of the country.

Foreign Investment Policy

- Foreign Investors can enter into a joint venture with an Indian partner for financial and/or technical collaboration and also for setting up of renewable energy based Power Generation Projects.

Industrial Policy

- Ministry of New and Renewable Energy is promoting medium, small, mini and micro enterprises for manufacturing and servicing of various types of renewable energy systems and devices.
- Industrial clearance is not required for setting-up of renewable energy industry.
- No clearance is required from Central Electricity Authority for power generation projects upto Rs. 100 crores (Rs. 1000 million).
- A five-year Tax holiday allowed for renewable energy power generation projects.
- Soft loan is being made available through IREDA for renewable energy equipment manufacturing.

15.9 Incentives for investing in Renewable Energy Technologies

Fiscal Incentives

The fiscal incentives include direct taxes, exemption or reduction in excise duty, exemption from central sales tax, and customs duty concessions on the import of material, components and equipment used in RE projects.

The MNRE has issued guidelines to all state governments for creation of an attractive environment for evacuation and purchase, wheeling and banking of electrical power from RE sources. The Ministry has urged that the states should announce general policies for purchase of electrical power from all sources.

Financial Incentives

The MNRE provides financial incentives for various renewable energy programmes.

These include interest and capital subsidies. In addition, soft loans are provided through

IREDA and also through some of the nationalized banks and other financial institutions for identified technology systems.

A comprehensive Renewable Energy Policy for all round development of the Renewable sector, encompassing all the key aspects, has been formulated by MNES. Through this Energy policy statement, it is proposed to send appropriate signals to industry, scientific and technical community, business and investors to indigenously develop new and renewable energy technologies, products & services, at par with international standards, specifications, and performance parameters for deployment in a manner so as to arrive at an optimal fuel-mix that most effectively meets the overall concerns of the country. Besides the National level policy, many states also have announced policy packages including wheeling, banking, third party sale and buy back.

Summary and Conclusion: Could India meet all energy needs with renewable energy?

India is a nation in transition. Considered an "emerging economy," increasing GDP is driving the demand for additional electrical energy, as well as transportation fuels. India is a nation of extremes. Poverty remains in areas with no energy services, while wealth grows in the new business hubs.

Coal fired generation currently provides two thirds of the generation capacity, and hydropower supplies the other third. Yet, India is blessed with vast resources of renewable energy in solar, wind, biomass and small hydro. In fact, the technical potential of these renewables exceeds the present installed generation capacity.

Unique in the world, India has the only Ministry that is dedicated to the development of renewable energies: the Ministry of New and Renewable Energy. This bodes well for the acceleration of renewable development throughout the nation -- both to meet the underserved needs of millions of rural residents and the growing demand of an energy hungry economy.

The development and deployment of renewable energy, products, and services in India is driven by the need to

- decrease dependence on energy imports
- sustain accelerated deployment of renewable energy system and devices
- expand cost-effective energy supply
- augment energy supply to remote and deficient areas to provide normative consumption levels to all section of the population across the country
- And finally, switch fuels through new and renewable energy system/ device deployment.

In a report on the Indian economy by Deutsche Bank, in which countries were ranked by attractiveness for outsourcing and off-shoring, India came in #1, well ahead of China.

India is currently experiencing strong economic growth, while at the same time attempting to extend modern power services to millions still in poverty. Expanding electrical capacity is essential. Renewable energy remains a small fraction of installed capacity, yet India is blessed with over 150,000MW of exploitable renewables.

It makes sense to the authors that all efforts and investment should consider accelerating these sustainable energy resources before committing to the same fossil fuel path as western nations. The fossil fuel strategy will surely bring price volatility from dwindling supplies and added pollution from carbon combustion. Tapping India's wind, solar, biomass, and hydro could bring high quality jobs from a domestic resource. Extending the electric grid between all states, and ultimately between neighbor nations will expand international trade and co-operation on the subcontinent.

15.10 Biogas – A Boon for India

Biogas – is gas produced by means of anaerobic fermentation of biomass. Biomass decomposition is made by methanogenic bacterium. Gas composition is methane 50%-65%, 25%-45% CO₂, and some admixtures. Microorganisms metabolizing carbon from organic substrates in oxygen free conditions (anaerobically). This process is called rotten or oxygen free fermentation.

Biogas is also known as sewage gas, mine gas, marsh gas, and methane or gobar gas in India.

According to the United Nations' Food and Agricultural Organization (FAO)(2008), the world population of animals is 1.3 billion cattle, 1 billion sheep, 1 billion pigs, 800 million goats and 17 billion chickens. The waste the animals produce has 55 percent to 65 percent methane, which if released into the atmosphere is bad news for us (it traps heat at 21 times the rate that carbon dioxide does) but when burned is another matter entirely. It gives us energy. 62.5 liters of bio gas can be produced from one kilogram of cow manure (heated at around 28 degrees Celsius or 82.4 degrees Fahrenheit).

According to the 1997 Livestock Census, the cattle population in the country is about 290 million. The estimated potential of household biogas plants based on animal waste in India is 12 million. Till December 2004, under the National Biogas Programme, over 3.7 million biogas plants in the capacity of 1–6 m³ had been installed.

Larger units have also been set up in many villages, farms, and cattle houses.

The estimated biogas production from these plants is over 3.5 million m³ per day, which is equivalent to a daily supply of about 2.2 million m³ of natural gas.

Bio Gas Plant would serve many purposes such as: Environment friendly converting waste to energy, which is the need of hour. Generation of fairly good amount of fuel gas, which will reduce dependence on the dwindling energy resources. Generation of high quality manure, which is an excellent soil conditioner. This is very important for replenishing fast decreasing resources of productive soils. Biogas is a color less, odour less and inflammable gas. The gas generated in this plant can also be used as a source of natural gas. The production is about 0.25 to 0.35 cubic meters per kg of cake.

15.11 Advantages of Biogas

Reliability

Biogas not only is a renewable energy source but is also a reliable fuel. Unlike other renewable energy sources such as wind or solar energy, biogas production is relatively unaffected by the weather conditions.

Versatility

Biomass is the only renewable energy source that is suitable for generating heat, power, gas and liquid fuels as well. The energy obtained from biogas is not only environmental friendly, but also is incredibly versatile. E.g. the waste heat that is a by-product from biogas generation process can be used to heat greenhouses or even for cooling. In particular, usage of biogas as an automobile fuel and as an injection into the existing natural gas grids will increase significantly in the coming years.

Environmental Compatibility

Combustion of biogas does not produce any additional carbon dioxide (CO₂), unlike the combustion of fossil fuels. The CO₂ emission that originates from the use of biogas matches the amount that plants need to grow and produce the renewable resources. In this way no additional carbon dioxide is being produced, which otherwise is considered to be harmful to the environment.

Production Process and By-products

The production of biogas results in high-quality fertilizer as by products. Nitrate, phosphor and potassium remain nearly untouched during the biological process. Almost half of Nitrate by-product is ammonium, which plants absorb fast and easily. The other part is organic nitrate, an ideal long term fertilizer for crop plants.

Avenue for safe disposal of bio-waste

Biogas is produced from renewable resources, agricultural residues and certain industrial effluents or even waste. Normally these wastes deteriorate the environmental quality of the region where they are produced. The collection and energy exploitation of these materials through anaerobic digestion, not only provides significant amounts of green energy to the grid, but also mitigates the pollution effects on the local ecosystems.

Uses of Biogas in India

While technically biogas can be produced from any type of organic material, most times, biogas is produced from organic waste. This waste could comprise agricultural and crop waste, human waste and animal waste (cow dung for instance). With a calorific value of about 5000 kilo Cal / m³, biogas is an excellent fuel for heating purposes as well as for generating electricity.

It is estimated that India can produce power of about 17,000 MW using biogas. This is over 10% of the total installed electricity capacity in India.

Biogas in households and communities

Biogas production in India has been quite dominant at household and community levels (especially in rural areas) rather than on a large scale commercial or industrial level. In villages especially, thousands of small biogas plants use the cattle waste (cow dung, etc) and provide biogas used for home heating and cooking. It is estimated that over 2 million such biogas plants have been installed all over India.

Such use of biogas systems in agrarian communities indirectly contributes to an increase in agricultural productivity. This is because producing heat using biogas is not only more efficient, but also more agricultural and animal waste can be re-used by the farmers as organic fertilizer. Moreover, the slurry that is returned after methanogenesis is superior in terms of its nutrient content and can be used as a soil conditioner and plant nutrient (fertilizer).

Biogas for electricity production

The use of biogas for electricity generation in India is a recent phenomenon, but this trend catching up. In many cities across India, sewage treatment centres and organic waste treatment plants (those treating municipal solid waste) already use anaerobic digesters to generate biogas and electricity. Some of the industries that generate significant amounts of solid or liquid organic waste also have installed digesters and gas engines for in-house electricity production. Many of these require sizable investments, but it is estimated that they have a good return on investment as the main feedstock (organic waste) that they use is essentially free.

Biogas in the Indian industry

Use of digesters at industrial complexes (to treat the waste generated at the factory) is also increasing. For the factories this is an excellent avenue to dispose of waste in a cost effective manner while at the same time generate heat and/or electricity. Industries that have an especially high potential for using anaerobic digestion include cattle and poultry industry, sugar, breweries, pulp and paper industry, leather tanning industry, and the fruits & vegetables processing industry. As pointed out

earlier, some of these industries are already producing electricity from biogas, and this trend is likely to grow in future. Many Indian industries, in their quest to become more environment conscious, are turning to biogas as one of their energy sources. In Sep 2009, for instance, PepsiCo India, a division of PepsiCo, installed a biogas plant at its Pune based Frito-Lay manufacturing unit. It is the first plant within Frito-Lay's global operations to use biogas. Companies such as Sintex Industries have introduced novel biogas digesters for the small users of this renewable energy resource.

Future prospects for biogas in India

With the Indian government keen on promoting usage of renewable resources for energy production, it is likely that there will be a greater thrust and higher incentive for concepts such as biogas production from waste. An increasing awareness among the public regarding sustainable use of resources will only enhance the production and usage of biogas. It can hence be expected that biogas will have a significant growth in

India at all levels of usage (household, commercial, industrial) for different purposes such as heat generation, electricity production, etc.

It is also possible to earn carbon credits for biogas-based power or heat generation in India. For instance, in April 2008, Andhyodaya, a non-government agency working in the field of promoting water management and non-conventional energy and social development distributed the first instalment of the biogas carbon credit to farmers in the state of Kerala. Andhyodaya had helped construct 15,000 biogas plants in the state and earned carbon credits. This trend is likely to grow further. Both the central and the state governments in India have recognized the significance of biomass-based energy in the context of development of the rural population. Steps are already being taken in this regard.

For instance, in Feb 2010, the Haryana Government has formulated a Rs. 85 crore project for setting up 50,000 family size biogas plants to harness the potential of generating biogas for cooking and use the remnants as organic manure in the fields.

In sum, India has significant potential for generating heat and electricity from waste in the form of biogas. While only a portion of the potential has been tapped, it is likely that more investments in this direction could accelerate exploitation of this source and realize the true potential in future.

15.12 Biogas – Sustainability

Emerging and developing countries are home to 80% of the world's population but consume only 30% of global commercial energy. As energy consumption rises with increase in population and living standards, the need to expand access to energy in new ways is growing as is the awareness of the environmental costs. This quest for alternative sources of energy leads to emphasis being laid on renewable energy (RE) sources. RE sources also offer other distinct advantages such as energy independence, climate change mitigation, rural development, improved health and lower health costs (linked to air pollution).

In this quest for alternative sources of energy, factors such as environmental friendliness and compatibility, sustainability and cost effectiveness are the major driving forces. Apart from these environmental and ecological considerations, rising cost of imports of LPG and CNG to meet local demands make it necessary to identify other feasible sources of energy. Hence the development and deployment of renewable energy in India is driven by the need to:

1. Expand cost-effective energy supplies
2. Sustain accelerated deployment of renewable energy system and devices

3. Augment energy supply to remote and deficient areas to provide normative consumption levels to all sections of the population across the country.

In the long run sustainability would be another major factor that would be given significant consideration while defining the path of energy sources development in India. In the current scenario there is a growing pressure on oil companies to substitute part of petroleum fuels with bio-fuels such as Ethyl alcohol in Motor spirit and Bio diesel in diesel to reduce the dependence on imported crude and also to meet the pollution norms. However use of CNG/NG alone would not be sufficient to meet the growing demand for alternative energy to reduce dependence on petroleum products as there are numerous challenges being faced by the oil industry such as limited reserves and escalating prices which only reiterate the need to identify and implement sources of energy that are not in danger of depletion.

15.13 Summary

The Indian government realizes the importance of promoting such sustainable energy sources and as part of this its promotion of biogas production. Keeping such factors in view, the Petroleum Ministry and oil industry is making a conscious effort to promote other forms of renewable energy. Biogas and bio-methane are among such renewable sources of energy that the oil industry and the Petroleum Ministry should consider in meeting India's future energy needs in a cost effective and a sustainable manner.

15.14 Further Readings

1. Meisen, Pelen (2006) Renewable Energy Potential of India. Global Energy Net work Institute available at www.cccindia.co/corcentral/Database
2. India Ministry of Non-Conventional Energy Sources (MNES) <http://mnes.nic.in/>
3. [http://www.teri in.org/](http://www.teri.in.org/)

15.15 Model Questions

1. What are renewable sources of energy? What is their importance in modern times due to energy crisis?
2. Write a note on Bio gas fuel as a source of energy.

EFFICIENT WATER MANAGEMENT PROGRAMS

Structure

- 16.0 Objectives
- 16.1 Introduction
- 16.2 What is Good Water Management?
- 16.3 Water Management Planning
- 16.4 Water Resource Management : Background
 - 16.4.1 National Water Policy 1987
 - 16.4.2 Nation Water Policy 2002
- 16.5 Water Related Challenges
- 16.6 Strategies
- 16.7 Summary
- 16.8 Further Readings
- 16.9 Model Question

16.0 Objectives

After reading this lesson you will be able to

- define water management
- explain national water policies
- describe water related challenges

16.1 INTRODUCTION

WATER is a finite but widely present resource. It is a good solvent, which makes it highly vulnerable to pollution. Despite its wide presence, water availability and demand at many places have high degrees of mismatch: spatial and temporal. Many a times, it is a challenge to provide water of desired quantity and quality at a desired place. This is especially true for monsoon climates where 70–90% of the annual rain falls in just 3–4 months. This leads to too much water and often floods in the wet season, and too little water and often droughts in the dry season. At times, enough water may be available but the quality may be so poor that it is of no use without treatment.

Sustainable water management in India poses numerous challenges: bridging the increasing gap between demand and supply, providing enough water for production of food, balancing the uses between competing demands, meeting the growing demands of big cities, treatment of wastewater, sharing of water with the neighbouring countries and among the co-basin states, etc. Increasing population, growing urbanization, and rapid industrialization combined with the need for raising

agricultural production generates competing claims for water. There is a growing perception of a sense of an impending water crisis in the country. Some manifestations of this crisis are:

- There is hardly any city which receives a 24-hour supply of drinking water.
- Many rural habitations which had been covered under the drinking water programme are now being reported as having slipped back with target dates for completion continuously pushed back. There are pockets where arsenic, nitrate, and fluoride in drinking water are posing a serious health hazard.
- In many parts, the groundwater table declines due to over-exploitation imposing an increasing financial burden on farmers who need to deepen their wells and replace their pump sets and on State Governments whose subsidy burden for electricity supplies rises.
- Many major and medium irrigation (MMI) projects seem to remain under execution forever as they slip from one plan to the other with enormous cost and time overruns.
- Owing to lack of maintenance, the capacity of the older systems seems to be going down.
- The gross irrigated area does not seem to be rising in a manner that it should be, given the investment in irrigation. The difference between potential created and area actually irrigated remains large.
- Unless we bridge the gap, significant increase in agricultural production will be difficult to realize.
- Floods are a recurring problem in many parts of the country. Degradation of catchment areas and loss of flood plains to urban development and agriculture have accentuated the intensity of floods.
- Water quality in our rivers and lakes is far from satisfactory. Water in most parts of rivers is not fit for bathing, let alone drinking. Untreated or partially treated sewage from towns and cities is being dumped into the rivers.
- Untreated or inadequately treated industrial effluents pollute water bodies and also contaminate groundwater.
- At the same time water conflicts are increasing. Apart from the traditional conflicts about water rights between upper and lower riparian in a river, conflicts about quality of water, people's right for rainwater harvesting in a watershed against downstream users, industrial use of groundwater and its impact on water tables and between urban and rural users have emerged.

India with 2.4% of the world's total area has 16% of the world's population; but has only 4% of the total available fresh water. This clearly indicates the need for water resource development, conservation, and optimum use.

16.2 WHAT IS GOOD WATER MANAGEMENT?

To the farmer, good water management means getting the right amount of water to the crops at the right time with minimum labor and expense. If this can be accomplished without creating other problems, such as a build-up of salt in the soil or losing water to spills and seepage, so much the better.

To the irrigation district or ditch company, good water management means meeting the water needs of its customers as efficiently as possible, with minimum waste or loss. Good *water* management is, therefore, fundamentally important to good overall *district* management.

To society, good water management means having adequate supplies of good quality water for all municipal, industrial, agricultural, recreational, and environmental needs. Those in charge of operating water supply and delivery systems bear the greatest burden of responsibility for promoting and achieving the good water management demanded by society.

16.3 WHY DO WATER MANAGEMENT PLANNING?

Planning is the process of thinking ahead to achieve desired future outcomes and to avoid undesired future pitfalls. It is something we all do at many levels every day of our lives. There are benefits to be gained and risks to be avoided by water management planning.

Benefits of Good Water Management Planning

Water management planning can benefit the irrigation district and the irrigator, as well as third parties and the environment. The range of potential benefits includes:

- Better water service to customers
- More effective use of available water supply
- Reduced operating costs
- Improved revenues to the district
- Improved crop yields and quality
- Reduced on-farm costs
- Development of additional water supply capabilities
- Improved water quality and aquatic habitat
- Habitat maintenance for endangered species
- Better documentation of uses and accomplishments
- Education of customers and the public
- Diminished groundwater overdraft
- Improved system and water supply reliability
- Postponed need for new or expanded water supplies
- Reduced drought impacts

16.4 WATER RESOURCE MANAGEMENT: BACKGROUND

In pre-British India, water management was essentially a local matter and was in the hands of the community, though some rulers took the initiative to construct canals and other water supply structures. Digging of ponds/tanks was considered as the paramount duty of the rulers to provide water for cultivation and drinking purposes. Control of water resources passed from the hands of the community into those of the State. The State claimed the ownership of the natural resources, including water, and their management passed into the hands of the bureaucrats and engineers. Traditional forms of water management declined and the era of large dams began (Iyer, 1998). One piece of early legislation in the area of water resource management was the North India Canal and Drainage Act of 1873. The preamble to the act says that "the provincial government is entitled to use and control for public purposes the water of all lakes and other natural collections of still water". Without talking about the ownership, the act asserts the right of the State to use and control water. The natural riparian right also found a statutory footing under the Indian Easements Act 1882. The customary rights of the people

were legitimized, but they were subject to the overriding provision of "any right of the government to regulate the collection, retention and distribution of the water of rivers and streams flowing in natural channels, and of natural lakes and ponds, or of the water flowing, collected, retained or distributed in or by any channel". One of the earliest cases decided by a court confirmed the government's right, subject to the condition that they would not inflict injury on any other riparian owners and diminish the supply that they have traditionally utilized. Clearly the power of the government over water management was conditioned upon the fact that the traditional supplies of water should not be diminished (Upadhyay, 2002). However, the various Irrigation, Canal and Drainage Acts passed prior to independence and passed thereafter, vested farmers and local populace outside the decision-making process. Therefore, the Supreme Court's declaration of the right to enjoyment of pollution-free water as a fundamental right under the Constitution was a boon (1991).

The East India Company took up the construction of large canals diverting huge flows of the rivers Krishna and Godavari, in the south, thanks to Sir Arthur Cotton, and the Ganga, Yamuna Indus and its tributaries in the north, largely in response to Cautley's initiative. A number of dam constructions were taken up and completed following the recommendations of the First Indian Irrigation Commission of 1903 to ward off the recurrent famines in the country. After independence, large scale river projects were taken up all over the country with the objective of making the country self-sufficient in food. The gross area irrigated increased from 28 to 68 x 10⁶ ha and food grain production quadrupled from 50 to 198 x 10⁶ t. It is estimated that between 1950 and 1995 over 500 000 million Rupees were spent on projects to create a storage capacity of around 200 km³ (Vohra, 1996). Surface water and groundwater contributed almost to the same degree towards this achievement. The Central Water Commission was set up in 1945, before independence, charged with the responsibility of initiating, coordinating and furthering, in consultation with the state governments concerned, schemes for control, conservation, and utilization of water resources for flood control, irrigation, navigation and hydropower generation. The Commission developed technological know-how in planning, investigation, design and management of water resources development. This Commission and the Central Soil and Materials Research Station and eight subordinate offices came under the Ministry of Water Resources, whose role was to formulate policies, overall planning, development and management of water as national resources and to monitor the countrywide development of irrigation. As a first step to achieve these objectives, the National Water Resources Council, under the Chairmanship of the Prime Minister, adopted the National Water Policy on 9 September 1987.

16.4.1 NATIONAL WATER POLICY 1987

The Policy recognized water as a precious national asset embodying the nation's resolve that planning and development of water resources would be governed by national perspectives. The Policy also recognized the drainage basin as the basic unit of planning for water resource development and called for appropriate measures to optimize utilization of these resources not only for the benefit of people living in India, but also for transfer of surplus water to meet the requirements of water-short areas.

Having regard to the importance of water, the federal structure of this country, and the nature of the allocation of responsibilities in respect of water in the Constitution, the need for a national consensus on a policy framework was felt and it was this that led to the National Water Policy in 1987. The Policy document discussed the various aspects of water: its availability in India, maximizing its availability, project planning, maintenance and modernization, safety of structures, groundwater development, water allocation priorities, drinking water, irrigation, water rates, participation of farmers and voluntary agencies, water quality, conservation of water, flood control and management, land erosion by the sea or rivers, drought management, science and technology and training. Surprisingly enough, the phrase "water management" rarely figured in

the entire document. Under the heading Science and Technology, this following phrase occurred:

"For effective and economic management of our water resources, the frontiers of knowledge need to be pushed forward in several directions by intensifying research efforts in various areas, including the following", one of the areas being better water management practices and improvement of operational technology. It concluded: "In view of the vital importance of water for human and animal life, for maintaining ecological balance and for economic and development activities of all kinds, and considering its increasing scarcity, the planning and management of this resource and its optimal, economical and equitable use has been a matter of the utmost urgency. The success of the national water policy will depend entirely on the development and maintenance of a national consensus and commitments to its underlying principles and objectives" (Government of India, 1987).

16.4.2 NATIONAL WATER POLICY 2002

The 1987 National Water Policy needed to be revised in the light of the experience gained and emergence of new challenges in the water resources sector. A revised and updated draft National Water Policy, finalized by the working group, was then considered and deliberated upon at the fifth meeting of the National Water Resources Council on 1 April 2002. The Council adopted the "National Water Policy-2002" (Government of India, 2002). It notes that the gross irrigation potential had increased to about 95 x 10⁶ ha by the end of the year 1999-2000, that the production of food grains increased to about 208 x 10⁶ t by 2000, and that this would have to be raised to 350 x 10⁶ t by 2025 when the country's population itself will reach around 1390 million, and that water will become scarcer as years pass in view of increases in demand for drinking purposes, industrial demands, and hydro and thermal power generation. The need for the utmost efficiency in its use and a public awareness of the importance of its conservation was underscored. It re-emphasizes sustainable planning, development and management in the government's national policies. The water resources will have to be planned for a hydrological unit, i.e. a drainage basin as a whole, or for a sub-basin, multi-sectorally, taking into account surface and groundwater for sustainable use and incorporating quantity and quality aspects as well as environmental considerations. It also notes that the existing institutions at various levels in the water resources sector will have to be re-oriented/re-organized and even created, wherever necessary.

The policy envisages establishment of appropriate river basin organizations for the planned development and management of a river basin as a whole, or for sub-basins, wherever necessary. It advocates planning and development of water resource projects as multipurpose projects, and stresses that preservation of the quality of the environment and the ecological balance should be a primary consideration. The role of various government agencies, users and other stakeholders in various aspects of planning, design and development, and management of the water resources schemes would make it a participatory approach to Water Resources Management. These would include women, water users' associations and local bodies for appropriate roles in the management of water infrastructures/facilities. The private sector is also to be encouraged in the planning, development and management of water resources for diverse uses. Use of remote sensing techniques in development and management of water resources, and use of the static groundwater resource as a crisis management measure are the new areas for intensifying research efforts.

Drainage basin management through extensive soil conservation, catchment area treatment, preservation of forests and increasing the forest cover and the construction of check

dams are included as part of water management, which has been welcomed (Iyer,2002). The need to get optimal productivity per unit of water has been stressed, while monitoring and evaluating the performance and socio-economic impact of the projects undertaken is emphasized.

Water quality, flood control and management, and drought prone area development are other points of importance in the new policy, though these were also in the light of the Narmada and Sardar Sarovar projects is a vital addition in the new policy.

The National Perspective for Water Resources Development envisages a long-term plan of interlinking the rivers of the north to those in the south, which is expected to significantly alleviate the problems of floods and droughts in the country. This plan has also been ordered by the Supreme Court of India recently, while it was hearing the case between Tamil Nadu and Karnataka on the River Cauvery. Previously, the Court had declared water as a Fundamental Right. Water is a State subject as per the Constitution of India. These basic points should be reflected in any Water Policy of the country.

16.5 WATER-RELATED CHALLENGES

India is currently facing a daunting set of water-related challenges.

Access to and adequacy of safe water: The per capita water availability at national level has declined over the years. Deteriorating water quality, pollution problems and seasonal water shortages are increasingly making water unsuitable and inadequate for basic human needs. Key challenge is providing safe and adequate water to all. In rural areas burden of fetching water from distant sources falls on women and yet women (who are the providers and managers of water in the household) have little or no voice in 'water resources planning'. As for the urban areas, most large cities are chronically short of water..

Institutional challenges: By far the most serious challenges are those of management of the existing infrastructure and of the water resource itself. Over the past few years several high-level commissions have been appointed to deal with water management issues and also new national/state policies have been promulgated. However, not much of it has been implemented effectively. This divide between the problem and practice has led to extensive loss of credibility of the state apparatus for water development and management. Problem is balancing between service providers and users of all kind.

Service Provision: The provision of formal irrigation and water supply services in India is the virtual exclusive monopoly of government agencies, which often do not provide services to many (especially the poor) or provide poor quality services to those who do have access. On the contrary, market competition could correctly be argued to improve efficiency. Absence of clear, enforceable water entitlements at all levels is also at the root of service shortcomings such as, water use inefficiency, corruption, financial problems and conflicts which plague the water sector in India currently.

Over-extraction of Groundwater and Quality Problems: Problems related to groundwater governance include high extraction rates, fluctuating water tables, groundwater pollution, and reduced agricultural production and equity issues. Complexities such as the existence of millions of wells across the country, unhindered public access to groundwater and often poorly understood character of the system dependent on groundwater, pose a serious challenge to the groundwater managers. Although the CGWB has classified areas as safe, semi-critical, critical and unsafe based on units of groundwater availability for its development, there is general lack of vision about the development and recharge of groundwater resources. There are no legal and financial checks to ensure that the resource is developed only in safe and semi-critical areas. The over-extraction of groundwater in some coastal

areas has led to the problem of saline water intrusion thereby resulting in quality deterioration of fresh water aquifers. Some natural geographical processes are also responsible for deterioration of groundwater quality (arsenic and iron concentration). Therefore, policy makers face a unique dilemma: how to ensure and preserve the benefits to farmers and the wider economy of rapid groundwater expansion; while attempting to control its excesses. Much of the problems related to groundwater management is owing to undefined property rights, which is conducive neither to equity nor to sustainability. Private landowners in India have absolute ownership of groundwater beneath their land and they can extract any amount of groundwater without regard to the impact on other adjacent landowners. Individual rights to groundwater are recognised only indirectly through land rights. Therefore, under conditions of unequal land, the practice of linking groundwater with land and the fact of de facto control by better endowed persons only accentuates rural inequality and water use inefficiency.

The main provisions of the 'Model Ground Water Bill' to regulate and control the development and management of groundwater are:

1. Constitution of a Groundwater Authority by each state to discharge the various functions under the legislation, comprising of a Chairman, a representative of the Central Groundwater Board, representatives of the concerned state government departments and knowledgeable persons in matters relating to groundwater. The authority should also be supported by technical persons and other staffs considered necessary for enforcing the legislation.
2. The State governments acquire power to restrict construction of groundwater abstraction structures by individuals or communities for all purposes including drinking and domestic use.
3. The Authority can declare any area to be a 'notified area' if it is of the opinion that controlling and regulating groundwater extraction and use of groundwater in that area is necessary.
4. Anyone (except small and marginal farmers) wishing to sink a well for any purpose within the notified area must obtain a permit from the authority. Such applications for permit are to be considered by the Authority keeping in view, the purpose for which water is to be used, availability of groundwater, existence of other competitive users, long-term groundwater level behaviour, and other relevant factors.
5. Every existing user of groundwater in the State should apply to the Authority for grant of a Certificate of Registration recognising its existing use and authorising the continued use of groundwater. The Authority is vested with the power to cancel any permits, registrations or licences if necessary
6. The Authority could take up steps to ensure that exploitation of groundwater resources does not exceed the natural replenishment to the aquifers. Wherever, there is a mismatch, steps could be taken to ensure augmentation of groundwater resources in addition to regulatory measures.
7. The Authority should upkeep the data-base on groundwater related information.
8. To improve groundwater situation, the Authority may identify the recharge worthy areas in the State and issue necessary guidelines for adoption of rain water harvesting for groundwater recharge in these areas.
9. The Authority should take steps for promotion of mass awareness and training programs on artificial recharging of groundwater through different government, non-governmental or educational institutions.

10. The Authority should be provided with complete legal support to enforce the various provisions of the legislations and the Civil Courts are barred from granting injunction on any decision taken by the Authority

Growing Financial Crunch: Currently, India's water sector is in severe financial distress and there is enormous liability from deferred maintenance. There is shortage of substantial funds to deal with the needs for the development of water resources infrastructure, maintenance and management. Funds are required not only for annual maintenance and rehabilitation of the sector but also for providing services to those who do not have them. Distortion in pricing of water services has further induced substantial overall economic costs by enlarging the gulf between prices and costs. National Water Policy, 2002 has emphasized that the management of water resources should incorporate a participatory approach by involving not only the Government agencies but also all stakeholders in various aspects of planning, design and management. Recognizing the need for legal framework for Participatory Irrigation Management (PIM), the Ministry of Water Resources (MoWR) has brought out a model act to be adopted by the States for this purpose. Presently more than 61,000 Water Users' Associations (WUAs) have been formed in 23 States covering an area of about 12.55 million hectares. Some of the remaining States have been encouraging participation of farmers in Irrigation Management at outlet level under cooperative/society acts. Despite this progress, PIM is not Working effectively in all States. The constraints in the implementation of PIM (like deficiencies in the irrigation supply system, lack of training and leadership, cooperation of Irrigation Departments, etc.) need to be addressed adequately.

Expanding Water Conflicts: Allocation of water between users (agriculture, industry, domestic supplies, hydro-power, etc.) and between areas within river basins (e.g. catchment areas versus flood plains) is often uncontrolled, and inequitable. Severe water shortages have already led to a growing number of conflicts across the country. Some 90 percent of India's territory is drained by inter-state rivers. The lack of clear allocation rules and uncertainty about how much water each state has a right to, impose high economic and environmental costs. Such growing water conflicts between different users, areas and States (inter-state disputes on sharing of river water) and inequities in distribution of the available water resources are some of the crucial concerns currently faced by the country's water-sector.

The major rivers of the country are mostly inter-State rivers. There has been an increasing demand for water in all sectors, sometimes leading to inter-State disputes on sharing of water.

Absence of Affected People's involvement : There are serious issues about how the affected people are dealt with in major water infrastructure projects. In coming decades planned infrastructure projects include hydropower that generates large revenues and involves substantial resettlement of people. Infrastructure developers need to see the economic and social development of local communities to be as important as the technical aspects. There are important issues of responsibility which need to be worked out between project developers and state governments (to whom non-state developers pay massive royalties of 12% of the gross value of the power generated).

Inadequate transparency: A central feature of modern water management in a liberalized economy and democratic environment is that of openness and transparency. In most countries now all relevant information – hydrological, performance, planning – is available publicly, on the web and in real time. Unfortunately, India has been slow in adapting to this changed information environment. However, recently there has been some modest progress. This change would undoubtedly stimulate a chain reaction of accountability, participation and demand for more and better data which would transform the culture of water management in the country.

16.6 STRATEGIES OPTIONS

From 'Water resources development' to 'Water resources management': India need to shift its focus from 'water resources development' to 'water resources management' by restructuring and strengthening existing institutions for better service delivery and resource sustainability. Planning for big water resources projects should be interdisciplinary with all environmental, ecological and human concerns internalized and thereby assessing the impacts by a concrete statute. At the national level, a number of national commissions have been constituted by the central government to review specific water policy issues as well as plan for a long-term development of the water sector.

Promote River Basin Organizations: Despite the legal provisions, not a single River Board has been constituted under this Act (Iyer, 1994; Naqvi, 2006). None of the state governments has so far made any such "request" to establish River Basin Organisations. In such circumstances, the co-existence of a River Board and a Water Tribunal seems questionable. Even if a River Board would have been set up it cannot be said that the riparian states would have waived their rights under the Inter-States Water Disputes Act of seeking the constitution of a Water Tribunal for the settlement of any disputes with respect to the very same inter-state river for which the Board is operating. Therefore, an element of "dispute" seems to be the primary reason for the government to act and not the "regulation and development of the river". The origin of River Basin Boards in India can be seen from two perspectives:

- a) functions vested upon the board by certain policies,
- b) legal considerations for its formation.

River Basin Organizations in India are typically either headed by the Ministry of Water Resources or Power or a Chairman appointed by the GOI. The structure of the RBOs is generally highly bureaucratic, with no participation of the stakeholders. A few water users or water-using sector are generally represented on these boards. Over the past 50 years several River Basin Authorities have been constituted. A few noteworthy RBOs are; the Damodar Valley Corporation, the Tungabhadra Board, Bhakra-Beas Management Board, Cauvery river authority, Ganga Flood Control Board, Brahmaputra Board, etc. Despite this, the National Commission for Integrated Water Resources Development Plan admits in one of its reports submitted in 1999 that India does not have a successful model of RBO and it is in this report it recommended for a model RBO. Till date such a model RBO has not yet been constituted. There is a need to promote a few pilot RBOs as models to refine and replicate later. These RBOs can also embark on IWRM in the process.

However, there are impediments to the formation of River Basin Organizations based on formal rules, laws and procedures. Leaving those aside there are also other impediments originating from the political, economic, and institutional environment.

a) Political Impediments:- Political reasons might have led to the enactment of the River Boards Act in 1956, but might also have stopped the Central Government in constituting any River Boards for the inter-state rivers. The political compulsions may be due to multi-party political structure of the country where there may not be the same political party ruling at the Centre and the State simultaneously. This prevents the Central Government from imposing upon a State, a decision, which a state is unwilling to accept.

b) Economic Impediments:- Insufficient funds for the large projects may also be one of the reasons to create River Boards and Organizations.

c) Institutional Impediments:- Over the past 50 years several River Basin Authorities have been constituted. Despite this, the National Commission for Integrated Water Resources Development

Plan admits in one of its reports submitted in 1999 that India does not have a successful model of RBO and it is in this report it recommended a model RBO. Till date such a model RBO has not yet been constituted.

Ensure Integrated Water Resource Management: Coordinated and conjunctive use of all water - by location (surface, ground), by users (rural, urban, peri-urban), or by use (domestic, irrigation, industrial and institutional) - is a working definition of integrated water resource management (IWRM). In the absence of demand management (inducing water conservation through prices or other incentives) in urban as well as rural India, supply augmentation alone is not likely to bring supply in line with demand. Another major conundrum is how to make 'demand-responsive' water development in rural India match with the technical requirements of watershed-wide management under IWRM. Different institutional arrangements are needed for water resources planning (example: Department Water Resources Planning in Rajasthan and District Water Management Agencies in Andhra Pradesh).

Since water is a political issue and most river basins are inter-state (water is a state subject), improvement in water resources management is not easy. The increased focus on integrated surface and groundwater management, which has been advancing significantly in India, will likely reduce the perception of India's groundwater dependence.

Support Groundwater Governance: Introducing a groundwater management system that ensures balance between abstractions and recharge is a rather difficult. Groundwater management essentially requires a legal framework which constrains the rights of people to pump as much water as they wish from their land; the separation of land rights and water entitlements, with the latter usually based on historical use; strong government presence to give legal backing for the development of participatory aquifer management associations and to provide the decision-support systems which enable aquifer associations to monitor their resource; and, above all, clarity that the primary responsibility for the maintenance of the resource on which they depend is with those who have entitlements to use water from a particular aquifer.

Currently, there is a need for a paradigm shift from groundwater management mode to a broader and holistic concept of groundwater governance mode which has to be multi-level, multi-actor and multi-instrumental.

Scale-up Community-based Tanks Rejuvenation: India has some 580,000 tanks of various sizes spread over across the country. Most of them were managed by local communities for several centuries. In the post-independence era, they collapsed owing to poor maintenance and lack of interest from the government. Community based tank rejuvenation is of critical importance for a country like India. With growing water scarcity, tank rejuvenation is an important way in which water can be conserved for both surface and groundwater irrigation. With limited water resources, vagaries of monsoon and looming water scarcity in many parts of India, water conservation and use by medium and micro water retaining structures have assumed greater significance.

Provide Water for All: The National Water Policy – 2002, has assigned the highest priority to drinking water. However, it is important to note that despite five decades of planning and over a decade of 'Drinking Water Missions' there are large numbers of 'no source' villages, i.e., those with no identified source of safe drinking water. Interestingly, although the targets for covering such 'no source' villages are repeatedly achieved, their numbers grow, which in turn mean that some 'covered' villages are lapsing back into the uncovered category, and that newer villages are being added to this class.

India needs to revamp its model of drinking water provision. The country needs to tap assured sources and link them within the river basin, if required. This would enable within a river basin, guaranteed domestic supplies both in terms of quantity and quality. For this, investments have to be

focused on creating effective infrastructure and mechanisms to operate them efficiently. If required, supply links need to be provided across the basins. Since, provision of drinking water is prime concern, both states and central governments and all stakeholders would support such venture. All this would enable to provision of adequate safe drinking water for all in the country.

Promote Extensive Use of Water Treatment technologies to Reclaim Water: In recent years, various technologies have proven, across the country – both in rural and urban areas. Several agencies have demonstrated on a larger scale in hundreds of villages and small towns, that poor quality of water (sea water, groundwater, and sewage water) can be converted to provide safe and adequate water to local people, at a low cost. Such programmes need to be scaled up on a large scale to make dent in demand management. This would enable

- a) sustainable supplies,
- b) provision of safe and adequate water to both domestic and industrial supplies,
- c) low capital cost,
- d) self supporting system,
- e) user pay principle comes into practice:

Promote Public-Private-Panchayat-Partnership (4P): Considering the financial constraints and managerial limitations of governments, part of the water resources development and management activities may be shared under 4P (PPPP) model. The interest to mobilize financial resources from the private sector was first considered in 1995 by the Government of India, when it was realized that such involvement could provide better and efficient services to the water sector. The National Water Policy 2002 also encourages private sector participation in planning, development and management of water resources project for diverse uses, which might help in generating financial resources and introducing corporate management and improving service efficiency and accountability to users.

The public sector should play an expanded role in financing and provision of public services (such as flood control and sewage treatment) and the government should develop a set of laws, policies, capacities and organizations for defining and delivering an enabling environment, with special emphasis on the establishment and management of water entitlements, and the regulation of services and resources. It would be fruitful to promote a few pilot irrigation projects across the country on 4P model with clear outcomes. This model may also be extended to provision of drinking water, wastewater recycling in urban areas and at river or sub-basin level.

Set up and Strengthen Water Regulatory Authorities at State Level: Currently, Maharashtra and Uttar Pradesh (and proposed in Andhra Pradesh) have water regulatory authorities. The lessons from these authorities need to be learnt and replicated in other states, including successful experiment of the water auditing system implemented in Maharashtra.

These authorities need to be oriented to focus on:

- a) effective water allocation and entitlement mechanisms at each river basin level to take care of both lean and flush season supplies across competing water uses;
- b) Evolve locally suitable approaches to promote effective irrigation management transfer at various levels;
- c) design models to promote public-private partnerships at sub-basin levels for effective operation and maintenance activities, and also to provide adequate infrastructure facilities to boost up both backward and forward linkages to all farmers; and

- d) introduce and refine methods for performance measurement at all levels of the irrigation project.

16.8 Summary

In this Chapter an attempt has been made to explain how efficient water resources should be managed. Good Water management is essential to preserve the scarce natural resource. Government of India has come out with different plans and policies to check the misuse of water resources. There is an urgent need to use rain water harvest and conserve water bodies.

16.9 Further Readings

1. India Infrastructure report (2011) Water : policy and Performance for Sustainable development oxford available at www.idfc.com/pdf/report
2. Water Sector in India (2011) Ernest & Young available at [www.ey.com/publication/water_in_India/---Water_Sector in India](http://www.ey.com/publication/water_in_India/---Water_Sector_in_India)
3. Water in India : Situation & Prospects – Unique available at [www.unicef.org/India/Final_Report pd/](http://www.unicef.org/India/Final_Report.pdf)
4. WHO 2011 Guidelines for drinking Water quality, 4th ed, Geneva : WHO.
5. Ministry of Water Resources, 2010 <http://www.wrmin.nic.in>.

16.10 Model question

What is the need of water management? Briefly discuss national policy of water management?

Use of Appropriate Technology for Environment Protection

Structure

- 17.0 Objectives
- 17.1 Introduction
- 17.2 Appropriate technology
- 17.3 Definitions
- 17.4 Characteristics
- 17.5 Challenges to the Environment and Sustainable Development
- 17.6 Use of Appropriate Technology in developed and developing countries
- 17.7 Relevance of Appropriate technology
- 17.8 Uses of Appropriate technology
- 17.9 Summary
- 17.10 References
- 17.11 Further readings
- 17.12 Model questions

17.0 Objectives

After reading this lesson you will be able to

- define appropriate technology
- identify the characteristics of appropriate technology
- mention the relevance of appropriate technology
- list the areas where it can be used

17.1 Introduction

Many people are coming to realize that neither our economy nor our population can continue to grow forever. We are running out of the natural resources necessary to sustain ourselves. In addition we are limited in our ability to deal with the social and environmental problems that result from continuous growth. There seems to be a growing dissatisfaction with the complexity and hectic lifestyle of 20th-century society. Many people would prefer to return to a simpler way of life. Appropriate technology is attractive because it makes households and industries more self-sufficient, and most things can be managed at a local level. We may have to do more hand labor instead of depending on automation to satisfy our basic needs. However, there are many advantages to simplifying our lives. By growing more of our own food and producing and buying goods in our own communities, we spend less time and money on transportation, produce less waste and consume fewer environmental resources.

17.2 Appropriate Technology

The concept of Appropriate Technology (AT) stemmed from the work of British economist Dr. Fritz Schumacher in the 1970s. Motivated by disillusionment with large-scale organizations and his experience in Burma and India, Schumacher developed the ideas behind the concept of intermediate technology, which became the linchpin of his seminal book *Small Is Beautiful: Economics As If People Mattered*, published in 1973. Perhaps, more than the others, Gandhi's work exerted the most influence on Schumacher. In using the term intermediate technology, Schumacher envisioned a technology for the Third World that was midway between, for example, a hand hoe and a tractor. As Schumacher (1973) described it, "Such an intermediate technology would be immensely more productive than the indigenous technology...but it would be immensely cheaper than the sophisticated, highly capital-intensive technology of modern industry" (p.180). In order for the concept of intermediate technology to be considered useful, it must be conducive to meeting the challenges outlined in the following propositions:

- Workplaces have to be created in the areas where the people are living now, and not primarily in metropolitan areas into which they tend to migrate;
- These workplaces must be, on average, cheap enough so that they can be created in large numbers without this calling for an unattainable level of capital formation and imports;
- The production methods employed must be relatively simple, so that the demands for high skills are minimized, not only in the production process itself but also in matters of organization, raw material supply, financing, marketing, and so forth;
- Production should be mainly from local materials and mainly for local use. (Schumacher, 1973, pp.175-176.)

To tackle these challenges, Schumacher and his colleagues founded the Intermediate Technology Development Group (ITDG) in London in 1965 (Schumacher, 1974).

The term 'Appropriate technology' has been used in similar sense. It can be a technique or a package of techniques or a process and a product. Appropriate technology may be sometimes "considered a social movement and a collection of hardware (such as machines, products, infrastructures-roads, water distribution system) and design alternatives presumably responsive to the ideology of that movement.

17.3 Definitions

Innumerable definitions are available for appropriate technology and each definition represents different facets of appropriate technology. Some are given below. According to Jequier and Gerard (1993), "Appropriate Technology (AT) is now recognized as the generic term for a wide range of technologies characterized by any one or several of the following features: (i) low investment cost per work place; (ii) low capital investment per unit of output; (iii) organizational simplicity; (iv) high adaptability to a particular social cultural environment, (v) sparing use of natural resources; (vi) low cost of final product or high potential for employment.

At present there is no consensus about the term "appropriate technology". However it is clearly recognized by its various characteristics. In terms of material aspects of appropriate technology production, "appropriateness" connotes the use of renewable sources of energy and recyclable materials, minimum destructive impact on the environment and maximum utilization of local resources. In terms of application, appropriate technology connotes assimilation with local environmental and cultural conditions. It does not overwhelm the community but is comprehensible, accessible and easy to maintain. Other phrases often used to describe appropriate technology are technology that is

intermediate (lying in scale of sophistication between primitive and large scale, contemporary technology), bio-techniques (modelled on natural energy flows, maximizing thermodynamic efficiencies), soft (harmonious with the environment), and low cost (regarding price of inputs and products and investment per work place).

According to Darrow and Rick (1978)", appropriate technologies: 1) "are low in capital costs; 2) use local materials whenever possible; 3) create jobs, employing local skills and labour; 4) are small enough in scale to be affordable by a small group of farmers; 5) can be understood, controlled and maintained by villagers wherever possible, without high level of Western style education; 6) can be produced out of a small metal working shop, if not in a village itself; 7) suppose that people can and will work together to collectively bring improvements to their communities, recognizing that in most of the world important decisions are made by groups rather than by individuals; 8) involve decentralized renewable energy sources, such as wind power, solar energy, water power, mechanic gas, animal power and pedal power (such as in that highly efficient machine, the bicycle); 9) make technology understandable to the people who are using it and thus suggest ideas that could be used in further innovations; 10) are flexible so that they can continue to be used or adapted to fit changing circumstances; 11) do not involve patents, royalties, consultant fees, import duties, shipping charges, or financial wizards; practical plans can be obtained free or at low cost and no further payment is involved." Examples of some appropriate technology are: (a) low cost construction materials for housing, water supply and waste disposal system, grain storage etc.; (b) decentralized power sources; (c) simple tools and equipment for agriculture and manufacturing."

An appropriate technology, according to Rahnman and Subbankhan (1972), "is a blend of technology in consonance with particular social reality in respect of goods, the disposal of technical know-how, the organization and mechanism of market and availability of labour. The choice of technology may be affected by the consideration of social justice and egalitarianism. The technologies selected may also be subjected to further development or modification to suit the particular environment. The selected technology should have the following characteristics: the technology may be primitive, low or high or anywhere between the primitive and modern technologies. It fits in the resource endowment position of the country and it is in consonance with its economic, social, cultural and political objectives, it does not degrade the environment and it is non-alienating."

According to Kerr (1989), "Appropriate technology is a term used to describe both a method and a movement. It is the appropriate application of scientific knowledge to development and also the movement started in 1960s and which is now active all over the world. It is worth to note that the conceptual framework of the term appropriate technology has not changed even at a time when we enter the next millennium.

Appropriate technology may be the technology developed by people of the land taking into consideration the local conditions that meet their own requirements and needs. It has to be simple, within affordable reach, and perfect in service. Appropriate technology, when we enter the next millennium, shall mean self-reliance in the development of technologies. An appropriate technology is one which, in a sustainable fashion and using locally accessible resources, meets the real and felt needs of individuals or communities without concentrating power in the hands of elite. It must be easily used, easily understood by the user, locally acceptable, affordable, and designed not only for the current situation, but related to the future scenario of projected population, climate, and socio-economic condition. It empowers people regardless of age, race, religion, and especially gender and locale (within a country, or among countries) to cope with international markets with new sustainable products and which includes mechanisms of informing, educating, and combating bottlenecks and structural conditions that otherwise would render the technology 'inappropriate'. Appropriate technology means exploring and harnessing the potential of both simple and complex technologies to contribute (in

environmentally and institutionally sustainable ways) to both the reduction of inequality (along ethnic, gender, and class lines) and an improvement in the quality of life (in social, economic, and psychological ways) for individuals and groups within communities around the world. Appropriate technology is the system of technology, science, and management that is evolved, accepted, and practiced by any cultural community of people, for increasing their vitality, productivity, and sustainability through education, training, and minimal external resources to ensure self-reliance of the community in their own environment.

Appropriate technology is technology that satisfies three criteria: (i) it works in the environment in which it is used; (ii) it satisfies the goals of the user better than any alternative technology available. (iii) it harms no-one, now or in the future. Appropriate technology is more about process than about tools. Appropriateness is more likely to result when local people participate in analyzing their own problems and planning their own solutions, and then deliberately choose technology which is relevant because it comes out of that process.

An appropriate technology is one which is designed to optimally satisfy demands by taking into account the economic and social situation of its users, and the natural environment of its operation. In comparison with conventional technologies, appropriate technology is affordable by a larger number of users, decreases social inequalities, and creates environmental sustainability. Thus an appropriate technology is one which meets a locally defined need using locally available materials and resources, which are themselves managed in a sustainable manner.

Appropriate technology is a technology sprouted in a specific culture in order to help satisfy the needs of that culture. Culture itself is sprouted and developed in a particular environment. Environments differ from one another. Cultures also differ from one another hence different appropriate technologies.

Self-assessment Question
Define Appropriate Technology.

17.4 Characteristic Features of Appropriate Technology

The major characteristic features of AT evolving from the definitions of appropriate technology can be listed as follows:

17.4.1. Low cost of technology

Adaptability, diffusion and indeed appropriateness of a technology will depend upon the cost of the technology. More the sophistication of a technology the more will be its capital cost. More the capital cost the more will be its distance from the poor and underprivileged. It is quite natural that if the poor and underprivileged sections of the people are to be helped the technology should be medium with cost and sophistication. Schumacher (1973) himself writes on intermediate technology, "If we define the level of technology in terms of 'equipment cost per work place', we can call the indigenous technology of a typical developing country-symbolically speaking-a \$ I-technology, while that of the developed countries could be called a \$ 1,000-

technology. The gap between these two technologies is enormous that a transition from the use to the other is simply impossible. In fact, the current attempt of the developing countries to infiltrate the \$ 1,000-technology into their economies inevitably kills off the \$ 1-technology at an alarming rate, destroying traditional workplaces much faster than modern workplaces can be created, and thus leaves the poor in more desperate and helpless position than ever before. If effective help is to be brought to those who need it most, a technology is required which would range in some intermediate position between the \$ 1-technology and the \$ 1,000-technology. Let us call it again symbolically speaking a \$ 100-technology." Regarding its viability, Schumacher continues, "Such an intermediate technology would be immensely more productive than the indigenous technology (which is often in a condition of decay), but it would also be immensely cheaper than the sophisticated, highly capital-intensive technology of modern industry. At such a level of capitalization, very large numbers of workplaces could be erected within a fairly short time, and the creation of such a workplace would be 'with reach' for the more enterprising minority within the district, not only in financial terms but also in terms of their education, aptitude, organizing skills and so forth." The ox-plough in tropical African countries is a good example of intermediate technology. Small two-wheel tractors developed by International Rice Research Institute, Philippines or rural latrine developed by the Planning Research and Actions Institute in India, small-scale sugar mills developed in India etc. are examples of intermediate technology. But intermediateness is of course a relative term and it varies from place to place.

17.4.2. Self-reliance

One of the major features determining appropriateness of a technology is its dependency on local environment not only for resources for production but also for know-how's and solutions. Appropriate technology fairly addresses this problem. The great Chinese leader, Mao Tse Tung has been using two slogans for his country's pursuit for self-reliant development. They are "rely on its own forces" and "walk on two legs." Technological self-reliance is the key factor for endogenous development. From its inception, appropriate technology has been viewed as a movement for attaining technological self-reliance exclusively depending upon the know-how generated locally restricting the import or transfer of alien technologies. The import or transfer of foreign technology also brings its isms and social structure that instead of solving the problems creates newer problems. The high local content in selecting a technology has ushered in the indigenous knowledge and research systems. This self-reliant local or village technologies make use the local resources judiciously and produced employment opportunities.

17.4.3 Labour intensiveness

Generating maximum employment opportunity is a key feature of appropriate technology. Modern technologies, in its process of mass production, tend to displace labour power and create idle hours for man and women. The severe unemployment and underemployment as a result of labour saving technologies will result in poverty. All visionaries of welfare society stood for production by masses rather than mass production. Mahatma Gandhi believed that poor of the world can only be helped by production by masses and not by mass production. The system of mass production, based on sophisticated, highly capital-intensive, high energy input dependent, and human labour-saving technology presupposes that you are already rich. According to Schumacher (1973), "The system of production by the masses mobilized the priceless resources which are possessed by all human beings, their clever brains and skillful hands, and supports them for first class tools The technology of mass production is inherently violent, ecologically damaging, self-defeating in terms of non-renewable resources and stultifying for the human person. The technology of production by the masses making use of the best of modern knowledge and experience is conducive to

decentralization, compatible with the laws of ecology, gentle in its use of scarce resources and designed to serve the human person instead of making him the servant of machine.

17.4.4. Smallness, simplicity and non-bureaucratic features

Appropriate technology is meant for small-scale production. The production unit is small and simple it is easy to manage. The production process employs local materials and as a result this minimizes the transport costs in both the input and output. As the production process is controlled the products will find a ready market in the command area of its operation. The technology is devoid of any complexity and because of this feature no special skill training to operate the unit is required. But a villager with his craft training is sufficient to manage the unit. Bureaucratic intervention is totally lacking in any stage of its operation. The individuals and families or village and community are responsible for its management.

17.4.5. Non-Violence

Another important characteristic feature of appropriate technology is its non-violent nature. Non-violence in this context is nothing but its non-destructive or harmful dealings with the living nature, with the limited and finite resources of the earth. Interaction of high-tech with nature and its resources was very violent. It is evident by the crisis of resource exhaustion and the ecological crisis. But appropriate technology tends to lead the nature to the rock of permanence.

17.5 Challenges to the Environment and Sustainable Development

Environmental and developmental challenges facing the nations today are complex but well known. One side of problem is like the situation in regions such as South Asia where high population levels, rapid population growth and unbalanced population distribution are already overloading the capacities of various natural systems. The increasing inability of these systems to provide for basic needs is resulting in increased poverty. Countries are caught in a vicious cycle of poverty, rapid population growth, environmental deterioration and more poverty. The other side of problem is well exemplified in the pacific- rim region where rapid industrialization is taking place. Number of negative environmental impacts due to industrialization is rapidly affecting the human life and benefits received from the growth of industries. Haphazardly planned industrialization could lead to rapid natural resources depletion, air, water and noise pollution, accumulation of hazardous wastes, deadly industrial accidents, urban congestion and damage to human health.

Environmental trends and projects are generally used as the bases for anticipating changes in the region and to identify challenges that must be faced if the region is to sustain the long term needs of both present and future generations. This has triggered the concept of sustainable development.

Sustainable development meets the needs at present generations without compromising the ability of future generations to meet their own requirements. It involves wise use of nature and its resources to promote the greatest sustainable benefits to the present generation while maintaining the potential to meet the needs and aspirations of future generations. Sustainable development is an inter-generational concept, seeking equity over time and minimization of disparities between generations. Even now only a very small fraction of humanity enjoying the good life even within developed countries and there are wide disparities in the less developed countries. Since present standard of living is low in most of the low developed countries, people aspire for a higher standard. Sustainable development cautions that there are limits to such growths due to finite stocks of natural resources and energy available on other side pollution of environment, exploding population is escalating aspirations and conflicting interests.

17.6 Use of Appropriate Technology in developed and developing countries

Appropriate technology is important due to its holistic nature. Firstly, it permits local needs to be met more effectively through community involvement, and for this reason it tends to be aligned with local values and traditions. Secondly, it utilizes human labour by developing tools rather than machines. This enables people to self-organize without complicated management training and specialized knowledge. Thirdly, it minimizes transport of goods in an era of expensive and environmentally harmful energy, allowing greater local industry participation and implementation of local resources, both human and material. Fourthly, it reinforces local control which provides a cushion against the effects of outside economic changes. Finally, it establishes a self-sustaining skill base and reduces economic, social and political dependency between individuals, regions and nations. Appropriate technology recognizes the will of local people to act on their own behalves, and is a technology made by and for the people.

The appropriate technology movement in the rich countries such as the United States got started due to the convergence of a variety of concerns. These included the need to find a more harmonious and sustainable relationship with the environment, identify a way out of the accelerating energy and resource crises, reduce alienating work disconnected from its products and goals, develop more democratic workplaces, bring local economies back to health with diverse locally owned and operated enterprises, and revitalize local communities and cultural traditions. Thoughtful, careful social choices are needed to correct the excesses and imbalances of an industrial culture driven by materialism. An essential quality of the appropriate technology movement in the United States can therefore be expressed by the word "restraint".

The appropriate technology movement in poor countries has, on the other hand developed in a very different fashion. In the poor countries the small amounts of capital available have usually been concentrated in the small industrial sector, creating very few jobs due to the high investment required per workplace. The appropriate technology movement in poor countries has come out of the recognition that industrialization strategies have not been successfully solving the problems of poverty and inequality. Indeed, in many cases "modernization" efforts have been massive assaults on local culture. The result for hundreds of millions of people has been the modernization of poverty—the neglect or construction of traditional craft occupations, the consolidation of farmlands into fewer and fewer hands, and the division of communities, leaving these people to eke out an existence on the fringe of economic activity. The appropriate technology movement in the developing world has developed as "the art of the possible" among the world's poor, seeking ways to solve pressing basic problems and create jobs with resources consisting of local skills and materials but little surplus cash.

From these different origins, the appropriate technology movements in rich and poor countries have been moving towards each other. The development of renewable energy technologies has long been a chief area of activity among U.S. appropriate technology groups. It moved high on the list of priorities in oil-importing poor countries in the late 1970's, as they faced high prices and scarcity of fuel for buses, tractors, and irrigation pumps. Similarly, environmental protection has gained increased attention in poor countries as pesticides have created major health risks for farmers and farm workers, and deforestation has reached a critical level.

17.7 Relevance of Appropriate technology:

The appropriateness of a technology lies in the optimum utilization of local resources, including human resources, by gainfully employing them. It also needs to be a technology that can facilitate decentralization, help human beings to realize their self, facilitate the sustainability of ecological system, strike a chord of harmony with nature and so forth. The fundamental objectives of any such technology should be to meet the basic human needs of any society, to begin with. The fundamental principle of synergy in systems should be the guiding point in selection of a technology, since the whole

is more than the sum of the parts. This also calls for an integrated and holistic vision of reality. It is further to be noted that this being the premises where appropriate technology is drawn from, the concept of appropriate technology is not a static one, but is highly dynamic. There cannot be a universal appropriate technology for a particular problem, since the socio-cultural base and the resource endowment in different parts of the globe vary significantly. Even in any given geographic space, the appropriate technology does not continue to be a permanent solution, statically, because with the changes in the system, the technology ought to change to continue to be 'appropriate'.

Appropriate technology thus involves judicious use of high energy materials to improve the properties of resulting composite materials. It will also involve development of eco-friendly processes to solve environmental problems. The development of appropriate technology in materials, products and services may demand simple cost effective equipment, machineries and process. Thus, appropriate technologies will help sustainable development of the region through use of local materials and skills and hence reduce the pressure on conventional costly materials and process.

Appropriate technology emphasizes the use of renewable resources, like the energy from the sun, wind, or water. Appropriate technology makes it possible to satisfy our basic human needs while minimizing our impact on the environment. We are running out of the natural resources necessary to sustain ourselves. In addition we are limited in our ability to deal with the social and environmental problems that result from continuous growth. There seems to be a growing dissatisfaction with the complexity and hectic lifestyle of 20th-century society. Many people would prefer to return to a simpler way of life. Appropriate technology is attractive because it makes households and industries more self-sufficient, and most things can be managed at a local level. We may have to do more hand labor instead of depending on automation to satisfy our basic needs. However, there are many advantages to simplifying our lives. By growing more of our own food and producing and buying goods in our own communities, we spend less time and money on transportation, produce less waste and consume fewer environmental resources.

17.8 Uses of Appropriate Technology

The five “R” s i.e. reduce, recover, recycle, reuse and rethink should be made part of modern day life because we will be running out of space. Each year, we generate millions of tons of trash in the form of wrappings, bottles, boxes, cans, grass clippings, furniture, clothing, phone books etc.

Reducing the amount of waste you produce is the best way to help the environment. There are lots of ways to do this. For example: Buy products that don't have too much packaging. Some products are wrapped in many layers of plastic and paperboard even though they don't need to be. .Instead of buying something you're not going to use very often, rethink your decision. Cars use a large amount of energy and cause pollution. Some ways to reduce the environmental damage caused by cars include carpooling with friends, walking, taking the bus, or riding your bike instead of driving or invention of electrical cars.

Durable goods (tyres, appliances, furniture) and nondurable goods (paper, certain disposable products, clothing) account for several million tons of the solid waste stream. Biodegradable cleaners and garbage bags, that use less toxic chemicals should be used, Use of cloth sacks to the store instead of taking home new paper or plastic bags can also be done. You can use these sacks again and again. You'll be saving some trees. Plastic containers and reusable lunch bags are great ways to take your lunch to school without creating waste.

Since Appropriate Technology is cost effective and eco-friendly it can be used in following ways.

1. **Indigenous Material Technology** : Use of different natural materials such as bamboo, coconut coir, jute fibers, banana fibers, sisal , sugar baggase, etc; in efficient way, application of bio-technology in development of required properties in these natural material.
2. **Energy Efficient Technology**: It includes cost effective technology applicable to green building, energy saving system (natural ventilation) , use of local materials in construction, use of solar, wind energy , bio gas energy etc.
3. **Disaster resistance Structures**: It includes earthquake resistance structures using lightweight materials, portable structures, Temporary sheds in disaster affected areas, floating structures near coastal areas
4. **Rain water harvesting techniques**: Water conservation through roof top water collection and utilization system, Collection of rainwater from open spaces, parks, roads and using it for storage and ground water recharge. Reuse of water through recycle systems in processing units and factories like sugar, clothes, paper mill etc. and service industries like automobile, washing hotels etc.
5. **Waste Material Technology**: conversion of waste materials into value added products. Waste may be solid waste from treatment plants industries, sewage, processing units, wastes from construction sectors like recycled aggregates, road materials, waste from pipe, tile and other precast factories, waste from furniture, plastic wastes agricultural wastes, bio-composting etc.
6. **Cost effective Transportation systems**: Low cost roads in rural and remote areas, Temporary and emergency bridges, use of rope way systems in remote hilly areas, Use of Inland water ways for transportation of goods and persons with water cleaning techniques. Further use of recycled rubber of cars tyres along with Bitumen enhances the quality of roads which used recently in many places.
7. **Use of Renewable energy**: Appropriate technology emphasizes the use of renewable resources, like the energy from the sun, wind, or water. These energy sources are available almost everywhere and need only the right technology to capture them. Unlike burning coal and oil, these local energy sources do not contribute to air and water pollution and they do not need to be transported over long distances. Food, energy, water, and waste disposal are also handled locally by ecological systems. These are systems that conserve resources by recycling organic nutrients back into the soil and re-using manufactured goods in innovative ways. Thus, appropriate technology makes it possible to satisfy our basic human needs while minimizing our impact on the environment.

Clean energy sources, such as solar energy, can help meet rising energy demands while reducing pollution and preventing damage to the environment and public health at the same time. Solar energy is an excellent alternative to fossil fuels for many reasons. Using solar energy to replace the use of traditional fossil fuel energy sources can prevent the release of pollutants into the atmosphere.

17.9 Summary

The concept of Appropriate Technology (AT) stemmed from the work of British economist Dr. Fritz Schumacher in the 1970s. Appropriate technology is a grass roots approach to technology that builds a strong sense of community and encompasses benefits that span across social, environmental, cultural, economic, and spiritual facets.

Appropriate Technology

1. requires only small amounts of capital;
2. emphasizes the use of locally available materials, in order to lower costs and reduce supply problems;
3. would be relatively labor-intensive but more productive than many traditional technologies;

4. would be small enough in scale to be affordable to individual families or small groups of families;
5. can be understood, controlled and maintained by villagers whenever possible, without a high level of specific training;
6. can be produced in villages or small workshops;
7. supposes that people can and will work together to bring improvements to communities;
8. offers opportunities for local people to become involved in the modification and innovation process;
9. would be flexible, can be adapted to different places and changing circumstances;
10. can be used in productive ways without doing harm to the environment.

17.10 References

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17.11 Further Readings

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17.12 Model Questions

- What is the role of use of appropriate technology in environment conservation?
- What do you understand by use of appropriate technology for environmental preservation?
