UNIT 1 INTEGRATED ENVIRONMENTAL MANAGEMENT

Structure

1.1 INTRODUCTION

The idea of integrated environment management has gained prominence in the past few decades, ever since sustainability became the central theme in economic development. You have studied about sustainable development in the course MED-002. You have learnt that it signifies an approach to environment and development issues in which the requirement to satisfy human needs is balanced with the capacity of the environment to cope with the consequences of economic development. It also delineates the contours of integrated environment management, which are being introduced in this unit.

We begin the unit by presenting a brief history of environmental management. The concept of integrated environmental management is closely linked with the need for sustainable development. Therefore, we revisit the concept of sustainable development briefly. We recapitulate the underlying principles of and the approaches to sustainable development. Finally, we outline the concept of integrated environmental management. In the next unit, we discuss the relevance of integrated environment management in the rural context.

Objectives

After studying this unit, you should be able to:

- outline human concerns about the environment in a historical perspective;
- discuss the principles and characteristics of sustainable development; and
- explain the concept of integrated environmental management.

1.2 HISTORICAL PERSPECTIVE

Since the Rio Summit in 1992, the objective of environmental protection has been accorded high priority by the international community. The concern for environmental degradation at local, regional and global levels has led to several national, regional and international measures and initiatives. It has at the same time become quite clear that reversing such degradation is not a purely technical and managerial matter. For, technical knowledge does not necessarily lead societies to change their environmentally damaging behaviours. Hence a critical understanding of socio-economic, political and cultural structure has acquired central importance in approaching environmental problems. Most of these are complex problems whose solutions require grasping the big picture, appreciating and dealing with complexity and supporting effective strategies. This is only possible by integrating the

environmental perspective into socio-economic, socio-cultural and ethical systems. There is a dire need to develop an environmental approach based on a system of collectively held factual ideas, beliefs and attitudes that advocates a particular pattern of social relationships with the environment. It also focuses on arrangements aimed at justifying a particular pattern of conduct towards the environment. We now trace the human approach to environment in a historical perspective to clarify why such advocacy is needed.

Early human societies were dependent on nature. The evolution of agriculture reduced this dependence. Together with urbanisation, it affected the environment negatively but human beings still lived in relative harmony with their environment. However, with the growing pace of industrialisation, the impact of human activities on the environment underwent a drastic change in the past two centuries. This has been accompanied by a gradual broadening and deepening of concerns towards human beings and nature. From early human societies to the industrial era, we can note four major strands in human concerns about the environment.

- Protection of nature,
- Pragmatic resource conservation,
- Moral and aesthetic nature preservation, and
- Environment and development.

We now describe each one of these, in brief.

- **Protection of Nature**

  Human misuse of nature is not unique to modern times. Plato, a famous Greek philosopher of the fourth century B.C., wrote that the Greek peninsula of Attica was once blessed with fertile soil and abundant forests of fine trees (Fig. 1.1). He lamented that after the trees were cut to build houses and ships, heavy rains washed the soil into the sea, leaving only a rocky "skeleton of a body wasted by disease". Springs and rivers dried up while farming became all but impossible.

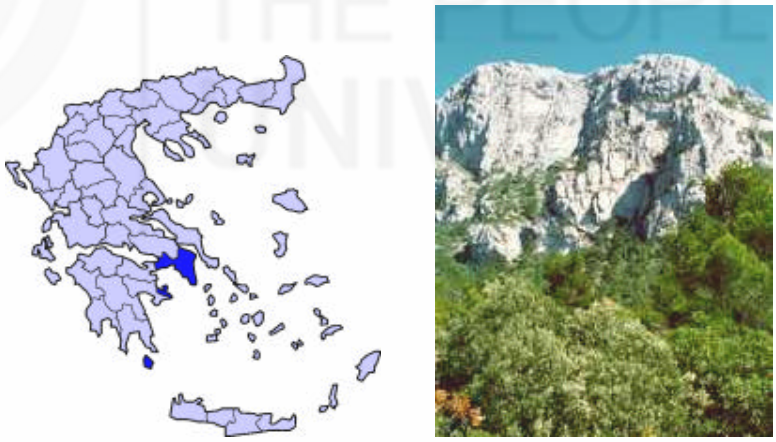


Fig.1.1: Attica is located in what is today southern Greece, and covers about 3,800 square kilometres. In addition to Athens, it contains within its area the cities of *Peiraeus*, *Eleusis*, *Megara*, *Laurium* , and *Marathon*, as well as the islands of *Salamis*, *Aegina*, *Poros*, *Hydra*, *Spetses*, *Kythira*, and *Antikythera*

Classical authors often regarded the Earth as a living being, vulnerable to aging, illness, and even mortality. Periodic threats about the impending death of nature as a result of human misuse have persisted through the middle ages and into our own times. However, many of these dire warnings have proven to be premature or greatly exaggerated. We have to be careful about "crying wolf" too many times!

French and British colonial administrators, who often were trained scientists, considered responsible environmental stewardship an aesthetic and moral priority as well as an economic necessity. They carried out some of the earliest scientific studies of environmental damage in the eighteenth century. These early conservationists observed and understood the connection between deforestation, soil erosion, and local climate change. The pioneering British plant physiologist Stephen Hales, for instance, suggested that conserving green plants preserved rainfall. His ideas were put into practice in 1764 on the Caribbean island of Tobago, where about 20 percent of the land was marked as "reserved in wood for rains."

Pierre Poivre, an early French governor of Mauritius (an island in the Indian Ocean), was appalled at the environmental and social devastation caused by destruction of wildlife – such as the flightless dodo – and felling of ebony forests on the island by early European settlers. In 1769, Poivre ordered that one quarter of the island was to be preserved as forests, particularly on steep mountain slopes and along waterways. Mauritius remains a model for balancing nature and human needs. Its forest reserves shelter a larger percentage of its original flora and fauna than most human occupied islands.

Fig.1.2: The island of Mauritius

- **Pragmatic Resource Conservation**

Many historians consider the 1864 publication of *Man and Nature* by geographer George Perkins Marsh to have been the wellspring of the American environmental protection in North America. Marsh, who was a lawyer, politician, diplomat, and geographer, travelled widely around the Mediterranean as part of his diplomatic duties in Turkey and Italy. Not only was he well read and familiar with the works of Plato, he was also a keen nature observer. He observed the damage caused by excessive grazing by goats and sheep and deforesting steep hillsides. Alarmed by the wanton destruction and profligate waste of resources still occurring on the American frontier in his lifetime he forewarned of its ecological consequences. Largely as a result of his book, national forests reserves were established in the United States in 1873 to protect dwindling timber supplies and endangered watersheds.

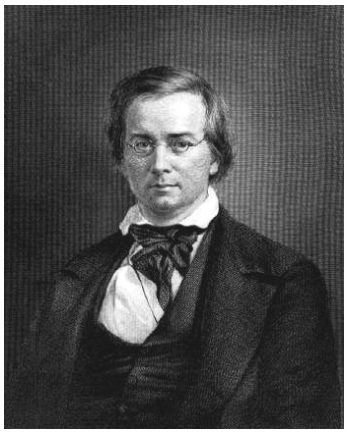


Fig.1.3: George Perkins Marsh

Among those influenced by Marsh's warnings were President Theodore Roosevelt and his chief conservation adviser Gifford Pinchot, a champion of the populist, progressive movement. They put resource management on an honest, rational, and scientific basis for the first time in U.S. history. Together with naturalists and

activists such as John Muir, William Brewster, and George Bird Grinnell, Roosevelt and Pinchot established the framework of national forests, parks, and wildlife refuge systems, and passed game protection laws.

The basis of these policies was **pragmatic utilitarian conservation**. It was argued that the forests should be saved "not because they are beautiful or because they shelter wild creatures of the wilderness, but only to provide homes and jobs for people." Resources should be used "for the greatest good, for the greatest number, for the longest time."

Pinchot observed, "There has been a fundamental misconception that conservation means nothing but husbanding of resources for future generations. Nothing could be further from the truth. The first principle of conservation is development and use of the natural resources now existing on this continent for the benefit of the people who live here now. There may be just as much waste in neglecting the development and use of certain natural resource as there is in their destruction." This pragmatic approach can still be seen in many resource management programmes in the USA, and particularly in the multiple use policies of the Forest Service.

- **Moral and Aesthetic Nature Preservation**

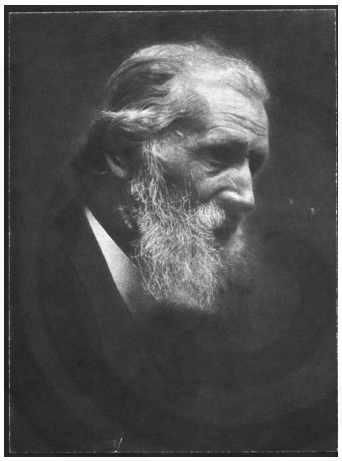


Fig.1.4: John Muir

John Muir, an American geologist, and the first President of the Sierra Club, strenuously opposed Pinchot's influence and policies. Muir argued that nature deserves to exist for its own sake, regardless of its usefulness to humans. Aesthetic and spiritual values formed the core of his philosophy of nature protection. This outlook has been called *bio-centric preservation* because it emphasises the fundamental right of living organisms to exist and to pursue their own goods. Muir wrote, "The world, we are told, was made for man. A presumption that is totally unsupported by the facts is that nature's object in making animals and plants might possibly be first of all the happiness of each one of them. Why man ought to value himself as more than an infinitely small unit of the one great unit of creation?"

Muir, who was an early explorer and interpreter of the Sierra Nevada Mountains in California, fought long and hard for the establishment of Yosemite and King's Canyon National Parks in USA. The National Park Service of USA, established in 1916, has always been oriented toward preservation of nature in its purest state. It has often been at odds with Pinchot's utilitarian forest service.

- **Environment and Development**

Over the past thirty years, growing numbers of people around the world have come to recognise that efforts to improve their standards of living must be in harmony with the natural world. Many have realised that lack of development can be as great a threat to nature as reckless or misguided development. Relationship between environment and development is an integral part of the social environment. As principle 4 of Rio Declaration points out, environment and development are interrelated. It states that:

"In order to achieve sustainable development, environmental protection should constitute an integral part of the development process and cannot be considered in isolation from it."

Let us briefly explain the process of development to put the environment-development relationship in perspective.

The process of development encompasses economic growth, reduction of inequality and elimination of poverty. Economic growth results from a variety of activities, e.g., development of industry, agriculture, services, forestry, mining,

tourism, etc. All economic activities directly or indirectly depend on resources – renewable or non-renewable. The basic function of all economic activity is to provide as many people as possible with the means of overcoming the helplessness and misery, which arises from lack of food, shelter, health and protection. Therefore, economic growth can help in reducing inequality and eliminating poverty.

The process of development has a direct impact on the environment about which you have studied in the course MED-001. Conversely, the condition of the environment and its resources also affect development and, therefore, the social environment. In fact, we can say that it is a cyclical process. On a long-term basis, over-exploitation of the environment could lead to the continuation of the cycle of poverty.

The lack of development and poverty also contributes to environmental degradation. In effect, the process of development has an integral relationship with the environment. Unsustainable development strategies can hinder future efforts to develop countries. Having gone through the discussion so far, you may like to know: What kind of strategies should be adopted for environmentally sustainable development? We take this question up in the next section. However, you may like to attempt an SAQ before studying further.

SAQ 1

Explain how environment and development impact each other. If possible, give specific examples from your own context in your answer.

1.3 SUSTAINABLE DEVELOPMENT

The expression 'sustainable development' was first used by the economists who were concerned about the problems caused when efforts to promote growth ignored the environmental dimensions of growth. Such efforts focused on activities in which projected benefits exceeded projected costs by the highest margin possible. In the 1980s, the term sustainable development was used to describe the development that takes into account the environmental consequences.

You may wonder: **How did this change come about**?

During the 1980s a number of reports from agencies concerned with environment and development called for a radical approach to natural resources exploitation and economic development. They suggested that existing forms of economic development were not sustainable because they undermined the natural resources and services on which all economic activity is based. In fact, these forms of development failed to meet the needs of a growing number of the world's people, many of whom lived in a state of absolute poverty.

The approach of sustainable development would bring together two aspects of development, which were separated in the previous approach:

1. The **socio-economic** aspect, which involved economic production and the satisfaction of human needs; and

2. The **environmental** aspect, which involved the capacity of the environment to cope with the effects of economic activity.

You have learnt about the concept of sustainable development in the course MED-002. We recapitulate it here, in brief.

Since the release of the Brundtland Commission's report, *Our Common Future*, the concept of sustainable development has captured the world's attention.

The term was defined by the Brundtland Commission as:

> "**Development that meets the needs of present generation without compromising the ability of the future generations to meet their own needs**."

The definition contains two key concepts:

1. The **concept of need**, in particular, the essential needs of the world's poor, to which overriding priority should be given; and
2. The **limitations** imposed by the state of technology and social organisation.

Thus, sustainable development strives to integrate social and environmental concerns into economic decisions (Fig. 1.5). The concept of sustainable development implies a fusion of two imperatives: **the right to develop**, and **the need to sustain the environment**. What it means is that any future development ought to be achieved in a sustainable manner. This concept denotes a balance that brings environmental concepts into the developmental process, and developmental matters are placed in the ambit of environmental protection efforts.

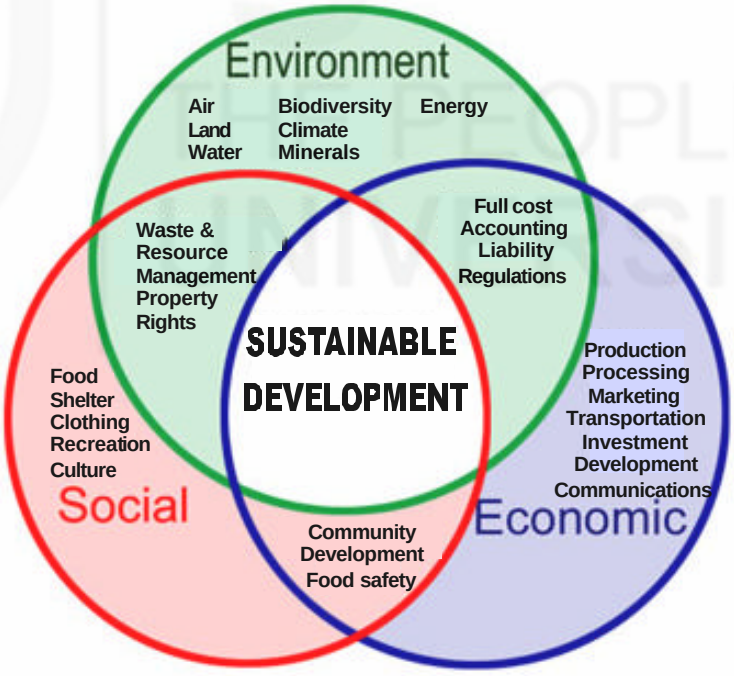


Fig.1.5: Sustainable development

The concept of sustainable development has also fundamentally changed the nature and scope of the debate on the environment and its relation with development. The pursuit of economic growth no longer occupies primacy in human objectives. It is now a part of the larger picture, a central theme of which is how to integrate economic and environmental concerns in the development strategy. The *characteristic features*

that distinguish sustainable development from other forms of development are, concerns for:

- Quality of life, and
- Social equity.

Quality of life: Sustainable development views quality of life as the main concern of development. It lays stress on a **gradual change** in the quality of human life brought about by economic growth. The change must be gradual because sudden and rapid change requires over-exploitation of environmental resources and thus defeats the purpose of sustainable development.

Social equity: Sustainable development also accords central importance to social equity, that is, conditions in which the fruits of development are accessible to **all citizens** in an equitable manner. This implies

- respect for regional, national, local and cultural diversity;
- the strengthening and full exercise of all citizens' participation in the development process, and
- peaceful coexistence and harmony with nature.

A natural question that follows is: How can sustainable development be attained? What conditions do we need to fulfil to meet this goal?

1.3.1 Requisite Conditions for Sustainable Development

Democracy, **autonomy**, **fairness**, **interdependence**, **responsibility** and **accountability** are some preconditions required for nations to pursue the path of sustainable development. Let us explain this idea further.

Democracy: Although these two ideas are not absolutely linked, sustainable development can hardly be initiated or implemented in the absence of genuine democracy. A genuinely democratic society has to have various mechanisms and institutions, which enable the participation of all citizens in the process of sustainable development. After all, isn't sustainable development everyone's business and everyone's future?

> Only in a genuine democracy can all human beings, no matter what their country of origin, aspire to
>
> - get **clean air** and **water**,
> - obtain **sufficient** and **safe food**,
> - get **comfortable housing**,and
> - have **satisfying work**.
>
> in an atmosphere of peace and respect for differences and diversity, that ensures the protection and survival of their natural and cultural heritage.

In brief, all human beings enjoy a fundamental right to an environment that is of high quality and is healthy. We must understand that democracy implies respect not only for individual rights, but also for collective rights and, in particular, the rights of women, to participate actively and fully in all socio-economic political processes.

Autonomy: While sustainable development must be achieved in a democratic context, the autonomy of governments, peoples and ethnic groups in making their development choices must also be respected. This does not mean that governments and peoples must operate in isolation; on the contrary, they must adopt a global view of

development and development planning by taking an active part in international fora and processes for determining major common objectives for sustainable development. This also does not exclude the establishment of common international environmental standards, although each government is free to adopt national standards consistent with these.

It is important to understand that the development and implementation of environmental standards by less developed countries will depend on the limits and ability of those countries to act and pay the associated costs. At the same time, these countries have certain potential skills and practical knowledge that often remain underexploited in the absence of appropriate support structures. Thus a greater need for mutual assistance, cooperation and the transfer of knowledge and clean technologies arises directly from the interdependence of countries in attaining the goal of sustainable development.

Fairness: The concept of fairness is based on the recognition of the global and common nature of our environment and on the need for the planet's resources to be shared in a sustainable way. It is central to the entire issue of sustainable development. Achieving fairness in sustainable development must be addressed at three levels:

Within popu lations or states, **between populations or states**, and **between generations**

Fairness **within a single population** or **government** essentially requires **meeting the needs of all** and **improving the quality of life** through a **better distribution of wealth**.

At the next level, the disparities between the rich and poor countries must be reduced by waging a relentless struggle against poverty. **Sustainable development cannot be viewed solely from an environmental standpoint, particularly in the countries of the South, where it must be achieved by accelerating equitable development**.

Lastly, fairness between generations implies that each generation should leave to the future a world that is at least as diverse and productive as the one it inherited. Development of one society or generation should not limit the opportunities of other societies or generations.

Interdependence: With industrialisation, improved technological capabilities and the globalisation of trade and commerce, has come increased interdependence, even at the local level. All of us have a common interest in the environment. Each decision has to be made and each action taken in the full knowledge of the repercussions for the environment and the welfare of others. Interdependence extends beyond a local and regional framework, and implies international cooperation, particularly in respect of the environmental problems affecting the biosphere.

It is based on the capability for mutual assistance and cooperation at all levels of action, from the local to the international.

Responsibility and accountability: Since it is in everyone's interest to preserve the environment and to use it in a sustainable way, all countries have a responsibility from the outset to preserve and restore the environment and to achieve development, without harming their own environment or that of others. The responsibilities of all involved may be different but complementary, depending on the needs of each, and may vary in proportion to the extent of damage to the environment and the abilities of each party to rectify this. Moreover, in the context of globalised trade and environmental problems, it is vital for the economic benefits of a given business activity to be linked with its environmental repercussions, so that the responsibilities of each stakeholder are recognised. All players must be accountable for their own actions.

Some have argued that the question of accountability, and thus of every stakeholder's assumption of responsibility, may lead to a redistribution of profits so that compensation can be established, for example, for the use of natural resources or for environmental impacts. This proposal might be one way in which the richest countries can make a greater contribution to the sustainable development of poor countries and take an active part in solving environmental problems. Collective and individual responsibility for managing the environment and natural resources in a sustainable manner must take into account both present and future generations. Making stakeholders responsible for their actions is at the same time encouraging the principle of stewardship, whereby a representative of both present and future generations acts as the "custodian" of natural resources and the environment.

Fig.1.6: Prerequisites for sustainable development

So far you have learnt about the basic conditions necessary for ensuring sustainable development. We now describe certain principles underlying its implementation.

1.3.2 Principles for Sustainable Development

Five broad principles have been identified as being vital to the process of sustainable development.

- **Integration of environment and economy**

  The integration of environment and economy is an absolute necessity for sustainable development. Today, various economic tools and policies are used to promote sustainable development, and ensure an environmentally conscious use of resources. These tools or policies, such as the Polluter-Pays or Consumer-Pays Approach, may be applied equally to producers, consumers and taxpayers. These enable the market to determine the correct overall cost of using resources. In future, tax incentives or other economic tools may be necessary to promote further integration of the environment and the economy.

  This could hopefully result in a softening of world trade rules whereby poorer countries would be enabled to lay claim to greater economic development.

- **Conservation of natural resources and maintenance of biological diversity**

  Achieving sustainable development presupposes that the limits of utilisation of natural resources are commensurate with their renewal capacity. The life of non-renewable resources should also be extended by developing and using more effective and environment-friendly cleaner technologies and by encouraging re-use and recycling practices.

  Moreover, we should preserve biological diversity, maintain ecological processes and life support systems and use the world's species and ecosystems in a sustainable manner. This means that we should be able to protect the structure,

functions and diversity of natural systems, the species inhabiting them as well as their genetic heritage.

How can this be achieved? See Fig. 1.7 for some answers.

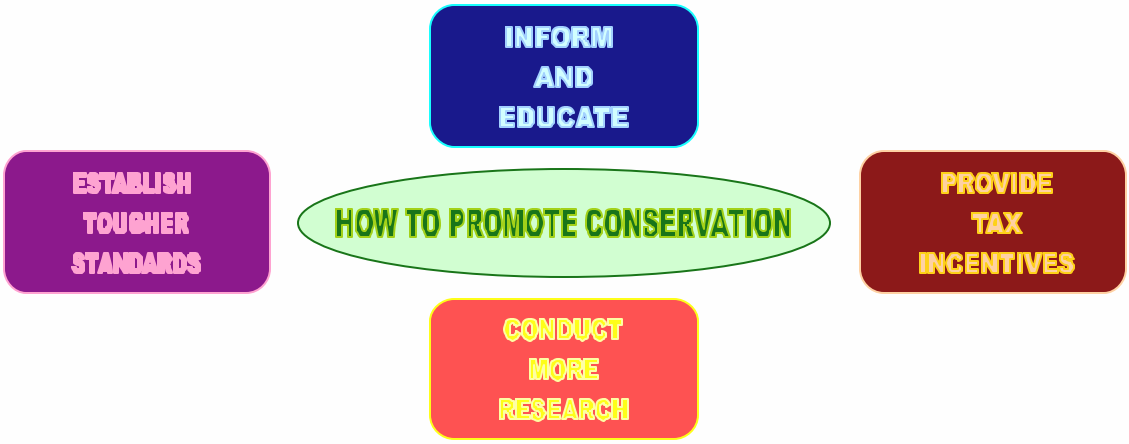


Fig.1.7: Some ways of promoting conservation of natural resources

First of all must come changes in the behaviours of individuals and communities and in their attitude to the environment, along with the provision of genuine means for managing it better. New approaches at the state level must then integrate development and conservation of resources on the basis of authentic information and knowledge and through effective legal and institutional instruments. Efforts at the international level must focus on promotion of development, adoption and implementation of Conventions and Protocols on the environment and natural resources.

- **Precaution, prevention and evaluation of harmful effects on the environment**

Precaution, prevention and evaluation of the effects of every development project on the environment must form an integral part of their planning and implementation. Planners and decision-makers must make it routine to foresee and provide for the environmental consequences of their projects. Current environmental protection measures are precautionary. However, in many cases, they are merely a band-aid solution that is not always compatible with the concept of sustainable development, particularly from a long-term perspective.

However, the concepts of precaution, prevention and evaluation are difficult to instil because they are often removed from the day-to-day reality and have benefits that will be felt only in the distant future. What needs to be underscored is that **forewarned is forearmed**, **foresight is knowledge** and **evaluation enables planning**. It is imperative that countries and societies adopt these three watchwords so that all development can become sustainable.

- **Cooperation, partnership and participation of communities**

Sustainable development is a collective responsibility. Consultation, cooperation and participation in all decision-making are essential to the sustainable management of terrestrial, aquatic and marine ecosystems.

All governments must cooperate in a spirit of partnership and accept their responsibilities to protect, preserve and restore the environment. They should

introduce and facilitate the participation of all sections of the society in all development and environment-related activities.

In addition, states must join forces to strengthen international law by adhering to existing Environmental Conservation and Management Conventions and protocols and by passing the necessary statutes for their implementation. They must also promote and develop new agreements and instruments as per the emerging needs and situations for achieving sustainable development. Meaningful cooperation and partnership also requires that rich countries introduce financial and technical assistance measures for enabling the poor countries to integrate environmental issues into their development projects and to improve their access to the advanced and environmental-friendly technologies. The creation of Environmental Protection and Restoration Funds would go a long way in fostering genuine cooperation and partnership in this area.

For example, the experiences and issues in the preservation of biological diversity clearly illustrate how interdependent countries of the North and South blocs are. The main centres or sources of biological diversity are situated in the countries of the South, whereas the major "technological or biotechnological centres" are mainly in the countries of the North.

In other words, the countries of the South as well as those of the North must be party to all discussions, solutions and conventions necessary to the achievement of sustainable development. They must all ensure that the measures chosen are suited to the situation of each.

- **Education, training and awareness generation**

  Safeguarding the environment and achieving sustainable development depend not only on technical and economic matters, but also on changes in ideas, attitudes and behaviours. The direct participation of individuals and communities is essential. All citizens of the world must become fully aware of their environment, know its demands and limits and alter their habits and behaviours accordingly. To this end, countries must develop strategies to better educate, inform and sensitise their populations on environmental matters and actions towards achieving sustainable development.

  For example, ecological and environmental concerns can be integrated into school programmes; the awareness of the general public can be raised through extensive information campaigns, particularly through the media; green projects can be encouraged in local communities, and training programmes can be developed to promote more informed resource management and the use of environmentally - compatible technologies.

  You may like to stop for a while to concretise these ideas.

SAQ 2

Suggest ways of ensuring that the principles of sustainable development are applied in your own context.

So far, we have briefly recapitulated the basic principles underlying sustainable development along with its characteristics. You would perhaps like to know: Can the goal of sustainable development be attained? If so, how?

Sustainability is related to the quality of life in a community: Are the economic, social, and environmental factors that govern a community providing a healthy, productive, and meaningful life for all community residents? Would the same be true for the future generations?

Economy, society and environment comprise three domains of human activity and all three have to be linked in a holistic, integrated manner to attain sustainability.

To understand this point, let us consider a situation in which these domains are segregated: the community's problems are viewed as isolated issues, economic development agencies try to create more jobs, social needs are addressed by health care services and housing authorities, and environmental agencies are expected to prevent and correct pollution and other environmental problems (Fig. 1.8).

Fig.1.8: Segregated approach

This piecemeal approach has a number of shortcomings:

- Solution to one problem can make other problems worse. For example, creating affordable housing is a good thing, but when that housing is built in areas far from workplaces, the result will be traffic congestion, pollution and extra use of fuel and various other resources.
- Piecemeal solutions often result in discontentment. How often have you heard the argument 'if the environmentalists win, the economy will suffer'? When the economy driving businesses have their way, the environment invariably gets affected and even destroyed.
- Piecemeal solutions tend to focus on short-term benefits without monitoring long-term results. The pesticide DDT seemed like a good solution for getting rid of insect pests at the time, but the long-term results were devastating.

In an integrated holistic approach, all domains require interaction among people constituting a society. And the social aspects like religion, culture, friends, families, music, art and ethics play crucial role in economic activities. So the economy exists entirely within society. Society, in turn exists entirely within the environment. Environment surrounds society. It fulfils our basic requirements of food, water, air and shelter. Since people need food, water, air to survive, society can never be larger than the environment. This needs to be clearly understood by all of us.

Sustainability requires managing all households at various levels – individual, community, national and global, in ways that ensure that our economy and society can continue to exist without destroying the natural environment on which we all depend.

Sustainable communities acknowledge that there are limits to the natural, social and economic systems upon which we depend.

Sustainable development also requires capital, viz., ***natural capital, human or social capital***, and ***economic or built capital*** (Fig. 1.9).

Natural capital refers to

- *Natural resource stocks*, i.e., sources of raw materials used in the production of manufactured goods;
- *Land*, that provides space for economic activity; and
- *Ecosystem*, which provides services directly and indirectly to the economy. Some examples are: Cleaning of polluted air and water, provision of productive soil, provision of biodiversity, protection from incident solar radiations, provision of largely stable climate, and provision of reliable flows of renewable natural resources.

Human capital can be described as the capabilities and capacities, both innate and derived or accumulated by humans throughout their lives. This refers specifically to the working age population that works productively with or using other types of capital. This term is traditionally applied to education, and includes the knowledge and skills that working age population accumulates through formal education attainment, training and experience. The more human capital is available in the economy, the greater the value of the services rendered by its workers.

Economic capital includes goods produced, tools, machines, buildings and other forms of infrastructure as well as *financial capital*, which enable other types of capital to be owned and traded. It has no real value itself but is representative of natural, human, social or manufactured capital, e.g., shares, bonds or banknotes.

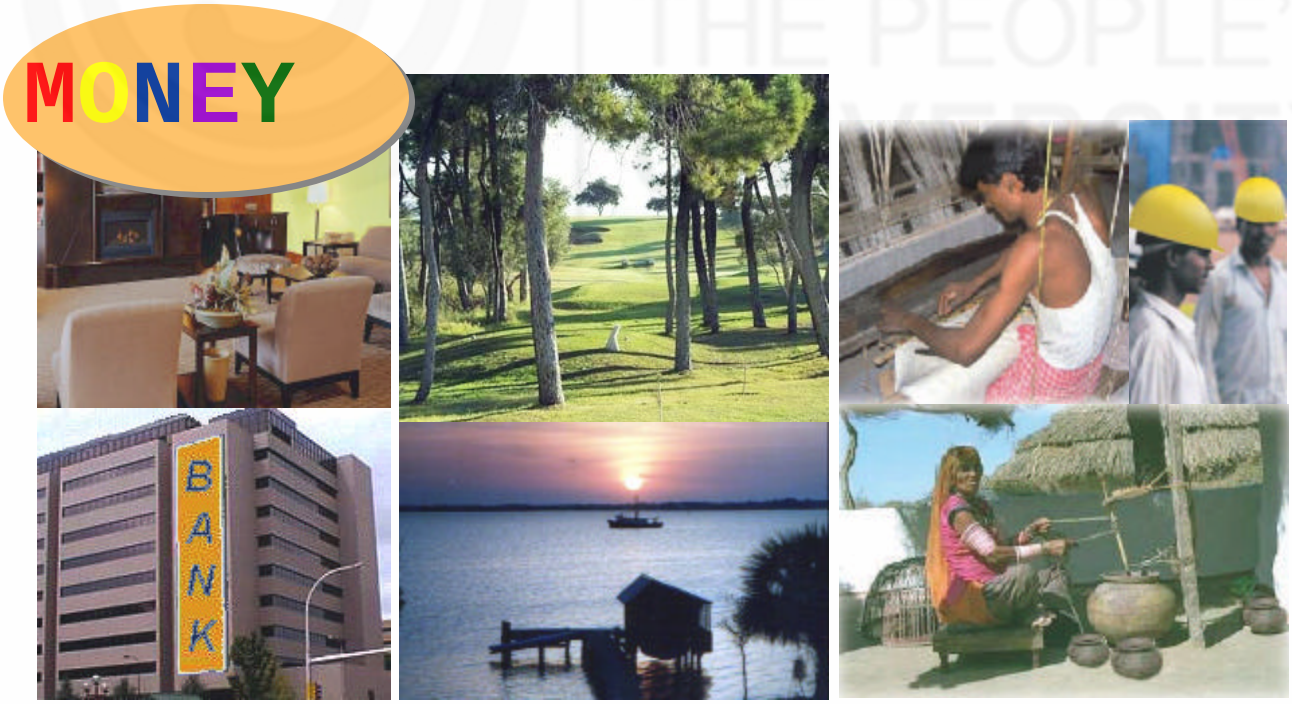


Fig.1.9: Economic, natural and human capital for sustainable development

So far you have briefly revisited the concept of sustainable development. You know that sustainable development seeks to integrate environmental, social and economic concerns, now and in the future, and to maintain the carrying capacity of the

environment. It implies that present, as well as future generations should enjoy a better quality of life as a whole.

You have learnt that to achieve this goal, we need to strengthen democracy, human rights policies, equity, and autonomy, and employ the tools of technology, participatory governance and capacity development through, for instance, education to empower people. Sustainable development can become a reality only if economic and social development policies are pro-poor, pro-women and pro-nature. All programmes and projects undertaken for sustainable development should address issues such as conservation of natural resources like land, water, forest, air, etc.

Thus, environmental concerns should form an integral part of the process of development. In order to achieve this, we need to strengthen environmental planning and management and integrate environmental policies into the development process along with other policies. At present, we see a rather fragmented approach to environment management wherein different agencies are active in specific areas. For example, there are government departments and NGOs working for watershed management and others working for forest management, wasteland development or rural development.

Now from your studies so far you would have realised that the management of resources calls for an integrated approach. For example, watershed development has to be integrated with forest management and land and soil management, and all these have to be undertaken in a participatory sustainable development approach in order to be successful. It is in this context that the concept of **integrated environmental management** (IEM) becomes meaningful in our situation. It was formulated during the 1980s in the western countries and constitutes a holistic approach to the management of the development process. We now introduce this concept to you.

1.4 INTEGRATED ENVIRONMENT MANAGEMENT

During the 1960s there was a growing awareness of the complex, and often negative, environmental effects of development projects and policies (e.g., changing land use due to industrialisation and urbanisation, construction of roads, mining, providing water or electricity to large number of people and so on). These developments led to environmental degradation of an undesirable degree. Their effect has grown through the past few decades. For example, the relatively poor water quality and ever increasing stress on water resources, deteriorating air quality due to industries, power plants and traffic, urban congestion, deficient sewerage, industrial effluents, lack of proper solid waste and hazardous waste disposal are threatening our health and environment as never before (see Fig. 1.10).

In this century, many cities in the developing world are expected to double or grow even more in size, due to population growth and migration of people. This is bound to increase environmental, social and economic problems. A world water crisis is looming ahead and it is said that the next world war may be fought for water.

You know that environmental degradation is a significant problem in South Asian countries. This has been associated with rapid urbanisation, poor sanitation infrastructure, unregulated industrialisation, deforestation, etc. For example, the construction of large dams, hydropower schemes, diversion canals, and vast irrigation systems has caused ecological disturbances in the river ecosystems of these countries. Industrial effluents and agricultural runoffs poison these systems. In India, many rivers and water bodies are already dead, massive deforestation has caused severe soil erosion problems and reduction in biodiversity. Pollution from industries and the transport sector is at unacceptable levels, especially in the metropolitan cities.

The challenges for these countries are to manage and protect their land, water, forest and air resources, provide a reasonable quality of life and other

Fig.1.10: The environmental impact of industrialisation and urbanisation

The traditional approach to the management of the development process did not consider the natural environment in any significant way. Environmental issues were traditionally regarded as being part of the natural sciences. Management theory did not traditionally deal with nature and made no mention of managing nature as common to the interests of society. The result was that managers and employers in the traditional mould did not take into account environmental factors in their decision-making and programme implementation.

However, this approach changed as the realisation of environmental problems grew in the developed industrialised countries of the west and Asia. It is in response to such problems that various approaches and techniques to manage development and its impact on the environment evolved and were implemented over the past few decades. For example, the process of **environmental impact assessment** (EIA) was developed in an attempt to provide environmental information to advise development decisions. During the 1970s and early 1980s, this process became widely used, mainly in western industrialised countries, and some countries in Eastern Europe. However, the role of EIAs in planning the developments projects was not clarified, and EIAs were often tagged on after planning had occurred. This was followed by the concept of **integrated environment management** (IEM) in the 1980s, which succeeds in marrying traditional management thinking with the more recent eco-centric management thought.

1.4.1 The Concept of IEM

As a philosophy, IEM prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development process in order to achieve a desirable balance between environmental concerns and development. The philosophy of IEM emphasises the ecological complexity and interdependency of humans and nature.

Functionally, IEM is a management-oriented approach to control environmental disruption amidst a process of sustainable development. In this approach to the management of development projects, all actions taken during project planning and implementation should ensure that none of their consequences are overlooked or underestimated. This philosophy and approach of IEM thus ensure that

Fig.1.11: An icon for IEM

In *IEM*, sustainable and equitable development is combined with sound environmental practice for a healthy environment, which

- **sustains people and nature,**
- **provides protection for our unique resources and**
- **results in an enhanced quality of life for all.**

It is a process, which recognises the relationship between the environment, natural resources and socio-economic development and strives to integrate their management to achieve sustainable development. It serves as a useful tool when management of one resource can have implications for other resources and their users, and when a conflict of interest arising from different goals is involved in a development project. **Integrated environmental management includes the processes of planning, conducting environmental impact assessments, developing proper management plans, and the thorough monitoring and auditing of implemented programmes.**

In the SAARC context, integrated environmental management means that policies and projects should be developed and strategies should be implemented across national borders to attain regional coordination for sustainable development. This approach should yield short as well as long-term economic benefits, and the long-term survival and maintenance of the South Asian ecology. It presupposes that greater environmental awareness and training in enhanced environmental management skills are essential interventions for future sustainable development, improvement of productivity and maintenance of environmental integrity.

Goals of IEM

The objectives of integrated environmental management are to:

- ensure that development does not compromise environmental sustainability, health and safety and does not endanger natural and cultural resources,
- ensure that the environmental consequences of development proposals are understood and adequately considered in the planning, implementation and management of all development programmes;
- establish a framework of cooperation between the government organisations, the public sector, the private sector and the public so that sustainable development can take place;
- stimulate responsible and justifiable decision-making and action, and creative thinking in the planning and initial design stage;
- guide the development process by implementing and encouraging the collection of objective information and reliable data with respect to environment related aspects and ensuring that it can be easily understood by all interested and affected parties in the development;

- resolve or lessen any negative environmental impacts and to enhance positive aspects of development proposals.

To achieve these goals, economic, social and environmental issues should be integrated into developmental decision-making. Further, in calculating and planning for the economic, social and environmental costs and benefits of projects and development, decision makers should be made accountable for the environmental impact of their decisions.

Benefits of IEM

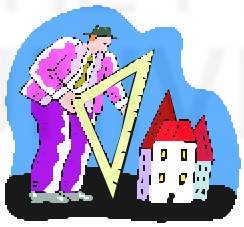
Some benefits of IEM include:

- improved land productivity,
- efficient water management,
- biodiversity conservation ,
- conservation of natural resources,
- enhanced environmental protection, and
- improved productivity and activities based on sustainable development.

Participants in IEM

Integrated environmental management involves every one from individuals to governmental and non-governmental organisations. The participants or stakeholders in the process are shown in Table 1.1.

Table1.1: Participants in IEM

The community	• individuals, • landholders, • farmers, • developers, • community interest groups, e.g., water user groups, self-help groups, • local environmental care groups in urban or rural areas, e.g., resident's associations, and • public.	 
Non-governmental Institutions	• educational establishments, • research organisations, • NGOs.	
Industries	• manufacturing, • chemicals, • mining, • energy industries, • service industries, etc.	
Local, State and Union Government	• city and village bodies, • community health service, • environmental authorities, • road and transport authorities, • water and river authorities,	

	• agricultural agencies, • health agencies, • all concerned Ministries.	

Politicians at all levels are an essential category of participants in the IEM process.

Any of these stakeholders could put up the capital for the project, and stand to make a profit from it. The government would have legal control over the project related activities, e.g., land to be developed. It would have a final say in whether or not the development goes ahead, and what conditions should be attached to development. There could be interested and affected parties, for example, neighbouring landowners and the public. All the participants in the process are involved in planning, implementation, action, and monitoring and evaluation.

Fig.1.12: The participation of politicians is a must at all stages of IEM

Let us consider the example of watershed management to explain the role of various participants in IEM. A surface water catchment is a naturally-defined eco-system. At any given time it may be occupied by given species of flora and fauna. If human beings occupy the area, then they can disturb the natural balance either by population explosion or by various activities. Now if we want to prepare and implement an integrated environmental management plan for a catchment we would need to involve, a mix of governmental and non-governmental organisations and individuals in the planning and implementation process.

Individuals should be sensitised about their responsibility to ensure that their activities do not have detrimental effects in their catchment, e.g., unrestrained cattle grazing and felling of wood in forest areas leads to deforestation, which affects water retention in those lands. Local participatory groups could be formed to contribute to the resolution of catchment-wide issues. These groups could be informal groups or more formally established committees. The informal groups could deal with simple issues such as establishing riparian vegetation, local erosion control, litter control, etc.

However, a lake or river management problem involving point source and diffused source pollution from a variety of land uses in the catchment is more complex. It would require involvement of a formally organised committee comprising of individuals, public agencies and private organisations. A surface water catchment could be divided into a number of sub-catchments, each managed by participatory group and these groups should aim not only towards remedy or restoration but should concentrate on preventive measures.

More complex environmental management issues that involve many participatory groups and government agencies could be handled by environmental coordinating committees. These committees should consist of representatives of the major sectors of the community, institutions, agencies, industries and governments which are engaged in, or affected by the management of natural resources in the catchment.

The Joint Forest Management Programme is case in point. You have studied about it in the course MED-004.

Appropriate environmental management strategies should be formulated to identify the important land and water issues in the region. They should also contain recommended actions to address specific issues through governmental support. As the project is implemented monitoring and research should go hand in hand. A follow-up strategy should also be put in place.

It is important to note that the involvement of the community, government, public and private sector in sustainable development are enhanced through participatory approach adopted in the integrated environmental management.

By now, you would have realised that management thinking on development issues has changed significantly over the past few decades. We summarise a comparative study of the traditional management approach and IEM in Table 1.2.

Table 1.2: A comparison of the traditional management approach with the integrated environment management approach

Traditional Management	Integrated Environment Management
Goals	
Economic growth, higher productivity and profits Shareholder wealth	Sustainability and quality of life Stakeholder welfare
Values	
Anthropocentric Patriarchal values Rationality and packaged knowledge	Centred around sustainable developmental concerns Egalitarian and democratic values Intuition and understanding
Products	
Designed for function, style and price Wasteful packaging	Designed with concern for the environment Environment-friendly packaging.
Production system	
Energy and resource intensive Technical efficiency	Low and efficient energy and resource use Environmental efficiency
Organisation	
Top-down decision-making Centralised authority	Participatory decision-making Decentralised authority
Environment	
Domination over nature Environment managed as a resource Pollution and waste are external to the project	Harmony with nature Resources regarded as strictly finite Pollution and waste elimination management
Participants	
Owners, Managers, Workers	Community, Institutions, Industries, Local, state and union government bodies, politicians, law makers, etc.
Business functions	
Marketing aims at increasing consumption Finance aims at short-term profit maximisation	Marketing for consumer education Finance aims at long-term sustainable growth Accounting focuses on environmental costs as well

Accounting focuses on conventional costs Human resource management aims at increasing labour productivity	Human resource management aims to make work meaningful and safe and improve the quality of life.

It has now become clear that all stakeholders including managers and administrators should be deliberately trained to apply integrated environmental management principles as part of their daily functions. We now present the principles and process of IEM. But before studying about them, you should revise the concepts discussed so far.

SAQ 3

Consider a problem related to environment and development from your region. Explain how IEM could be used to handle the problem in a better way to meet the goals of sustainable development.

1.4.2 The Principles and Process of IEM

Certain principles form the basis of any effective and efficient integrated environmental management plan.

The Principles of IEM

Compliance with the principles of IEM is essential at all stages of the planning, implementation and decommissioning of developmental proposals. These are:

- **Pro-active planning**

  Through good proactive planning, IEM endeavours to decrease negative impacts and increase positive impacts of a development project / process. It attempts to ensure that the social benefits outweigh the social costs of development (those borne by society and not by the developer). It also attempts to mitigate negative impacts and enhance positive aspects of development proposals.

- **Informed decision making**

  This is achieved by integrating contributions from professionals involved in all disciplines (e.g., biology, hydrology, geology, sociology, urban planning, etc.) relevant to the planning of a particular proposal, and all interested and affected parties. Possible alternative options for development should be considered, including the option of no development at all. There should be an opportunity for both public and specialist input in the decision-making process.

- **An open and participatory approach**

  Participation of interested and affected parties in the planning and decision making process is an essential principle of IEM. This involves thorough consultation with interested and affected parties, due consideration for alternative proposals or options and democratic regard for individual rights and obligations.

- **A broad understanding of the term environment**

  The term **environment** is taken to include physical, biological, social, economic, cultural, historical and political components.

- **Accountability**

  This includes accountability for information on which decisions are based as well as accountability for decisions made. In order that decision makers are held accountable (i.e., responsible and answerable) for the decisions made, a record of decisions made, and the reasoning behind each must be maintained. It must also be made available on request. Consultants, too, must be accountable for the information they provide.

The IEM Process

The integrated environmental management process consists of **three main stages** in terms of which a project could be planned and implemented. The process allows for public participation at each stage.

Stage 1: Development and assessment of the proposal

Stage 1 of the integrated environmental management process involves the development of a project proposal. The development project or programme has to be planned and developed in a certain framework of planning, in which the policies, legal and administrative requirements of the project also need to be established.

Central to the planning stage for a project is the identification of the relevant authorities and interested parties and stakeholders and communication between them. Drawing up the proposal should involve consultation with all stakeholders including the interested and affected parties. Consultation with these groups would help in identifying issues and alternatives that should be considered during the planning stage itself. It may result in mitigatory options that would lead to better planning and enhance effective and efficient decision-making.

The proposal is then assessed to establish its potential environmental impact. On this basis, it is classified into the following categories:

- **an EIA is needed** before implementing the development plan. An environment impact assessment must be done when it is evident that the proposed project will have a significant environmental impact. For example, EIA is necessary before setting up power plants, hydro projects, industries, etc.
- **initial assessment is needed** as some measure of uncertainty exists about the potential impact of the proposed project on the environment and more information must be gathered to establish whether or not an EIA is necessary;
- **no EIA is needed** as the proposed project meets all planning requirements. It will have no environmental impact and can be allowed to proceed.

Stage 2: Decision on whether to accept the development project proposal or not

Stage 2 of the integrated environmental management process involves decision-making prior to the commencement of the actual project. It is done on the basis of the outcome of Stage 1. At this stage, all stakeholders (the authorities, the public or affected parties) have the opportunity to raise their concerns, review the proposal and decide whether to accept it or not. They can even appeal against the proposed project. Besides appealing to the decision-making authority, appellants have the option to launch a legal appeal if malpractice is suspected.

It is also possible to refer the project proposal to the previous stage to reassess the potential impact.

If the proposal is approved, some conditions could be set according to planning, policy, legal and administrative requirements. One of the conditions for the approval of the project proposal could entail the preparation of an **environment management plan**. The management plan may describe how the proposal will be implemented. It could stipulate the controls over the implementation with regard to the environmental restoration that should be carried out after the project implementation. It could also outline how negative impacts of development would be managed, and include periodic environmental audits.

Stage 3: Implementation

After the project is approved, the management plan is activated. A monitoring programme is required for the approved project, irrespective of the existence of a management plan. The programme should include clear guidelines on what should be done, who should carry the responsibility for doing it, and the financial aspects associated with the monitoring process. Furthermore, audits need to be carried out periodically to provide feedback on whether the integrated environmental management process is meeting its goals or it needs to be modified. The audit is thus a reassessment of the project or policy proposal in the light of the developments during the implementation stage.

The integrated environmental management process is designed to ensure that the environmental consequences of project proposals are understood and adequately considered during the planning process. As stated earlier, the term environment should be used throughout the process in its broadest sense to encompass biophysical as well as socio-economic components. The ultimate purpose of the integrated environmental management process is therefore to resolve or mitigate any negative impacts on the environment and to enhance positive aspects of development.

Integrated environmental management is a useful tool to deal with the present environmental problems as well as the environmental challenges facing the twenty-first century. The process recognises the interaction and interdependency of the participants and the resources in the management of the issues relating to the environment. The success of such a plan is achieved by a balance between economic development, protecting natural eco-systems, providing appropriate environmental services and satisfying social values.

1.5 SUMMARY

- The early societies were known to live in harmony with their environment. In the recent years concern about environment and its management has increased considerably.
- Sustainable development is defined by Bruntland Commission Report as: Development that meets the needs of present generation without compromising the ability of future generations to meet their needs. The sustainable development approach views quality of life and social equity as the main concerns. Democracy, autonomy, fairness, interdependence, responsibility and accountability are the basic conditions required to attain sustainable development. In addition five major principles underlying its implementation, are:

  i) Environmental and economic integration,
  ii) Maintenance of biological diversity and conservation of natural resources,
  iii) Precaution, prevention and evaluation of harmful effects on environment,
  iv) Cooperation, partnership and participation of communities, and
  v) Education, training and awareness generation of people.

- Sustainability involves, change in our perception and action, learning, commitment for managing a salubrious environment, innovation and matrices to analyse costs and benefits of innovations. Sustainable development requires holistic approach of community activity in which the spheres of, economy, and society are present within the single sphere of environment Human, natural and financial capital are important for sustainable development.

1.6 TERMINAL QUESTIONS

1. Collect, arrange chronologically, and group spatially the concerns of individuals/ communities for environment from documented history.

2. Explain how sustainable development led to the idea of integrated environment management.

3. Considering South Asia's need for economic growth, we cannot afford to allow development to be held back by environmental concerns. Comment.

4. Analyse whether IEM is a practical option for addressing environment and development issues in India.

UNIT 2 INTEGRATING ENVIRONMENT INTO RURAL DEVELOPMENT

Structure

2.1 INTRODUCTION

In Unit 1, you have learnt about the concept of integrated environment management, which arose in the context of sustainable development. You know that the majority of people in South Asian countries live in rural areas. Therefore, it is in the fitness of things to apply the concept of integrated environment management to rural development.

In recent years, rural development has undergone a paradigm shift from economic growth to integrated rural development. In this new outlook, environmental considerations are interwoven into the various endeavours of rural development. The critical thrust areas in rural environmental management include regeneration of ground water and forest cover, conservation of soil resources, sustainable agriculture and creation of sustainable rural industry and markets. Environmental planning for rural development also needs to address problems of drinking water supply, sanitation, health care, and above all alleviation of poverty as poverty is the greatest polluter. In this unit, we examine how the idea of integrated environment management can be applied to rural development.

Objectives

After studying this unit, you should be able to:

- explain the current paradigms of rural development;
- discuss the salient issues in the management of common goods in integrated rural development;
- suggest ways of dealing with the environmental problems in rural areas; and
- analyse the measures for alleviating poverty in rural areas.

2.2 PARADIGMS OF RURAL DEVELOPMENT

Rural development involves a set of activities and actions by diverse actors, individuals, organisations and groups, which together lead to development and progress in rural areas. However, progress may mean different things to different people. It may mean material progress, growth of incomes and wealth, and poverty alleviation. Historically, these have been the main considerations in development theory and its practice. However, now-a-days other indicators of progress, such as

cultural, spiritual, and ethical are increasingly taking an important place alongside material progress. This has led to a reformulated and holistic concept of development. There are two main paradigms of rural development:

- The modernisation paradigm, and
- The holistic development paradigm.

We now discuss these, in brief.

The modernisation paradigm

Broadly speaking, this paradigm equates development with four basic processes:

- **Capital investment**, which leads to increase in productivity;
- **The application of science** to production and services;
- The **emergence of nation-states** and large-scale political and economic organisations; and
- The **urbanisation of rural areas**.

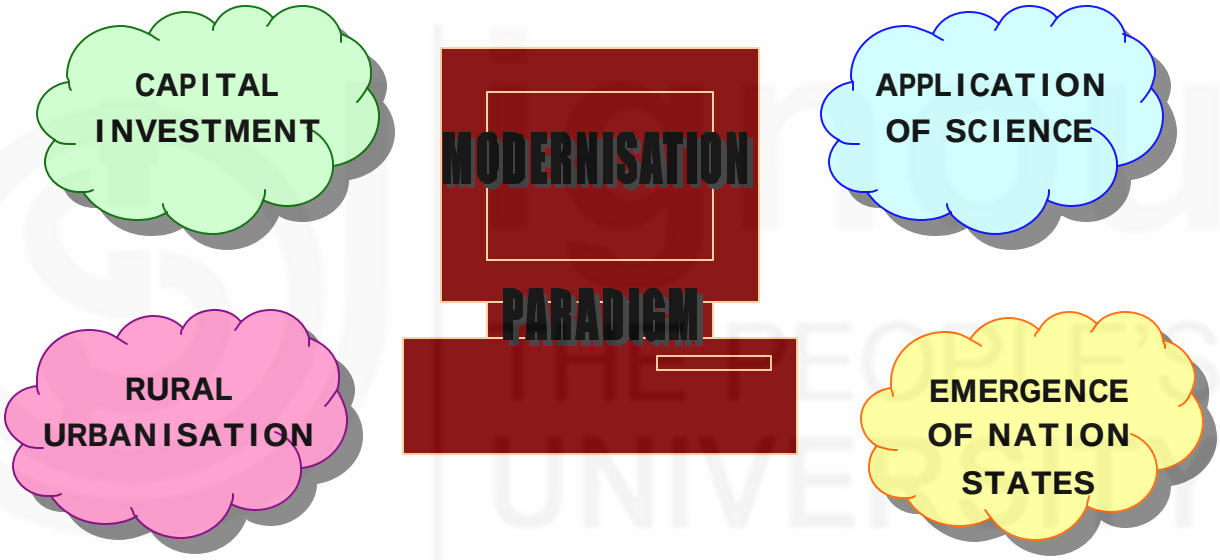


Fig.2.1: The modernisation paradigm of rural development

As nation states gained independence from their erstwhile colonial rulers, most of them chose to follow this path for rural development. The modernisation paradigm in rural development has focused on growth in production and the expansion of the market economy. If redistribution was part of the agenda, it was to be controlled by the state.

The assumption has been that growth and markets are best promoted by the state and by a range of external interveners, donors and non-governmental organisations who know best about the kind of production and what the markets required. Rural development was achieved by big, bureaucratic organisations, with professionals and administrators in command of the process. Economic criteria dominated decision-making; social, environmental, political factors were given much less importance; participation of the beneficiaries of the development process was included only as an afterthought.

It is now accepted widely that the modernisation paradigm has failed on a number of counts. Poverty and insecurity still exist in many poor countries, as well as some

resource-rich ones, despite implementation of various development policies and programmes for four or five decades.

Due to these reasons, there has been a paradigm shift in theory and practice of rural development. People are now turning towards a far more holistic approach to rural development.

The holistic development paradigm

The new paradigm represents a move from an industrial approach to technology development to an organic or holistic approach, with sustainable improvement replacing profit as the implicit objective. In addition, it encompasses a shift from a technocratic and exclusive approach to a participatory and inclusive approach to development management; and from resource control by big organisations to local resource management, considering the various common property aspects.
The two paradigms of rural development are summarised and compared with each other in Table 2.1.

Table 2.1: Paradigms of rural development

The Modernisation Paradigm	The Holistic Development Paradigm
• Economic growth at all costs.	• Quality growth: environment enhancing, socially just, acceptable, and contributing to peace.
• Redistribution, if any by the state.	• Process of inclusion of the excluded in decision making.
• Authoritarianism tolerated as price of growth.	• Intangibles like freedom, autonomy, dignity valued.
• Subsidies for small enterprises provided by the state.	• Availability of enabling environment for enterprise growth.
• State-provided social security.	• Local institutional development for security.
• Transfer of technology from rich countries.	• Value of local technology and knowledge; participatory technology development.
• Transfer of valuable assets to rich countries.	• Institutions to protect assets of poor communities.
• Tangible, economic valuation of development; governments to define it.	• Development as multi-faceted, and often intangible: people to define it.
• Privatise/nationalise common properties.	• Affirm common enterprise as common, and expand field of goods seen as common.
• Build large powerful organisations for development: focus on government and large NGOs.	• Polycentric institutional arrangements: people's organisations, framework of governance.
• Planning is the central thought process	• Evaluation is the central thought process.
• Organisational hierarchies: to implement plans.	• Non-hierarchical learning organisations.
• Compartmentalised.	• Holistic.
• **Role of the state**: major producer, provider and regulator.	• **Role of the state**: creating enabling legal frame works, devolving power, encouraging associations

Fig.2.2: Rural development should lead to an improved quality of life for all

Rural development is clearly about improving the quality of life and well being of individuals and households in rural areas, particularly of the rural poor. In the holistic paradigm the rural poor who have been left out in the process of economic growth are included in the development process.

The dominant modernisation paradigm strategies have focused on individuals and households, and assume that they exist in a context of well-functioning markets. Where markets do not function (market failure) strategists resort to the state to provide and control.

However, all individuals and households in rural areas directly depend on the non-marketed **common property resources** for their livelihood. This is obviously true for marginalised sections such as pastoralists, landless and quasi-landless households, and within peasant households, for women, who often have an important role in taking animals to graze, collecting firewood out of **common forests**, and collecting water from **common supplies**. Therefore, managing common goods is an essential component of IEM in rural areas. We now discuss the major issues related to the management of common goods in rural areas.

2.3 MANAGING COMMON GOODS

Let us first define common goods.

Common goods, also called **common property resources**, are special types of public goods. There is an important distinction between common and public goods.

Public goods are those from which no one can be excluded. For example, protection against air or water pollution generally benefits everyone. It would be impossible to change air users, but it is possible to fine or tax air polluters. Likewise, water users can generally be charged. This makes water a "toll" good. Roads are another example of "toll" good. These are public goods for which a charge can be levied.

If people are excluded from benefiting – those who do not pay, or who do not live in a certain area or are not members of a certain organisation or kinship group – and if benefits are positively allocated to a restricted membership, then we speak about **common goods**, or **common property resources**.

For example, in rural areas, all households rely on common sources of drinking and irrigation water, common forests and pastures. The well-being of village people depends substantially on the availability, quality, and replenishment of these resources. Since water is the most precious resource, the construction and maintenance of water storages are important tasks, which must be accomplished, usually on a collective basis.

Fig.2.3: Some common property resources in rural areas: water bodies, pastures and forests

Common goods therefore overlap with toll goods, but are not necessarily toll goods; membership may be by ascription, or residence. The term is generally used to refer to cases where members identify with the good in question and perceive it as common to them. It often refers to the local resources. Common goods are often regarded in law as public goods, and there is much confusion because of this. Sometimes this is deliberate, e.g., nationalisation of a resource may be designed to facilitate transfer of access from one social group to another.

Just as there are common goods, so there are **common baddies**. **Floods**, or **forest fires**, and other events which generally affect the residents of certain areas and from which those residents require protection, are some examples. Protection can be assured and organised locally, in which case it will only stretch so far and no further. Some mechanism of local governance is required to enable the achievement of this common good. Sometimes hazards are so widespread that protection against them takes on the character of a public good.

SAQ 1

Distinguish between common goods and public goods with the help of examples.

You will be studying about the technological aspects of managing common property resources such as forests, biodiversity, land and water in the next block. Here we discuss the social issues related to the management of common goods.

2.3.1 Social Issues in the Management of Common Goods

Government and rural development efforts have a bad record of substituting public goods for what should be common goods. Many of the above resources have been nationalised in many countries, usually over the heads of people who think of the resources as, collectively, theirs. The tendency of state-led rural development in support of private enterprise has been to take over the provision and maintenance of naturally or previously collectively-supplied goods. Then, having committed themselves in this way many states have not had the resources to honour their commitments, leaving substantial areas of provision unmet or subject to poor quality and low levels of maintenance.

Centralised, competitive political processes have at the same time contributed to the decline of local institutions and leadership patterns, which could have taken up the unmet commitments. In some cases centralised states have actively prevented local communities or groups from developing collective, locally appropriate provisions. In customary law there are often complex layers of rights to use common pool resources, which are completely disregarded by legislated nationalisation or privatisation. It is important that rural development workers criticise these acts of disenfranchisement, fight them in the courts where relevant, and strengthen common people's claims over common pool resources.

There are new (or newly conceptualised) common goods as well as old genetic resources. And there is scope for creating new common goods in particular from resources that were previously under the state's control, but also from privately owned resources where ownership rights are becoming increasingly conditional. The new rural development agenda involves moving in from a defensive to an aggressive position on common goods: exploiting opportunities to create new ones, and recreating old ones, as well as defending existing common goods.

Paradoxically, while states were busy taking over functions to which they could not do justice, they also naively promoted community development. In many cases this turned out to mean the development of village elite favourable to the central power, allowing a trickle of funds to enable them to patronise supporters in the village. Among other things, village elites used their influence to privatise village common land, which was an important part of the survival kit of the rural poor.

The state-controlled cooperative movements were another tool used in the same way. In fact, the dominant strain of rural development has consistently sought to develop new, supposedly perfect common goods institutions, community spirit and cooperative enterprise, and frowned on individual enterprise and archaic (imperfect) institutions. These institutions have usually led to the development of the few and the exclusion of the many. Typically, the poor women and minority groups were excluded, or were benefited much less. These (perfect) institutions were often too complex for ordinary members to understand, and assisted with external resources to grow too rapidly. The generation of internal resources was neglected, and external sponsors (usually governments) used the institutions to legitimise themselves and sometimes to enrich themselves.

A later generation of development programmes promoted self-help and self-sufficiency as a method of spreading the benefits of development more rapidly to a large group of people. In the 1970s, a strong concern emerged for the participation of the poor in both state-led development and self-help efforts. This did not rely so much on the notion of village as a community, characterised by equality and solidarity, and therefore good at working together for mutual benefit, as on the idea of groups with sufficient common interest to support each other in enterprises or common services. This represented progress conceptually, but practice often lagged behind, stuck with idealistic notions of community self-help.

Community development and self-help efforts relied heavily on idealism and altruism among participants if they were to work effectively in managing common resources or providing common services. Sociological analyses, such as those conducted for the United Nations Research Institute on Social Development (UNRISD) and the International Labour Organization (ILO) in the 1970s and early 1980s shed some light on why certain collectivities succeeded while others failed. These studies situated particular collective initiatives in wider analysis of the social structure and process of particular societies.

Some generalisations were possible on the basis of comparative study – for example, that the cooperatives whose members were relatively homogenous in socio-economic terms were more likely to succeed than the heterogeneous ones, i.e., those with sharply differentiated memberships. There also emerged a more general pessimism about the prospects for collective action, since there seemed to be few success stories, which were not highly context-specific. This was reflected in the virtual demise of the collectivist solution in the 1980s.

Reintroducing the notion of common property as central to the new rural development paradigm has some advantages: it does not presume any kind of community of interest among the members of natural communities, (e.g., village administrative areas, etc.). Community of interest has to be discovered, and conflict among common property users is seen as the norm; the work of development agencies, in cooperation with users, is to evolve solutions to conflict of interest which advance the cause of the poor, of women, and of oppressed minorities. This may involve legal and institutional changes which have to be lobbied for.

SAQ 2

Outline the socio-political problems in the management of common goods.

2.3.2 The New Institutional Economics and the Common Property Resources

Until the 1980s, the models for common property resource management were relatively crude. They have generally been dismissive of the possibility that groups of people with different and often competing interests can use and manage a resource in common. The phrase '*tragedy of the commons*' says it all: policy prescriptions

resulting from these models have tended to conclude that commons should be privatised or that 'the government' should regulate their use.

The new institutional economics applies economic concepts of rationality, and the calc ulation of costs and benefits to the analysis of institutions for the common good. The government along with the activists and development functionaries are some of the actors in these models; but the most important actors are the users.

Fig.2.4: Principal actors in common goods management

This economics is useful to analyse situations where common goods users struggle to operate their common goods resources, be it land, water, forest, a fishery, or even a computer network through the development of operating strategies, rules and constitutions. Rather than government, it is better here to speak about the process of governance. This may be carried out by a government (village, local or central), or by an organisation of civil society.

The economist's basic strategy is to identify those aspects of the physical, cultural and institutional settings that are likely to affect

- the determination of who is to be involved in a situation,
- the actions they can take and the costs of those actions,
- the outcomes that can be achieved,
- the linkages between the actions and their outcomes,
- the information that is to be made available,
- the extent of control individuals can exercise, and
- the payoffs that are to be assigned to particular combinations of actions and outcomes.

Once one has all the needed information, one can then abstract from the richness of the empirical situation to devise an implementable scheme that will capture the

essence of the problems individuals are facing. In the analysis of Common Property Resources (CPRs), we have to consider

The resource system – which produces a flow of the

Resource units – which can be used by

Appropriators – who may or may not be the same people as the

Providers – who create or maintain the resource system.

Fig.2.5: Key elements in CPR analysis

Appropriators learn about the impact of their actions on themselves and others through trial and error over a period of time. Their decisions are affected by their time horizon: usually local appropriators expect their children and grandchildren to make use of the resource system so they will have a low discounting rate for future benefits. The behaviour of all parties is affected by *values* of right and wrong and the degree of *opportunism* expected of other parties, and the degree of trust and a sense of community. In most CPRs, the resource units are subtractable, one appropriator's use affects that of others.

Decisions to cooperate depend on expected benefits, expected costs, internal norms and discount rates, in the context of an external world which affects all of these. These decisions are complex and involve weighing many uncertainties:

a) A successful working arrangement should be based on rules which can be agreed.

b) It must generate continued widespread commitment to those rules.

c) It must engage in mutual monitoring to support individual commitment to the rules and to the process of rule making.

d) Appropriators need to be assured that the (managerial) benefits of appropriation are greater then the (managerial) costs. Open access CPRs are likely to fail in this, as users have no incentive to leave resource units for other users. In a limited access CPR used by a well defined group, 'the incentives facing the appropriators will depend on the rule governing the quantity, timing, location and technology of appropriation, and how these are monitored and enforced'.

e) Investment in the resource itself must be adequate to maintain or improve it, and appropriators' current use must not be at the expense of future use.

Decisions about CPR management occur at different levels:

- *the operational level* – where well known rules govern appropriation, provision, monitoring and enforcement;

- *the collective or management level* where eligibility to make rules and management is decided.

People involved in common goods management move between these different levels of decision, and all are important in determining whether a CPR is well managed or not. For common property resources to be managed sustainably in environmental and equity terms, the rules may need to change. Successful change of rules, whoever proposes it, requires support from interested parties. Economics holds that individuals assess alternative rules and the costs and benefits of making changes rationally. However, the data to model individual behaviour adequately rarely exists, so that the analyst must be familiar with the situation as different parties experience it, and identify the 'situational variables' which will affect individuals' judgments about the benefits and costs of changing the rules.

These would include:

- the type of rule change proposed;
- the skills and assets of leaders;
- the degree of autonomy available in changing rules; and
- the heterogeneity of interests involved, and so on.

Setting new rules is extremely difficult in the rural context: it is often impossible to calculate accurately the effects of the new rules. People usually weigh the likely costs and the benefits in a biased way. Invariably, the losses are weighed more heavily than gains. The recent experiences figure more prominently in people's minds than those of the more remote past. Small changes are less opposed than the big ones, and so on. Different groups of appropriators may have quite conflicting interests and derive very different levels of benefits from existing or proposed arrangements. It will be easier to agree to new rules where:

- Most appropriators share a common judgment that they will be harmed if they do not adopt an alternative rule.
- Most appropriators are likely to be affected in similar ways as per the proposed rule changes.
- Most appropriators highly value the continuation activities from this CPR; in other words, they have low discount rates.
- Appropriators face relatively low information, [rule] transformation and enforcement costs.
- Most appropriators share generalised norms of reciprocity and trust that can be used as initial social capital.
- The groups appropriating from the CPR are relatively small and stable.

These conclusions are similar to those of the UNRISD studies mentioned above, and are largely based on common sense. Where such conditions do not apply, CPR management may be enhanced or made possible by external intervention. However, in the interest of strengthening the institution managing the CPR, governments or other external agencies should not intervene without acquiring a great deal of understanding of the situation, and the different interests involved. They should act in support of local, sustainable institutional solutions rather than taking over the rule making and other management tasks. Social scientists working on these problems should be able to address their ideas as much to the users as to the agency that has employed them to give advice. Governments provide the legal and institutional framework, the courts, and the policy and should be wary of providing and managing the solution.

Critical issues in the application of the new economics

In its support for local and popular institutions, and in its recognition of the limits to government or external action, the new economics is progressive. However, like all economic theorising and modelling, there remain strongly mechanistic notions at the heart of institutional economics. It assumes a material rationality, and relegates many important issues to the realm of values or norms. Economic analysis needs to be complemented by social analysis, which would address the importance of informal relationships and networks, cross cutting ties and sources of motivation, the importance of politics, and the existence of altruism based on personal or social philosophies, which reject or qualify materialism.

A social analysis would also investigate the worldview and knowledge system upon which particular management strategies are based. Economics assumes the disembodied (detached), context less (universal) system of knowledge of modern industrial society. However, as we know, many societies operate with knowledge systems which are firmly embedded in a complex of thought and practice, and applied in a local context.

In any particular case, the range of variables may be so complex as to defy easy analysis. People's perceptions of a situation also frequently vary from an 'objective' (external) analysis of their interests because of the social, political and philosophical complexities involved. Model building can be done in a participatory way. Such that interested parties are involved, share in the information which is generated and are then in a stronger position to retain decision making powers in a local arena.

SAQ 3

Analyse the role of appropriators in the management of common property resources.

So far, you have studied about the socio-economic issues involved in the management of common property resources such as forests, pastures, water resources, etc. Access to water supply and sanitation is a major problem in rural areas though it is a fundamental need and a human right. It is vital for the dignity and health of all people. The health and economic benefits of water supply and sanitation to households and individual (and especially to children) are well documented. Of special importance to the rural poor are the time saving, convenience and dignity that improved water supply and sanitation represent. Those without access are the poorest and least powerful. Access for the poor is a key factor in improving health and economic productivity and is therefore an essential component of any effort to alleviate poverty. Let us now discuss these aspects of environmental management in rural areas.

2.4 MANAGEMENT OF DRINKING WATER, SANITATION AND HEALTH

The water supply and sanitation sectors in rural areas face enormous challenges, which are bound to increase over the coming decades. Although the greatest increase in population is projected to occur in urban areas, the worst levels of coverage at present are in rural areas. In Africa, Asia, and Latin America, rural coverage for sanitation is less than one half of urban areas: just under 2 billion people in rural areas are without access to improved sanitation, and just under 1 billion are without access to safe and improved water supply.

Poor water supply and sanitation have a high health toll whereas improving water and sanitation brings invaluable benefits to both social and economic development. The simple act of washing hands with soap and water can reduce diarrhoeal disease transmission by one third. Hygiene promotion, therefore, is an important priority.

Health hazards of poor water supply and sanitation include diseases like

- **Diarrhoea that causes 2.2 million deaths each year,** mostly among children under the age of five. This is equivalent to one child dying every 15 seconds, or 20 jumbo jets crashing every day.
- **Intestinal worms infestations that affect 10% of the population of the developing world** and lead to malnutrition, anaemia and retarded growth, depending upon the severity of the infection.
- **Trachoma,** which leads to blindness in about 6 million people.
- **Schistosomiasis,** affecting 200 million people in the world**,** of which 20 million suffer severe consequences.

Fig.2.6: People are vulnerable to diseases in rural areas due to lack of safe drinking water, sanitation and health care

Lack of improved domestic water supply leads to disease through two principal transmission routes

- **Waterborne disease transmission occurs by drinking contaminated water.** This has taken place in many dramatic outbreaks of faecal oral diseases such as cholera and typhoid. Outbreaks of waterborne disease continue to occur across the developed and developing world. Evidence suggests that waterborne disease contributes to background rates of disease not detected as outbreaks. The waterborne diseases include those transmitted by the faecal oral route (including diarrhoea, typhoid, viral hepatitis A, cholera, dysentery) and guinea worm disease.
- **Water washed disease occurs when there is a lack of sufficient quantities of water for washing and personal hygiene.** When there is not enough water, people cannot keep their hands, bodies and domestic environments clean and hygienic. Without enough water, skin and eye infections (including trachoma) are easily spread, as are the faecal oral diseases.

Diarrhoea is the most important public health problem affected by water and sanitation and can be both waterborne and water washed.

Adequate quantities of safe water for consumption and its use to promote hygiene are complementary measures for protecting health. The quantity of water people use depends upon their ease of access to it. If water is available through a house or yard

connection, people will use adequate quantities for hygiene, but consumption drops significantly when water must be carried for more than a few minutes from a source to the household.

Obviously, there are many health benefits of improved water supply and sanitation.

Sanitation and Health Management

Sanitation facilities interrupt the transmission of faecal oral disease at its most important source by preventing human faecal contamination of water and soil. Epidemiological evidence suggests that sanitation is at least as effective in preventing disease as improved water supply. Often, however, it involves major behavioural changes and significant household cost.

Sanitation is likely to be particularly effective in controlling worm infections. Adults often think of sanitation in adult terms, but the safe disposal of children's faeces is of critical importance. Children are the main victims of diarrhoea and other faecal-oral disease, and also the most likely source of infection. **Child friendly toilets** and the development of effective **school sanitation programmes** are important and popular strategies for promoting the demand for sanitation facilities and enhancing their impact.

Adequate quantities of safe water and good sanitation facilities are necessary conditions for healthy living, but their impact will depend upon how they are used. Three key hygiene behaviours are of greatest likely benefit:

- hand washing with soap (or ash or other aid).
- safe disposal of children's faeces.
- safe water handling and storage.

Fig.2.7: Some simple sanitation measures

Low cost technologies are available that require less quantities of water to maintain sanitary and hygienic conditions. Such technologies should be promoted in both rural and urban areas. Table 2.1 lists the water supply and sanitation technologies considered to be "improved" and those considered to be "not improved".

While many health hazards prevalent in rural areas can be managed by providing safe drinking water and sanitation, many other problems of health stem from lack of adequate nutrition, and good housing. Impact of environmental pollution due to

chemical intensive agriculture on health is another area that needs intervention. The health impact of the Green Revolution has been very little studied; comparative studies are not surprisingly a very new field, and so far confined to industrial countries. For example, in Denmark it was found that male sperm counts were twice as high in consumers of organic produce compare with the rest of the population – and declining sperm counts is a feature of industrial society. This has now been replicated in the UK.

Table 2.1: Improved and not improved water supply and sanitation technologies

Improved	Not Improved
Water supply	***Water supply***
Household connection	Unprotected well
Public standpipe	Unprotected spring
Borehole	Vendor-provided water
Protected dug well	Bottled water
Protected spring	Tanker truck provision of water
Rainwater collection	
Sanitation	***Sanitation***
Connection to a public sewer	Service or bucket latrines (where excreta are manually removed)
Connection to septic system	Public latrines
Pour flush latrine	Open latrine
Simple pit latrine	
Ventilated improved pit latrine	

Research has shown that species diversity is greater on organic than on non-organic farms in the developed countries. Birdlife, insect and plant diversity aresignificantly greater. Not surprisingly since the organic farmer attempts to live with nature rather than control it to a greater extent than the conventional farmer. However, the health and environmental benefits of non-Green Revolution agriculture would be much easier to substantiate in the developing countries where careful comparisons can be made between regions where chemicals are widely used and those where their use is insignificant. This is a key area in which research needs to be funded.

SAQ 4

Discuss the challenges in rural environmental management stemming from health related problems.

Rural poverty alleviation is the greatest challenge in rural development and is intricately linked with rural environment management.

2.5 RURAL POVERTY ALLEVIATION

Rural income is very low in most South Asian countries. Economic growth is thus an essential ingredient of rural development. Market-led economic growth has relied on benefits to trickle down to the rural poor, but this has only happened under very specific circumstances among countries coming late to the development process. As a result, these countries are moving towards a **new paradigm of poverty alleviation** that encompasses **equitable high quality poverty reducing growth**, **giving attention to the poor and vulnerable**, **protecting the environment**, **generating income-earning opportunities** and **improving access to services and technologies** for the rural poor. Increasingly it is the positive participation of the poor in the development process which is seen to reduce poverty. This strategy is seen to be far better than supporting growth biased towards the rich since the poor anyhow supply much of the

overall cost of investment, through labour and even savings. By contrast, the rich typically require more expensive support in the form of capital.

A shift is being seen from heavy direct promotion of enterprise involving subsidy, generally on capital investment, to the creation of an appropriate policy and market environment. This involves removing obstacles and decreasing equal opportunity for competition, usually removing discrimination in favour of large, urban-banded enterprise and external investors. The move is away from industrialisation at all costs, costs not only to the state but also to rural communities, pollution, unhealthy working conditions, and child labour.

From providing subsidised bank credit for capital investment to creditworthy entrepreneurs, development efforts have increasingly turned to collateral-free group-based lending with a savings base, often supporting **self-constituted, self-help** groups of women, who would be considered credit worthy by normal banking standards. These efforts swing between developing entrepreneurial skills among the very poor, to providing critical injections of working capital into existing artisan enterprises to enable a better chance of survival. This implies moving from a belief in modern industry to an understanding that traditional occupations may have a lot to offer, provided there is good demand for their products.

There has also been a shift away from bureaucratically managed credit back to community/locally controlled rotating or accumulating savings and credit associations which function not only as financial intermediaries but often also as safety nets providing insurance and consumption loans to members. There is a debate about whether development agencies should intervene in such an organisation, which is otherwise independent.

Poverty alleviation is also about social security. It is clear that savings and credit schemes cannot reach all the poor: the poorest are usually very hard to reach. What they need is a wage; and help in sending their children to school. Many development agencies and governments now offer wage guarantee schemes when the local labour market is slack. Then there is a small proportion among the poor who cannot hold down a job and depend on charity. Most poor countries have yet to provide effectively for these groups, who may be disabled, chronically sick or mentally ill.

Increased rural incomes can give rise to greater purchasing power and generate greater demand. This, in turn, is the key to balanced and sustainable rural economic growth and food security, because it will promote a diversity of local services, trade and production, with impacts locally perceived and manageable. In agriculture, diversification of farm and off-farm activities, including CPR–based ones (livestock, fishing, forestry, bee-keeping, wildlife management), has become a major thrust. Enhanced rural prosperity coupled with environmental consciousness can go a long way in improving rural environment.

In spite of multi-pronged efforts, rural poverty and inequality is increasing day by day. Many more interventions are needed to meeting the twin goals of eradicating rural poverty and improving rural environment. Here we discuss some major steps.

2.5.1 Land Reforms

The extent to which the ownership and control of land is concentrated in a few hands or widely distributed among those who live from farming is probably the most important single determinant of the welfare of the people on the land. In countries with widespread distribution of land ownership, one observes:

- the strongest propulsions to steady work and the maximum of thrift;
- the highest average levels and standards of living;

- the least development of social stratification, the fewest class distinctions, the relative absence of caste, and very little class conflict and class struggle;
- a high degree of vertical social mobility so that the individual comes nearest to occupying the social position commensurate with his effort and natural abilities;
- general intelligence that is at a high level and a minimum in range; and
- rural population having well rounded and highly developed personalities capable of managing their environments.

The opposite of this system, (the concentration of control in the hands of a few and impoverishment of the majority of rural people turning them into landless agricultural workers), appears to result in

Fig.2.8: Land reforms lead to rural welfare

- struggle for survival or a very low average standard of living, although the members of the landowning elite may live in fantastic luxury;
- tremendous class distinctions between the favoured few at the apex of the social pyramid and the toiling masses who lack any rights to the land;
- relatively little vertical social mobility, because caste is strong and because the chasm which separates the upper classes from the masses is so great that the offspring of those of low estate (even those of rare ability) find it very difficult to ascend in the social scale in rural areas;
- people low in self-confidence and skilled only in performing a limited number of manual tasks, unable to carry on the self-directed activities required by managerial and entrepreneurial work;
- interpersonal interactions characterised by domination-subordination, order-and-obey relationships;
- a society that stresses routine, regulation, and order rather than innovation, progress, and change.

Where large-scale agriculture prevails, the vast majority of those involved are landless labourers whose total potential as human beings remains undeveloped and who are subject to all of the disabilities mentioned before. On the other hand, where land ownership and control are widely distributed among those who make up the rural population, such problems are of little consequence. Middle-class social status is the rule arising not from the accident of birth, but from the individual's own abilities and efforts to succeed. Such a condition is a logical part of the pattern of social relationships associated with family sized farms. Within this relatively large middle class, individuals move up and down to levels fairly commensurate with their talents and effort.

The farmer owning a farm is a labourer, as is the one working on the large estate he does not own. However, unlike the serf, the peon, the sharecropper, or even the wage hand, he is also an entrepreneur and the manager of his own farming affairs. In these capacities he is constantly motivated to seek efficient, economical methods and he lacks any predisposition to preserve wasteful routine or a debilitating status quo. Where owner-operators of family-sized farms are typical, average levels of living and of intelligence are likely to be very high. There is little in the social relationships of these persons that would bring some under the domination of others; genuine leadership is common, but operates among a community of especially equal farmers who have no reason to fear each other or to acquiesce to principles and procedures with which they disagree.

Thus, land reforms aiming at redistribution of land to the dispossessed are one of the major preconditions for rural poverty alleviation.

SAQ 5

Explain the benefits of land redistribution that places adequately sized farms in the hands of rural poor.

Fig.2.9: Some ways of reducing rural poverty

Practically every society has placed some restrictions upon the use of land. Provisions have been put in place for regulating the use of land, and for governing the associations between those who own and control it, and those who do not. These are being implemented through grassroots organisations. However, lack of scientific knowledge of management of land and other common property resources is leading to many environmentally damaging developments in rural areas, viz., soil erosion, depletion of nutrients in soil and its degradation, ground water pollution, etc. The course MED-007 on Agriculture and Environment looks at these problems in detail. Here we discuss briefly the importance of Environment Education for rural environment management.

2.5.2 Environment Education

Development, above all else, requires new ways of thinking and acting. Education is the principal means for responding to new situations, requirements and possibilities with fresh thinking and effective action. Whether the issue is the reduction of poverty, the preservation of the environment, the improvement of quality of life or the promotion of the rights of women, education is often a very sizeable part of the answer. It is identified as a "key factor in sustainable development". It is a vital force in the struggle to shape a happier future for humanity.

The relationship between environment education and people should not be understood in isolation, but in the context of the struggle for development and sustainability; and must, in turn, be placed in the broader context of the struggle to overcome poverty, promote justice and equity and ensure respect of the environment and, thus, for the right of future generations to live healthy and fulfilling lives. What ultimately counts is the quality of life people enjoy and the communities they form and foster. A world in which the richest fifth of humanity consumes 150 times more than the poorest fifth is rendered fragile both by the excesses of the rich and the desperation of the poor. To restore a sustainable balance we must begin by forging a new sense of community based on mutual responsibility and an ethics of the future; a far sighted acceptance of our shared interdependence and the long term action that it implies.

Environment education needs to be given a prominent place in our general education system as it can play vital role in the quest to ensure the basic needs and well-being of the entire world's people as well as a conducive, salubrious environment. More specifically, **people in rural areas need to develop the knowledge base**, **capacity** and **skills** in **natural resource conservation and management**, **preserving biodiversity**, **community health care**, and also in **information and communication technologies**.

Fig.2.10: Education and training should be a priority in rural areas

Farmers need to be trained in the technologies and practices of sustainable agriculture and need to be able to access them. Training in other environment friendly income generating technologies in the areas of infrastructure development (e.g., rural transport, housing, energy, etc.) can help alleviate rural poverty. However, this is an ambitious programme that requires utmost commitment from the state. While the primary responsibility for education rests with national governments, the experience of recent years demonstrates that they cannot shoulder the burden alone. They need the active involvement of civil society and the effective solidarity of the international community.

The challenge is not merely to ensure survival, but to provide humanity with a more productive, peaceful, just and meaningful future. In this challenging situation, education is humanity's best hope. Without invention, innovation, new systems of organisation and values, and new ways of thinking and acting the future prospects of education are bleak. New learning and learning systems, open to all, are the keys to a brighter future.

2.5.3 Rural Diversification

The rural people of the South Asian countries principally rely on agriculture and related activities like fishing, forestry, horticulture, etc. for their livelihoods. They need to diversify beyond their primary economic bases as these are now unable to support them. Diversification thus means a shift in employment from one sector to a new (or expanding) sector.

Rural diversification can be defined as economic development of non-agricultural activities or a livelihood which has multiple, part-time components. Although agriculture is the key growth sector of rural areas, diversified or non-farm economic sectors also have potential (e.g., forest products, dairying, tourism, processing industries, economic activities involved in setting up, operating and maintaining rural infrastructure, e.g., construction of roads, water and energy supply, housing and other construction, telecommunication facilities, etc.).

Rural livelihood or occupational diversification has two key components which are usually related:

- **Multiplicity**: multiple livelihoods (jobs, incomes etc.) requiring several part-time, concurrent activities.

- **Change, transformation or adaptation**: usually from an essentially subsistence agricultural sector to non-subsistence, non-agricultural sectors.

Declining global terms of trade and population densities above carrying capacity, amongst other factors, present a bleak prospect for small farms as a fulltime livelihood for the majority. Likewise, rapid growth in urban employment through labour-intensive industrialisation has not been realised. The rural non-farm economy lies between these two sectors. With many rural areas facing a chronic under-unemployment or unemployment crisis, especially for the unskilled masses, this raises important questions:

- Can rural economy offer new jobs to replace those lost in agriculture?
- Will these jobs offer real opportunities for the poor?
- What will be the wider impacts of such diversification on rural society?

- What are the potential challenges of creating a pro-poor rural non-farm economy?
- What measures need to be taken? What options exist for intervention?

While considering these issues, we need to consider three basic questions:

1. What can be done to promote **a rural non-farm economy** (RNFE) which will contribute to rural growth and positive diversification?

2. What mode of RNFE development is most efficient and equitable?

3. What policies can be implemented to improve the quality and accessibility of employment in a diversifying world?

To achieve growth, rural areas need productive activities which produce goods and services that can be traded within and outside rural areas. It is important to understand where rural competitive advantage lies. The following categories of rural resources provide the basis for rural advantage:

- **Availability of natural resources:** Natural resource extraction (forestry, mining, fishing, etc.), allied agricultural activities (stall-fed livestock, bees, silk, aquaculture) and rural tourism and recreation are all growth sectors although the most important are likely to be agricultural products, particularly those that are land extensive.

- **Processing:** Processing of natural resources close to extraction point reduces transport (by reducing bulk and weight) as well as wastage costs (by early processing, e.g., sugar processing, mineral processing).

- **Skilled Labour:** Rural artisanal skills (pottery, weaving, basketwork) are often unique and in varying demand from city dwellers. Rural, off-season labour can be some of the cheapest available which can give labour intensive enterprises advantage.

Important sources of **other rural inflows** include income from government spending (direct employment and welfare transfers) and from migration savings and remittances.

Rural disadvantage lies in the economic distance of the site of production from major markets, goods and services. The dispersed and small scale nature of rural economic activity increases transaction costs and reduces competitiveness.

Once the non-farm sectors with potential demand have been identified, and the political will and resources mustered, the recommendations for broad based, diversified rural growth are clear. For poor areas, the very basics are **investment in infrastructure**, **human capital** and **markets**, preferably oriented to non-agricultural as well as agricultural uses, e.g.,:

- investments in roads, electricity, telecommunications;
- investments in education and people;
- activation of credit, capital and land markets.

Rural diversification involves mobilising resources such as land, buildings, or family labour to create new enterprises. These may be a direct extension of the farming activity, by creating a value added product and marketing it, or indirect, by selling contracting or other skills on and off the farm. Also, typically, buildings may be leased for office or other small business purposes unrelated to farming of the land.

The **land use planning** criteria for judging diversification schemes on farms could be: how far the scheme supports the variability of the farming enterprise; the number of local jobs created or retained; the scale of the activities, and any new buildings, and how they fit into the countryside; a preference for the reuse of existing buildings;

issues of vehicular access and its quality, and the need to avoid additional dwellings in the open countryside.

While formulating policies for promoting rural diversification, we need to consider questions like the following:

- **Where to invest scarce resources?**

  In view of the scarcity of resources, the extent of investment directed towards low-potential areas distant from urban areas that often have the highest poverty and the least potential for RNFE (or agricultural) growth is a contentious issue.

- **Where is the political will?**

  Even if the ideology is agreed to, it is difficult to influence the political will for such investment as rural people in remote areas have very little political voice.

- **Does the institutional structure exist?**

  Agencies dealing with RNFE sectors often do not exist, or tend not to see the RNFE as their territory. Given the specific and diverse nature of local conditions, local governments are clearly the agency of choice for implementing rural diversification programmes. Local authorities should make provision in their development plans, appropriate to the needs of the area, for commercial and industrial development, which can be accommodated without serious planning problems. Wide and varied opportunities for employment should be provided for rural people.

  The levels of provision in development plans should be based on an assessment of the needs of the area. The detailed needs of rural areas should be analysed separately from those of the urban areas. This implies that authorities should have a clear analysis of factors such as unemployment, the skills in the bcal labour market, and the development intentions of existing employers. Rural areas are almost without exception highly dependent upon and increasingly interlinked with, urban areas and wider production systems.

  However, serious questions remain as to the ability of local authorities to support development and manage a local economy given their weak administrative, technical and financial resources, poor revenue raising powers and patchy support from the police and judiciary.

- **Should growth in the RNFE sector be through small-scale or large-scale units?**

  Traditional enterprise support, particularly from NGOs, has targeted micro or small-scale producers, through micro-enterprise development programmes, income generating schemes, micro-credit and so on. However, is this the most efficient way to provide pro-poor livelihoods? Do the assumptions on which this mode of support is built still hold? It is argued that small, family-sized businesses may not be more efficient than large. Small-scale enterprises need to have high labour productivity along with being highly labour intensive if they are to provide high employment and good wages.

  Policies in local plans should provide a guide to the scale of allowable development and the criteria against which planning applications will be considered. Sensitive, small-scale new development can be accommodated in and around many settlements. Comprehensive strategies are needed to integrate environmental considerations with economic and social development. Central government and its ministries would need to work in conjunction with local governments, but more innovative approaches in cross-sectoral administration are needed.

Efforts to invest capital in rural businesses and reduce capital flight from them, including encouraging local sourcing, could help rural diversification. A strategy of encouraging interaction between urban and rural businesses would also help avoid competition between the rural and urban sectors. Some of these opportunities will require low capital, low skill micro-enterprise. However, increasingly, high capital medium to large scale enterprises will provide real growth potential, and thus employment potential. **The challenge then will be to ensure that the employment generated in rural areas is pro-poor**.

- **What policies should be adopted for ensuring pro-poor labour markets?**

  There are many challenges in governing rural labour markets:

  1. The costs of long-distant job search need to be reduced in view of the multi-spatial nature of households and livelihoods, the rights of workers in non-local employment should be supported, remittance transfer and financial management back home should be facilitated.

  2. Improved job security and welfare standards at work place should be ensured. Increasing move towards employing casual labour should be prevented, without stifling private sector development.

  3. Equitable access to jobs should be ensured. This could be done by providing information, education and training and increasing investment in rural economy.

  4. Infrastructural development is essential to ensure competitive advantage and it can also be turned into income and employment generating venture

  However, free capital has a tendency to flow to the urban sector first, given its massive economic advantages. The final decision on public investment and intervention will depend on the state's commitment and political will for sustainable and equitable development.

We end this section by looking at the question: **What are the effects of diversification on social well-being?**

You can arrive at an answer yourself after going through the tale of two villages in India.

One enjoyed irrigation, success in agriculture and stability. The other received no irrigation and the people, including the landlords, were forced to diversify and migrate. The former retained its hierarchical structures of patronage and tied agricultural labour. The latter saw many of these traditional, regressive institutions break down. Thus, it could be argued that sectoral and spatial mobility create the possibility for social mobility and, perhaps, economic mobility among those who never before had the chance.

Today for the younger generations, whose fathers may have wished only for a secure farming existence, such mobility and experience is more often the desired norm. And for women, the transformation of labour market participation that diversification brings has surely contributed to their empowered status within the household.

These issues remind us that the study of livelihood diversification is about more than multiple income sources; it relates to the current transformations of global, national and local economies. The implications for rural societies, traditional ways of peasant life and well-being are paramount. Who will win and who will lose? Such questions will continue as key debates for social scientists in coming years. Central to this will be the trade-offs between increased growth and more equitable opportunity. The degree to which rural sectors should be promoted, labour markets should be regulated or micro-enterprise encouraged beyond larger scale capital are questions

which reflect this. Ultimate accountability lies with the state for which there are difficult decisions ahead. On this note, we summarise the contents of this unit.

2.6 SUMMARY

- There are two paradigms of rural development: The **modernisation paradigm**, which equates development with four basic processes: **Capital investment**, the **application of science to production and services**, the **emergence of nation-states** and large-scale political and economic organisations, and the **urbanisation of rural areas**. The alternative paradigm for rural development involves a more holistic approach towards development focusing on social justice, environment and institutional sustainability.

- The main problem that occurs while developing an integrated plan for rural development is the management of **common goods** such as water bodies, forests and pastures.

- Rural areas of South Asia face many problems related to **water supply and sanitation, health, education, lack of access to technologies,** etc. The magnitude of rural poverty in these countries is still very shocking. This stems from lack of rural land reforms, lack of income generating opportunities and education.

- The integrated rural development demands policies and planning of **rural diversification**, which needs assessment of the needs of the particular area. The industrial or agricultural development and provisions of facilities should be based on the needs assessed.

2.7 TERMINAL QUESTIONS

1. Discuss the two major paradigms of rural development, giving examples from your own region.
2. Describe the major environmental problems in rural areas. Explain the possible causes of these problems. What socio-economic measures are needed to deal with these problems?
3. What do you understand by rural diversification? What are its benefits? How can the process of providing non-farm income generation opportunities be accelerated in rural areas?
4. Analyse the avenues available to the rural population to deal with rural poverty. Suggest measures that can help in alleviating rural poverty.

UNIT 3 MANAGING THE URBAN ENVIRONMENT

Structure

3.1 INTRODUCTION

In Unit 2, you have studied about the challenges in managing *rural* environment and measures needed for meeting them. We now turn our attention to *urban* environment management.

The world is becoming increasingly urbanised and its cities are changing rapidly. The number of mega-cities – sprawling, multi-centred settlements covering enormous areas – is on the rise. The rapidly expanding cities face the twin challenges of exploding populations and scarce resources and suffer from a number of environmental problems including **poor urban infrastructure** (inadequate housing, polluted air and water, growing problems of solid waste collection and disposal), **congestion**, **overcrowding**, **uncontrolled and conflicting land uses**, **unabated pollution** and **poor maintenance**.

Lack of readily accessible drinking water, unsanitary living conditions, and prolonged exposure to air, land and water-based pollution continue to jeopardise the health and economic productivity of urban residents. These problems have many aspects including multi-sectoral (e.g., manufacturing, services, households), multi-system (e.g., water supply, sanitation, transport) and multi-level aspects (central, regional, local and community). They also concern multiple actors (governmental, non-governmental, community-based and private organisations).

The environmental challenges in urban areas can be handled with careful design, planning and management and the involvement of all actors. This endeavour also requires professional expertise. Urban professionals – planners and managers – will increasingly be faced with a multitude of urban environmental challenges such as maintaining air quality, protecting water resources, disposing of solid waste and meeting an increasing demand for energy. They would need to be equipped with the outlook, concepts, and tools needed to understand them and find workable solutions for them. Finding such solutions would require drawing from the knowledge of a broad range of technical and managerial disciplines.

In this unit, we outline the challenges in urban environment management and the measures required to meet them. You would agree that we need to make cities more pleasant and healthier places to live in and to reduce undesirable effects on the urban environments. We hope that as you study this unit, you will be able to decide your

own role in improving the environment of urban areas and your surroundings, in particular.

Objectives

After studying this unit, you should be able to:

- describe the various components of urban environment;
- explain the challenges in urban environment management; and
- discuss specific measures needed to improve urban environments.

3.2 THE URBAN ENVIRONMENT

Worldwide, we are becoming an increasingly urbanised species. This is because economic development leads to urbanisation. There is a rapid growth of huge metropolitan areas with more than 10 million residents. It might interest you to know that in 1950 there were only two such areas in the world – New York City and its nearby New Jersey areas (12.2 million residents) and greater London (12.4 million). By 1975, Mexico City, Los Angeles, Tokyo, Shanghai, and Sao Paulo, Brazil, had joined this list. It is clear that in the future most people will live in cities; in fact, in most nations, most of the urban residents will live in the country's single largest city. Most of the world's largest cities are now in Asia, not in Europe and Northern America.

We have to prepare right now for a future in which most urban dwellers live in an environment of good quality, in cities that are managed carefully to maintain that environmental quality. The preparations for such a future require addressing the sources of environmental degradation, enabling access to basic shelter and environmental services for the urban poor, and reducing their vulnerability to environmental problems.

In the past, the emphasis of environmental action has most often been on wilderness, wildlife, endangered species, and the impact of pollution on natural landscapes outsides cities. Now it is time to turn more of our attention to urban environments. In the development of the modern environmental movement in the 1960s and 1970s, it was fashionable to consider everything about cities bad and everything about wilderness good. Cities were thought of as polluted, lacking in wildlife and native plants, dirty, and artificial and therefore bad. Wilderness was considered as unpolluted, clean, full of wildlife and native plants, natural and therefore good. Although it was fashionable to disdain cities, the majority of people lived in urban environments and suffered directly from their decline. Comparatively little public concern focused on **urban ecology**; as a result, many urban people saw environmental issues as outside their realm.

However, city dwellers are at the centre of some of the most important environmental issues. Today there is a rebirth of interest in **urban environment** and in the development of urban ecology. People are realising that city and wilderness are inextricably connected. We cannot fiddle in the wilderness while our rooms burn from sulphur dioxide and nitrogen oxide pollution. Any action on managing urban environment must be based on a sound understanding of the urban environment.

3.2.1 Understanding the Urban Environment

The urban environment encompasses the interaction of population, growth, city management, the built environment, and the natural environment (ecological system) in which the city is located. It also links other pieces of the urban jigsaw puzzle such as health, infrastructure, energy, transport and land use.

In a very broad sense, the urban environment consists of **resources**, human and other; **processes**, that convert these resources into various other useable products and

services; and **effects of these processes**, which may be negative or positive (see Table 3.1).

Table 3.1: Constituents of the urban environment

Resources	Sunlight, Land, Water, Minerals, Electricity, Fuels, Human Resources, Finance, Intermediary Products, Recyclable Materials, etc.
Processes	Manufacturing, Transportation, Construction, Migration, Population Growth, Living, Community Services, (Education, Health, ...), Civic Services (Sanitation, Waste Disposal, Cleanliness,....)
Effects	*Positive Effects*: Increased knowledge base/ education, Access to better services, Job Opportunities, Products, Value-addition, etc. *Negative Effects*: Pollution (air, water, land, noise), Waste Generation, Congestion, Overcrowding, etc.

These resources, processes and their effects can be categorised into three **components** of the urban environment:

1. **Natural Environments:** Flora and fauna, human beings, minerals, water, land, air, etc.
2. **Built Environments:** Buildings, housing, roads, railways, electricity, water supply, gas, sewage treatment facilities, commercial establishments, etc.
3. **Socio-economic Environments:** Economic and business activities, education, health, sports, arts and culture, heritage, urban lifestyles in general.

It is the interaction of these three components that constitutes an 'urban environment'. We need to understand the interrelationships of the three components to develop coherent and sustainable policies and programmes for managing the urban environment.

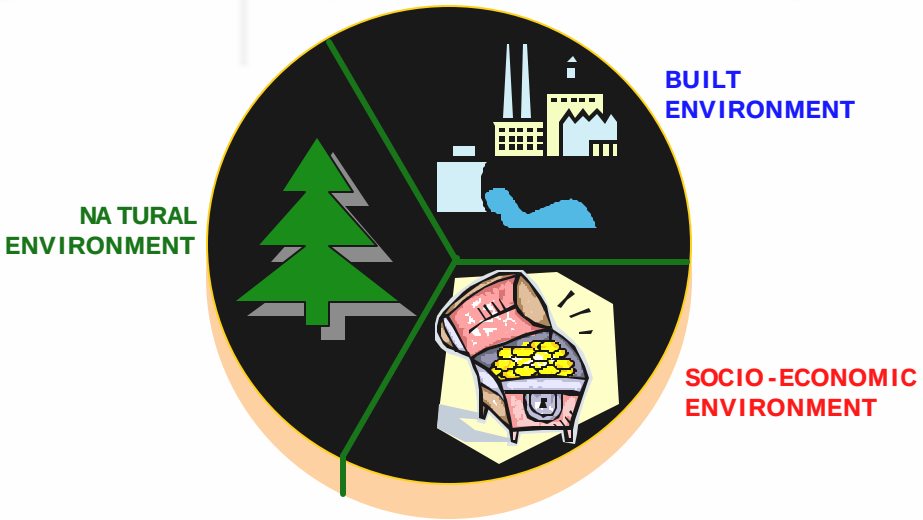


Fig.3.1: Components of the urban environment

You may like to put the resources, processes and effects listed in Table 3.1 into these three categories. Attempt an SAQ.

SAQ 1

List the resources, processes and their effects listed in Table 3.1 under the three components described above.

The technologies required for urban environment management, the levels of responsibility and decision making is different at the various levels of urban areas, e.g., the household level to the city or regional level. Therefore, we also need to understand the ***scale*** of urban environmental problems (see Fig. 3.2).

Fig.3.2: The scale of urban problems

Table 3.2 lists some of the problems according to the spatial scale.

Table 3.2: The urban problems at different scales

Household	Community	City	Region/Nation
Indoor pollution, Household health, Garbage generation, Air/water/noise pollution, Spread of diseases, Energy supply, Water, Gas supply, etc.	Polluted land, Garbage disposal, Air/water/noise pollution, Civic supplies, Energy supply, Natural disasters,	Polluted land, Garbage disposal, Air/water/noise pollution, Natural disasters, Traffic congestion, Loss of agricultural land, Land use and habitat, Toxic and hazardous waste dumps, Water and electricity supply, etc.	Soil erosion and increased salinity, Loss of habitat, biodiversity and endangered species, Toxic run-off and acid rain, Land clearance and loss of forest cover, Effects of climate change and global warming, Natural and man-made hazards and disasters, etc.

You could add to the issues listed in Table 3.2.

The understanding of spatial scale of environmental problems can help us in a variety of ways: in collecting data and information at the appropriate level, identifying resources and stakeholders involved at a particular scale, and in formulating policies and taking action appropriate for a given level.

When we consider the spatial scale of the impact of environmental problems, we find out that:

- health impacts are greater and more immediate at the household or community level and tend to diminish in intensity as the spatial scale increases;
- natural disasters impact households as well as communities and cities but do not extend to the entire nation or region;
- problems like waste management are more important at the household, community and city levels than at the global level, but environmental pollution can become important even at the global scale;
- energy and resource supply and use are the most important issues at household level but their management involves all other levels, right from the community to the national or regional;
- equity issues arise in relation to the provision of basic services at all levels;
- non-sustainable resource use and global environmental issues extend up to the regional and global scale; and so on.

SAQ 2

Describe the environmental issues that are relevant for your own household and community.

The preparations for managing urban environment also involve an understanding of the city from an ecosystem perspective.

3.2.2 The City as a System

One of the ways in which we can improve the management of the urban environment is to analyse the city as an ecological system. Recall the concept of an ecosystem from Block 3 of MED-001. Like any life-supporting eco-system, a city must maintain a flow of energy, provide necessary material resources, and transportation and communication with outlying areas. A city is not a self-contained ecosystem: it depends on other cities and rural areas. It takes in raw materials from the surrounding countryside; food, water, wood, energy, minerals, etc. It produces and exports material goods and, if it is a truly great city, exports ideas, innovations, inventions, arts, and the spirit of civilisation.

A city cannot exist without the countryside to support it. As was said half a century ago, city and country, urban and rural, are one intimately connected system of energy and material flows – not two separate entities. As a consequence, if the environment of a city declines almost certainly the environment of its surroundings will also decline and the city itself will be threatened.

Cities also export to the countryside waste products, including polluted water, air, and solids. If these are exported without care, they pollute the countryside, reducing its ability to provide necessary resources for the city. This makes the life in the surroundings less healthy and less pleasant.

With such dependencies and interactions between a city and its surroundings, it is no wonder that relationships between people in cities and in the countryside have often been strained. Why, country dwellers want to know, should they have to deal with the

wastes of those in the city? The answer is that many of our serious environmental problems occur at the interface between urban and rural areas.

So far, you have developed an understanding of the various dimensions of urban environment. You can now go into a more in-depth study of the environmental challenges of urban areas.

3.3 CHALLENGES IN URBAN ENVIRONMENT MANAGEMENT

Third world countries are paying the price of rapid, unplanned urbanisation that began decades earlier, when the popular view favoured growth at all costs. Growth had become a buzzword that influenced planning, as the countries embarked on a frenzy of economic activity. The dramatic transformation of cities from sleepy towns into thriving megalopolises was seen as an inevitable part of the growth process. Now, several decades down the road, economists, administrators, town planners, engineers, social scientists and others of their ilk, no longer share those sentiments.

The huge, unplanned cities that have acquired a psyche of their own are a nightmare for those who are required to manage the mess. The sprawling metropolises, apart from pulsating with the industry of people, are also wastelands of environmental decline, social decay, conflict, poverty and the ubiquitous problems of crime and drugs. Even the best of the world's cities are not without the miseries that result from their unmanageable size; the third world cities fare much worse. Their rapid expansion, lacking plan and vision, means ad hoc urban expansion and a culture of survival.

The government is blamed for the shambles the cities are in today. From the time the process of large-scale urbanisation started, an overall authority was exercised by an unresponsive administration, in spite of the fact that the governance of most cities had passed to municipal control. The failure of the government is seen not only in its indifference in the early years to ensure meaningful development of the cities, but also in the faulty planning at present which is creating more problems than it resolves.

The official approach to issues is rigid and influenced by procedures that are bureaucratic and divisive in nature rather than analytical and helpful. Experts already see the distinct fault lines that have emerged, which mark the boundaries between sectors organised, unorganised; formal, informal; affluent, poor.

The unplanned urbanisation that has taken place in developing countries has thrown up many serious challenges such as

- providing basic **environmental services**, e.g., reduced pollution, access to safe water supply, sanitation, drainage, solid waste collection, etc.;
- identifying and implementing **integrated approaches** to urban air quality and watershed management to prevent and abate the impacts of pollution and degradation, including ambient air pollution, water pollution, solid and hazardous waste disposal, land and ecosystem degradation;
- dealing with **environmental disasters** deriving from natural and man-made hazards;
- addressing **emerging global environmental challenges** such as climate change and so on.

Here we consider some of these.

Fig.3.3: Urban environmental challenges stem from the need to maintai n the quality of urban life and preventing damage to the environment at the same time

Pollution in the City

You have studied about environmental pollution in Block 4 of MED-001. City dwellers are exposed to more kinds of outdoor and indoor pollutants (e.g., toxic chemicals in high concentrations) and to more human-produced noise, heat, and particulates than are their rural neighbours. This environment makes life riskier. Health problems due to pollution are greater in metropolitan areas compared to small towns or villages. Air pollution is heaviest in the central parts of cities where motorised transport is heaviest and in areas, where industries tend to be concentrated. Deaths from cancer are 50% greater for people living in the areas of highest air pollution than for those living in the least polluted areas.

The more serious environmental problems at the household and community levels, such as inadequate water and sanitation facilities and indoor air pollution, are more prevalent in and acute for poor cities and poor neighbourhoods. In addition, inadequate diets exacerbate the environmental health risks of the poor by low ering their resistance to many diseases. The urban poor live in the constant presence of pathogenic micro-organisms and crowded, cramped housing conditions.

Slum dwellers both contribute to and are victims of urban pollution. High population densities and unregulated urban growth combined with a lack of environmental services, cause slum residents to further contribute to the poor environmental quality of informal settlements. The environmental risks of these settlements perpetuate the cycle of urban environmental degradation and contribute to greater economic and environmental vulnerability, both for low -income households and the urban area at large.

Thus, poverty constrains the poor to live in unsafe environments, whether it is inside home or outside it. In turn, the poor environmental conditions lead to poor environmental health, which aggravates poverty and leads to impacts such as loss of income owing to sickness and disease and inadequate medical treatment. Increased

spending on health care depletes household savings. Lowered incomes and aggravated poverty divest the poor of their capability either to live in safer environments or to improve the environment where they live in. Hence, it is essential to improve environmental conditions that surround the urban poor to enhance their capability to fight poverty.

The Urban Atmosphere and Climate

Cities affect the local climate. As the city changes so does its climate. Buildings and other structures obstruct the flow of air. City buildings also channelise air flow sometimes creating local wind tunnels with high wind speeds. The actual flow of wind around one building is influenced by nearby buildings. The total wind flow through a city is the result of the relationships among all the buildings and must be taken into account while planning a city. In some cases when this has not been done, dangerous winds around tall buildings have resulted in blown-out windows.

A city can receive less sunlight than the countryside because particulates in the atmosphere over cities are often 10 or more times greater than in surrounding areas. In spite of the reduced sunlight, cities are warmer than surrounding areas (a city is a heat island) because of increased number of buildings and residential activities and also because there is a decreased rate of heat loss, partly owing to the abundance of buildings and paving materials that act as solar collectors.

In past, it was common to make use of solar energy to heat city houses. Cities in ancient Greece, Rome, and China were designed so that houses and patios faced south and solar energy was accessible to each household. Our century is one major exception because cheap and easily accessible fossil fuels have led us to forget certain fundamental lessons about solar passive design. Today, we are beginning to appreciate the importance of solar energy once again; some cities have enacted solar energy ordinances that make it illegal to shade another property owner's building in such a way that it loses solar heating capability.

Water Flow in the Urban Environment

The construction of modern cities affects the water cycle greatly in turn affecting soils and, consequently, plants and animals in the city. Paved city streets and city buildings prevent water infiltration. Most rain water runs off and is channelled into storm sewer systems. Hard city surfaces prevent water in the soil from evaporating to the atmosphere. In nature, evaporation is an important way of cooling the land surfaces. The pavements in city increase the chances of local flooding within the city, and the increased runoff from the city to the countryside can increase the chances of flooding downstream. Cities can have higher local rainfall than their surroundings, because the dust above a city provides particles for condensation of raindrops.

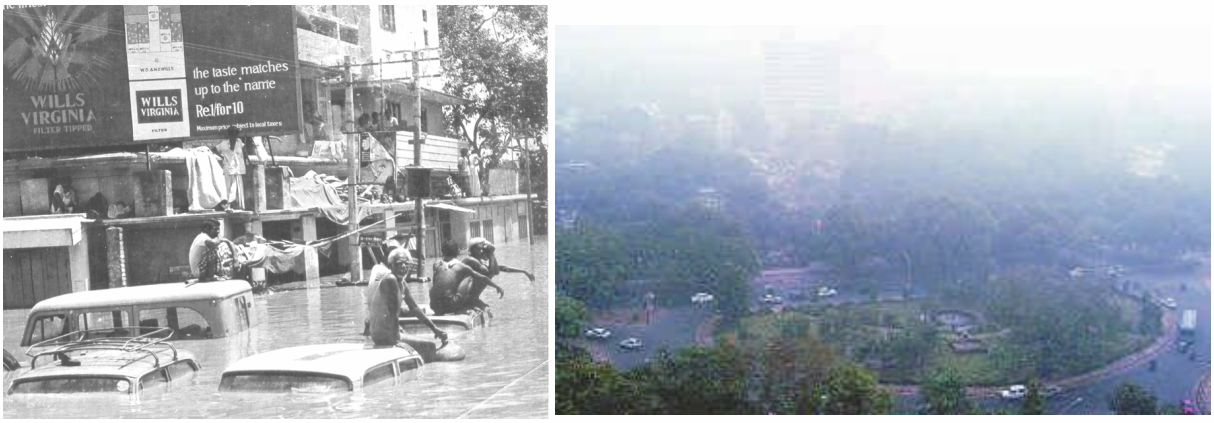


Fig.3.4: Floods in the city of Patna; winter fog in Delhi

Some urban areas have 5% to 10% more precipitation and considerably more cloud cover and fog than do surrounding areas. Fog is particularly troublesome in the winter and often impedes ground and air traffic.

Most cities have a single underground sewage system. During times of no rain or light rain, this system handles sewage alone. But during periods of heavy rain, the runoff is mixed with the sewage and can exceed the capacity of sewage alone. During heavy rains, sewage is emitted downstream without sufficient treatment. It is too expensive to build a completely new and separate runoff system in an existing city, so other solutions must be found.

The problem with flooding and overtaxing storm-sewage systems is made worse in many cities built on floodplains. Floodplains are often chosen as sites for cities because the land is flat and easy to build on and river transportation is available nearby. This practice leads to a conflict, because cities are typically built as if there will never be flooding. Floods damage buildings and other properties, cause loss of lives, and are considered a natural catastrophe.

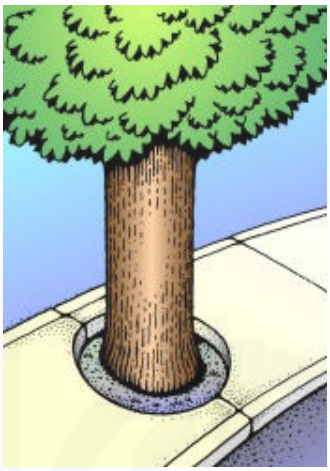


Fig.3.5: City soils are covered by roads and pavements made of cement, concrete or stone that prevents water infiltration into soils

More often than not the river is channelled at levees built along the shores. Long stretches of major rivers are channelised. It is a fact that channelisation too has negative effects. First, when the river is maintained in an artificial channel, its sediment load is not deposited on the land, and the land's fertility is not renewed. Second this sediment load passes down the river and is lost at the mouth. It causes siltation there and may fill in important harbours and damage cities at the ocean side.

Soils in the City

A modern city has a great impact on soils. Most soil is covered by cement, asphalts, or stone. It no longer has its natural cover of vegetation and the natural exchange of gases between the soil and air is greatly reduced. Such soils lose organic matter, because they are no longer replenished by vegetation growth. Soil organisms die from lack of food and oxygen. The process of construction and the weight of the buildings compact the soil, which restricts water flow, city soils are more likely to be compacted, waterlogged, impervious to water flow, and lacking in organic matter.

SAQ 3

Explain how the changes brought about due to urban development impact the climate.

A major challenge in managing urban environment is related to habitat development.

3.3.1 Shelter and Habitat Development

Links between villages and cities have become stronger through transport, exposure to the mass media and education, and flows of migration, trade and finance. As a result, urban concentrations have increased. Simultaneously, the crisis in agriculture coupled with the paucity of income generating avenues in villages has led to mass migration of people from villages to cities. There has been a visible decline in the capacity of the state to perform its functions. The most visible element in the decline of state institutions is at the municipal and local levels, as small and sleepy towns have been transformed into urban concentrations of millions of people.

Given the inability of governmental institutions to cope with the high pace of urbanisation, much of the urban expansion has taken place in the unorganised and unplanned sector, which has grown at twice the rate of urban growth. Since governmental resources were allocated mainly to formal sector settlements, informal areas, including the traditional sectors of old cities, were deprived of investments in housing, public infrastructure, water supply, sewerage treatment and disposal, transportation systems, cargo terminals, warehousing and storage facilities, wholesale markets, social service facilities, planned housing, and credit facilities. Some of these

services are provided through informal arrangements, but both their quality and coverage are quite inadequate.

The result of this dualistic development is environmental degradation, growing inequity and cultural dualism, breakdown of community, strangulation of inner cities, the proliferation of slums and the destruction of cultural and architectural heritage. All of this has produced direct economic and social costs. The breakdown of communities is associated with a sharp rise in crime and civic violence, especially against women.

Governmental Efforts for Housing

Shelter is recognised as a basic human right. The key evaluation criteria for housing developed in the First World are **persons per room**, **rooms per house**, and **area available per person**. Though these criteria have vastly differing cultural meanings, especially because of varying climatic conditions, you may like to find out the data for your locality.

States have tried to develop national settlement policies to enable their populations to live in safe, decent, and healthy settlements. They have formulated strategies for land resource management for human-settlement development, and to ensure public participation at all levels of development related to human settlements. Most government and public sector organisations provide housing or housing allowances to their employees for renting accommodation. In addition, many formal sector employees make use of their provident fund for buying land for housing or for construction purposes.

The goal of the governmental initiative in the housing sector was primarily to remove obstacles in low-income groups' access to land, infrastructure, and credit. The major problems in these efforts are: **low quality housing**, **lack of timely delivery**, **lack of transparency in allotment**, **price escalation** and **inadequate supply**. The governmental schemes for the urban poor are fast becoming unaffordable for low income communities as the procedures are long and cumbersome, and the time lag between application for allotment and actual possession may be as long as 10 years. The result is an increasing gap between demand and supply, and the need to turn to the informal sector for shelter needs. The houses built for low-income groups are invariably purchased by middle-income groups or by speculators as the costs are too high. In many cases, the overhead costs are covered by the sale of shops and/or other commercial units in the project. The purchasers pay in instalments during construction, thus financing the projects. In the majority of such projects, loans are arranged for the purchasers.

Housing development authorities in cities and housing departments have been created in states to oversee the habitat development programme in urban areas. The main problem with the schemes implemented by these agencies is the rising cost of land, and the failure to target low-income groups. State owned land is depleting rapidly in many urban areas. The government agencies do not posses the financial resources to purchase land on the open market. The government has involved the private sector in such programmes.

Until the early 1980s, the larger developers had access to public sector developed land at well below market prices, but they now have to purchase it on the open market. Developers acquire 50 per cent of the finances required for construction through sale of their units of the open market even before construction has commenced, and the balance well before the projects are complete. Thus, apart from the land cost and initial overheads, there is no investment from the developers. The more influential developers manage to get purchase units in their schemes.

Many city master plans have declared certain agricultural or desert areas around the city as urban. This has led to the sale of this land by the owners for development.

Many of the owners themselves have found a developer partner, and undertaken subdivision and sale of their land. On approval of the layout plan, the developer advertises the scheme and allots the plot to customers at 25 percent of its cost well before development begins, and recovers the investment at this stage. The balance payment is made in instalments while development is taking place. Profits in such schemes are over 200 percent of the initial investment.

There are a large number of co-operative housing societies in India. However, they have been misused by formal sector developers for promoting land speculation, not paying back their loans, and relaxing membership rules and operational procedures. Their large size makes them easy prey for powerful vested interests and the "land mafia".

Housing in the informal sector includes the establishment of slums through illegal occupation of state land, and the development of settlements through the sale of privately owned agricultural land or wastelands. The poor are constrained (by their poverty) to live in unsafe, marginal and environmentally sensitive sites such as steep hillsides and floodplains, or the most polluted land-sites near solid waste dumps, next to open drains and sewers, or adjacent to polluting industries.

Lessons learned from developing countries show that the informal settlements with the least land security also harbour the greatest in-migration and population density; face the greatest environmental risks; and have the least coverage of urban services. Without effective property rights and legal or de facto recognition of informal settlements, the urban poor have neither the incentives nor the proper legal channels to reinvest in improving their communities and to strengthen the social networks necessary for community environmental planning and upgrading.

Slums come up when state land, wherever it is available, is illegally occupied by middlemen, subdivided and sold to low-income groups at prices the poor people can afford. No services are provided to the settlement, but some form of water supply is initially arranged by the middlemen till the settlement is big enough to set up an organisation to manage such needs independently, or to attract the attention of municipal authorities.

Fig.3.6: The Dharavi slum in Mumbai

The residents, backed by the middlemen, lobby for services. Thus, with time (usually between 10 to 20 years), most settlements acquire electricity, water supply systems, transport and a road network. And then they are regularised for political reasons.

Sometimes they are also cleared; the residents are often evicted and relocated far away from their work places. Evictions are carried out as a result of government development programmes, or as a result of pressure from residents of high-income localities, who want to remove slums from their areas so as to upgrade them environmentally. Eviction of people from slums is also the result of the real estate lobby's activities, which are supported unofficially by civic agencies.

Unplanned residential areas also mushroom on agricultural land in and around cities, and large and intermediate towns. Increasingly, waste lands (such as quarries), or lands prone to flooding, are being subdivided and sold to low income groups. Low-income communities who have de facto tenure security invest large sums of money for the development of water and sewerage facilities in their neighbourhood. Most of this investment is substandard except where it is supported by technical advice from NGOs or professional groups.

Most of the older low-income settlements acquire education and health services from the informal sector as well. Entrepreneurs or community managed education societies as well set up primary and often secondary schools. These are affordable since the teachers are poorly paid educated women from the neighbourhood. Health services are also provided through private clinics, often run by paramedics or quacks. However, governments and most NGOs do not recognise the role of the informal sector in the development and provision of infrastructure and services. No attempt is made to integrate its functioning in larger city planning exercises, or to support and upgrade its activities. On the contrary, most of this activity is persecuted and unofficially taxed by corrupt government agencies.

From the discussion so far, it is clear that the urban development authorities and municipal governments have neither the capability nor the capacity to deal with the high rate of urban growth. Development takes place before planning, and is largely ad hoc and unguided. Government agencies are incapable of providing basic urban requirements, such as wholesale markets, warehousing and storage facilities, transport terminals, transportation, and housing. Most of these facilities also develop in an ad hoc fashion in the city centre. This process degrades the city both in social and environmental terms, and also destroys the urban, cultural, and historic heritage.

All major and most secondary cities have master plans. However, these master plans do not reflect the social, economic, and political reality of the cities. The informal sector in the city plays a very important role in employment generation, provision of land and housing, development of infrastructure, and transportation. In major cities, powerful mafias finance and control these activities with support from various political lobbies.

The real estate lobby in the private sector has acquired an increasingly important role in determining the directions and nature of urban growth. It seeks to acquire control of all private and public land in key locations and to use it for commercial and high-income residential use. This often brings it into conflict with the recommendations of city master plans and area development schemes. However, the lobby is powerful and it has been known to successfully subvert these recommendations and to prevent the implementation of a number of public use development projects.

It is quite clear that the state sector is incapable of handling the task of habitat development. Alternatives to the conventional approach to habitat development have been explored by the NGO sector. These innovative alternatives include support for the direct involvement of communities in urban and rural resource management. Such NGO programmes identify the direction of sustainable development and the potential

for cooperation between communities, NGOs and the state in planning, operation, and maintenance of civic facilities.

However, despite the visible success of such alternatives, their scope has been limited by larger socio-political factors. Government programmes have tended to be bogged down by bureaucratic tangles, inefficiency and corruption. NGO strategies, on the other hand, are constrained by the limited reach of their proponent organisations. They cannot increase their coverage unless they can be integrated into a national programme that includes the state's planning process.

In sum, the habitat issues need to be dealt within the broader, overall perspective of sustainable human development, which submits itself to the logic of nature and promotes and egalitarian world society. A perspective in which every human being women, child and man gets an opportunity for full self expression, in which every life form has the right to non-extinction, and in which all life support systems are nurtured and sustained.

So far, we have described the environmental problems faced by cities. You may like to list the problems faced by you in your own city before studying about how to improve city life.

SAQ 4

Enlist the major environmental problems of your city. Describe their causes.

How do we deal with the environmental challenges faced by cities and improve their environment? Many of these problems could be overcome by proper city planning as new cities come up. But in developing countries urban growth is rarely planned except for a few exceptions like Chandigarh in India. Mostly, it is a question of improving an already existing urban expanse. In this section, we first enunciate the general framework for urban environment management and then discuss the solution of some specific problems.

3.4 IMPROVING THE CITY ENVIRONMENT

An urban environmental management strategy and action plan is an integral and essential component of any city development strategy today. Addressing complex environmental issues is only possible if a strategic approach is taken to identifying environmental priorities and desired outcomes; engaging various sectors and players to work together toward common objectives; and ensuring the necessary means for achieving them. We first set out the general framework for managing urban environments.

3.4.1 General Framework for Managing Urban Environments

There is a tendency for city managers to resort to an ad-hoc, piece-meal, 'band-aid' approach to land-use and environmental management. Instead of putting out fires, cities in developing countries need to proactively plan for addressing their major environmental challenges described in the previous section. The very high cost of environmental clean-up and treatment and the irreversibility of vanished ecosystems should encourage cities to think creatively about urban environment management.

Managing the urban environment is intricately linked to questions of **urban governance** and **finance**. Priorities need to be analysed in terms of existing and potential financial resources. It is also linked with the capacity of cities to provide needed environmental infrastructure and services on an equitable and self-sustaining basis. While urban governance issues deal with political boundaries, environmental impacts respect only natural boundaries such as watersheds, underlying aquifers or

urban air sheds. Therefore solutions to environmental challenges often call for new approaches to planning and management, for example, by introducing water basins or air basins.

Cities can design and implement longer-term, environmentally sustainable, growth management goals by integrating the physical, social, political and economic aspects of the urban environment. These may be categorised into **hardware** and **software.**

- **Hardware** consists of the physical fabric of a city – infrastructure, buildings, railway, roads, ports, gardens, parks, etc.
- **Software** consists of the sets of rules and regulations, laws and legislation, ordinances, etc. governing the socio-economic and political aspects of city life. It also includes habits, ethics, and traditionally established codes of conduct.

In addition to these, the behaviour and conduct of urban inhabitants, which determines their needs and desires also influences their interaction with the surrounding environment.

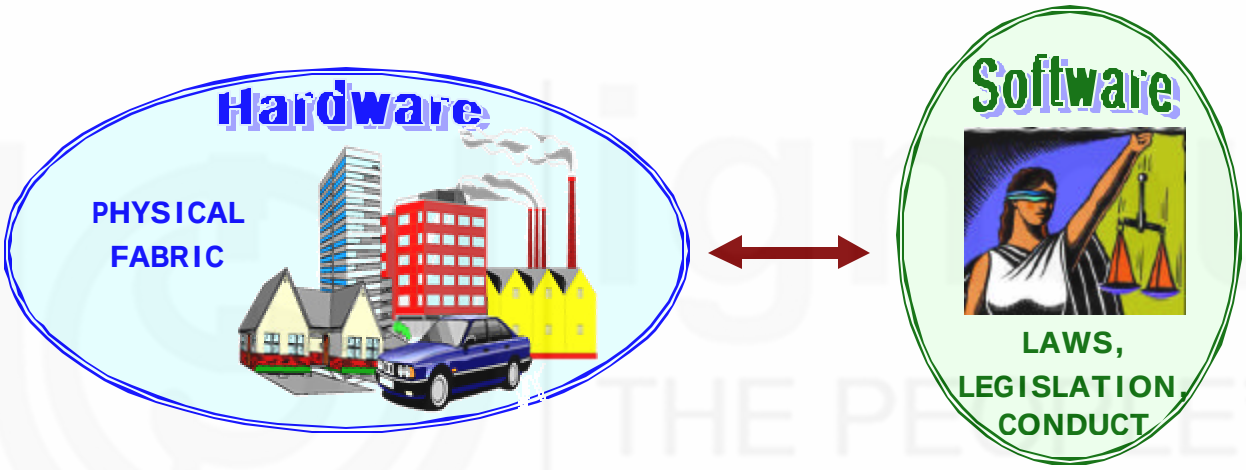


Fig.3.7: The hardware, software and heart-ware in urban environment management

An integrated approach to managing urban environments requires:

- A holistic understanding of a city's environmental quality and natural resource constraints.
- A means of mapping and prioritising key problems and designing specific interventions within an environmental action plan.
- A focus on environmentally sound economic development, balancing growth needs with the resiliency and carrying capacity of ecological systems.
- Recognition of the local impact of emerging global environmental issues like global climate change.
- Implementation of participatory community planning practices that include representatives from key stakeholder groups.
- Integration of market incentives and appropriate cost recovery mechanisms that ensure timely and cost-effective delivery of environmental services.

We describe below some tools that are useful for effective urban environment management.

Environmental Maps: Environmental maps convey information that can help policy-makers make important decisions about growth and development in their cities. These allow urban managers to view the environmental quality and services in their cities from a holistic perspective. Maps of the chosen city can be developed with satellite

imagery, aerial photographs, and data from soil, air and water samples that include the location and types of existing infrastructure and human settlements as well as its geographical features. Where data is available, layers can be added that will exhibit the current reach of water supply, sanitation, health, fire and other city services. This information is combined with demographic surveys and fed into a GIS mapping tool that serves as a one-stop shop.

Community Surveys : Properly conducted community surveys can elicit important information about land-use patterns and physical features that cannot be accessed in any other way. Surveys also need to account for land-use preferences. How would people prefer to use the natural resources around them? An understanding of people's preferences is an important step that will allow managers to involve the community in this process. Surveys can either be collected by household or through community meetings. Household surveys may elicit more detailed information from participants. However, they are quite costly. Discussions in group surveys may lead to revelations that would not have otherwise been made.

Environmental Risk and Land Use Impact Analyses: Once the physical features of a city have been mapped, the compatibility of existing and prospective land uses needs to be analysed. High density settlements, for example, are often highly vulnerable if located upon unstable land masses, steep slopes and wetland areas. It is important to collect specialists from a variety of fields. What is readily apparent to a health officer, may not be apparent to an environmental engineer. The inputs of community groups and NGOs are invaluable as they can analyse the impacts of land use from first hand experience. It is extremely important, at this point, to consider the data collected in community surveys regarding preferred and actual land use patterns.

The implementation of urban environment management plans can be facilitated by the following measures:

- **Regulatory frameworks** established at the national level that should recognise that environmental management will be largely implemented at the local level, and thus should grant some flexibility to local governments. For example, a city can enforce strict environmental standards in residential areas and simpler standards in zones where adverse impacts are not as great.

- **Capital improvement plans** (linked to the budget) must consider protecting ecosystems when planning for new roads and other infrastructure. The placement of infrastructure will largely determine where industries and residents locate. Many cities own surplus land that could be used more efficiently by the private sector, while slowing the encroachment of vulnerable ecosystems in outlying areas. In these land deals, the city should dictate that the buyer use the land in an environmentally sensitive manner.

- **Public/private partnerships** can be developed to establish and achieve mutually agreed upon benchmarks on pollution abatement. Pollution fines and incentive-based programmes can be designed to increase the accountability of polluters and increase efficiencies at the production sites. If the government does not have the capacity to enforce compliance or if polluters cannot be clearly identified, the inputs used in production can be taxed as an indirect way of making the polluter pay. Subsidies and capital grants can be distributed for pollution-control equipment.

- **Natural disaster and environmental hazard mitigation activities** can be implemented such as flood plain delineation, storm drainage systems, steep slope protections, and the development of building restrictions to govern ecologically sensitive areas.

Let us now discuss some specific practical solutions for improving the environment of the city.

3.4.2 Some Practical Steps

Improving the city environment involves several specialised professions, including **urban forestry**, **landscape architecture**, **waste management**, and **city engineering**. Most cities of the world employ professionals for designing buildings, landscapes, transportation corridors, etc. and to determine the best sites for planting trees and the best species of trees to suit the environment. These professionals take into account the climate, soils, and the general influences of the urban setting such as the shading imposed by tall buildings and the pollution from motor vehicles.

Planning with Nature: Landscape Architecture and Urban Forestry

The critical thrust in urban systems should be planning with nature. This includes:

- declaration of water courses and their embankments, flood zones, aquifer regeneration zone and other ecologically sensitive areas as recreation areas, protecting them from exploitation by the government and the rich and from encroachment by the poor;
- setting the limits of water availability according to the capacity of the local watershed, and not allowing land prices to rise to levels which distort the urban economy, raise the cost of infrastructure and thereby further marginalise the poor;
- development of green zones in and around the city.

Planting of trees, shrubs, and flowers in the city is an important aspect of landscaping as it improves the aesthetic look of a city. Plants provide for different needs in different locations. Development of protective green belts around cities acts as a check against urban sprawl which dislocates the ecology and leads to additional poverty. Trees provide shade that reduces the need for air-conditioning and make travels much more pleasant in hot weather. In parks, vegetation provides places for quiet contemplation, trees and shrubs can block some of the city sounds, and the complex shapes and structures create a sense of solitude. Plants also provide habitats for wildlife such as birds and squirrels, which many urban residents consider pleasant additions to a city.

Fig.3.8: Gardens, parks and forests make a city beautiful and help reduce pollution

Managing Pollution

Although it is impossible to eliminate exposure to pollutants in city, it is possible to reduce the exposure to them by careful design, planning, development and legislative

measures. For example, when lead was used in petrol, exposure to lead was greater near a road than away from it. Exposure to lead has now been reduced due to the use of unleaded petrol. It can also be reduced by placing houses and recreational areas away from main roads and by developing a buffer zone that makes use of trees resistant to pollutants. Trees absorb pollutants and slow the rate of spread. In addition, such tree buffer zones can reduce the amount of noise in residential areas of a city.

We have described several ways of combating urban pollution in MED-001 and other courses. Here we will not repeat them but give you an exercise to recall them.

SAQ 5

Suggest the measures that can be taken to combat the environmental problems you have described in SAQ 4.

Managing the municipal waste generated in a city is a burning problem today and merits some discussion.

Solid Waste Management

An effective municipal solid waste management is required in every city to keep the environment clean, hygienic and safe. For this, we need to support and modernise indigenous waste collection and recycling networks. We also need to enhance the awareness of citizens, especially women, train people in waste management, provide health education and build the capacity of relevant organisations. It is important to involve the urban communities in this exercise along with the civic agencies and officials. The objectives of such programmes have to be clearly enunciated. They could be any one or more of the following:

- To improve solid waste collection, management and recycling in the area.
- To create awareness regarding solid waste and its effects on environmental degradation among the people of the area.
- To contribute to the capacity building of relevant departments involved in solid waste management.
- To improve the work environment and build the capacity of professionals working in this area.

To achieve these objectives, an integrated approach needs to be adopted that includes community participation, improving the socio-economic and literacy level of the personnel involved, compost making and marketing, and capacity building of concerned departments. Many successful urban waste management programmes are being implemented with the support of the community and the civic agencies in India. As more and more people participate in such programmes, they become self-sustaining, income generating and increasingly effective. You have studied about waste management in Block 4 of MED-001. You will also learn about some such programmes in the next block.

Let us now summarise what you have studied in this unit.

3.5 SUMMARY

- The **urban environment** consists of **resources** like sunlight, land, water, minerals, electricity, fuels, human resources, finance, intermediary products, recyclable materials, etc., **processes** such as manufacturing, transportation, construction, migration, population growth, living, community services, (education, health, ...), civic services (sanitation, waste disposal, cleanliness,....)

that convert these resources into various other useable products and services; and **effects of these processes**.

- The resources, processes and their effects can be categorised into **natural environments**, **built environments**, and **socio-economic environments**. It is also important to understand the ***scale*** of urban environmental problems.

- The **city** may be analysed **as an ecosystem**: It must maintain a flow of energy, provide necessary material resources, and transportation and communication with outlying areas. It is not a self-contained ecosystem as it depends on other cities and rural areas. It takes in raw materials from the surrounding countryside and produces and exports material goods, ideas, innovations, inventions, arts, and the spirit of civilisation.

- The major **urban environmental challenges** involve
  - providing basic **environmental services**, e.g., proper shelter, reduced pollution, access to safe water supply, sanitation, drainage, solid waste collection, etc.;
  - implementing **integrated approaches** to urban air quality, land and watershed management;
  - dealing with **environmental disasters** deriving from natural and man-made hazards; and addressing **emerging global environmental challenges** such as climate change.
- The major problems in providing good quality habitat are: **low quality housing**, **lack of timely delivery**, **lack of transparency in allotment**, **price escalation** and **inadequate supply**.
- An **integrated approach to managing urban environments** requires a holistic understanding of a city's environmental quality and natural resource constraints, a means of mapping and prioritising key problems and devising an environmental action plan, a focus on environmentally sound economic development, recognition of the local impact of emerging global environmental issues like global climate change, participatory approach that includes representatives from key stakeholder groups, integration of market incentives and appropriate cost recovery mechanisms.
- Some other helpful measures are:
  - **Environmental maps** of cities developed with satellite imagery, aerial photographs, and data from soil, air and water samples,
  - **Community surveys** about land-use patterns, physical features and land-use preferences,
  - **Environmental risk and land use impact analyses** are some tools used for urban environment management
  - **Regulatory frameworks** established at the national level,
  - **Capital improvement plans** (linked to the budget),
  - **Public/private partnerships**, and
  - **Natural disaster** and **environmental hazard mitigation activities**.
- Practical measures such as **urban forestry**, **landscape architecture**, **waste management** improve the city environment and many people's initiatives have worked wonders in improving the neighbourhood environments.

3.6 TERMINAL QUESTIONS

1. Describe the environment of your city in terms of the concepts and categories you have studied in this unit.
2. Discuss the specific measures needed to address the environmental issues relevant in your context at the level of households, communities, city and region/nation. Explain which agencies or individuals are responsible for handling these issues. Analyse why these agencies/ individuals are not able to discharge their functions.
3. Compile instances of individual and community initiatives for improving urban environments. What initiatives can you take in your area?
4. Prepare an action plan for reducing resource use, eliminating pollution and carrying out solid waste management in your residential/office complex.

UNIT 4 ENVIRONMENTAL MANAGEMENT SYSTEM

Structure

4.1 INTRODUCTION

So far, you have studied about rural and urban environment management. In this unit, we focus on the integration of environmental considerations into business operations. Business and environmental integrity were considered two opposing forces in the past but now businesses have started involving environmental considerations in their operations as it results in economic advantage to business. This requires the building of institutional environmental management capabilities based on coherent and comprehensive **environmental management systems** (EMS). EMS includes organisation, structure, tasks, auditing and accreditation procedures and it is a part of the organisation's overall management system.

In this unit, we introduce the concept of **environmental management system**, its procedures, benefits, and approaches to EMS. We also talk about certain tools to implement EMS, such as the Initial Environmental Examination, Environmental Impact Assessment, ISO 14000 and National Environmental Quality Standards.

Objectives

After studying this unit, you should be able to:

- discuss how environmental considerations could be integrated into the management processes of an organisation;
- explain the concept of environmental management system; and
- describe the different tools of EMS such as IEE, EIA, NEQS, and ISO 14000.

4.2 ENVIRONMENTAL MANAGEMENT SYSTEMS: AN INTRODUCTION

Environmental disasters such as Bhopal Gas Tragedy and Chernobyl, and problems like global warming and ozone depletion that arise due to the industrial mode of development have opened our minds to the fact that there is something grossly wrong with it. These are major accidents or problems. There are several minor happenings

around us, which reveal the crying need for good environmental management. For instance, think about the distance you have to travel for reaching your work place. You may have suffered irritation from noise and health problems due to the exhaust of vehicles.

Thus, developments that signify economic and industrial progress also lead to environmental degradation. Does it then mean that the interests of business and the integrity of the natural environment are naturally opposing forces? In the past, it often seemed so. Exploitation of natural resources was directed more by financial balance sheets than by environmental concerns. More recently, however, industries have become more responsible for the environmental side effects of their operations. What has led to this change of heart? Let us find out.

4.2.1 Setting the Context

Let us ask: How can societies meet human needs and nurture economic growth while preserving natural resources and environmental integrity? Why is it important for businesses and industries to care for the environment?

You could list a number of reasons such as the following:

- National economies depend upon the wise use of natural resources. Agriculture and the industries of energy, forestry, pharmaceuticals, chemicals, fishing, real estate, recreation and tourism could all be jeopardised by poor management of the environment.
- The management of resources in developing countries has a direct impact on the economic well-being of developed countries. The failure of a country to observe the policy of sustainable development could lead to economic restrictions, social turmoil, and even political instability. Any of these factors could affect access to both materials and markets, and result in long term repercussions to the local and world economy.
- Global economic interdependence is affected by factors such as explosive population growth, which affects the consumption of natural resources.
- It is in the best interest of businesses and industries to resolve their environmental problems before the governments become involved and impose their restrictions on industry.

Do you agree with these reasons? Would you like to add some of your own, or change this list? You may try doing so.

SAQ 1

Why should environmental concerns figure in all measures taken for economic growth and progress? Explain.

Besides the reasons given so far, good environmental management can be of economic advantage to any organisation. The benefits of environmental management include both economic benefits and strategic benefits.

Let us enumerate them in a table.

Table 4.1: Benefits of good environment management for businesses

Economic benefits	Strategic benefits
A. Cost saving due to • reduced consumption of energy and other resources. • recycling, selling of by-products and wastes, resulting in decreased waste disposal costs. • Reduced environmental charges, pollution penalties, and compensation following legal damage suits. **B. Revenue increases due to** • Increased marginal contribution of "Green Products" which sell at higher prices. • Increased market share due to product innovation and decreased number of competitors. • Completely new products that open up new markets. • Increased demand for a traditional product, which contributes to pollution abatement.	• Improved public image. • Renovation of product portfolio. • Productivity improvement. • Higher staff commitment and better labour relations. • Creativity and openness to new challenges. • Better relations with public authorities, community and Green activist groups. • Assured access to foreign markets. • Easier compliance with environmental standards.

Perhaps, due to the reasons cited above, we have been witnessing important changes in the approaches to environmental management. These changes could be described briefly in terms of three generations of organisational environmental management (see Fig.4.1).

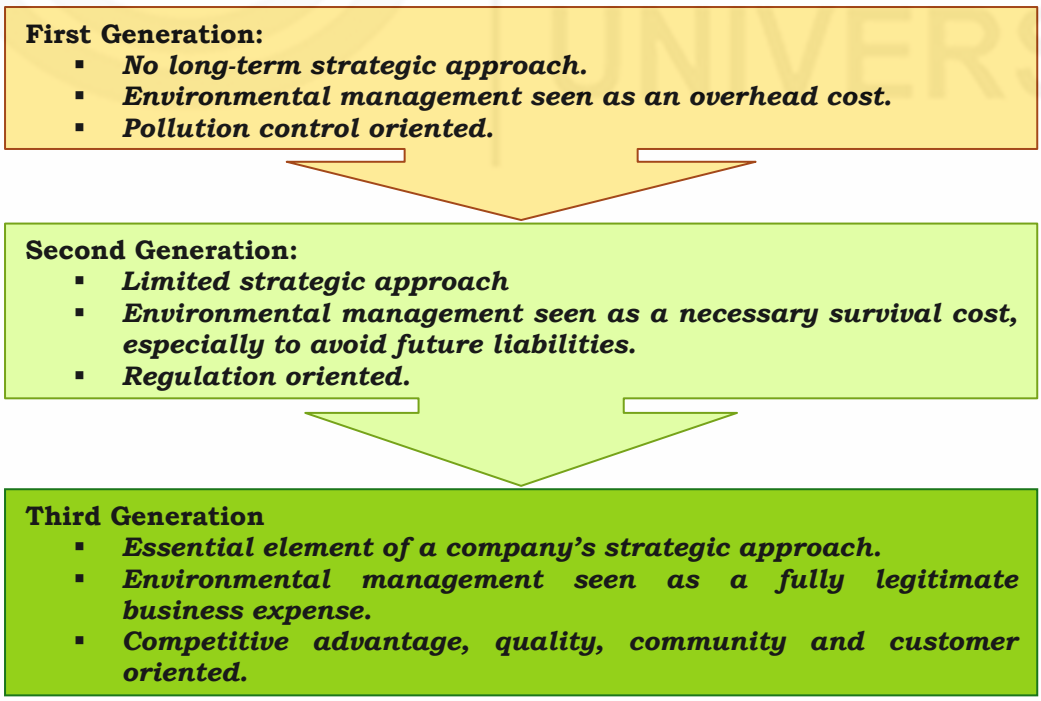


Fig.4.1: Evolving approach to organisational environment management

The third generation approach requires the building of institutional environmental management capabilities based on coherent and comprehensive environmental

management. This is where the concept of **environmental management system** becomes important.

4.2.2 What is an Environmental Management System?

The definition of environmental management system (EMS) as given in ISO 14001 is as follows:

> **An EMS is that part of the overall management system which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the *environmental policy*.**

It could also be defined as follows:

> **An EMS is that facet of an organisation's overall management structure that addresses the immediate and long term impacts of its products, services and processes on the environment.**

The EMS approach brings together three concepts:

- Everything we do in business has some impact on the environment.
- Management systems control everything we do in business.
- Standards can be set for the environmental management system.

An EMS makes the following possible:

- controlling environmental impacts,
- setting initiatives to improve environmental performance,
- achieving environmental objectives, and
- demonstrating that they have been achieved on an ongoing, continual basis.

An effective EMS makes good sense, whether the implementing organisation is in the public or the private sector. By helping to identify the causes of environmental problems and then eliminating them, an EMS can help save money and improve productivity in any organisation.

An EMS is characterised by the following elements:

- A **policy statement** that indicates the organisation's overall commitment to the improvement of environmental performance, including conservation and protection of natural resources, waste minimisation, pollution control and continual improvement.

- A set of **plans and programmes** to implement the policy throughout the organisation including the advancement of the programme through suppliers and customers.

- The **integration of the environmental plans into the day-to-day operation** of the organisation, developing innovative techniques and technologies to minimise the impact of the organisation on the environment.

- The **measurement of the environment management performance** of the organisation against the plans and programmes – auditing and reviewing progress towards achieving the policy.

- The **communication of information**, **education** and **training** to improve understanding of environmental issues and to publicise various aspects of the environmental performance of the organisation.

Conceptually, an Environmental Management System is no different from other management systems that have typical “Plan, Do, Check, Act” loop. This loop ensures that environmental matters are systematically **identified**, **controlled**, and **monitored**.

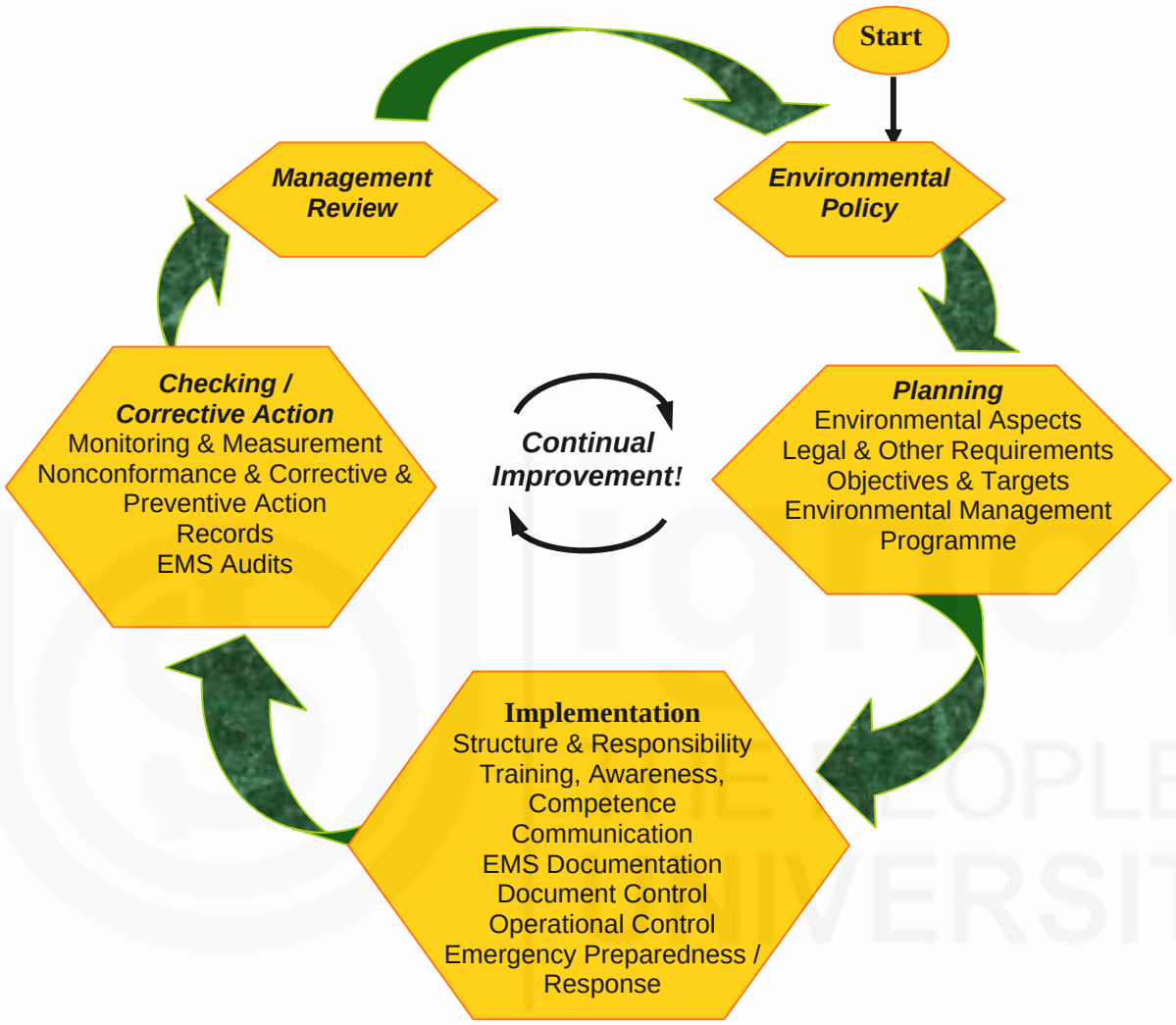


Fig.4.2: A model for the EMS

Management Tools for EMS

A number of management tools are needed to implement an EMS. These include

- An **initial environment examination** (IEE).
- An **environmental impact assessment** (EIA) before any new operation starts.
- An **environmental audit** (EA) by which the environmental performance of the organisation and its units can be assessed, weak points can be identified and subsequently the required mitigating measures may be determined.
- An appropriate **organisation of environmental functions** in the enterprise ensuring that initiatives are taken, expertise is available and responsibilities are clear.
- **Communication** and **participation inside and outside the enterprise**, which play a decisive role in the creation of a positive image of the organisation to avoid resistance and commit staff to contribute to a common cause.

- **Environment-related training**, which raises awareness, introduces behaviour changes and helps to acquire the necessary managerial and technical skills.

So far you have learnt about the need for an EMS, its benefits and characteristics and the management tools needed to implement it. In the next few sections, we describe these tools. But before learning about them, check whether you have understood these ideas about EMS.

SAQ 2

Explain the need for an EMS. Outline its features.

4.3 INITIAL ENVIRONMENTAL EXAMINATION

Initial environmental examination (IEE) is an important tool for incorporating environmental concerns at the project level. IEE should be carried out as early as the project planning stage as part of the feasibility study to ensure that the project will be environmentally feasible. The general objectives of any IEE study should be:

- To provide information about the general environmental settings of the project area as baseline data;
- To provide information on potential impacts of the project and the characteristics of the impacts, magnitude, distribution, the affected groups;
- To provide information on potential mitigation measures to minimise the impacts including mitigation costs;
- To assess the best alternative project at maximum benefits and least financial, social and environment costs. It is not always necessary to change the location of the project but the project design or project management can be changed; and
- To provide basic information on formulating the management and monitoring plan.

4.3.1 The Process of Preparing IEE

An early step in this process is to determine the **scope** of the IEE study. This activity is known as “scoping”. It is a procedure designed to establish the terms of reference for the IEE. The **scoping procedure** should at least produce the following outputs:

- Identify the likely environmental impacts or other environmental concerns and considerations that need to be further investigated in IEE study.
- Identify environmental components, which need detailed or further study.
- Determine a general approach and methodology required to carry out the IEE study.
- Identify in general all affected parties to be consulted in carrying out IEE study.
- Identify the need to fit the outputs of IEE into the project context especially on environmental management and monitoring plan.

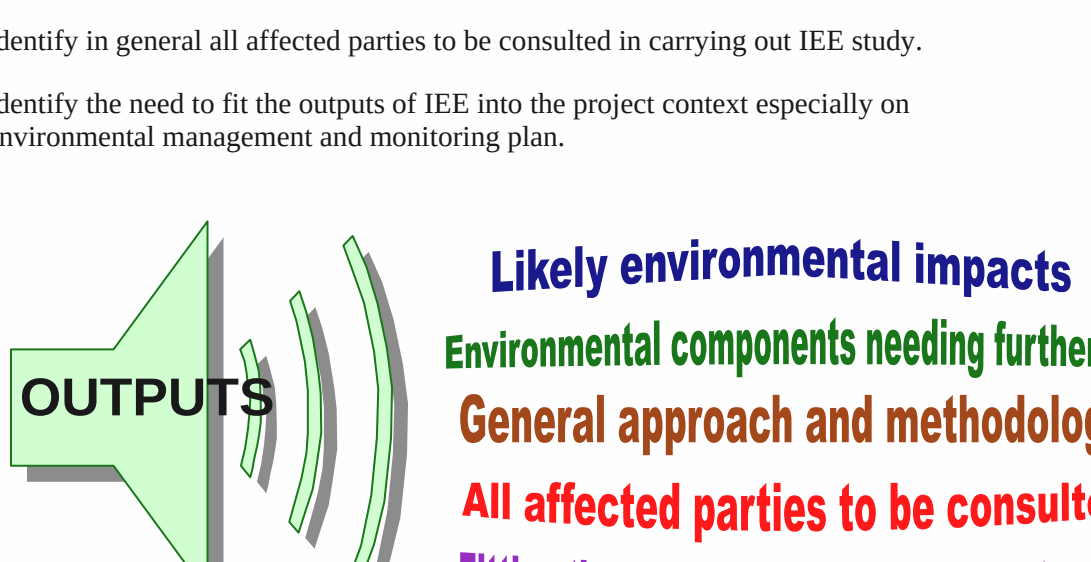


Fig.4.3: Outputs of the scoping study

The next step is undertaking the IEE study. The following are the key activities in the study:

- **Describing environmental conditions of the project area:** Collection of baseline information on biophysical, social and economic aspects of the project area is the most important reference for conducting IEE study. Normally information is obtained from secondary sources when there is a facility of maintaining database or other existing documentation, and through field sampling. Collection of baseline data should be designed to satisfy information requirements and should focus on relevant aspects that are likely to be affected by the proposed project. Therefore, the level of details in this description of study area should be sufficient to convey to its users, the condition and nature of environmental and social resources of the affected areas.

- **Assessing Potential Impact:** The "technical heart" of the environmental assessment process involves the prediction of changes over time in various environmental aspects as a result of a proposed project. The prediction of the nature, extent and magnitude of environmental changes likely to result from the proposed project is aided by various tools and techniques, the choice of which depends upon the impacts of concern, data availability or lack thereof, and the appropriate specificity of quantitative models.

- **Formulating Mitigation Measures:** Once the impacts have been analysed, their significance has to be determined, i.e., whether they are acceptable, require mitigation or are unacceptable. Subsequently, measures have to be devised to mitigate anticipated environmental changes and consequential impacts during project implementation and operation or to further reduce the residual environmental changes inherent in the selected project design. They normally include technical, social and institutional measures to be implemented as an integral element of the project.

- **Preparing the Institutional Requirements and Environmental Monitoring Plan:** Environmental management involves the implementation of environmental protection and mitigation measures and monitoring for significant environmental impacts. Environmental protection measures are taken to:

  - Mitigate environmental impacts;
  - Provide in kind compensation for lost environmental resources; and
  - Enhance environmental resources.

These measures are usually set out in a plan, which covers all phases of the project from pre-construction to decommissioning. It outlines mitigation and other measures that would be undertaken to ensure compliance with environmental regulations and reduce or eliminate adverse impacts.

Environmental monitoring involves:

- planning a survey and sampling collection of data/information relevant to environmental assessment and project environmental management;

- conduct of the survey and sampling programme;

- analysis of samples and data / information collected and its interpretation; and

– preparation of reports to support environmental management.

The IEE yields a lot of information and data which has to be documented properly in the form of a report.

4.3.2 Documenting IEE Studies

IEE reports and their summaries are presented in a specific format (see Fig.4.4), which is described below.

Outline of an IEE Report

- **Introduction:** This section includes the purpose of the report, brief description about the project and its importance, any other background information, scope of the study, magnitude of efforts, who is performing IEE and acknowledgement.
- **Description of the project:** This provides sufficient details to give a clear picture of the project.
- **Description of the environment:** This section furnishes sufficient information to give a brief but clear picture of the existing environmental resources including physical, ecological, economic, social and cultural resources in the area affected by the project.
- **Screening of potential environmental parameters for different sector projects:** The impacts that are not significant screened out and the parameters with potential significant adverse impact are retained. In this screening process each relevant parameter is reviewed according to the stages of operation. Mitigation measures, where appropriate, are also recommended.
- **Institutional requirements and environmental monitoring plan:** This section includes impacts that are to be mitigated and activities to implement the mitigation measures including, how, when and where they will be implemented.
- **Public consultation and information disclosure:** This section describes the process undertaken to involve the public in project design and recommended measures for continuing public participation; it summarises major comments received from beneficiaries, local officials, community leaders, NGOs, and others and describes how these comments were addressed.
- **Findings and recommendations:** This section includes an evaluation of the screening process and recommendations as to whether significant environmental impacts exist, needing further detailed study or EIA. If there is no need of further study, the IEE itself, becomes the complete environmental assessment for the project and no follow-up EIA is then needed. At times it may need to be supplemented by a special study in view of limited but significant impacts.
- **Conclusions:** This section discusses the result of the IEE and justification, if any, of the need for additional study or EIA.

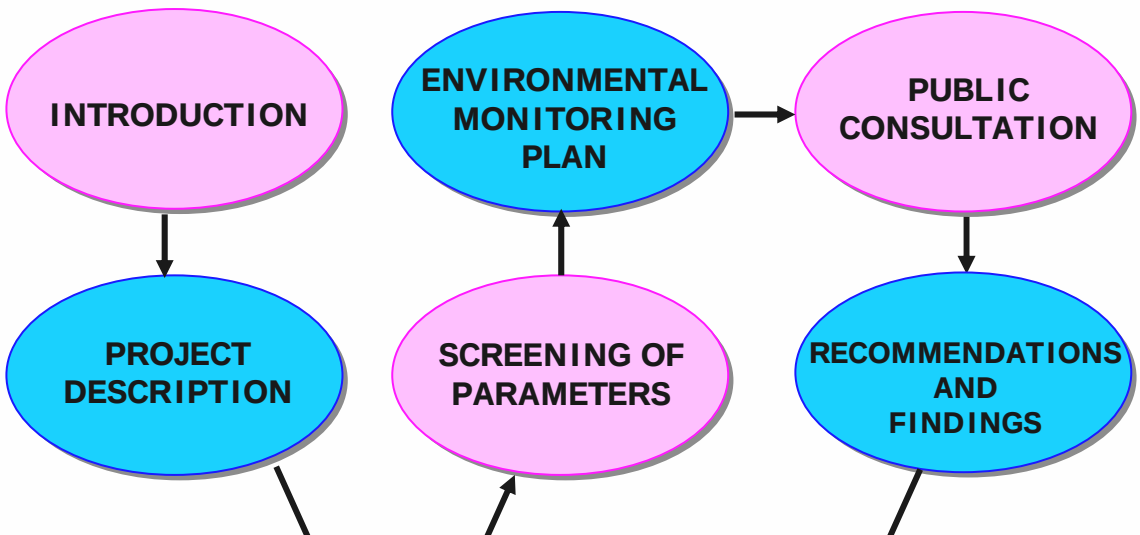


Fig.4.4: Structure of an IEE report

Summary Initial Environmental Examination Report

The summary IEE report is the executive summary of the IEE report. It describes the significant findings of the IEE report and recommendations to manage them. It is presented clearly and concisely as a stand-alone document for submission to the decision-making authorities in the organisation and disclosure to the public.

The possible outcomes of IEE are shown in Fig.4.5:

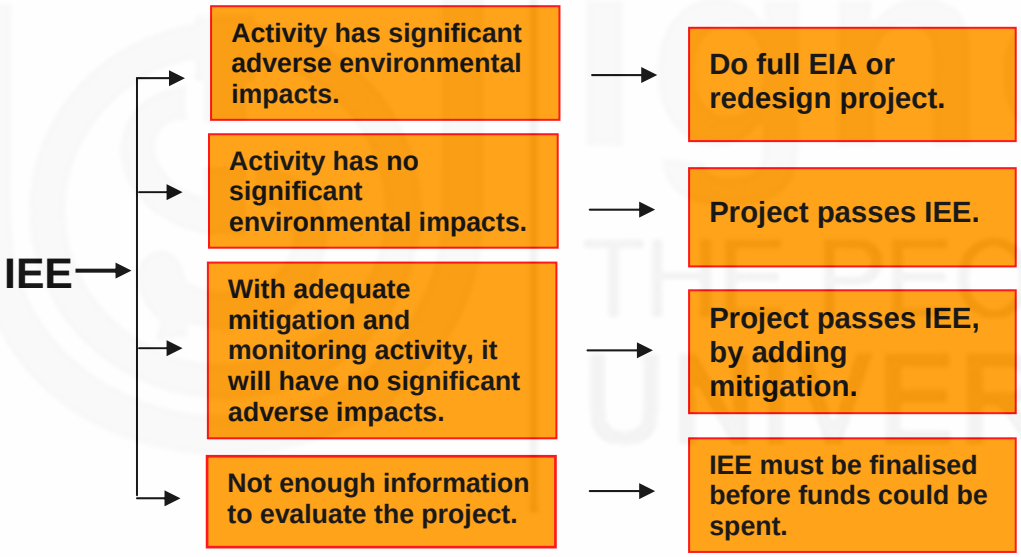


Fig.4.5: Possible outcomes of IEE (**Source:** www.encapafrica.org/MSE_CP_Course/mod%206/6Bhanout2.doc)

SAQ 3

What information does an IEE provide?

4.4 ENVIRONMENTAL IMPACT ASSESSMENT

Environmental impact assessment (EIA) procedures were developed in the 1970s in order to predict environmental impacts of any development activity and to provide an opportunity to mitigate negative impacts and enhance positive impacts.

An EIA may be defined as

> **A formal process to predict the environmental consequences of human development activities and to plan appropriate measures to eliminate or reduce adverse effects and augment positive effects.**

The EIA is a management tool to

- forecast the impact that a project will have on the environment, and
- find ways to reduce unacceptable impacts.

EIA should apply to all actions likely to have a significant environmental effect. So the potential scope of an EIA could include the appraisal of policies, plans, programmes and projects.

Why is EIA Needed?

There are a number of reasons to carry out Environmental Impact Assessment:

- Assurance of adequate procedures for managing environmental risks, and compliance with procedures.
- Improved statutory compliance.
- Identification of environmental risks and problem areas, early warning and prevention of potential adverse environmental effects (risk identification, assessment and management).
- Improved financial planning through the identification of future and potential capital, operation and maintenance costs associated with environmental activities.
- Improved preparation for emergency and crisis situation management.
- Improved corporate image and positive public relations.
- Enhancement of environmental awareness and responsibility throughout the corporate hierarchy.
- Improved relations with regulatory authorities.
- Facilitation of obtaining insurance coverage for environmental impairment liability.

4.4.1 Principles of EIA

An EIA is not a one time process ending with the preparation of a report. It provides an essential input to project management through a continuing evaluation and re-evaluation of the various environmental issues as project plans are developed and defined. This process should continue throughout the life of the development from conception to final abandonment or closure. It is important, therefore, that careful consideration be given to the scope, management and planning aspects of an EIA. In the management and planning of EIA there are a number of factors that require consideration. There are five basic principles of managing an EIA.

Principle 1: Focus on the main issues.

- It is important that an environmental impact assessment does not try to cover too many topics in too much detail.
- At an early stage, the scope of the EIA should be limited to only the most likely and most serious of the possible environmental impacts, which could be identified by screening or a preliminary assessment.
- Where mitigation measures are being suggested, it is again important to focus the study only on workable, acceptable solutions to the problems.

Principle 2: Involve the appropriate persons and groups.

The persons that need to be involved are

- Those appointed to manage and undertake the EIA process.
- Those who can contribute facts, ideas or concerns to the study, including scientists, economists, engineers, policy-makers and representatives of interested or affected groups.
- Those who have direct authority to permit, control or alter the project – that is, the decision makers including, for example, the developer, aid agency or investors, competent authorities, regulators and politicians.

Principle 3: Link information to decisions about the project.

An EIA should be organised so that it directly supports the many decisions that need to be taken about the proposed project. It should start early enough to provide information to improve basic designs, and should progress through the several stages of project planning and implementation.

Principle 4: Present clear options for the mitigation of impact and for sound environmental management.

- To help decision makers, the EIA must be designed so as to present clear choices on the planning and implementation of the project, and it should make clear the likely results of each option. For instance, to mitigate adverse impacts, the EIA could propose:
  - Pollution control technology or design features;
  - The reduction, treatment or disposal of wastes;
  - Compensations or concessions to affected groups.
- To enhance environmental compatibility, the EIA could suggest:
  - Several alternative sites;
  - Changes to the project's design and operation;
  - Limitations to its initial size or growth;
  - Separate programmes, which contribute in a positive way to local resources or to the quality of the environment.
- To ensure that the implementation of an approved project is environmentally sound, the EIA may prescribe:
  - Monitoring programmes or periodic impact reviews;
  - Contingency plans for regulatory action;
  - The involvement of the local community in later decisions.

Principle 5: Provide information in a form useful to the decision-makers.

The objective of an EIA is to ensure that environmental problems are foreseen and addressed by decision-makers. They must fully understand the EIA's conclusions, which should be presented in terms and formats immediately meaningful.

SAQ 4

Consider any development project in your area, e.g., setting up of a power plant or a factory, or building a dam. State the implications of the principles of EIA for this project.

4.4.2 The Process of EIA

The way in which an EIA is carried out is not rigid: it is a process comprising a series of steps. These steps are outlined below and the techniques more commonly used in EIA are described in some detail later on. The **main steps** in the EIA process are:

- Screening,

- Scoping,
- Prediction and mitigation,
- Management and monitoring, and
- Auditing.

Screening: This is the process of deciding on whether an EIA is required. This may be determined by size or it may be based on site-specific information. The output from the screening process is often a document called an Initial Environmental Examination or Evaluation (IEE) about which you have studied in the pervious section. The main conclusion of this step is a classification of the project according to its likely environmental sensitivity.

Scoping: It is used to identify the key issues of concern at an early stage in the planning process. It aids site selection and identifies any possible alternatives. The scoping process should involve all interested parties such as the proponent, planning or environmental agencies and members of the public. The results of scoping will determine the scope, depth and terms of reference to be addressed within the Environmental Statement.

Prediction and mitigation: Several major options are likely to have been proposed either at the scoping stage or before, and each option may require separate prediction studies. An important outcome of this stage is recommendations for mitigation measures. The aim is to introduce measures, which minimise any identified adverse impacts and enhance positive impacts.

Management and Monitoring: The part of the EIA covering monitoring and management is often referred to as the **Environmental Action Plan** or **Environmental Management Plan.** The purpose of monitoring is to compare predicted and actual impacts. The results of monitoring can be used to manage the environment, particularly to highlight problems early so that action can be taken.

The Environmental Management Plan needs to not only include clear recommendations for action and the procedures for their implementation but must also define a programme of action and costs. It must be quite clear exactly how management and mitigation methods are phased with project implementation and at what stage the various costs will be incurred.

Auditing: This is usually done by a separate team of specialists from the one working on the bulk of the EIA. The audit should include an analysis of the technical, procedural and decision-making aspects of the EIA. The audit will determine whether recommendations and requirements made by the earlier EIA steps were incorporated successfully into project implementation.

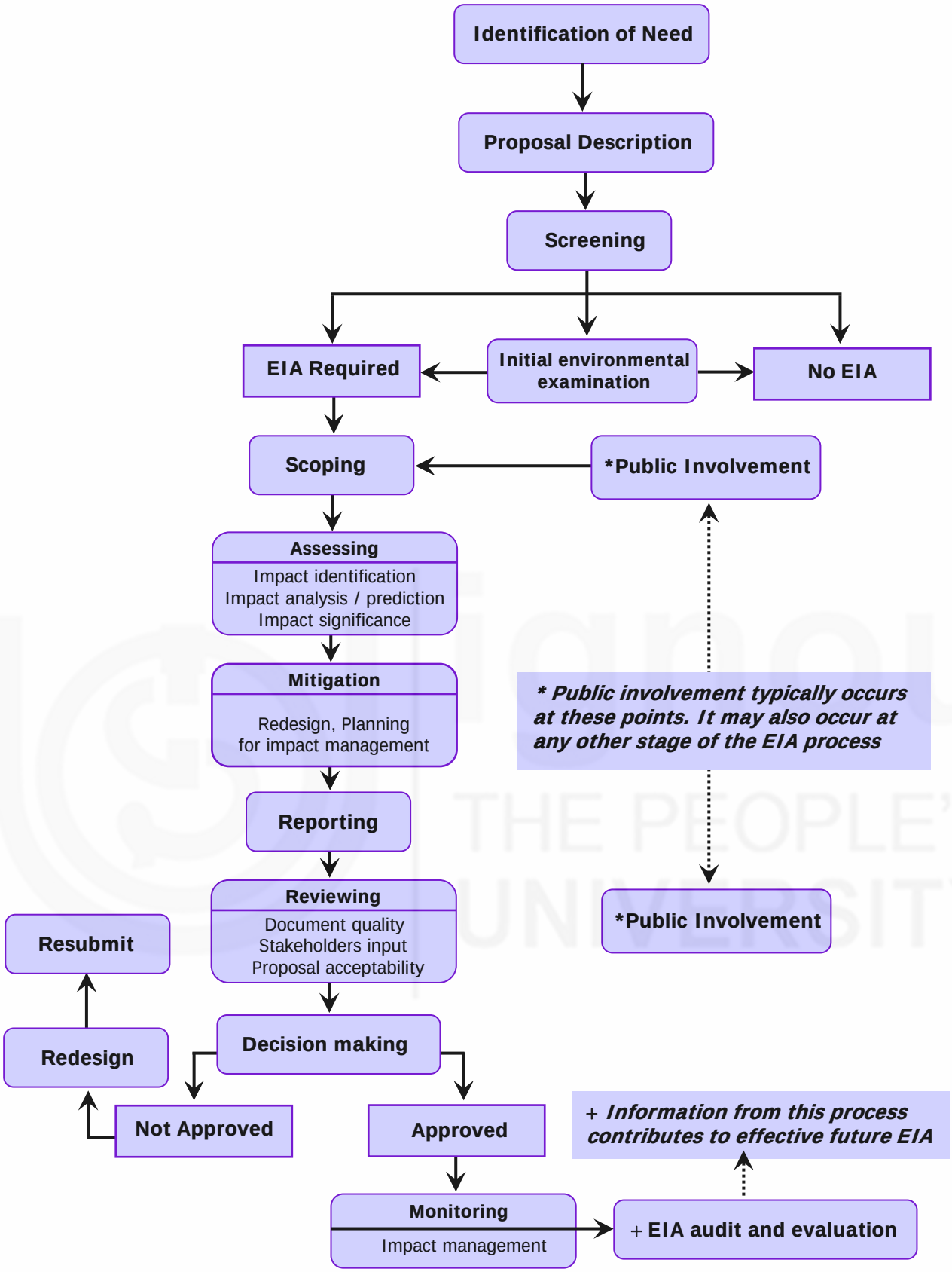


Fig.4.6: Flow chart of EIA process (**Source:** http://www.unep.ch/etu/publications/EIA man_2edition.htm)

4.4.3 EIA Tools and Techniques

We now describe certain tools and techniques used in EIA.

Baseline studies

Baseline studies using available data and local knowledge are required for scoping. Once key issues have been identified, the need for further in-depth studies can be clearly identified and any additional data collection initiated. Specialists, preferably

with local knowledge, will be needed in each key area identified. They will need to define further data collection, to ensure that it is efficient and targeted to answer specific questions, and to quantify impacts. A full year of baseline data is desirable to capture seasonal effects of many environmental phenomena.

Matrices

The major use of matrices is to indicate cause and effect by listing activities along the horizontal axis and environmental parameters along the vertical axis (see Table 4.2).

Table 4.2: Matrices as EIA tools: A simple example

Environ-mental Components	Project Activities								
	Building of Plant	Farming	Use of pesticide/ fertiliser	Transport of Raw Materials	Water Intake	Solid Waste	Effluent Discharge	Emissions	Employ-ment
Surface Water Quality			⊗			⊗	⊗		⊗
Surface Water Hydrology					⊗				
Air Quality				⊗				⊗	
Fisheries			⊗				⊗		
Terrestrial Wildlife Habitat	⊗								
Terrestrial Wildlife	⊗								
Land use Pattern		⊗							
Highways/ Railways				⊗					
Water supply			⊗				⊗		
Agriculture		⊗							
Housing									⊗
Health						⊗	⊗	⊗	
Socio-economic									⊗

In this way the impacts of both individual components of projects as well as major alternatives can be compared. Table 4.2 shows the environmental impact matrix for a pulp mill. It reveals, for example, that the use of fertilisers/ pesticides, solid waste, effluent discharge and employment impacts surface water quality in a pulp mill. The greatest drawback of matrices is that they can only effectively illustrate primary impacts.

Check-lists

Check-lists are prepared by experts for non-specialists and enable much time-consuming work to be carried out in advance of expert input. It includes extensive data collection sheets. The collected data can then be used to answer a series of questions to identify major impacts and to identify shortages of data. A matrix indicates which data are linked to which questions.

Network diagrams

A network diagram is a technique for illustrating how impacts are related and what the consequences of impacts are (see Fig.4.7).

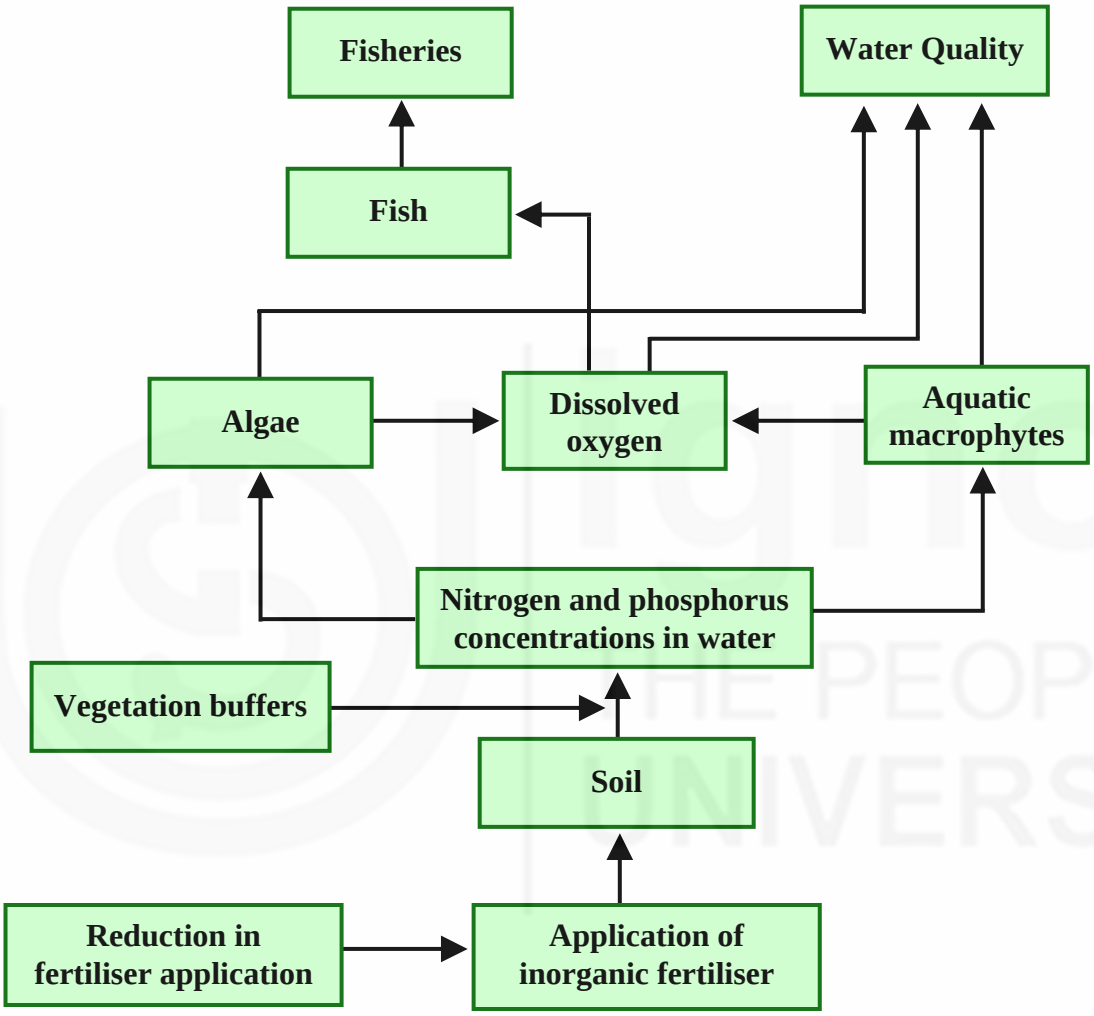


Fig.4.7: An example of the network diagram of the causal chain that begins with the application of inorganic fertilisers (**Source:** www.adb.org/Documents/ Books/Environment_Impact/chap3.pdf)

Overlay

Overlays provide a technique for illustrating the geographical extent of different environmental impacts. Each overlay is a map of a single impact. The original technique used transparencies, which is somewhat cumbersome. However, the development of Geographic Information Systems (GIS) has made this technique particularly suitable for comparing options, pinpointing sensitive zones and proposing different areas or methods of land management (see Fig.4.8).

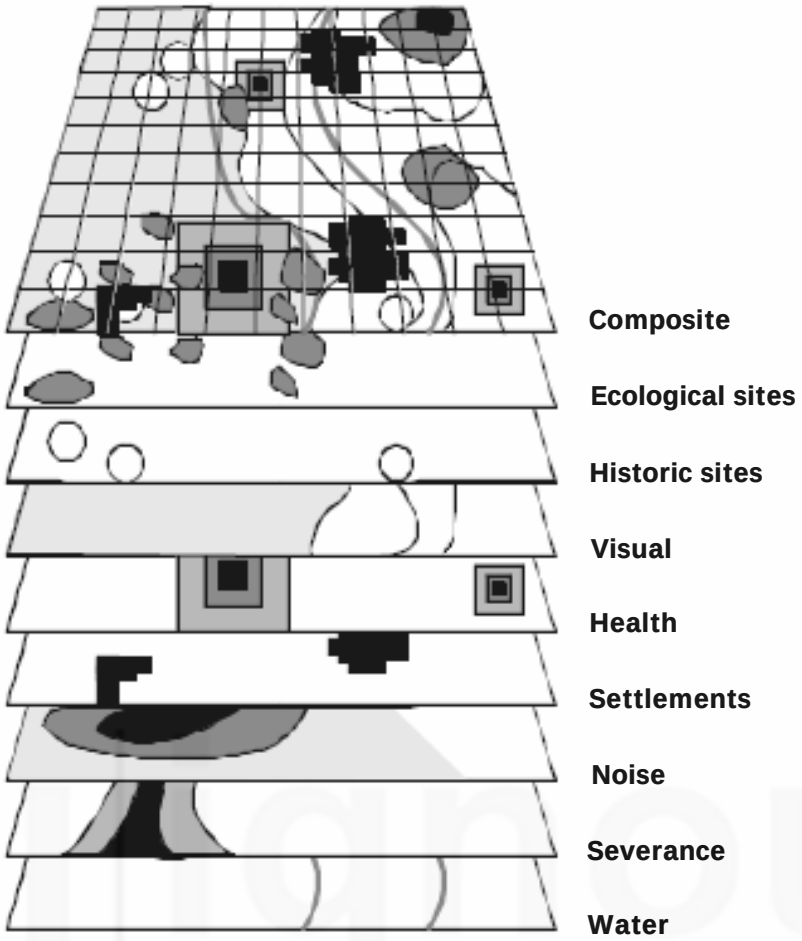


Fig.4.8: An example of an overlay
(**Source:** www.adb.org/Documents/ Books/Environment_Impact/chap3.pdf)

Mathematical modelling

Mathematical modelling is one of the most useful tools for prediction work. It is the natural tool to assess both flow quantities and qualities (e.g. salt/water balances, pollution transport, changing flood patterns). However, it is essential to use methods with an accuracy, which reflects the quality of the input data, which may be quite coarse.

Expert advice

Expert advice should be sought for predictions, which are inherently non-numeric and is particularly suitable for estimating social and cultural impacts. It should preferably take the form of a consensus of expert opinion. Local experience will provide invaluable insights. Expert opinions are also likely to be needed to assess the implications of any modelling predictions.

Economic techniques

Economic techniques have been developed to try to value the environment and research work is continuing in environmental economics. The most commonly used methods of project appraisal are cost-benefit and cost-effectiveness analysis. It has not been found easy to incorporate environmental impacts into traditional cost-benefit analysis, principally because of the difficulty in quantifying and valuing environmental effects.

Environmental health impact assessment

There are various stages in an Environmental Health Impact Assessment:

- Hazard Identification,
- Exposure Assessment,
- Exposure-Response relationship,
- Estimation of risks to health, and communication of these risks to all concerned,
- Determination of health costs (potential or actual),
- Option appraisal, and so on.

SAQ 5

Explain the purpose for which the following tools are used in EIA: Matrices, Mathematical modelling, Overlays, Baseline studies.

4.4.4 Environmental Impact Statement

The **Environmental Impact Statement is the final report of an EIA**. EIS is defined as a document prepared to describe the effects of the proposed activities on the environment. The report consists of a summary of the impact of alternatives and a section on follow up action required to enable implementation of proposals and to monitor long-term impacts. Recommendations are a crucial part of EIS. The format of the report should preferably follow a standard as recommended by the appropriate institution or required by legislations.

The main text should include:

- A description of the programme, plan or project,
- A summary of the EIA methodology,
- The policy, legal and administrative framework,
- A summary of the base line data,
- A description of the government and non-government participation,
- Environmental impacts,
- Environmental action plan,
- Recommendations and guidance to the decision maker, and
- A statement of provision for auditing, who should carry it out and when.

The appendixes should include:

- A glossary of technical terms used and the units,
- A list of the team who prepared the EIA,
- Records of public meeting and consultations,
- A catalogue of information, both data and written material and their sources, and
- Technical information too detailed for the main text.

4.5 ENVIRONMENTAL AUDITING

Environmental auditing (EA) is a management tool comprising a systematic, documented, periodic and objective evaluation of how well management and equipment are performing in environmental terms. Its aim is to help safeguard the environment by:

- Facilitating management control of environmental practices; and
- Assessing compliance with company policies, which would include meeting regulatory requirements.

Thus, **EA is a systematic, documented, periodic and objective review by a regulated entity of facility operation and practices related to meeting environmental requirements.**

You may like to know: **What is usually audited in an EA?** The answer is

- Policy, responsibilities and organisation;
- Planning, monitoring and reporting procedures;
- Management and staff awareness and training;
- External relations with regulatory authorities and the community;
- Compliance with regulations;
- Emergency planning and response;
- Pollution sources and minimisation, pollution treatment and discharge;
- Resource savings;
- Housekeeping; and
- Land management.

The benefits of EA are shown in Fig.4.9.

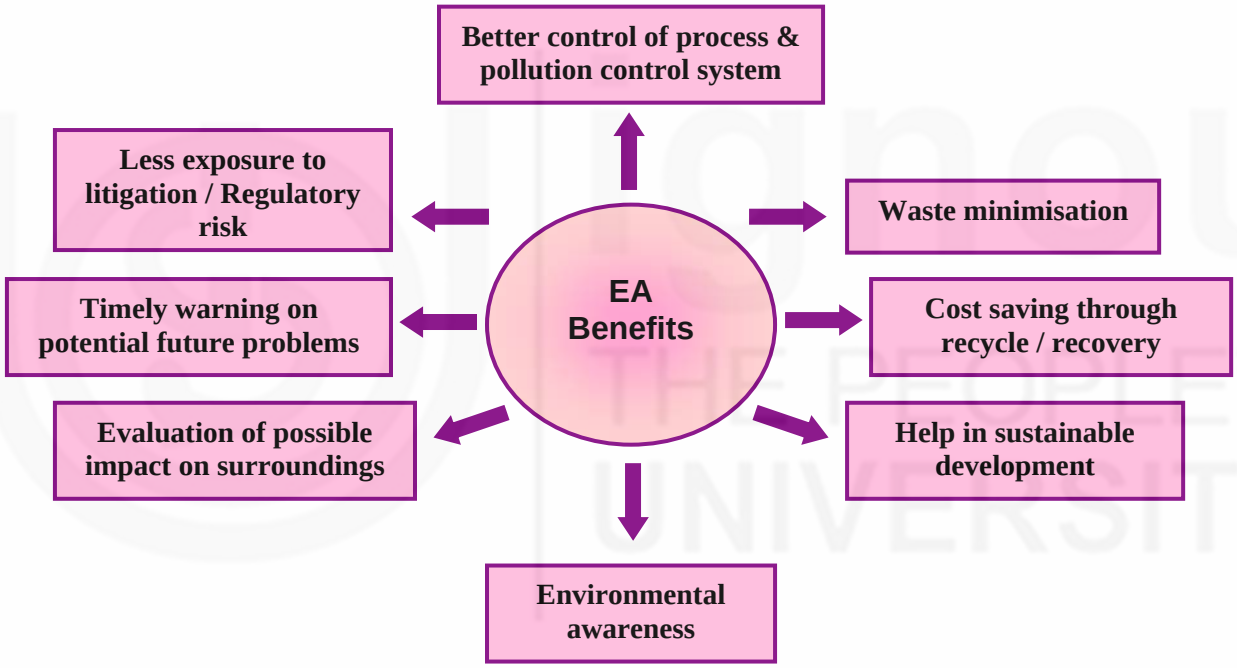


Fig.4.9: Benefits of EA

Principles of EA

EA should:

- Meet a clear purpose.
- Be objective, independent and proficient.
- Reflect professional care.
- Employ systematic methods.
- Ensure Quality Assurance.

How frequently do we need to carry out EA? This depends upon the nature of operations, the significant environmental aspects/impacts identified earlier, result of the monitoring programme and the result of previous audit.

Process of Auditing

Depending upon the needs, companies have developed their own auditing procedures, but the results of international working groups in this area suggest that there is a consensus on the main characteristics of the steps of environmental auditing (see Fig.4.10). The basic steps of an EA developed by the Canadian Naranda Corporation, have been adopted by the International Chamber of Commerce's (ICC) working party on environmental auditing. An audit is divided into three parts:

- Pre audit activities;
- Activities at the site; and
- Post audit activities.

- **Pre audit activities**

  This involves questions like: How to select facilities? Most companies who apply this tool audit all of their facilities regularly. One oil refining company, for example, audits each refinery every 18 months, medium-risk facilities every three years, and low-risk facilities every five to six years. In each category, facilities to be audited each year are generally selected randomly.

  Who should form the audit team? The audit team tends to comprise two to eight people. They may be full-time auditors, subject specialists, representatives from the business unit being audited, and representatives from other company plants or qualified external consultants. It is also advisable to include workers' representatives, who will require adequate training and information on the auditing process.

- **Activities at the site**

  Each company has developed its own methodology and set of procedures for conducting an audit. Site visits, questionnaires, interviews and review of documents are used. In general, the performance of units is audited according to:

  – Government requirements (national, state and local); and

  – Internal requirements (corporate, divisional and facility policies, procedures and standards).

  Once the audit has been performed at site, the so-called post-audit activities follow.

- **Post-audit activities**

  A draft report should be issued and discussed with management and workers' representatives of the audited unit. Some companies prefer the audit report to be only a statement of facts; others prefer to include proposals on how to improve things. Once a final report has been issued and adopted, an action plan based on the audit findings has to be prepared, usually by the audited unit assisted by the respective specialists. Proposals for improved environmental performance have to be implemented by the department in charge of the audit.

  To improve confidence, at both local authority and community levels, in a company's operations, information should be periodically supplied about audit results and measures taken to improve environmental performance.

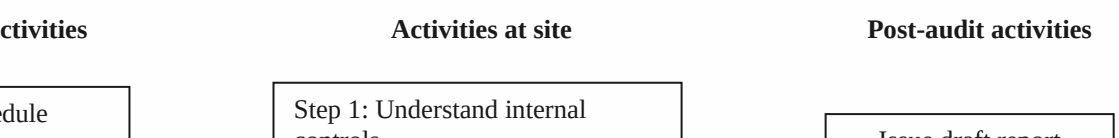


Fig.4.10: Basic steps of an environmental audit (**Source**: UNEP/IE, 1990)

4.6 ISO 14000

ISO is the International Organization for Standardization. It is a network of National Standard Institutes from 140 countries working in partnership with International Organisations, Government, Industry, Business and Consumer Representatives. ISO is a non-governmental organisation and its members are the Standards Institutes in their respective countries instead of their Governments. India is also Member of ISO and is represented by the **Bureau of Indian Standards**.

ISO provides business management with the structure for managing environmental impacts. ISO 14000 is a series of voluntary generic standards developed / being developed by ISO. The standards include a broad range of **environmental management disciplines**, including the **basic management system, auditing, performance evaluation, labelling** and **life cycle assessment**.

ISO 14001 refers to the first of the ISO 14000 series standards, which is the only standard available so far in this series against which an organisation can go for certification/registration.

The ISO 14000 family standards may be categorised into seven major groups as shown in Table 4.3.

Table 4.3: ISO 14000 family of standards

Group	Standards
Environmental Management Systems	ISO 14001 ISO 14004 ISO/TR 14061
Environmental Auditing	ISO 14010 ISO 14011 ISO 14012 ISO 14015 ISO 19011
Environmental labeling	ISO 14020 ISO 14021 ISO 14024 ISO/TR 14025
Environmental Performance Evaluation	ISO 14031 ISO/TR 14032
Life Cycle Assessment	ISO 14040 ISO 14041 ISO 14042 ISO 14043 ISO/TR 14047 ISO/TR 14048 ISO/TR 14049
Environmental Management Vocabulary	ISO 14050
Environmental Aspects in Product Standards	ISO 14062 ISO Guide 64

You may like to know: **Why should we have ISO 14000?**

World trade is playing an increasingly important role in the economic health of nations. It is dependent on various bilateral or multilateral agreements amongst industrial countries, most of which are under the umbrella of WTO. These trade agreements, however, require an underpinning by technical agreements, which provide for compatible standards of products of the trading partners. Trade between countries thus becomes easier and fairer by using standards which are widely acceptable. The ISO 14000 provides such internationally acceptable standards.

4.6.1 ISO 14000 Certification, Registration and Accreditation

In common usage and even in publications, the term certification and registration are used interchangeably. Scholars may make the distinction between “registering” a management system and “certifying” a product standard but this distinction is rarely noted in the world of ISO 14001.

Even the Standard speaks of certification/registration. Each country has its own accreditation body established either nationally or by their government. They are expected to perform the following accreditation services:

- Quality Management Systems,
- Product Conformity,

- Environmental Management Systems and/or EMAS,
- Certification of Personnel, and
- Information Security Management Systems.

Each accreditation organisation has developed their criteria for accreditation, ISO 14001 registration or Certification. Accreditation is not a legal requirement. However, accreditation provides organisations with the assurance that their registrar has met the accreditation requirements for things such as impartiality, confidentiality, a documented registration system, quality assurance, and policies to handle complaints and appeals.

A common myth about EMS and ISO 14001 certification is that the organisation will completely eliminate all sorts of pollution before deciding to get it certified for ISO 14001 standards. However, this is not entirely true. ISO 14000 is a management standard, and does not mandate any specific requirements for improved environmental performance.

Instead, the requirement is more obliquely stated, requiring an organisation to identify their environmental impacts; prioritise those impacts; set targets and objectives for reducing those impacts; select activities to achieve the identified targets and then to use a continuous improvement cycle to evaluate and re-approach the system. There is nothing in the standard that tells organisations what goals to set, which means that improved environmental performance is not guaranteed.

SAQ 6

How are environmental concerns incorporated in ISO 14000?

The central concept of ISO 14001 is **continual improvement**. During certification audits, what an auditor would like to see is the continual improvement or a "delta improvement" from time to time. There are many benefits of ISO 14001 and the most common ones are shown in Fig.4.11.

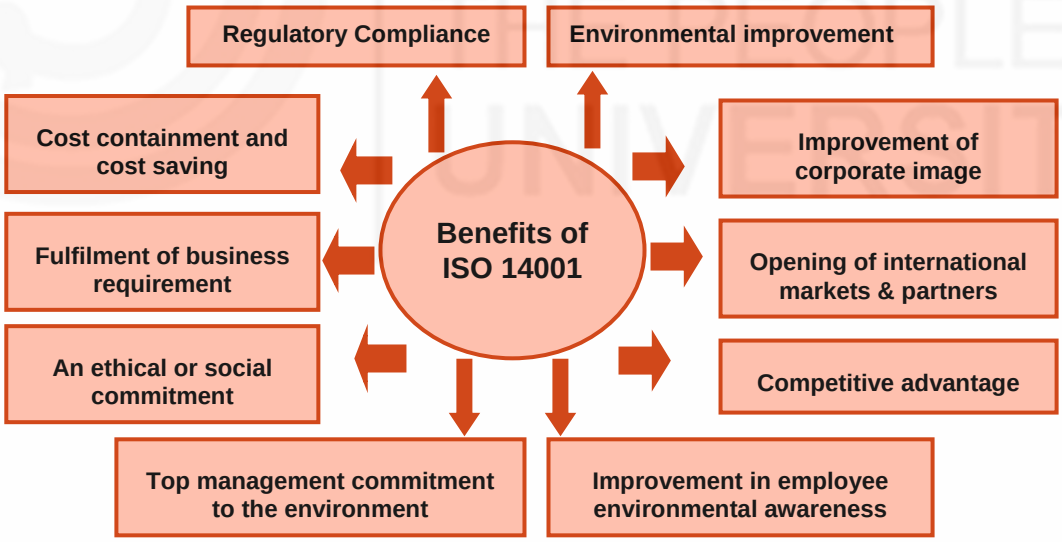


Fig.4.11: Benefits of ISO 14000 (**Source:** Nyati, http://www.cleantechinititative.com/cti/cpnyati.htm.)

4.6.2 The ISO 14001 Certification Process

The ISO 14001 Certification process is generally divided into the following four steps. However, there could be exceptions where some organisation may opt to skip or merge some of the steps. The four steps are:

1. Gap Analysis

All organisations would have some environmental practices and procedures in place. Therefore, it is a usual practice that organisations seeking ISO 14001

certification conduct a Gap Analysis exercise to see how the existing practices and procedures are complying with the Standard, and what more needs to be done.

2. Initial Planning

Implementation of an ISO 14001 EMS will require an organisation to:

a) Develop an implementation strategy (including selecting a certification agency);

b) Develop or redesign documentation (policies, programmes, procedures, forms).

3. Registration and Certification

The selected certification company usually performs three EMS audits to test for the conformance of the organisation's EMS to the requirements specified in ISO 14001. These audits are usually titled as:

- **Pre stage assessment:** Baseline conditions for EMS are developed.
- **First stage assessment:** First formal audit followed by a report of system non conformities is done.
- **Second stage assessment:** This is the assessment for certification. There are four possible scenarios as a result of this certification assessment:

  Scenario 1: recommendation for certification without any non-conformance.

  Scenario 2: recommendation for certification with some minor non-conformance.

  Scenario 3: not recommended for certification because of some major non-conformances.

  Scenario 4: not recommended for certification and the entire EMS or major part of it is declared in non-compliance with the standards.

4. Surveillance and Maintenance

Once certification is conferred upon the organisation, it undergoes a series of surveillance audits. The frequency of surveillance visits will be a function of the rate of change within the organisation and/or the scale of the environmental impacts.

4.7 NATIONAL ENVIRONMENTAL QUALITY STANDARDS

To approach the environmental pollution control, various countries of the world have adopted different approaches so as to suit their local and socio-economic conditions. Nevertheless all the approaches start from the desire to achieve and maintain an acceptable quality of the environment. In this respect, many countries have technically specified quality standards even though many difficulties are inherent in establishing such specifications. By general definition,

A standard is a document, established by consensus and approved by recognised body that provides, for the common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree or order in a given context.

Standards are varied in character, subject and medium. They cover several disciplines dealing with all technical, economic and social aspects of human activity. Standards are developed by technical committees, which are coordinated by a specialised body.

Environmental quality standards are the *measuring stick* for substances in soil, surface water and groundwater at sites. They tell us "*how* clean is clean". The environmental quality standards can be defined in terms of Primary, Secondary and Emission Standards.

- **Primary Environmental Quality Standards:** These are defined as those standards that establish the maximum and minimum concentration and period values for elements, compounds, substances, chemical or bio-chemical derivatives, energy, radiation, vibration, noise or a combination of them, whose presence or lack thereof in the environment can constitute a risk to life or the health of the population, defining the levels that give rise to emergency situations.

- **Secondary Environmental Standards:** These standards establish the maximum or minimum concentration and the period values for substances, elements, energy or a combination of them, whose presence or lack thereof in the environment can constitute a risk for the protection or conservation of the greater environment, or the preservation of nature.

- **Emission Standards:** These establish the maximum permissible quantity of a pollutant measured in the effluent of the emission source.

The benefits of environmental quality standards are shown in Fig.4.12.

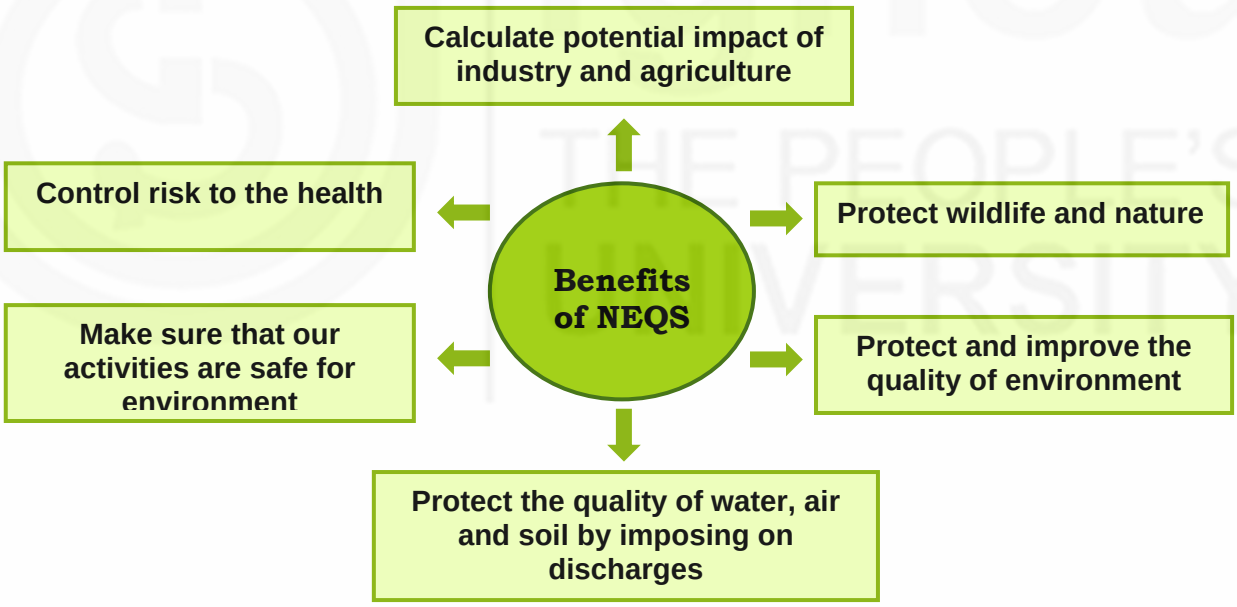


Fig.4.12: Benefits of Environmental Quality Standards

4.8 SUMMARY

- A holistic approach to environment should be incorporated into business operations. EMS is an approach that ensures operationalisation and self-regulation of company as compared to government imposed regulations.

  An EMS is that part of the overall management system which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

- The **tools** to implement an EMS include **IEE, EIA, EA, ISO 14000, NEQS**.
- **Initial Environmental Examination** (IEE) helps in deciding whether an EIA is required or not.
- **Environmental Impact Assessment** (EIA) describes details of impacts, its mitigation measures and monitoring.
- **Environmental Auditing** (EA) comprises a systematic, documented periodic and objective evaluation of how management and equipments are performing in environmental terms.
- **ISO 14000** provides guidelines for business management with the structure for managing environment.
- **National Environmental Quality Standards** (NEQS) are designed to control pollution and tell us how environment friendly the products and services are.

4.9 TERMINAL QUESTIONS

1. Explain how an Environment Management System can help an organisation integrate environmental concerns in its activities.
2. What are the benefits of EIA? Explain the EIA process.
3. What do you understand by ISO 14000 and NEQS? Discuss the advantages of these EMS tools.
4. Compile information from newspapers, magazines or the INTERNET about EMS in any business organisation.

UNIT 5 SUSTAINABLE AGRICULTURE

Structure

5.1 INTRODUCTION

Sustainable agriculture is an important component in the scheme of integrated management of environment in urban and rural areas. One may argue that most of the agricultural activities are confined to the rural areas, so how do the urban areas come in its purview. You have learnt about the reason in Unit 3: the urban and rural areas are inseparably linked by way of inflow of off-farm inputs (to the latter), and outflow of the agricultural produce (to the former). In addition, both the areas are subsumed in, and form a continuum in the natural environment. These aspects have to be kept in mind for devising strategies for effective management of environment.

This unit analyses the evolution of different models of agriculture, highlighting the fact that its sustainability hinges on the balance between socio-economic realities and a healthy environment. It looks at sustainable agriculture from socio-economic and cultural perspectives. Its conceptual basis and practical aspects have been presented in the Unit 5 entitled, **Sustainability – the New Paradigm** in the elective course on **Agricultural and Environment**, (MED-007), of this programme. We suggest you look at this reference along with the study this unit, to form a broader picture about this topic. In case you have not opted for the MED-007 course, you can get the above reference in your study centre library.

Objectives

After studying this unit, you should be able to:

- compare traditional farming and modern farming;
- discuss the concept, goals, elements, practices and different perspectives of sustainable agriculture;
- analyse why the resources like water, energy, air, soil and agrochemicals need to be used judiciously for promotion of sustainable agriculture;
- highlight the importance of integrating good plant production practices with livestock keeping practices to promote the sustainability of the farming system; and
- sensitize the farming/non-farming communities including the stakeholders about the socio-economic, political and environmental realities that need to be considered for the promotion of sustainable agriculture.

5.2 AGRICULTURE: TRADITIONAL TO MODERN FARMING SYSTEMS

In this section, we present a brief overview of the evolution of traditional to modern farming systems beginning with the post World War II period.

Agriculture after World War II

Since the end of World War II, agriculture has undergone dramatic changes. Food and fibre productivity soared due to the use of new technologies, mechanization, introduction of new and better seeds/varieties, increased use of chemical fertilizers and pesticides, availability of specialists' advice and supportive government policies that favoured maximizing production. These changes allowed fewer farmers with reduced labour demands to produce the majority of the food and fibre in the developed countries of North America like the United States, in some of the European states and to some extent in some parts of the Third World.

Although these changes have had many positive effects and reduced many risks in farming, the costs have also been significantly high. Prominent among these are depletion of topsoil, contamination of groundwater, decline in the size of family farms, neglect of the living and working conditions for farm labourers, high costs of production, and the disintegration of economic and social fabric of the rural communities.

The changing agricultural approach that appeared to hold the promise of fulfilling the increasing needs of the society took the form of the familiar Green Revolution. We now describe it briefly.

Green Revolution Agriculture

The Green Revolution in agriculture was an attempt to solve world hunger problems by boosting food production through an increase in the yield of grain crops. In the 1960s and 1970s, scientists working in agricultural research institutes, mostly funded by public money, began to carry out research into ways in which the yield of the grain crops, in particular, wheat, maize and rice could be improved. The new crops, known as **hybrids**, were developed by selectively crossbreeding different plant varieties.

There were two distinctive categories of these new crops:

- **Maize hybrids**, developed from varieties grown in the USA and Zimbabwe, spread across large parts of Central America and to a lesser extent East Africa.
- Fertilizer-responsive varieties of crops were introduced in East Asia (rice); and in North Mexico, India and Pakistan (wheat).

However, these hybrid crops necessitated extensive chemical inputs like artificial fertilizers, pesticides and herbicides and the use of machines such as tractors, combine harvesters, pumps for irrigation and food processing technologies.

The Effects of the Green Revolution

In many areas the Green Revolution resulted in two-or-three-fold increase in food production. In some areas, it enabled farmers to plant two or even three crops a year. In some countries national food production increased remarkably as a result of Green Revolution. For example, India, once a net importer of wheat, is now a major exporter. In other countries, the Green Revolution has not resulted in such an unprecedented increase in agricultural production. For example, it is generally accepted that most African countries benefitted little from the Green Revolution.

Besides this, a variety of new issues have opened up with the onset of Green Revolution. On the one hand, promoters of Green Revolution point to the fact that in

the most benefitted areas such as the South and the South East Asia, the proportion of the population that is undernourished declined rapidly between 1970 and 1990, while in regions like Sub-Saharan Africa it has risen. On the other hand, many critics argue that the agri-practices of Green Revolution have had serious consequences for the poor. According to them:

- Green Revolution crops lend themselves to mechanised farming which is the most efficient on large farms. This has led to many small farms and holdings being subsumed into larger farms, displacing tenant farmers and sharecroppers and resulting in increased landlessness.
- The increased production of new crops has sometimes taken place at the expense of crops traditionally grown and consumed by the poor. For example, traditionally, pulses have been a source of protein for poor people in India and Pakistan, yet in areas covered under Green Revolution, pulses have been replaced by wheat, which is more expensive to be as much nutritious.
- Many farmers have become dependent on the chemical industries that supply the agro-inputs such as fertilizers, pesticides, and herbicides for growing the Green Revolution crops. In India alone, during the mid-1990s, fertilizer consumption was 200 times higher than it was at the beginning of the 1960s.
- Traditionally, farmers have taken care not to over-utilize their resources such as land, soil and water. However, the excessive use of artificial fertilizers and pesticides has harmed the water quality in many areas, and has contributed to land degradation.
- The heavy use of fertilizers and pesticides has had adverse effects on the health of the farmers as well as the consumers.

The debates about the benefits of the Green Revolution still continue. The increase in pests and diseases, coupled with declining soil and water quality, cast serious doubts on whether the high crop yields can be sustained in the times to come!

Problems related to the Green Revolution

The following problems related to the Green Revolution vis-à-vis the conventional agriculture practices, have also been observed.

- The various regions of the world under the Green Revolution have not exhibited uniform and increased crop production trends. In some there has been unprecedented increase whereas in others famine-like conditions prevailed.
- The new more productive methods have been found to have detrimental effects on the environment, for example:
  - **Soil erosion** (Fig. 5.1) for every ton of grain produced, approximately 20 tons of top soil is utilized;
  - **The lowering of the water table**, as more crops are planted than the land can sustain and new seed varieties often need large amounts of water;
  - **The salinisation and alkalization of soils** through excessive irrigation and removal of trees;
  - **Residues of pesticides and herbicides** are found in other living beings, in water supplies and various food items.
- Farm subsidies in industrialized nations affect the terms of trade in the Third World countries.
- Third World debt leads to the use of land for large scale cash crop production, pushing subsistence farmers onto marginal lands, thus contributing to further degradation of soil.

- Deforestation and the advance of desert areas through harmful farming methods.

Fig.5.1: Different forms of soil erosion
(Source: http://eusoils.jrc.it/ESDB_Archive/pesera/pesera_cd/images/img_h2.gif**)**

So far, we have familiarised you with some aspects of modern agriculture and the Green Revolution. You may like to revise them before studying about sustainable agriculture in the next section.

SAQ 1

a) Discuss the status of the agriculture since World War II focussing on the transition from traditional to modern farming systems.

b) Discuss the features, development and effects of the Green Revolution on our agriculture.

5.3 SUSTAINABLE AGRICULTURE

A growing movement has emerged during the past two decades (1980s and 1990s) to question the role of the agricultural establishment, especially with reference to Green Revolution in promoting practices that contribute to a variety of socio-economic and other problems. This movement for sustainable agriculture is gradually garnering increasing support and acceptance within mainstream agriculture throughout the world. Not only does sustainable agriculture seen to address many environmental and social concerns, but it offers innovative and economically viable opportunities for growers, labourers, consumers, policy makers and many others in the entire food production system.

5.3.1 Concept of Sustainable Agriculture

The concept of sustainable agriculture is still evolving. However, it is important to identify the basic ideas, practices and policies that constitute our concept of sustainable agriculture. This will help in clarifying the research agenda and priorities and suggesting practical steps that may be appropriate for moving towards sustainable agriculture.

FAO – An agency of United Nations, its full form is Food and Agriculture Organisation.

According to the FAO sources,

Agriculture is sustainable when it is ecologically sound, economically viable, socially just, culturally appropriate and is based on a holistic scientific approach.

Reijntjes, Haverkort and Water-Bayers, in *Farming for the Future* (1992), define

Low External Inputs and Sustainable Agriculture (LEISA) as the agriculture which makes optimal use of locally available natural and human resources such as soil, water, vegetation, local plants and animals, human labour, knowledge and skills and which is economically feasible, ecologically sound, culturally adapted and socially just.

Main Elements

The main elements of sustainable agriculture are as follows (also see Fig. 5.2):

- Appropriate land use for crop production as against monoculture,
- Working in harmony with natural systems,
- Harnessing the powers of nature for example, in pest control,
- Soil protection using mulch and minimal tillage methods,
- Organic matter build up through the use of manure and compost,
- Animals are important for making manure and, therefore, for maintaining soil fertility,
- Plant nutrient maintenance through crop rotation,
- Judicious use of artificial fertilizers or chemical pesticides,
- Local markets and decentralized systems of distribution, and
- Biological diversity maintenance and conservation.

Monoculture – repeated production of one crop on the same piece of land over a period of time.

Mulch – a material applied to the soil surface.

Manure – organic materials like animal dung mixed with soil to make it fertile.

Compost – organic materials after decomposition, used for maintaining fertility of soil.

Fig.5.2: Some elements of sustainable agriculture. a) Mulching with crop residues is highly effective ; b) Natural pest control is very promising; and c) Manure is a valuable resource for sustainable agriculture
[Sources: a) http://www.ipmthailand.org/images/Components/Organic_farm_egg_plant_mulching_3.JPG. b) http://pested.unl.edu/pic18.gif. c) http://www.ipmthailand.org/images/Components/Organic_farm_straw_manure_rice_husk_ash_1.JPG]

5.3.2 Goals

Sustainable agriculture integrates three main goals:

a) Environmental health,

b) Economic profitability, and

c) Social and economic equity.

A variety of philosophies, policies and practices have contributed to these goals. People in many different capacities from farmers to consumers have shared this vision and contributed to it. Despite the diversity of people and their perspectives, the following themes commonly weave through the basic concepts and definitions of sustainable agriculture.

Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, ***stewardship of both natural and human resources*** is of prime importance. Stewardship of human resources includes consideration of social responsibilities such as working and living conditions of labourers, the needs of rural communities, and consumer health and safety both in the present and in the future. Stewardship of land and natural resources involves maintaining or enhancing this vital resource base for the long term usage.

A ***systems perspective*** is essential to achieve sustainability. The system is envisioned in its broadest sense, from the individual farm to the local ecosystem, and to communities affected by this farming system both locally and globally. An emphasis on the system allows a larger and more thorough view of the consequences of farming practices on both human communities and the environment. A systems approach helps us to explore the interconnections between farming and other aspects of our environment.

A systems approach also implies ***interdisciplinary efforts in research and education***. This requires not only the input of researchers from various disciplines but also farmers, farm workers, consumers, policy makers and all the stakeholders.

Remember: *Making the transition to sustainable agriculture is a process*. For farmers, the transition to sustainable agriculture normally requires **a series of small**, **realistic steps**. Family economics and personal goals influence how fast or how far participants can go in the transition. It is important to realize that each small decision can make a difference and contribute to advancing the entire system further on the "sustainable agriculture continuum". The key to moving forward is the will to take the next step.

Finally, it is important to point out that *reaching towards the goal of sustainable agriculture is the responsibility of all participants and stakeholders in the system*, including farmers, labourers, policy makers, researchers, retailers, and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable agriculture community.

SAQ 2

a) What were the factors leading to transition towards sustainable agriculture?

b) Discuss the basic concept and practices of sustainable agriculture.

c) Define sustainable agriculture and list its main elements.

d) What are the main goals of sustainable agriculture?

Let us now discuss the strategies needed for promoting sustainable agriculture.

5.4 PROMOTION STRATEGIES

The strategies for realizing the goals of sustainable agriculture and to establish an effective system need to incorporate the following four areas of concerns:

i) Appropriate use of natural resources in farming,
ii) Sustainable plant production practices,
iii) Sustainable animal production practices, and
iv) The socio-economic and political contexts.

These strategies represent a range of potential ideas for individuals committed to translating the vision of sustainable agriculture within their own circumstances.

5.4.1 Appropriate Use of Natural Resources in Farming

Water, energy, soil are the chief natural resources used in agriculture and affected by the farming practices. The air quality is also affected by these activities. Let us learn about the issues involved in using these resources so as to minimise their environmental impact.

Water: A Principal Resource

When the production of food and fibre degrades the natural resource base, the ability of future generations to produce and flourish decreases. The decline of ancient civilizations in Mesopotamia, the Mediterranean region, Pre-Columbian Southwest U.S. and Central America is believed to have been strongly influenced by natural resource degradation from non-sustainable farming and forestry practices. Water is the principal resource that has helped agriculture and society to prosper, and it has been a major limiting factor when mismanaged.

Water supply and use: In drought hit areas, drought-resistant farming systems need to be introduced. For this purpose, the following steps arehelpful:

1. Improving water conservation and storage measures,
2. Providing incentives for selection of drought-tolerant crop species,
3. Using reduced-volume irrigation systems, such as drip irrigation and sprinkler irrigation (Fig. 5.3)
4. Managing crops to reduce water loss, or
5. Not planting at all.

(a) **(b)**

Fig.5.3: a) Drip; and b) sprinkler irrigation respectively
[Sources: a) http://www.florence.ars.usda.gov/research/water/dripirrb.jpg
b) http://static.howstuffworks.com/gif/irrigation-moveable-sprinkler.jpg**]**

Water quality: The most important issues related to water quality involve salinization and contamination of ground and surface waters due to excessive use of water for irrigation, pesticides, nitrates and selenium. Salinity has become a problem wherever water of even relatively low salt content is used on shallow soils in arid regions and/or where the water table is near the root zone of crops. Tile drainage can remove the

water and salts, but the disposal of the salts and other contaminants may negatively affect the environment depending upon where they are deposited.

Temporary solutions include the use of salt-tolerant crops, low-volume irrigation, and various management techniques to minimize the effects of salts on crops. In the long-term, some farmlands may need to be removed from production circle or converted to other uses. Other uses include conversion of row crop land to production of drought-tolerant forages, the restoration of wildlife habitats or the use of agro-forestry to minimize the impacts of salinity and high water tables. Pesticide and nitrate contamination of water can be reduced using many of the practices discussed in the sections on plant and animal production practices.

Wildlife: Another way in which agriculture affects water resources is through the destruction of riparian habitats within watersheds. The conversion of wild habitat to agricultural land reduces fish and wildlife through erosion and sedimentation, the effects of pesticides, removal of riparian plants, and the diversion of water. The plant diversity in and around both riparian and agricultural areas should be maintained in order to support a diversity of wildlife. This diversity will enhance natural ecosystems and could aid in agricultural pest management.

Energy: Non-Renewable versus Renewable Sources

Modern agriculture is heavily dependent on non-renewable energy sources, especially petroleum. The continued use of these energy sources cannot be sustained indefinitely, yet to abruptly abandon our reliance on them would be economically catastrophic. However, a sudden cut-off in energy supply would be equally disruptive. In sustainable agricultural systems, there is reduced reliance on non-renewable energy sources and there is a substitution of renewable sources or labour to the extent that is economically feasible.

Soil Erosion

Soil erosion is a serious threat to our ability to produce adequate food. Numerous practices have been developed to keep the soil in place. These include *reducing* or *eliminating tillage, managing irrigation to reduce runoff*, and *keeping the soil covered with plants or mulch*. More details about the enhancement of soil quality are given in the next section.

Air Quality

Many agricultural activities affect air quality. These include smoke from burning of agricultural wastes; dust from tillage, traffic, harvest practices, pesticide drift from spraying, and nitrous oxide emissions from the use of nitrogen fertilizers. Options to improve air quality include incorporating crop residue into the soil, using appropriate levels of tillage, and planting wind breaks, cover crops or strips of native perennial grasses to reduce dust.

Cover crop – a lower value crop grown in a season that is less favourable for cash crop production.

SAQ 3

Explain how appropriate use of natural resources in farming would help in mitigating the negative environmental impacts of modern agriculture.

5.4.2 Sustainable Plant Production Practices

Sustainable production practices involve a variety of approaches. These strategies must take into account the topography, soil characteristics, climate, pests, local availability of inputs and the individual grower's goals. Despite the site-specific and individual nature of sustainable agriculture, several general principles can be applied to help growers select appropriate management practices (also see Fig. 5.4):

- Selection of species and varieties that are well suited to the site and to the conditions on the farm;
- Diversification of crops including livestock rearing and cultural practices to enhance the biological and economic stability of the farm;
- Management of the soil to enhance and protect its quality;
- Judicious use of inputs; and
- Consideration of farmers' goals and lifestyle choices.

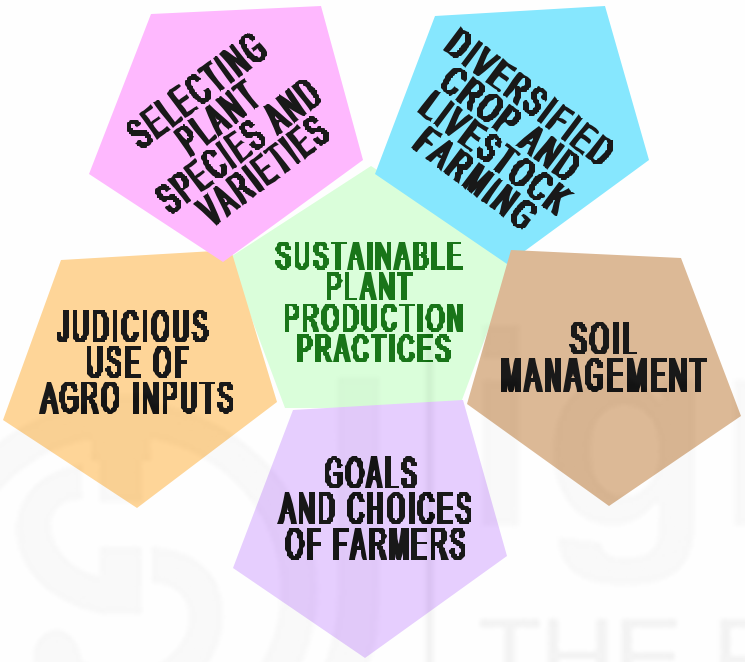


Fig.5.4: Sustainable plant production practices

Selection of Site, Species and Variety

Preventive strategies if adopted early can reduce inputs and help establish a sustainable production system. When possible, pest-resistant crops should be selected which are tolerant of existing soil or site conditions. When site selection is an option, factors such as soil type and depth, previous crop history, and location (e.g., climate, topography) should be taken into account before planting.

Diversity

Diversified farms are usually more resilient economically and ecologically. While monoculture farming has advantages in terms of efficiency and ease of management, the loss of the crop in any one year could put a farm out of business and/or seriously disrupt the stability of a community dependent on that crop. By growing a variety of crops, farmers spread economic risk and are less susceptible to the radical price fluctuations associated with changes in supply and demand.

Properly managed diversity can also buffer a farm in a biological sense. For example, in annual cropping systems, crop rotation can be used to suppress proliferation of weeds, pathogens and insect pests. Also, cover crops can have stabilizing effects on the agro-ecosystem by holding soil and nutrients in place, conserving soil moisture with mowed or standing dead mulches, and by increasing the water infiltration rate and soil water holding capacity. Cover crops in orchards and vineyards can buffer the system against pest infestations by increasing beneficial arthropod populations and can therefore reduce the need for chemical inputs. Using a variety of cover crops is

also important in order to protect against the failure of a particular cover crop species to grow and to attract and sustain a wide range of beneficial arthropods.

Optimum diversity may be obtained by integrating both crops and livestock in the same farming operation. This was the common practice for centuries until the mid-19th century, when technology, government policies and economics compelled farms to become more specialized.

Mixed crop and livestock operations have several advantages:

- First, growing row crops only on more level land and pasture or forages on steeper slopes reduce soil erosion.
- Second, pasture and forage crops in rotation enhance soil quality and reduce erosion; livestock manure, in turn, contributes to soil fertility.
- Third, livestock can buffer the negative impacts of low rainfall by consuming crop residues that in "plant only" systems would have been considered crop failures.
- Finally, feeding and marketing are flexible in animal production systems. This can help cushion farmers against trade and price fluctuations and in conjunction with cropping operations, make more efficient use of farm labour.

Soil Management

A common philosophy among sustainable agriculture practitioners is that a 'healthy' soil is a key component of sustainability, that is, a healthy soil will produce healthy crop plants that have high vigour and are less susceptible to pests. While many crops have pests that attack even the healthiest of plants, proper soil, water and nutrient management can help control some pest problems along with those caused by crop stress or nutrient imbalance. Furthermore, crop management systems that impair soil quality often result in greater inputs of water, nutrients, pesticides, and/or energy for tillage to maintain yields.

In sustainable farming systems, the soil is viewed as a fragile and living medium that must be protected and nurtured to ensure its long-term productivity and stability. Methods to protect and enhance the productivity of the soil include:

- Using cover crops,
- Addition of compost and/or manures,
- Reducing tillage,
- Avoiding traffic on wet soils, and
- Maintaining soil cover with plants and/or mulches.

Conditions in the soils, which are warm, irrigated, and tilled, do not favour the build-up of organic matter. Regular additions of organic matter or the use of cover crops can increase soil aggregate stability, soil tilth, and diversity of soil microbial life.

Efficient use of inputs

Many inputs and practices used by conventional farmers are also used in sustainable agriculture. Sustainable farmers, however, maximize reliance on natural, renewable, and on-farm inputs. Equally important are the environmental, social, and economic impacts of a particular strategy. Converting to sustainable practices does not mean simple input substitution. Frequently, it substitutes enhanced management and scientific knowledge for conventional inputs, especially chemical inputs that harm the environment on farms and in rural communities. The goal is to develop efficient, biological systems, which do not need high levels of material inputs.

Growers frequently ask if synthetic chemicals are appropriate in a sustainable farming system. Sustainable approaches are those that are the least toxic and least energy intensive, and yet maintain productivity and profitability. Preventive strategies and

other alternatives should be employed before using chemical inputs from any source. However, there may be situations where the use of synthetic chemicals would be more sustainable than a strictly non-chemical approach or an approach using toxic organic chemicals. For example, one grape grower switched from tillage to a few applications of a broad-spectrum contact herbicide in the vine row. This approach used less energy and compacted the soil less than numerous passes with a cultivator or mower.

Consideration of the farmer's goals and lifestyle choices

Management decisions should reflect not only environmental and broad social considerations, but also individual goals and lifestyle choices of the farmers and farming communities. For example, adoption of some technologies or practices that promise profitability may also require such intensive management that one's lifestyle actually deteriorates. Management decisions that promote sustainability should nourish the environment, the community and the individual.

5.4.3 Sustainable Animal Production Practices

In the early part of the last century, most farms integrated both crop and livestock operations. Indeed, the two were highly complementary both biologically and economically. The picture has changed quite drastically since then. Crop and animal producers now are still dependent on one another to some degree, but the integration now most commonly takes place at a higher level – between farmers, through intermediaries, *rather than within the farm itself*. This is the result of a trend towards separation and specialization of crop and animal production systems. Despite this trend, there are still many farmers, particularly in the developing countries in South Asia, who integrate crop and animal systems either on dairy farms, or with range cattle, sheep or hog operations.

Even with the growing specialization of livestock and crop producers, many of the principles outlined in the crop production section apply to both the groups. The actual management practices will, of course, be quite different. Some of the specific points that livestock producers need to address are listed below (see also Fig. 5.5).

Fig.5.5: Sustainable animal production practices

Management Planning

Including livestock in the farming system increases the complexity of biological and economic relationships. The mobility of the stock, daily feeding, health concerns, breeding operations, seasonal feed and forage sources, and complex marketing are sources of this complexity. Therefore, a successful ranch plan should include enterprise calendars of operations, stock flows, forage flows, labour needs, herd production records and land use plans to give the manager control and a means of monitoring progress towards goals.

Animal Selection

The animal enterprise must be appropriate for the farm or ranch resources. Farm capabilities and constraints such as feed and forage sources, landscape, climate and skill of the manager must be considered in selecting which animals to produce. For example, ruminant animals can be raised on a variety of feed sources including range and pasture, cultivated forage, cover crops, shrubs, weeds, and crop residues. There is a wide range of breeds available in each of the major ruminant species, i.e., cattle, sheep and goats. Hardier breeds that, in general, have lower growth and milk production potential are better adapted to less favourable environments with sparse or highly seasonal forage growth.

Animal Nutrition

Feed costs are the largest single variable cost in any livestock operation. While most of the feed may come from other enterprises on the ranch, some purchased feed is usually imported from off the farm. Feed costs can be kept to a minimum by monitoring animal condition and performance and understanding the seasonal variations in feed and forage quality on the farm. Determining the optimal use of farm-generated by-products is an important challenge of diversified farming.

Reproduction

Use of quality germplasm to improve herd performance is another key to sustainability. In combination with good genetic stock, adapting the reproduction season to fit the climate and sources of feed and forage reduce health problems and feed costs.

Herd Health

Animal health greatly influences reproductive success and weight gains, two crucial aspects of successful livestock production. Unhealthy stock not only waste feed but also require additional labour. A herd health programme is critical to sustainable livestock production.

Grazing Management

Most of the adverse environmental impacts associated with grazing can be prevented or mitigated with proper grazing management:

- First, the number of stock per unit area (stocking rate) must be correct for the landscape and the forage sources. There will need to be compromises between the convenience of tilling large, unfenced fields and the fencing needs of livestock operations. Use of modern, temporary fencing may provide one practical solution of this dilemma.
- Second, the long-term carrying capacity and the stocking rate must take into account short and long-term droughts. Properly managed grazing significantly reduces fire hazards by reducing fuel build-up in grasslands and bush lands.
- Finally, the manager must have sufficient control to reduce overuse in some areas while other areas go unused. Prolonged concentration of stock that results in

permanent loss of vegetative cover on uplands or in riparian zones should be avoided. However, small-scale loss of vegetative cover around water or feed troughs may be tolerated if surrounding vegetative cover is adequate.

Confined Livestock Production

Animal health and waste management are key issues in confined livestock operations. The moral and ethical debate taking place today regarding animal welfare is particularly intense for confined livestock production systems. The issues raised in this debate need to be addressed.

Confined livestock production is increasingly a source of surface and ground water pollutants, particularly where there are large numbers of animals per unit area. Expensive waste management facilities are now a necessary cost of confined production systems. Waste is a problem of almost all operations and must be managed with respect to both the environment and the quality of life in nearby communities. Livestock production systems that disperse stocks in pastures, their wastes are not concentrated and do not overwhelm natural nutrient cycling processes have become a subject of renewed interest.

SAQ 4

List the sustainable plant and animal production practices. How do they help in improving the environment?

5.4.4 The Socio-Economic and Political Contexts

In addition to develop strategies for preserving natural resources with the changing production practices, sustainable agriculture requires a commitment to change public policies, economic policies and institutions, and social values. Strategies for change must take into account the complex, reciprocal and ever-changing relationship between agricultural production and the broader society.

The "food production system" extends far beyond the farm and involves the interaction of individuals and institutions with contrasting and often competing goals including the farmers, researchers, input suppliers, farm workers, unions, farm advisors, processors, retailers, consumers, and policy makers. Relationships among these actors shift over time as new technologies spawn economic, social and political changes.

A wide diversity of strategies and approaches are necessary to create a more sustainable food production system. These will range from specific and concentrated efforts to alter specific policies or practices, to the longer-term tasks of reforming key institutions, rethinking economic priorities, and challenging widely-held social values. Areas of concern where change is the most needed are discussed below.

Food and Agricultural Policy

In most of the Third World countries, existing federal, state and local government policies often impede the goals of sustainable agriculture. New policies are needed to simultaneously promote environmental health, economic profitability, and social and economic equity. For example:

- Commodity and price support programmes could be restructured to allow farmers to realize the full benefits of the productivity gains made possible through alternative practices.
- Tax and credit policies could be modified to encourage a diverse and decentralized system of family farms rather than corporate concentration and absentee ownership.

- Government and land grant university research policies could be modified to emphasize the development of sustainable alternatives.
- Marketing orders and cosmetic standards could be amended to encourage reduced pesticide use.
- Coalitions must be created to address these policy concerns at the local, regional, and national levels.

Land Use

Conversion of agricultural land for urban uses is of particular concern in both developed and developing countries, as rapid growth and escalating land values threaten farming on prime soils. Such farmland conversion trends often discourage farmers from adopting sustainable practices in a long-term perspective on the valued land. At the same time, the close proximity of newly developed residential areas to farms is increasing the public demand for environmentally safe farming practices.

Comprehensive new policies to protect prime soils and regulate development, in developed and developing countries should be introduced. By helping farmers to adopt practices that reduce the use of chemicals and conserve scarce resources, sustainable agriculture research and education can play a key role in building public support for agricultural land preservation. Educating land use planners and decision-makers about sustainable agriculture is an important priority.

Labour

In some of the developed and most of the developing countries, like India and Pakistan, the conditions of the farmers and agricultural labour are generally far below accepted social standards and likewise lesser legal protection in other forms of employment. Policies and programmes are needed to address this problem, working towards socially just and safe employment that provides adequate wages, amiable working conditions, health benefits, and increased opportunities for economic stability. The needs of migrant labour for year-around employment and adequate housing are a particularly crucial problem needing immediate attention. To be more sustainable over the long-term, labour must be acknowledged and supported by government policies, and carefully considered when assessing the impacts of new technologies and practices.

Rural Community Development

Rural communities in all South Asian countries are currently characterized by economic and environmental deterioration. Many are among the poorest locations in the nations. The reasons for the decline are complex, but changes in farm structure have played a significant role. Sustainable agriculture presents an opportunity to rethink the importance of family farms and rural communities. Economic development policies are needed that encourage more diversified agricultural production on family farms as a foundation for healthy economies in rural communities. In combination with other strategies, sustainable agricultural practices and policies can help foster community institutions that meet employment, educational, health, cultural and spiritual needs.

Consumers and the Food Production Systems

Consumers can play a critical role in creating a sustainable food systems. Through their purchases, they send strong messages to producers, retailers and others in the system about what they think are important. Food cost and nutritional quality have always influenced consumer choices. The challenge now is to find strategies that broaden consumer perspectives, so that environmental quality, resource use, and social equity issues are also considered in shopping decisions. At the same time, new policies and institutions must be created to enable producers using sustainable

practices to market their goods to a wider public. Coalitions organized around improving the food systems are one specific method of creating a dialogue among consumers, retailers, producers and others. These coalitions or other public forums can be important vehicles for clarifying issues, suggesting new policies, increasing mutual trust, and encouraging a long-term view of food production, distribution and consumption.

5.5 SUMMARY

In this unit you have studied that:

- **Agriculture** has undergone dramatic changes since the end of World War II. These changes, confined largely to the developed countries, had many positive effects and reduced risks in farming, but their social and economic costs were very high.
- The **Green Revolution** ushered in the 1960s and 70s changed the national food production status for the better in South and South-east Asia. But it did not register similar success in the Sub-Saharan Africa region. The debate about the pros and cons of Green Revolution still continues.
- The **sustainable agriculture approach** encompassing concern towards environment and resource conservation has garnered immense support and acceptance in the recent years. Environmental health, economic profitability, social and economic equity are the main goals of sustainable agriculture. A systems perspective is essential towards achieving the outlined goals.
- The **strategies** for realising the goals of sustainable agriculture and in establishing sustainable agriculture system should include concerns such as **judicious natural resource use**, **sustainable plant and animal production practices**, and the **consideration of the socio-economic and political dimensions**.

5.6 TERMINAL QUESTIONS

1. Mention the features characterising the traditional and modern farming systems.
2. a) Define sustainable agriculture and express its goals in measurable terms.

   [**Hint:** While framing your definition keep in mind an agricultural area, its geography and socio-economic conditions of communities, and express the expected goals both in detectable and measurable terms].

   b) Devise ways of monitoring and ascertaining the sustainability of agriculture.
3. In your view, what are the impediments to sustainable agriculture? Discuss.

   [**Hint:** Some points for reflection are given below:

   - realising the outlined goals with the existent practices.
   - handling conflicting demands like growing more food on a given land yet maintaining the biological diversity.
   - balancing the ecological and economical viabilities of various agricultural operations].
4. Visualise the future for sustainable agriculture in the next 25 and 50 years focussing on the following aspects:

   – technological developments,
   – state of the environment,

- resource availability,
- population size, and
- food preferences of communities.

5. Why is it important to consider the systems perspective for attaining the goals of sustainable agriculture?

6. What are the main elements that need to be taken into account in the sustainable integrated management of agro-ecosystems? Mention also the responsibilities of the different stakeholders involved in the process.

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UNIT 6 SUSTAINABLE FORESTRY MANAGEMENT

Structure

6.1 INTRODUCTION

Forests, like many natural resources, are improved through use if certain basic principles are followed. For instance, more mature trees with slow growth should be harvested and replaced with younger rapidly growing trees to maintain a high level of forest productivity. The mature trees also become susceptible to diseases and insect attacks, which further reduce their productivity. Since the variety of life or biodiversity is maximized in old forests, hence, there is a case for preservation of representative communities.

An essential biological requirement for sustainable forestry is the regeneration and nurturing of a new crop of trees as quickly as possible after the harvest. The basic institutional requirement is the clear and enforceable property and use rights. For mapping out a management plan based on conservation strategy, it is important to distinguish forests on the basis of their physical type and ownership – whether owned by individuals, the community or the government. Therefore it is important to increase awareness and thereby muster the community and political support for sustainable development of forestry resources.

Objectives

After studying this unit, you should be able to:

- explain the need for sustainable development of forest resources;
- describe the fundamentals of forest management;
- detail the concept, principles and practices for sustainable forestry management; and
- discuss the requisites for developing and implementing policies for sustainable forestry management.

6.2 FOREST MANAGEMENT

The wise management of forests is a major environmental priority. Many new plans and programmes have been proposed, especially for tropical forests. The management of forests is called **silviculture.** A major goal of forest management is sustained yield. To meet this aim, some forests are managed like mechanized farms. A single species is planted in straight rows, and the land is fertilized, sometimes by helicopter. Modern machines make harvesting rapid. Some remove the entire tree with its roots. Intensive management such as this is characteristic of Europe and parts of the north-western United States. Other forests, such as those of New England, are

managed less intensively. In these forests, regeneration takes place from seeds from existing trees, and ecological succession follows. What approach is the best depends on the type of forest, the environment, and the characteristics of the commercially valuable species.

Ecological succession refers to the process of development of an ecological community or ecosystem. It is usually viewed as a series of stages: early, middle, late, mature (or climax), and sometimes post-climax.

Approximately 25 percent of the world's forests are managed scientifically for wood production. Forest management involves planning for sustainable harvests, with particular attention paid to forest regeneration. Aside from human use, there are some factors that contribute to forest loss. Fires, insects, and diseases damage up to one quarter of the annual growth in temperate forests. Recently, reduced forest growth and sudden die off of certain tree species in industrialized countries have caused great concern. It is thought that the origin and transport of air pollutants from the country houses are contributing to the sudden forest death, but not all the causes and solutions are yet understood.

We now outline some measures for forest management.

- **Reforestation**

  As the original forests of the world are cut to fulfil the increasing demand for timber, it is important to plant new trees and develop programmes in reforestation. There are many international and national efforts for reforestation. Most countries with a significant amount of economic forestry have such programmes. Many private forestry corporations plant trees and reforest areas they have cut. One of the largest of these programmes, Global ReLeaf, is conducted by American Forests, the oldest conservation organization in the United States. The World Bank has a reforestation programme with 48 projects in different nations. In China, 700,000 farmers have cooperated to plant a green wall to protect crops, with a shelterbelt of trees 100 m wide and 2400 km long. Although impressive, such programmes are small compared to the rate of deforestation.

  Most countries replant far less forests than are harvested or converted to other uses. Harvesting the established forests of say one thousand years results in problems like soil erosion and floods. Recently, world-over a massive reforestation campaign has been started. An average of 4.5 million hectares per year were replanted during the last decade. South Korea also has had very successful forest restoration programmes. After losing nearly all its forests during the civil war 30 years ago, the country is now about 70% forested again. In spite of being the world's largest net importer of wood, Japan has increased forests to approximately 68 percent of its land area. Strict environmental laws and prohibition on the harvesting of local forests encouraged imports so that Japan's forests are being preserved while it uses wood procured from other countries. It is estimated that two thirds of all tropical hardwoods cut in Asia are shipped to Japan.

  Many reforestation projects involve large plantations of single species, single use intensive cropping called *monoculture agro-forestry*. Although this is an efficient approach, high density of a single species encourages pest infestations and other diseases. High levels of pesticides and herbicides are often required to protect monocultures. This type of management lends itself to clear-cut harvesting, which saves money and labour but tends to leave soil exposed to erosion. Monoculture often requires higher fertilizer inputs than does a *mixed species forest*. A clear profit sharing mechanism is important for any agro-forestry project. Where profits from agro-forestry projects go to absentee landlords or government agencies, local people have little incentive to prevent fires or keep grazing animals out of newly planted areas. In some countries, such as the Philippines, Israel, and El Salvador, government reforestation projects have been targets of destruction by antigovernment forces, with devastating environmental impacts.

  Promising *alternative reforestation* plans are being promoted by conservation and public service organizations such as The New Forest Fund and Oxfam. These groups encourage people to plant community woodlots of fast growing,

multipurpose trees such as *Leucaena* (see Fig. 6.1). Millions of seedlings have been planted in hundreds of self-help projects in Asia, Africa, and Latin America. *Leucaena* is a legume, and it fixes nitrogen and improves the fertility of soil. Its nutritious leaves are good livestock fodder. It grows quickly up to 3 meters per year and provides shade, forage for livestock, firewood, and good lumber for building. A well-managed *Leucaena* woodlot can yield up to 50 tons per hectare on a sustained basis. Community woodlots can be planted on wastelands or along roads or slopes that are too steep to plough so they do not interfere with agriculture. In addition, they protect watersheds, create windbreaks, and also provide useful food and forest products such as fruits, nuts, mushrooms, or materials for handicrafts on a sustained yield basis.

(a)

(b)

Fig.6.1: a) A close up of a *Leucaena* plant from the *Leucaena*-plantation; b) A diagrammatic representation of a twig of *Leucaena* sp. with inflorescences, fruits and leaves
[Sources: a) http://www.tropicamente.it/immagini%20sito/CATALOGO/L/Leucaena%20glauca.jpg. b) http://www.tropicalgrasslands.asn.au/pastures/images/leucaena.gif**]**

- **Managing With and For Fire**

For much of the twentieth century, it was the practice to try to suppress forest fires. However, people have come to realize that some tree species and some forest animals depend on fire and grow/occur only in areas that have burned. Areas with great danger of forest fires, such as Yellowstone National Park, may best be managed through the intentional introduction of frequent light fires, which clear the ground of dry leaves and twigs that are the potential fuels and prevent conditions that lead to the fires that destroy homes, property, and life.

Prescribed fire, also called *controlled burning*, is becoming increasingly common. In the south-eastern United States, prescribed fire is used on about 1 million ha (2.5 million acres) annually. Study of the practice suggests that it has no significant effect on soil, nutrient cycling or water flow from the forests, but it reduces risk from wildfires, controls certain tree diseases, increases availability of food and habitat for wildlife, and above all it can be used to manage the forests for greater production of desirable tree species.

- **Shorter Rotation Time**

Rotation time is the time between two successive cuts of a stand.

In older or traditional forestry, *rotation times* were long, say, a century or more. In recent years, however, there has been an increasing emphasis on shorter and shorter rotation times. In some cases, where young trees are harvested for paper pulp which requires wood fibres and not actual timber, the rotation times is about 10 years. Such very short rotations can be hard on the soil and the forest ecosystem. Each cut results in soil erosion, especially when heavy machinery is used. Artificial fertilization also becomes necessary in this case.

- **Conservation of Old Growths**

Old growth, in popular usage refers to virgin forest.

Some of the most hotly disputed forest issues concern the conservation of *old growth forests* (see Fig. 6.2). This has become a major debate in recent times particularly pertaining to the tropical rain forests. The issue is particularly acute in the Pacific Northwest. Trees there live a very long time and are famous for their large size, and forests can take centuries to develop. For example, the Douglas fir, an important commercial timber species, lives for more than 600 years and can grow more than 61 m (200 ft) high.

The Douglar fir is botanically known as *Pseudotsuga menziesii***.** Its wood is in great demand as it is strong, relatively free of knots, and takes paints and polish well. It is used in making heavy plywoods and large beams.

Coastal redwood (*Sequoia sempervirens*) is also prized for its excellent wood that is soft, light in weight, splits easily, and is resistant to fungi and bacteria.

Coastal redwood is well known for its ability to live thousands of years and to reach more than 61 m (200 ft) in height. When a previously uncut stand is cut clear, a forest stand is eliminated that may take 500 to 1000 years to regenerate. These unique forests of the Pacific northwest are appreciated for their beauty and as habitats for many species of plants and animals. The old growth stands, however, also provide the best timber. As the percentage of original forests is declining, there is widespread concern as to how to use and conserve the remaining old growths. One difficulty in resolving this issue is the lack of direct legislation concerning protection of virgin forests and old growth stands. As a result, the disputes are reduced to surrogate issues, such as the conservation of specific endangered species whose habitats lie within these forests.

A forest that has never been cut is called a virgin forest.

(a)

(b)

Fig.6.2: a) Old growth forests, with in road; b) In pristine form
[Sources: a) http://worldtrip.iwebland.com/GIFs/USA/C0490049.gif
b) http://www.fish.washington.edu/classes/fish547/field_trip_photos/Olympics_web_photos/students/trail_oldgrowth.JPG**]**

SAQ 1

a) Why is immediate reforestation essential to modern forest management?

b) Explain the pros and cons of monoculture agro-forestry.

c) Describe how prescribed fires can serve as a multipurpose tool in forest management.

d) What are the consequences of shortening rotation times in agro-forestry practices?

e) i) Why is it important to conserve old growth forests?
ii) Cite the name of a region that is well known for its old growth forests.
iii) Mention the constrains in conserving old growth forests.

6.3 PRODUCTIVITY MANAGEMENT

The productivity of a forest varies with the soil fertility, water supply, and local climate. Foresters classify sites by *site quality*, which indicates the timber crop the land can produce in a given time. Site quality can decrease with poor management. For example, frequent burning of forests decreases the potential for tree growth by lowering soil fertility. Foresters develop *site indices* for types of forest lands and derive *yield tables* to estimate future production. The management of forests involves:

- removing poorly formed and unproductive trees or selected other trees to permit larger desired trees to grow more rapidly,
- planting genetically improved seedlings, and
- fertilizing the soil.

Forest geneticists breed new strains of trees just as agricultural geneticists have bred new strains of corn, wheat, tomatoes, and other crop plants. New super trees are developed to maintain a high rate of growth and increase the total production of forests.

There has been some success in controlling diseases and insect infestations in forests. Insect outbreaks occur infrequently, but when they do they can have devastating results. Some insect problems are due to introduction of exotic species. For example, the gypsy moth (Fig. 6.3) was introduced intentionally into New England around the turn of the century as a source of silk, but it escaped and has spread through many eastern states. These insects affect trees by defoliating them, by eating their buds and destroying their straight form by destroying the main trunk of the trees, causing forked growth besides eating their fruits, and acting as carriers of diseases. Pesticides are sometimes used to combat these insects. Many of the tree diseases are primarily of fungal origin. As with the Dutch elm disease, an insect spreads the fungus from tree to tree.

Dutch elm disease – a fungal disease that kills elm trees.

(a)

(b)

Fig.6.3: a) Gypsy moths on a tree trunk; b) A female (the top one) and a male (the bottom one) gypsy moth [Sources: a) http://www.invasivespecies.gov/profiles/images/2652087.jpg b) http://www.for.gov.bc.ca/hfp/gypsymoth/gm_eggs2.jpg**]**

Forests are complex entities, so is their management. However, trees provide many kinds of easily obtained information that can be of great help in their management. The age and growth rate of trees can be measured from the tree rings (Fig. 6.4). In

temperate and boreal (northern) forests, trees produce one growth ring per year, and the age of a tree can be determined by counting the number of its rings.

Fig.6.4: The tree rings tell us its age. Can you tell the age of this transversely cut trunk of a tree? (Source: http://www.idahoforests.org/img/cookie2.gif **)**

It is important for silviculturists to incorporate an *ecosystem approach* to management, because the success of trees depends on soil, climate, competition, and the abundance of parasites and herbivores and on various ecosystem and ecological community processes. One way in which an ecosystem approach is taken in forest management is in the use of the concept of **ecological succession** that is, the process of development of an ecosystem over a period of time. Some forests are managed for **early successional species**, and others are managed for **late successional species**. For example, in northern forests such as those in Canada, useful species include aspen, birch and pine, all of which are early successional species. For these species, rotation times are comparatively short, less than a century. In contrast, oaks in Germany or maples in the eastern United States are late successional species. Forests of these species, which are used to make furniture, must be managed for a long rotation time, or cutting must be done very selectively so that the forests do not open up greatly.

Clear-cutting and its alternatives

Clear-cutting is the practice of cutting all trees in a stand at the same time. Alternatives to clear-cutting are *selective cutting* and *strip cutting***.** In selective cutting individual trees are marked and cut. Sometimes, smaller, poorly formed trees are selectively removed. This practice is called *thinning*. At other times trees of specific species and sizes are selectively removed. For example, some forestry companies in Costa Rica cut only some of the largest mahogany trees, leaving other, commercially less valuable trees to help maintain the ecosystem, and permitting some of the large mahogany trees to continue to provide seeds for future generations.

In forestry parlance an area of a forest is referred to a stand that is classified on the basis of its tree composition and their age.

In strip cutting, narrow rows of forest are cut, leaving wooded corridors. Strip cutting offers several advantages. The uncut strips protect the regenerating trees from wind and direct sunlight, and provide seeds for future trees. In addition, strip cutting can minimize the negative aesthetic effects of logging by leaving buffer zones and allowing the corridors of forest that remain to be used for recreation and as wildlife habitats.

Experimental tests involving clear-cutting

Scientists have tested the effects of clear-cutting. For example, in the U.S. Forest Service Hubbard Crook Experimental Forest in New Hampshire an entire watershed was clear-cut and herbicides were applied for 2 years to prevent regrowth of plants. The results were dramatic. Erosion increased, and the pattern of water runoff changed substantially. The exposed soil degraded more rapidly. And the concentrations of harmful infiltrates in the stream exceeded public health standards.

Recognizing factors that should be taken into account, some scientists have begun to call for a new forestry that uses a variety of practices to increase the likelihood of sustainability, including recognition of the dynamic characteristics of forests and of the needs for management with in an ecosystem context.

SAQ 2

a) List the factors that need to be considered for productivity management of forests.

b) In what way can the forest geneticists contribute towards productivity management of forests?

c) What kind of information pertaining to the trees is valuable in forestry management?

d) What are the ecological repercussions on clear cutting, selective cutting, and strip cutting on the forest ecosystem?

So far, you have learnt about the technical aspects of forest management. We now discuss certain social and economic initiatives that can help regenerate forests.

6.4 SOCIO-ECONOMIC INITIATIVES IN FORESTRY MANAGEMENT

In many parts of the world, people cut nearby forests to meet the needs of small communities. This is particularly true in the developing nations, where the use of firewood for fuel constitutes up to half or more of all the energy sources used. In the past, most government forestry departments concentrated their efforts on government owned forest lands or acted merely to police a country's forests. Now there is a realization that this approach must change. People must be involved in conserving forests and forest industries should be regulated through a system of incentives and alternative measures. The importance of a sustainable forest management policy cannot be underscored. We discuss all these aspects in this section.

6.4.1 Community Forestry

Some countries lay emphasis on **community forestry**, in which professional foresters help villagers develop woodlots with the goal of achieving sustainable local harvests to meet local needs. The FAO and the World Bank are supporting these programmes. For example, in Malawi, Africa, a World Bank and FAO project sponsors reforestation in which almost 40% of the households have planted trees. In South Korea, villagers have been reforesting the country at the rate of 40,000 ha/year (89,840 acres/year). In India, the Joint Forestry Management programme is being undertaken on a massive scale.

In community forestry, good management practices include:

- limited access;
- cutting the slower growing and poorer burning species to make room for the growth of the better firewood species;
- making use of plantations for fulfilling various human needs; and
- supplementing firewood with other, more easily renewable fuels.

However, some of these practices are in conflict with local, traditional activities or are difficult to implement for other reasons.

Such community efforts, like reforestation projects, are impressive. Again, however, in total, they have only a small effect on the problem of the worldwide shortage of firewood. It is not clear whether developing nations can implement a successful management policy in time to prevent irreversible damage to their forests and the land. If alternative fuels for developing nations cannot be found, the effects will be severe not only for the land, but also for the people.

Community Participation and Joint Management

Active community participation is only possible if the communities are organized and given a stake in the use of forests. Some of the related measures are given below.

- Active community participation in forest management and conservation should be sought.
- A major effort is required to develop laws, partnership protocols, forestry methodologies to support *Joint Forest Management* (JFM). A focus on JFM will help to integrate FDs (Forestry Departments) more effectively into the "second wave" of participatory forest projects, but this focus must include mechanisms for learning from past experiences.
- Village organizations should be strengthened to play a lead role in natural resources management. Responsibility for managing natural forests should be delegated to them. The FDs can share their expertise in these local organizations for enhancing the management efficacy.
- Development of capacity for sustainable land use at the village level is a prerequisite to the sustainable land use strategy needed in each state. It should focus on integrated natural resource management with a particular emphasis on poverty alleviation.
- Effecting transparency and making all government forest management information accessible to communities and efficiently handling royalty payments to communities – all these need to be improved to reduce the communities' vulnerability to the exploiters.

SAQ 3

a) Why is community forestry increasingly being seen as a sustainable forestry alternative?

b) Discuss the role and responsibilities of a community in sustainable agroforestry.

6.4.2 Farm Forestry

The contribution of irrigated farmlands to timber and fuelwood production is currently estimated at 80 percent. There is growing emphasis on the farm and agro-forestry for meeting the increasing needs of industry and subsistence use. In view of this, some suggestions for farm forestry (see Fig. 6.5) are:

- Consultations between stakeholders including the farmers, the agriculture department, and the forestry department on farm water management.
- Census of tree stocks and other growths on farmlands as part of the agricultural census.
- Integrated research in farm forestry to optimize tree yields for food and commercial purposes.
- Preparation of outreach materials that are specific to different agro-ecological zones.
- Encouragement of farm forestry associations as user groups analogous to village organizations.

(a)

(b)

Fig.6.5: a,b) Two examples of farm forestry
[Sources: a) http://www.malenywoodexpo.com/img/ecotour_ff1.jpg
b) http://www.fao.org/docrep/X3989e/x3989e29.jpg**]**

6.4.3 Logging and Forest Industries

The experience of the management of logging operations, through either contractors or state enterprises, has not been very encouraging. Since forestry operations should also generate local employment opportunities, it is suggested that:

- Large scale state logging enterprises should phase out direct harvesting. Instead, they should build the capacity of local communities for co-management.
- Development of small scale wood based processing industries should be encouraged alongside the various efforts to encourage community afforestation and forest co-management, to serve as a commercial incentive for forestry; however, communities need also to take full responsibility for forest protection.

Indigenous wood production and imports

Given the high local prices in contrast to international prices, there are still incentives to cut wood from forests. Yet most of the natural forests would be better suited to producing the non-wood goods and services that are also scarce and often cannot be substituted by imports.

More thinking is needed on the overt and covert barriers to imports. Dismantling these barriers would help wood consumers, although it would obviously hurt royalty

earners, concessionaries and forest industry. Further, the removal of such barriers would enable a reanalysis of the comparative advantages in indigenous wood production. This in turn would lead to a reassessment of just what types of forestry activities should be promoted. It could be imagined, for example, that this might entail an increased emphasis on wood fuel production versus timber production. At the same time, liberalization of markets for fuels that might compete with wood fuel would also serve to alleviate pressure to undertake major changes in forest management. Liberalization may also lead to lowering profit margins in the timber trade. All these aspects need to be essentially taken into account for an effective management in the era of globalisation.

SAQ 4

a) Why is farm forestry important to the scheme of sustainable forestry management?

b) Detail the essential elements of sustainable farm forestry.

c) Prioritise the factors that need to be taken into account while deciding about the procurement of wood from within and/or outside the country for fulfilling various national needs.

6.4.4 Need for Sustainable Forest Management Policy

We cannot offer detailed policy recommendations, as these have to be generated by the processes discussed in Section 6.2. Nonetheless, based on the analysis in the previous sections the following could be some of the contents of the future policies.

Objectives of Forest Management

The full range of forest benefits has never been holistically assessed and, therefore, forests continue to be managed mainly for revenue from sale of timber and fuel wood. Policy recommendations should refine the objectives of forest management. One cannot be explicit about what these objectives might be, prior to improved information and consultation with all the stakeholders and the state functionaries involved. However, the following points may be considered:

- Production of timber and fuel wood should not be the primary objective of the natural forests. They should be managed to maximize the ecological benefits of biodiversity conservation, watershed regulation and mitigation of climate change;
- To meet timber needs, emphasis should be on farm forestry and plantations in the irrigated areas, and a limited area of those upland forests that can be managed without environmental damage.

Targets such as 25 percent forest cover are totally unrealistic and irrelevant to real demands for forest products. A consideration of such demands would point to the importance of farm forestry and irrigated plantations for construction timber, participatory forestry (in the context of integrated rural development) for livelihood needs and securing the protection of key biodiversity forests and erosion prone watersheds and other fragile areas. Such a focus on goods and services will result in more sustainable objectives than a focus on forest area alone. Only once these fundamental national and state-level objectives are defined can the Forest Department procedures and decentralization be effectively decided.

SAQ 5

Outline the objectives and various steps for formulation of sustainable forestry management policy.

Now that you have acquired an understanding of the issues in forest management, you may like to know: What needs to be done?

6.5 WHAT NEEDS TO BE DONE?

Firstly it is important to document and learn from the best practices available in the country and the regions with similar problems.

Next there is the need to establish multi-stakeholder forests for various user groups. These would put a premium on open and frank discussion, and in commissioning high quality, independent policy analyses. Institutionalizing the use of forest resources accounting in informing and reviewing policy could be done in parallel with this.

The third parallel step requires strengthening the village organizations and entrusting them with the responsibility of forest management. The promising recent developments in enabling legislation and governmental support service for joint forest management need to be carried forward. Forest Departments need to be linked more effectively with local institutions.

All of these steps could be tried on a pilot basis, with inclusive monitoring and review mechanisms. Once satisfactory results are available the pilot could be replicated in other parts of the country. However, for replication to be successful would require a careful assessment of the conditions. Especially those concerning user rights and tenure need to be taken into account.

These are interesting times in the recent history of South Asia's forests. We are beginning to move from an era of deforestation, towards one of investment in forest management and afforestation. Awareness of the forestry problems and potentials is growing, but new regulations and incentives, and more supportive forestry institutions are needed to ensure that stakeholders can make the transition to sustainable forestry management. One thing is now abundantly clear – things have to change.

Harvesting All Parts of the Trees

The technology used in cutting trees greatly affects the ecosystem. Traditional timber harvesting removes only the main stems and the large and straight branches of the trees that are the source of the most valuable timber, and the remaining parts that is leaves, bark, small stems, and roots are left behind in the forest. These parts in due course of time decompose and mineralise contributing to the fertility of the soil.

Modern earth-moving machinery makes it possible to remove all the aboveground parts of a tree, most of which are chipped into small fragments for making paper. This practice is called *whole tree harvesting*. Other machines remove roots along with some soil thereby removing some of the valuable nutrients from the forest. This technique can produce more wood fibre per unit area, but the benefits are short-termed. In the long run, these practices are detrimental to the forest. Whole-tree harvesting over long periods requires the addition of considerable amounts of fertilizers to replace the nutrients lost from the forest ecosystem.

The change from primary objective of revenue maximization to multiple objectives ranging from conservation management to development of local organizations for forest management has profound consequences across the forestry sector. The debate about decentralization is by no means confined to the developing world but is relevant to all countries.

Decentralization

The implementation of the decentralization process has brought issues of ownership and control to the forefront of the debate. In forestry, the historical development of state control over forestlands has meant that the land base held in trust by the

institution for the public good is enormous. The following statistics provide an indication of the extent of forestry estates in Asia. In India, Forest Departments control 22% of the national territory, in Nepal forests and shrub lands comprise some 43% of the total land area. In Indonesia, 74% of the territory is controlled by the Forest Department; and in Thailand, the Royal Forest Department administers some 40% of the nation's land. These extraordinary figures underline the fundamental challenge posed to these departments. This calls for devolution of some of these controls to the millions of people living in forest areas. The means by which this is being done needs considerably more analyses and the forms of the linkages between the state and the people need to be critically assessed.

At one extreme of the public to private sector continuum lies the example of New Zealand Forest Department, where a far-reaching restructuring of the sector has occurred. Here, the forest service was abolished and separate organizational structures were established. This deconstruction of a monolithic organization in favour of several discretely functioning units has been one mechanism to cope with the conflicts of multiple objective management engendered within one organisation. The major reason, which led to the restructuring of the New Zealand Forest Service, was an inability to provide the transparent accountability for the mix of functions. By identifying and separating out these objectives and forming different organisations each with primary responsibility for a major objective, conflict became public.

Such an approach may also be recommended for South Asia. Demarcation of territorial responsibility and accountability is easier to attribute. As such, the advisory and regulatory functions are the responsibility of the Ministry concerned with conservation of forests, a subject which has frequently brought forestry professionals into conflict with environmentalists, and which is considered by many to be irreconcilable with the practice of commercial forestry.

The strong message that emerges from the New Zealand experience is that there is no blue-print for institutional change; the structure of organizations necessary to meet international, national and local imperatives must emerge from the particular circumstances of each nation. The principle of decentralization, although global, does not necessarily lead to a globally uniform response.

SAQ 6

a) Discuss the advantages and disadvantages of harvesting all parts of the trees.
b) Why is decentralization necessary for sustainable forestry?

6.6 THE DEVELOPMENT – SUSTAINABLE FORESTRY CONTEXT: SOUTH ASIA

South Asia has been witness to a series of dramatic experiences in the participatory management of forest resources. Since the 1970s social and community forestry programmes in both India and Nepal have attempted to transform the relationship between a powerful state bureaucracy and local people directly dependent on forest resources. These programmes represent the realization that a large proportion of the population depends heavily on forest resources for subsistence, energy, nutrition, income and the maintenance of farming systems. They acknowledge the failure of traditional custodial management of forests by governments to halt the loss and degradation of the sub-continent's forests, without the active participation of local communities.

The inadequacy of government based approaches to forest protection and management led to the search for alternatives, and experimentation with a number of approaches. These can generally be classified into social forestry; farm forestry, community forestry and joint forest management and rural development forestry. The umbrella term used to refer to all these approaches is **participatory forestry**, accepting the diversity of interpretations of the term participatory. Although as some have contended the use of the word participatory is probably more problematic than

some of the more clearly focussed terms such as *collaborative* or *good forest management.*

The earliest linking of the word social in forestry was in India where several states pioneered tree growing programmes outside the traditional forest boundaries. For example, in India, the state of Gujarat in 1970 set up a community Forestry Wing in the Forest Department and Tamil Nadu started a tree-planting programme for local employment generation on tank foreshores and village wastelands as early as 1956. After 1973 half of the proceeds from these plantations were given to local panchayats (the lowest unit of local government administration) and local people were allowed to collect fodder from the plantation areas. Under some interpretations of social forestry it could be considered that its formal origins lie in government programmes of the late nineteenth century where village forests were demarcated. However, under other interpretations this would be considered to have been a programme of removal of local people's rights to manage forests. Indeed many commentators in both India and Nepal would assert that participatory forestry has been implemented informally and unrecognized by local people over many decades and generations, and that the so-called new approaches are merely reproducing indigenously derived systems of forest management.

Thus, by the early to mid 1980s it is was possible to make some assessments of the social and community forestry programmes' dichotomy of understanding the meaning of 'social' in social forestry that has interesting and long-running consequences for participatory forestry. In the early years, external funding was given on the basis of poverty alleviation where forestry was seen to be the appropriate entry point to reach the more marginal groups in society. However, as evidence from India indicates this ideal was far from realized through the social forestry programmes. In many instances, poorer groups were dispossessed from the land they had been using particularly those groups whose livelihoods were dependent on the access to grazing lands. The mix of objectives ascribed to social forestry doomed the programme to difficulties from the outset, with a multiplicity of target groups to be reached by only one model – that of woodlots.

However, there is evidence to indicate that farm forestry in certain parts of India proved to be immensely successful in the initial stages, as demonstrated by the demand for seedlings which far outpaced projections or supply. Private tree growing on large scales was confined to parts of north-western India, Gujarat and Karnataka, resulting in localized over-production and a consequent depression in prices. Perhaps because of falling prices and local surpluses, the initial boom in farm forestry later slowed down.

Reviews of social forestry programmes, which had the objective of developing the *common property resource*, have been far less positive. One of the common factors identified in their failure was the absence of people's participation in planning and management. This led to poor survival rates and the reluctance of community institutions to take over responsibility for the management of plantations. Furthermore, even though both these programmes shared the common objective of reducing pressure on forest lands through creating alternative sources of fuel, fodder and forest products, degradation still continued. The intense focus of funds and energy on private and common lands in India redirected attention away from investment and management of natural forests.

It is this background that led to the emergence of a fundamentally new practice – **community forestry** in Nepal by local people, or **joint forest management**, as it is known in India, involving local people actively in the protection and management of state forest lands. While community forests are being managed in Nepal, joint forest management arrangements are being explored in India between local people and State Forest Departments. In the process many self-initiated and indigenous forest management systems are being documented and are gaining recognition. Social forestry and farm forestry were the first new practices in recent history to bring foresters out of the forest and into the villages and farms of the people who are the forests' primary users. Now community forestry programmes seek to go a step

further, recognizing the role of these users in the management of natural forests – bringing the people back into the forests.

In a workshop to exchange experiences between practitioners of social and community forestry in India and Nepal the discussions brought out that, although there were many similarities in experiences, there were also some major differences. In many cases, failures in one country were mirrored at a later date in the other indicating that although these two notions may have many points of interaction there had been little or no sharing of experiences in the forestry sector. Yet these new forestry experiments are still evolving, and their focus on local institutions and equity make them more process-oriented, and less amenable to rigid target-based development planning. People's participation, reorientation and training of forest staff, building local level institutional participatory micro-planning, equitable benefit sharing, and gender-sensitive programming have all become the new development imperatives. Community forestry in Nepal and joint forest management in India are beginning to take on these challenges in different ways.

The essence of current changes in forest management in both Nepal and India lies in the attempt to shift control and management of forest land from centralized Forest Departments to decentralized people's organizations. The historical background and legal basis to the two programmes are unique to each country although they do share certain similarities particularly in recent years with the new hegemony of aid programmes. The types of community institutions though they are still evolving and share many features, are distinct and differ between countries and within states in India.

The nature and extent of the shift of control from state/national to local/ community level also differs considerably. It is in the implementation at various levels that a greater degree of overlap exists, although the sequence of planning and ownership of management varies significantly. Ironically, the programmes in both countries have focussed more attention on initiating community protection (India) or simple operational plans (Nepal) than on making the more dramatic shift to active co-operative forest managing and to addressing the technical, social and economic issues which accompany such a transition. Many of the problems faced by both countries are therefore very similar.

SAQ 7

a) Mention the different approaches of participatory forestry.
b) Elaborate the social forestry initiatives undertaken in India.

We now summarise the contents of this unit.

6.7 SUMMARY

In this unit you have learnt that:

- The wise management of forests is a major environmental priority. Many new plans and programmes have been proposed, especially for tropical forests.
- A major goal of forest management is **sustained yield**. Therefore, some forests are managed as mechanized farms. In such farms a single species is planted in straight rows, and the land is fertilized. In intensive forestry management modern machines make harvesting rapid, some remove the entire tree with its roots. Other forests, are managed less intensively. In these forests, regeneration takes place from the seeds from the existing trees, thus an ecological succession follows.
- What approach is the best depends on the type of the forest, the environmental, conditions and the characteristics of the commercially valuable species.
- There is no blue-print for institutional change. The structure of organizations necessary to meet national and local imperatives must emerge from the particular circumstance of each nation. The principle of decentralization, although global, does not necessarily lead to a globally uniform response. For this the ownership, and the control issues need to be critically assessed.

- Joint forest management with social commitment and local community involvement has emerged as an effective alternative in our country, and the South Asian region.

6.8 TERMINAL QUESTIONS

1. Detail the fundamental elements of sustainable forestry.
2. Compare the ecological features and outcomes of mixed species and monoculture agroforestry.
3. What are the implications of the controlled burning practice in forest management?
4. Mention the importance of virgin forests, and the factors hampering their conservation.
5. Why is it important to incorporate an ecosystem approach in forest management?
6. Forests when managed with an ecosystem approach can cater to the diverse needs of communities. Justify this statement.
7. Explain in detail the concept of community forestry highlighting the good management practices, the requisite conditions, and the operational constraints.
8. Out of the two forestry approaches – the government controlled, and the community forestry, in your opinion, which one will be best suited for your country? Give reasons.
9. What considerations and practices would make farm forestry both an economically profitable venture and an ecologically sustainable activity?
10. Discuss the aspects that need to be built into the logging enterprise to make it both socially and economically beneficial, and environmentally sustainable.
11. Discuss the wood production management strategies required for fulfillment of local needs while keeping the natural forest resource base intact.
12. Why there is an urgent need for implementing sustainable forest policy? Give reasons.
13. Discuss about the preparations required, and the necessary conditions for the formulation of sustainable forest management policy.
14. “We are beginning to move from an era of deforestation towards one of investment in joint forest management and afforestation.” Analyse this statement.
15. Describe the concept of joint forest management. Give the background for its emergence. What challenges face joint forest management in India?

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UNIT 7 WATER RESOURCE MANAGEMENT

Structure

7.1 INTRODUCTION

Water is a marvellous substance, flowing, rippling, swirling around obstacles in its path, seeping, dripping, trickling and constantly moving from sea to land and back again. The Earth is the only place in the universe known to us, where water is present in substantial quantities. Water is fundamental to life. It is difficult even to imagine a form of life that might exist without water. Oceans, lakes, glaciers and other bodies of liquid or solid water cover more than 70% of our world's surface. The total amount of water on our planet is immense. Water performs a number of direct and indirect functions in the ecosystem.

The distribution of water is often described in terms of interacting compartments in which water resides for short or long duration of time. The following example would explain this point. The ice in the Himalayan ranges melts and forms rivers that after traversing through the plains terminate in the ocean.

Human concerns regarding water can be divided into two categories: quantitative and qualitative. Quantitative refers to such issues as – is there enough water to meet our needs? What are the impacts of diverting water from one point of the cycle to another? Qualitative refers to such issue as – is the water of sufficient purity so as not to harm human or environmental health?

In this unit, we take a look at the resources associated with the major water compartments such as the oceans and wetlands; know the associated problems to think about their management.

Objectives

After studying this unit, you should be able to:

- explain the importance of water resources in the biosphere;
- enumerate the major threats to the water resources from various human activities; and
- discuss integrated management practices to manage water resources effectively.

7.2 COASTAL RESOURCES

Together the oceans contain roughly 97% of the entire water in the world. The ocean basins form a continuous reservoir. Shallow and narrow areas between them reduce water exchange, so they have different compositions, climatic effects, and even different surface elevations. Some 60% of the world's population lives within 60 km of the sea and the social, economic and environmental significance of the boundary between the land and the ocean is now widely recognized. The ecology of coastal lands and coastal waters provides numerous livelihood opportunities, encouraging concentrations of population and development activities in the coastal zone.

Over the last decade the management of coastal resources (see Fig. 7.1) for their sustainable use has become a critically important issue for the South Asian region. Included among these resources are some of the most extensive mangrove areas in the Indian Ocean and also some of the world's least disturbed coral reefs. These coastal ecosystems have been subject to increasing exploitation particularly over the last 20 years. For example, between 1975 and 1983 the area occupied by the Chakoria Sundarban Mangroves in Bangladesh has been reduced by 60% through conversion to shrimp ponds. In the Maldives, over the same period, more than 200,000 m^3 of live corals were extracted for construction purposes and tourism increased by almost ten fold from 8,000 to 75,000. Such pressures in the tropical coastal zone are not unique and the degradation of coastal ecosystems worldwide, as a result of non-sustainable use, has become an issue of major international concern.

Fig.7.1: Coastal resources. a) Mangroves; b) Corals; c) Fishes; and d) Kelps
[Sources: a) http://www.deh.gov.au/coasts/mpa/nrsmpa/protect/images/mangroves.jpg
b) http://mbgnet.mobot.org/salt/coral/reef1large.jpg
c) http://members.trump.net.au/ahvem/Fisheries/National/POLLOCK2.jpg
d) http://www.theseashore.org.uk/theseashore/SpeciesPages/kelp%20low%20March.jpg]

A regional meeting of South Asian nations was held in November 1985 in the Maldives to identify options for a regional policy and action framework. In particular the meeting served to reinforce the South Asian Seas Action Plan in which delegates from member states outlined the following key activities needed in the region:

- Promotion of research and monitoring, and exchange and sharing of data and information among member states.
- Promotion of methods and practices that safeguard environmental quality and utilize resources rationally and on a sustainable basis.
- Assessment and evaluation of causes, magnitude and consequences of environmental degradation.

Four major anthropogenic influences affecting the coastal zone in South Asia were also identified at the regional meeting. These were:

- sedimentation (from dredging, land derived run off and land reclamation);
- marine resource exploitation (sand, coral, mangrove, fisheries);
- pollution; and
- tourism activities.

These influences vary from country to country as shown in Table 7.1.

Table 7.1: Major anthropogenic influences (listedin order of importance) in the coastal zone of South Asian countries

Sri Lanka	Maldives	India	Bangladesh	Pakistan
1. Sedimentation (land development and mangrove clearance)	1. Marine resource exploitation	1. Sedimentation (Poor land practices)	1. Marine resource exploitation	1. Marine resource exploitation
2. Marine resource exploitation	2. Sedimentation (from dredging)	2. Marine resource exploitation	2.Sedimentation (Mangrove clearance)	2. Pollution
3. Pollution	3. Tourism	3. Pollution	3. Pollution	3. Sedimentation (Mangrove clearance)
4. Tourism	4. Pollution	4.Tourism	4. Tourism	4. Tourism

Apart from having their coastlines surrounded by Indian Ocean, South Asian countries share the problems of increasing population pressures and the resultant increasing demands on the coastal zones, at a level which is almost unprecedented elsewhere in the world. These problems are further aggravated by the fact that coastal populations in South Asia include some of the poorest members of the community – manual fishermen, the landless and nomadic pastoralists. Due to the accessibility of the coast and its aquatic resources, the coastal zone becomes a focus for settlement by poor people whose lot is not improved by non-sustainable use of resources. Population increases and the attraction of the coast for settlement by the poorest members of the community represent considerable challenges to the countries of South Asia and to the continued exploitation of resources in the coastal zone. These challenges may be met, by adopting an **integrated management approach** to the use of coastal resources. Conventional sectoral management has not been effective in addressing the complex management issues of the coastal zone, as these issues are **cross-sectoral** in nature and the degradation of one sector often adversely affects the others. We now discuss integrated coastal management.

7.2.1 Coastal Resource Management

The term **integrated coastal management** (ICM) is used to describe a continuous and dynamic process that unites government and the community, science and management, sectoral and public interests in preparing and implementing an integrated plan for the protection and development of coastal systems and resources (after GESAMP 1996).

ICM is a framework, which involves comprehensive assessment, setting of objectives, planning and management of coastal systems and resources, while taking into account traditional, cultural, and historical perspectives and conflicting interests and uses. It is an interactive and evolutionary process for achieving sustainable development and implementing a continuous management capability that can respond to changing conditions. ICM includes the following aspects.

- Integration of programmes and plans for economic development, environmental quality management and land use.
- Integration of programmes for sectors such as food production (including agriculture and fishing), energy, transportation, water resources, waste disposal and tourism.
- Integration of all the tasks of coastal management from planning to implementation, operation and maintenance, monitoring and evaluation performed continuously over time.
- Integration of responsibilities for various tasks of management among levels of government – local, state/provincial, regional, national, international and between the public and private sectors.
- Integration of available resources for management (i.e., personnel, funds, materials, equipment).
- Integration among disciplines (e.g., geomorphology, geochemistry, marine biology, economics, engineering, political science and law).

An in-depth understanding of the functions of the coastal resource systems and their characteristics is fundamental to a better appreciation and application of ICM. Before describing such characteristics we should first attempt to define the coastal zone. The functional definition of the coastal zone is:

The space in which terrestrial environments influence marine environments and vice versa. According to the international legal definition it is the 200 nautical mile limit from land over which coastal nations exert sovereignty (economic exclusive zone). The scientific definitions depend on the nature and scale of the processes that characterize the land ocean boundary. For most purposes:

The coastal zone represents an area of transition where terrestrial and marine environments interact to form unique environmental conditions. The coastal zone embraces inshore waters, intertidal areas and extensive tracts of land.

The definition will vary depending on the purpose for which it is used and we should view the concept of the 'coastal zone' as a means of focussing attention of the emergence of an innovative framework for planning and management to help make wise and sustainable use of resources. For example, the management boundaries for dealing with lowland flooding will be different from those considered for coral mining. Thus management boundaries need to be issue/problem-based rather than be rigidly defined. Although the coastal zone is an interface between land and sea, the area of real concern is that region where human activities are interlinked with both

land and marine environments. This area has been defined as the coastal resource system (see Fig. 7.2).

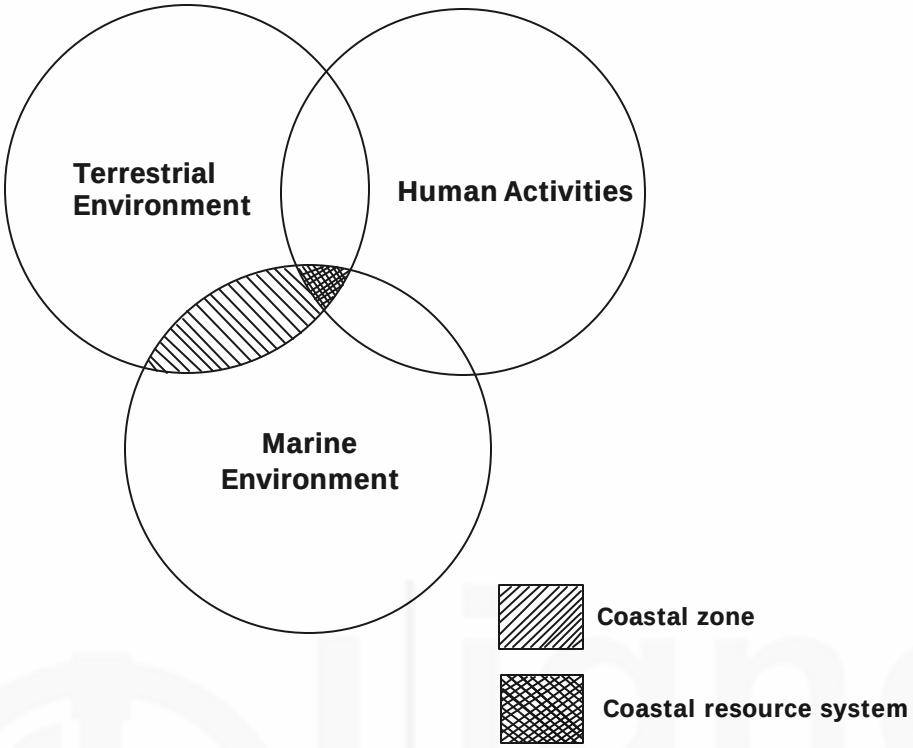


Fig.7.2: Relationship between the coastal zone and the coastal resource system (after Chua 1993)

The essential elements of integrated coastal management are **integration** and **co-ordination**. Any policy and management action which has been designed to address coastal development conflicts must be founded on a sound understanding of natural processes and ways in which these are disturbed; on political socio-cultural and economic conditions; on present and the likely future demands, as well as the social costs involved. The management of the coastal resources system has been likened to a cube consisting of three mutually supporting dimensions. These are **processes, issues** and **actions** and each forms an axis of the cube (Fig. 7.3). The three dimensions are closely linked and to consider only one may lead to collapse of the whole management system. This approach to integrated coastal management follows closely to that adopted for the countries of South East Asia.

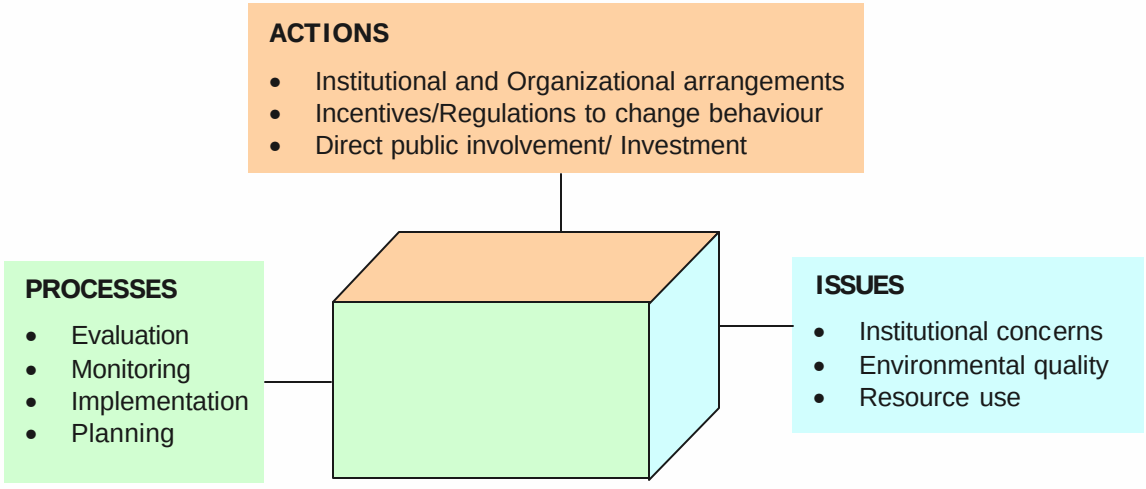


Fig.7.3: A diagrammatic representation of the three mutually supporting dimensions of the coastal area management system (afterChua 1993)

Management **processes** identify and analyze management issues and develop the necessary policy and management options. In this model management processes consist of four essential sequential components, namely *planning*, *implementation*, *monitoring* and *evaluation*. The planning constitutes the basic component of the management processes. The management **issues** such as the conflicts resulting from resource exploitation (e.g., over-fishing, coral mining) and use (habitat loss, pollution) form the second dimension to the cube. Management **actions** constitute the third dimension and include direct public investment (e.g., restocking, fisheries enhancement, education and public awareness); incentives and regulation, which might change behaviour (e.g., permits, quotas, rights, monitoring and enforcement). Unlike sectoral management, which is represented by only one sector of the cube (e.g., over-fishing), the spill-over effects of one form of development on all others can be addressed in this integrated approach.

Let us now look at these three dimensions in more detail.

Management process

The management processes (see Fig. 7.3) consist of integrated planning, implementation, monitoring and evaluation:

- Integrated planning involves inception, research/analysis, programme formulation, adoption and execution. While the detail and level of planning may vary according to the conditions at the site and the experiences of the planning team, the fundamental steps are essentially the same and they are:

  a) Establishing a multidisciplinary planning team to provide a framework for the management programme, initiate the planning process and identify the key participating agencies. Core staff might include a coastal management expert, a regional planner, a resource economist, an ecologist, a sociologist and an environmental engineer. Obviously the composition of the team will vary depending on the type of the project in hand or the management challenges.

  b) Adopting a planning process, for projects which are likely to take longer than 1-2 years to execute. In principle the planning process involves the evaluation of secondary data and also any formal targeted research with a view to the production of a strategic management plan as per the area profile.

  c) Collection of research data. Such data will include secondary information but may also involve instigation of focussed research needed for a specific coastal management programme.

- Implementation requires funds and human resources and primarily depends upon project design and the capabilities of the implementing agencies.

- Monitoring is an important component of the management process and it aims to see how the projects are progressing, to explore opportunities that could be developed and to assess the impacts and the lessons learned.

- Evaluation is critical since it enables corrective action to be taken where management plans are not producing the desired results. As a result of evaluation changes in plans and management strategies may be initiated and mistakes corrected at an early stage of the management process.

The most difficult transition occurs between planning and implementation. Each cycle of the policy process for a coastal management programme can be considered a generation. The procedures adopted in many mature coastal management programmes are substantially redesigned in subsequent generations as a result of earlier experiences and such exercises have been termed ‘adaptive management’. In this way constructive use is made of lessons learned from successes and failures in the management process. Because the planning, implementation, monitoring and

evaluation are sequential they can be depicted as a cycle, often described as the policy cycle (see Fig. 7.4).

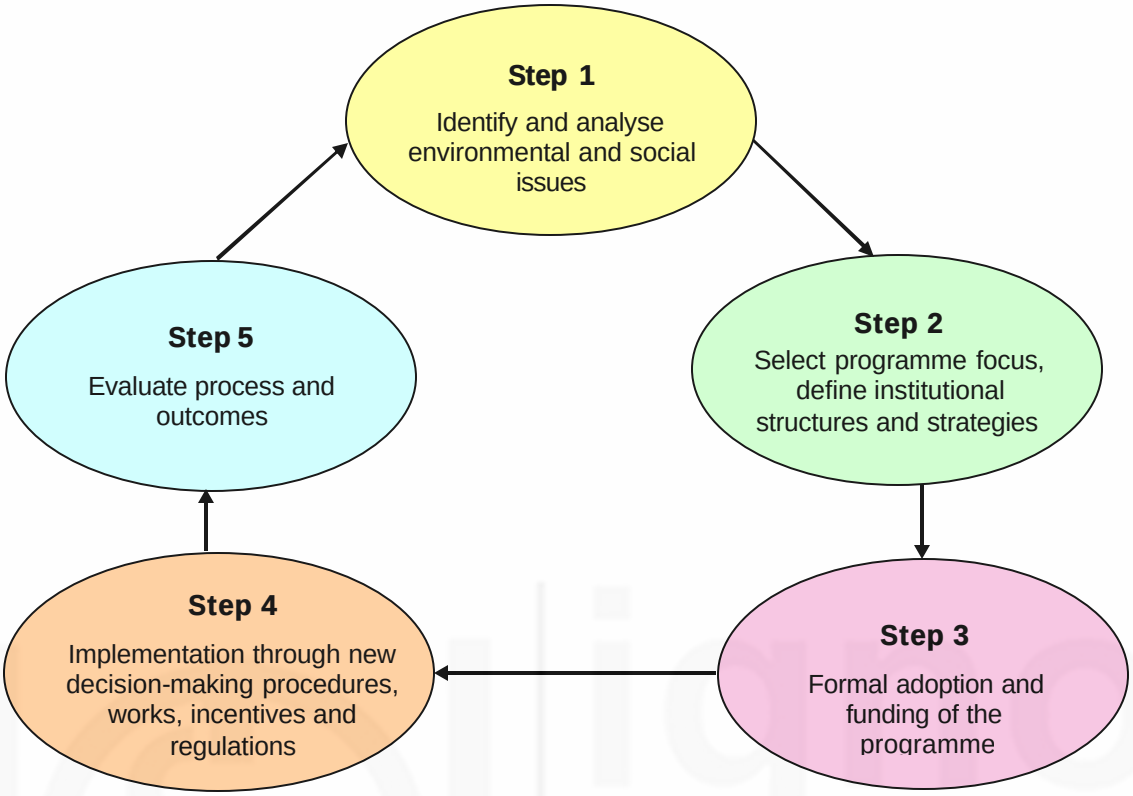


Fig.7.4: Steps in the evolution of various generations of a coastal management programme (after Oslen 1993)

Management issues

Management issues (see Fig. 7.3) include: resource use (over-fishing, exceeding tourism than the carrying capacity, destruction of habitats etc.); environmental quality (population, coastal erosion) and institutional concerns (conflicts in legislation, inter-sectoral conflicts, ineffective law enforcement etc.). Owing to the multiple use of the coastal environments, there is an overlap of many of these issues, this highlights another aspect of coastal management. At the heart of this concept lies a recurrent problem in coastal management described as a sectoral approach to resource use. This approach favours a single purpose and exclusive use of land and water resources. However, since shared coastal systems generate a wide variety of 'goods' and 'services' it has been argued that we should be looking for the optimal mix of uses that generate the greatest economic benefit to society. That optimal mix is hard to achieve and demands an effective and integrated coastal management policy if resource conflict is not to occur. In Sri Lanka coastal lagoon areas are frequently the sites which suffer from multiple resource conflicts (fishing, mining and tourism). Such locations have been considered under the heading of *special area management sites* where collaborative management plans have been set up to resolve conflicts. Diverse range of 'goods' and 'services' cannot be managed adequately through private ownership or control by sectoral agencies.

Management actions

Management actions (see Fig. 7.3) constitute the most important dimension of a coastal management programme since they involve the application of measures directed towards achieving the desired changes. Examples are maintaining the functional integrity of the ecosystem, improving water quality and changing human behaviour. They include:

- International and organizational arrangements, clarifying legal rights and obligations, strengthening enforcement capability and undertaking monitoring and evaluation.
- Incentives and regulations to change human behaviour which might involve establishment of subsidies, fishing permits or quotas, tax exemptions, fishing and mining bans, regulations of vessels and fishing activities.
- Direct public involvement which would involve investment by a government into increasing public awareness, conducting research, providing basic infrastructure (e.g. waste disposal systems) and technical assistance wherever needed.

You may like to stop for a while and review these ideas.

SAQ 1

a) Why is an integrated coastal management approach preferred over the conventional sectoral management approach? Explain.

b) What are the general features and broad aims of an integrated coastal management (ICM) framework?

7.2.2 Case Study

So far you have learnt about the theoretical aspects of integrated coastal resource management. We now present a case study from Pakistan to demonstrate its practical aspects. The Indus delta is one of the largest areas of arid climate mangroves in the world. There is evidence that the extent of mangrove coverage in the Indus Delta has decreased significantly in the recent times. These changes have been attributed to altered environmental conditions (decreased salinity and increased silt load), pollution from industry, port development and pressures from human use of mangrove wood for fuel and fodder.

The development of a coastal zone management plan for the Indus delta has been a major goal from the outset. The project proposal for Korangi-Phitti Creek had the following long term and short-term goals:

Long-term goals

1. To develop environmentally sound management policies, considering institutional capability and action, and in particular with improved co-ordination of scientific, technical, economic and industrial aspects in the development planning process.
2. To demonstrate the economic value of conservation and sustainable use of natural resources both at the local and national levels.
3. To promote improved management of the Indus Delta mangrove ecosystem as a natural resource with multiple functions and benefits including, but not restricted to, immediately quantifiable economic benefits such as fish nurseries, fuel, fodder, construction materials, storm protection and siltation preventation.

Short-term goals

1. To support a productive, profitable and expanding fisheries programme based on environmentally sound management of a renewable natural resource base.
2. To initiate projects, which will bring measurable benefits of conservation and sustainable development of natural resources to poor people in terms of economic welfare, income-generating activities during the closed fishing season, better living conditions and public health.
3. To make proposals on improving economic returns through mariculture, improvement of export earnings, development of effective closed season fishing

regulations more attuned to the ecosystem realities, and the development of specialized tourism packages for the mangrove wetlands.

4. To determine the sources of pollution and devise means for their monitoring and control.

5. To determine the effects of pollution and the indirect effects of human activities on the ecosystems of the delta.

6. To improve, through training, the environmental capacity of individuals and institutions concerned with management of this delta ecosystem.

The goals here were clearly defined and these required well-integrated interdisciplinary solutions to management issues.

Due to lack of funding at initial stages, a number of proposed projects on fisheries and analysis of freshwater flow in the delta were not taken up. As a result, the practical initiatives focussed on a single sector, i.e., forestry rather than on a broader multi-sectoral approach. The effectiveness of the programme was therefore significantly restricted.

The **management issues** of the area included: habitat loss, pollution, over-fishing and resource exploitation, ineffective law enforcement (both environmental legislation and fishery bans), and institutional issues.

Management actions taken include:

- *Rehabilitation of mangroves:* Replantation of mangroves, and capacity building of the forestry officers in mangrove rehabilitation and management.

- *Control of pollution:* An environmental evaluation of Port Qasim was carried out with recommendations to set up environment and safety mechanisms, together with training for oil spill clean up procedures. A series of workshops were also held involving tanners and other polluting industries. As a result the Pakistan Tanners Association have started recovering chrome compounds and also set-up a combined treatment plant for treating effluents.

- *Over-fishing and resource exploitation:* A ban has been operational since 1983 for a two-month closed season during June and July for catching shrimps in the Sindh province in Pakistan. Coastal community initiatives have been taken to provide alternative income sources but these have generally been small-scale operations. These included the promotion of handicraft skills, mangrove honey production and ecotourism. Another initiative included the introduction of improved efficiency cooking stoves, which would reduce the demand for mangrove wood as fuel.

At this point it is worth reiterating as to what constitutes good coastal management practices. Essentially there is no generalized prescriptive recipe for the management of coastal resources; each case, each site brings with it its own unique set of issues for consideration. There is however a general framework within which coastal resources can be sustainably utilized through appropriate policy making, management, and technological intervention – this framework is integrated coastal management (ICM). It is the most effective when it is proactive and the process of developing ICM can be described as a series of steps. These are:

1. Awareness

- Developing awareness of the value of coastal resources within national economic and social development programmes.

- Developing awareness of the ability of coastal ecosystems to sustain more than one economic activity at a time.

- Developing awareness about the dependence of different groups of people on the availability of goods and services generated by the coastal ecosystems.

2. Cooperation

- Promoting cooperation among different sectoral agencies, the private sector and community groups to achieve the outlined objectives.

3. Coordination

- Developing coordinated policies, investment strategies, administrative arrangements and harmonized standards by which performance can be measured.

4. Integration

- Implementing and monitoring policies, investment strategies, administrative arrangements and harmonized standards as part of a unified programme, and making adjustments where necessary to ensure stated objective are being met.

ICM can operate at all levels of governance. It is not always necessary to wait until national guidelines are in place before attempting to use the ICM principles. Key elements of good practices in ICM, which apply to all coastal management situations, include the following:

- The adoption of a systematic, incremental approach to developing and implementing ICM projects and programmes.
- The involvement of local communities in the ICM process.
- The establishment of mechanisms for integration and coordination.
- The establishment of a sustainable financing mechanism.
- The development of ICM capacity at all levels.
- The monitoring of effectiveness of ICM projects and programmes.
- Integrating environmental, economic and social information from the very beginning of the ICM process.

SAQ 2

a) Define/explain the following:

i) Coastal Zone
ii) Coastal resource system
iii) Adaptive management
iv) Policy cycle
v) Special area management sites

b) List the main steps of the process of developing and implementing an ICM framework for a project.

7.3 WETLAND RESOURCES

Wetland is a comprehensive term used for landforms such as swamps, marshes and bogs and saltwater marshes. Their common feature is that they are wet at least part of the year and as a result have a particular type of vegetation and soil. Standing water creates a special soil environment with very little oxygen, so decay takes place very slowly and only plants with specialized roots can survive.

Wetlands may be defined as the areas that are inundated by water or where the land is saturated to a depth of few centimetres for at least a few days per year. **Three major components** used to determine the presence of wetlands are **hydrology** or wetness, **type of vegetation**, and **type of soil**. Of these, hydrology is often the most difficult to define, because some fresh water wetlands may be wet only for a few days a year. The duration of inundation or saturation must be sufficient for the development of wetland soils, which are characterized by poor drainage and lack of or low levels of oxygen, and for the growth of specially adapted vegetation.

Although wetlands occupy only a small portion of the Earth's land area, they have very important role in the biosphere. In their oxygen less soils, certain bacteria survive that cannot live in high oxygen atmospheres. These bacteria carry out chemical reactions, such as the production of methane and hydrogen sulphide that have important effects in the biosphere. The vegetation of wetland environments in ancient times as a result of geological events turned into coal. Saltwater marshes are important breeding areas for many oceanic animals and contain many invertebrates. The dominant animals include crabs and shellfish, such as clams. **Saltwater marshes** are therefore **an important economic resource**. Besides this, wetlands perform a variety of natural services for other ecosystems and are equally important for the people, and these include:

- Freshwater wetlands are natural sponge for water. During high river flow they store water, reducing down stream flooding. Following a flood they slowly release the stored water, replenishing low flows.
- Many freshwater wetlands are important as areas of groundwater recharge (water seeps into the ground from a prairie pothole, for instance) or discharge (water seeps out of the ground in a marsh that is fed by springs).
- Wetlands are the primary nursery grounds for fish, shellfish, aquatic birds and other animals. It has been estimated that as many as 45% of endangered animals and 26% of endangered plants either live in wetlands or depend on them for their continued existence.
- Wetlands are natural filters that help purify water; plants in wetlands trap sediments and toxins.
- Wetlands are often highly productive and are the places where many nutrients and chemicals are naturally cycled.
- Coastal wetlands provide a buffer for inland areas from storms and high waves.
- Wetlands are important storage sites for organic carbon; storage is in living plants, animals and organic rich soils.
- Wetlands are aesthetically pleasing places for people.

Reasons of wetland loss

Almost 70% of the world's population lives on seacoasts, and the world river valleys and lakeshores have had human settlements since the earliest times. The communities established in these regions have often been attracted by the wetland system's easy access by land and/or water, level terrain, and high productivity. Exploitation of these features, even when leading the total conversion of wetland, has often brought social benefits, in both the short and long term.

Nevertheless, unacceptably high wetland loss had led to a net high social cost. Many of these losses have been deliberate, but others are the result of the decisions taken in ignorance of the full value of the wetlands in their natural state. Some are the result of inefficient management systems and others are unintentional by-products of other actions.

- *Limited information:* some of the products and services of wetlands are sold; commercial fisheries, meat and skins from grazing herds, crops etc. but many wetland values do not have markets such as water purification, and storm surge protection. Because these values are free goods they tend to be ignored in the economic calculations that decide whether wetlands should be conserved or developed. The result is a systematic bias favouring development and hence the degradation of wetlands.

- *Distribution of cost and benefits:* improving the quality and quantity of information on the distribution and values of wetlands is an important prerequisite for improving management. But even when sufficient information is available on the public benefits of conservation, wetlands are often lost because these benefits are not shared by the individual who owns the property. Private landowners frequently decide to drain their wetlands because they expect to earn more from growing crops than from leaving them in their natural condition.

- *Deficient planning concept:* point and non-point pollution are frequent causes of wetland degradation. Non point sources such as runoff of agricultural chemicals, and soil erosion, together with point source pollution from waste treatment plants, have resulted in the severe degradation particularly of estuarine wetlands.

- *Policy deficiencies:* despite increasing efforts to conserve wetlands, many are still lost because of competing government priorities. The most common example of this is where, despite an explicit government commitment to wetland conservation, national agricultural policy favours wetland drainage.

- *Institutional weakness:* most countries have institutions responsible for managing wetlands, though few pursue this mandate effectively. Among the many reasons for this, the ultimate cause is poor understanding of the true economic importance of wetlands and misperceptions of the nature of management problems.

Integrated wetland management

The 3rd Conference of Contracting Parties to the Ramsar Convention recommended in July 1987 that each country should develop a national policy for wise use of the country's wetland resources and provided following guidelines for the establishment of the national policies:

Guidelines for the establishment of wetland policies (Ramsar, 1988)

Wise use involves the promotion of wetland policies containing the following elements:

a) A national inventory of wetlands;

b) Identification of the benefits and values of these wetlands;

c) Definition of the priorities for each site in accordance with the needs of, and socioeconomic conditions in each country;

d) Proper assessment of environmental impact before development projects are approved, continuous evaluation during the execution of projects, and implementation of environmental conservation measures which take into account the recommendations of environmental assessment and evaluation studies;

e) Use of development funds for projects which permit conservation and sustainable utilization of wetland resources; and

f) Regulated utilization of wild fauna and flora, such that these components of the wetland ecosystem are not over-utilised.

While detailed polices are being established, immediate action should be taken on:

a) Interchange of experiences and informations between countries seeking to elaborate national wetland policies;

b) Training of staff in the discipline which will assist in the elaboration of such policies;

c) Pursuit of legislation and policies which will stimulate wetland conservation action, including the requisite amendments of the existing legislation;

d) Review of traditional techniques of sustainable wetland use, and elaboration of pilot projects, which demonstrate wise use of representative national and regional wetland types;

The following steps should be taken to manage the wetlands:

- *Improving information:* Until people understand why they should conserve wetland ecosystems and their species and are aware of the actions required to do so, the conservation would not take place. The quantity and quality of information on wetlands and their values must be increased and communicated more effectively to the people associated with wetland ecosystems. An information programme to make a people aware would essentially consist of the following four components:

  a) Assembling of national wetlands inventory and their classification,

  b) Assessing and tabulating the values of wetlands,

  c) Assessing the management potential of wetland systems, and

  d) Wetland research.

- *Improving awareness:* The understanding about the values of wetlands needs to be built at all levels of the society. The audience meriting particular attention are: the general public; local communities dependent upon wetland resources; the government departments and development assistance community, which make decisions on investments in wetland conservation and development.

- *Review and bring about change in agricultural policy:* This includes agricultural price support that would go a long way to reduce conversion of wetlands.

- *Re-look and change water policy:* This includes reducing impacts of water resources projects on wetlands.

- *Tax policy:* Tax laws may provide some incentives to prevent wetland drainage. By changing these laws wetlands could be conserved.

- *Wetland intervention/conservation policy:* The absence of specific national legislation limiting use of wetlands outside the protected areas has been one reason for wetland loss. In recent years a number of countries have moved to correct this situation.

- *Development assistance policy:* A great deal of wetland degradation and loss is supported by development assistance funds in the form of grants or soft loans. To arrest such practices, the development assistance institutions need to pay more attention to the importance of wetlands and pursue polices which promote a more environmentally sensitive approach to wetland development.

- *Enhancing cross-sectional management:* The greatest obstacle to integrated management of wetlands in most countries is the division of responsibility for wetland resources among different agencies. The effectiveness of national wetland

management efforts will be enhanced greatly by the establishment and effective operation of cross-sectoral structures. These may include specific ministry or department and inter-ministrial committees and commissions. The success of such efforts will depend upon the capacity of the coordinating mechanism to bring together the widest possible range of institutions concerned with wetlands and to assist them in including wetlands concerns in their work, rather than by replacing their existing functions.

- Improving human capacity to manage wetlands: substantial investment in training is required if wetlands are to be management effectively.

- Besides these steps regional and international cooperation is prerequisite for effective wetland management.

SAQ 3

a) List the prime causes of degradation of wetlands.

b) Explain the basic steps and essential requirements for the management of the wetlands.

c) Mention priority-wise the mandatory elements of an integrated wetland management framework.

d) Wetlands need to be managed in a responsible manner – what reasons demand this?

After having discussed the various aspects of wetlands in nature, we shall now take up another dimension, i.e., their use for activities with high economic returns.

7.4 AQUACULTURE

Aquaculture is the production of food from aquatic habitats – marine and freshwater. Although aquaculture provides only a small amount of the world's food at present, it is important as a source of proteins for many nations, especially Asia and Europe, and offers a potentially important cash crop in other parts of the world.

Like agriculture, aquaculture has also various dimensions and scales of operation. Rural aquaculture is basically a rural food farming activity, which is highly compatible with other food farming components of the family level farming system. On the other hand, highly commercialized, high input based intensive culture of high valued finfish and shellfish is another dimension of aquaculture. Besides there are also several intermediate levels and scales of operation.

Some fish growers grow several species of fish in the same pond, based on their different ecological niches. For example, a pond developed mainly for culturing carps – a bottom feeding fish, can also contain minnows which feed at the surface on plant leaves that are added to the pond.

7.4.1 Types of Aquaculture Systems

An extensive fish culture system depends largely on single input, the seed. No other extraneous material inputs are used and consequently such a system heavily depends upon the natural feed produced in the system or brought by the water in-flow. Extensive rice-fish-culture (see Fig. 7.5) based fisheries in ox-bow lakes and small seasonal reservoirs, shrimp/fish culture in rice field of Kerala and bheries of West Bengal and fish culture in seasonal tanks of Sri Lanka are common examples of such a system.

Bheries – large impounded shallow water areas with facilities for drawing tidal water

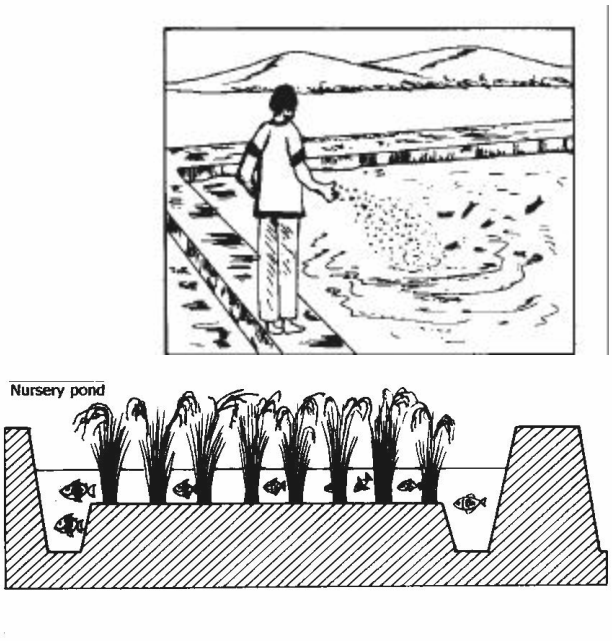


Fig.7.5: Fish farming in paddy fields

Semi-intensive culture system is another kind of aquaculture system, and it depends on the natural food produced *in-situ*. The production of natural food is enhanced by application of organic or inorganic manures or combination of both. At this level of intensification, the practices are invariably low-cost ones. Further intensification in this system is attained by increasing the stocking density and application of commercially available or farm-made or locally available agricultural byproducts like bran of rice, wheat, maize, various types of vegetables, and deoiled cakes as the supplementary feed.

Intensive culture systems are high inputs and high outputs based systems, which require certain infrastructure facilities, large investments and adequate managerial skill. Such systems depend largely on complete and commercially available feed, oxygenation of the system, exchange or circulation of water and so on. These culture systems are followed by corporate sector or commercial scale farmers and entrepreneurs.

Depending upon the level of intensification and extent of inputs used aquaculture practices are summarized in the Table 7.2.

7.4.2 Integrated Aquaculture Management Practices

Although many aquaculture projects have provided significant economic and social benefits with negligible environmental impacts there are several aquaculture industries, most notably the shrimp farming in certain Asian countries, that have significantly damaged the local ecosystems. Also these ventures have significantly damaged aquaculture's public image.

The main trend in aquaculture is towards sustainability. This issue of sustainability is likely to change based on how aquaculture is practised and what forms are desirable. One of the important realizations of this trend is that, to achieve full market potential the environment must be protected, as environmental damage results in a decrease in production and possibly the collapse of the industry.

Table 7.2: Types of aquaculture systems

Intensification levels	Major inputs	Some common examples
Extensive culture systems	– Seed from adjoining natural source or hatchery- produced or from both	Shrimp culture in paddy fields of Kerala Shrimp culture in bheries of West Bengal Shrimp culture in ghers of Bangladesh Fish culture/culture based capture fisheries in ox-bow lakes in Bangladesh Fish culture in seasonal and perennial tanks of Sri Lanka
Semi-intensive culture systems • Low-input based systems • High-input based systems	– Seed, manure, lime – Piscicide (once in several years for perennial ponds and only when drying is not possible) – Seed, organic and inorganic manures. – Feed (mostly farm made / compounded). – Lime, fuel or electricity for dewatering perennial ponds or Piscicide when drying is not possible – Common therapeutants	Carp polyculture in undrainable community and small family ponds Family level integrated fish culture in homestead ponds (VAC system of Vietnam) Integrated fish culture in larger ponds *Tilapia* culture in family ponds *Puntius* culture Oyster culture Composite carp culture in India Fish culture in family ponds Catfish culture in family ponds Shrimp culture in community pond complex Carp / prawn polyculture Sea bass culture
Intensive culture systems	– Seed, feed (mostly pelleted and commercially available) – Lime / dolomite – Piscicide Energy (electricity / gasoline) – Water (exchange / recirculation) – Oxygen (aeration) – Therapeutant – High level of management	Shrimp aquaculture Freshwater prawn culture Eel culture Culture of salmon and trout and other high valued species Culture in raceways Culture in high-tech indoor facilities

There are a number of issues that must be addressed for sustainability to be achieved. Among these are:

- *The development of an integrated infrastructure and appropriate management:* This system must encourage positive development of aquaculture, administrative and legal framework, institutional linkages, development policies, allocation of resources, zoning, and increased public awareness among other things.
- *More efficient resource usage*: Improved water management involving decreased usage is better usage, better feeding practices and less polluting feeds, improved health management, increased integration with agriculture and perhaps genetically improved stocks with specific pathogen resistance are the important side issues of more efficient resource usage. Disease control and the development of vaccines is important to establish efficient resource usage.
- *Avoiding permanent damages:* Negative environmental impacts that result in permanent damage must be avoided at all costs. If some environmental damage must occur it must not exceed the rate at which the environment can recover. This involves better site selection, planning, risk assessment, farm design, treatment of wastes, and the development of new more environmentally efficient technologies and techniques.
- *Establishing a database of aquaculture practices and effective management systems:* An adequate working knowledge of the impacts of aquaculture must be developed and also the means of communication so that all aquaculture farms can benefit from the information and avoid mistakes made by others.
- *Environmental quality enhancing practices should be maximized:* Some aquaculture practices such as mollusk and seaweed culture can have a positive effect on the environment by removing pollution from the local water systems. Systems that reduce pollution and are successfully integrated into the local ecosystem must be maximized.

Expansion of the aquaculture enterprise is expected through increase in area and intensifying production in existing aquaculture areas. Majority of the small and medium scale Asian farmers are primarily engaged in agriculture and aquaculture is the secondary or subsidiary farming activity. There is growing feeling among them that there is a limited scope for their development exclusively through agriculture. Main reasons being the marginalization of profit from crop farming due to increasing cost of inputs, erratic power supply, supply of sub-standard seeds, fertilizers and pesticides. Aquaculture, on the other hand, even at the subsistence level, assures substantial cash income from the sale of domestic surplus. Further, due to large number of native species of different feeding and living habits, aquaculture has great potential for its expansion in areas like saline soils, swamps, and flood plains, which are not suitable for agriculture. Farmers, although still keen to ensure food security for their families, are looking increasingly towards cash crops, trade and complementary activities to supplement their income and improve their living standards. Aquaculture is also viewed as one of the alternative farming activities.

A systematic approach that integrates the plant and animal materials in aquaculture farming and which assures use of wastes from fields and livestock farms as nutrients for fisheries is being increasingly preferred.

Using animal waste in fishponds

Direct feeding value of wastes is invariably low. Wastes usually stimulate phytoplankton production, and act as substrates for bacterial production (detritus) and as feed for zooplankton. These two processes are strongly interlinked, since phytoplankton is a major source of detritus for bacterial production. Also, phytoplankton, through photosynthesis, is the chief producer of dissolved oxygen in the pond which is used by all organisms including the fish.

However the following factors should be considered before using animal wastes in the fishponds:

1. Are any wastes available on-farm? If so, are the wastes already in use? Should the wastes be diverted for use in fish culture? Livestock wastes are often important as crop fertilizers and fuel. Consider the opportunity costs before making the choice.

2. Is it worth raising livestock, especially for the purpose of utilizing their wastes for aquaculture? Consider:

   - the costs/difficulties of doing so (e.g. feed availability and cost, marketing difficulties, technical abilities and interest of farmers); and

   - that inorganic manures are now cheaper to use than the livestock manures in many places.

3. Are all of the wastes to be utilized in fish culture? If wastes are to be used elsewhere, they should be collectible prior to entering the pond (e.g. use a sump/ small pond, see Fig. 7.6). Also, handling wastes available in larger quantities at certain periods when their use is reduced for fish culture (e.g. during the cool season) needs to be worked out in advance.

4. Can all wastes be collected and used? Feedlot livestock are kept confined at all times so all their wastes can be collected and used. Small-scale farmers often allow livestock to graze or scavenge during the day and only confine them at night. This reduces the feed costs considerably, often requiring only on-farm or low-cost, supplementary feeds to be given.

5. Livestock may be penned at the farmer's house for security or traditional reasons; this may limit potential advantages of integration. Labour is required to collect or prepare livestock feed.

6. Ponds may be multifunctional. Large animals are usually denied access to the pond because entry to and wallowing in it can destroy the dikes and cause turbidity, which reduces natural food production.

   Livestock wastes vary in terms of both quantity and quality, which are affected by the following:

   – quality of food given,

   – types of species (monogastrics and ruminants) and their size,

   – stage in life cycle (breeding, growing, and so on),

   – solids only or mixed with urine,

   – amount of waste feed,

   – contamination with bedding materials, rainwater, soil, and so on,

   – method and period of storage.

The following facts should be taken into account while designing an animal waste based fishpond:

- Young livestock tend to feed on diets higher in protein so their wastes have more nitrogen and are better as pond inputs.

- Ruminants' faeces contain high levels of carbon relative to nitrogen and these also discolour the water. If used alone, they generally give low-fish yields. Use of ruminants' urine is beneficial as it contains a better balance of nutrients.

- Laying hens are fed different diets than broilers.

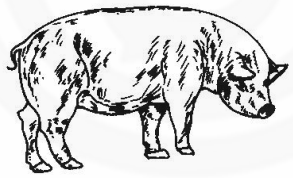
Layout/design options

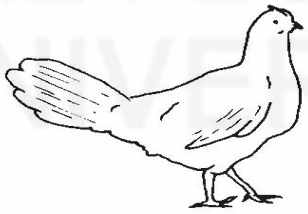
On the pond dyke	Over the pond
	
Pens close to the pond to reduce labour cost of loading waste	Pens are cooler and more humid

In the layout / design aspect, consider:
- size and number of livestock;
- space availability/land cost; and
- relative cost of materials

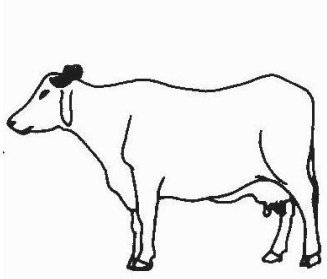
Design the pond to allow limited access

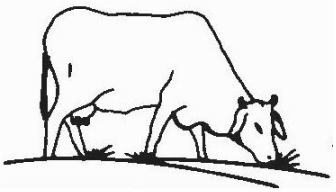
	
Fence around pond keeps buffalo out.	Fence across pond lets buffalo in water.





Pigs and chickens are mono-gastrics. They are fed a high-quality diet and their waste is high in nutrients.





Buffaloes and cows are ruminants. They are given a diet low in nutrients and their wastes too are low in nutrients. However, they are cheap to feed.

Fig.7.6: Aspects like pond design, and animal characteristic are important for utilization of animal wastes in fishpond (Source: www.fao.org/DOCREP/005**)**

Using plant material in fishponds

The use of plant materials for fishponds is a widely used practice in India. There are two concepts to feed the fish from plant materials as practiced in India:

1. The cultivation of aquatic macrophytes concurrently (*Trapa*) or in rotation (*Euryale*) with fish; and
2. The cultivation of terrestrial grass (*Napier*) on the banks of a pond and its feeding to fish.

In India, trapa (*Trapa bispinosa*) and makhana (*Euryale ferox*) are two seasonal, aquatic cash crops, which are grown extensively in Madhya Pradesh and Bihar, respectively. While the environment is not congenial for Indian carps, common carp goes well with trapa and an air-breathing fish species with makhana.

Trapa, is grown in perennial pond in the May/June season (see Fig. 7.7). These plants make use of the organic matter available there for their growth. In the same pond, in September-October, carp fingerlings are stocked. The layout for this type of pond is given in Fig.7.7 below:

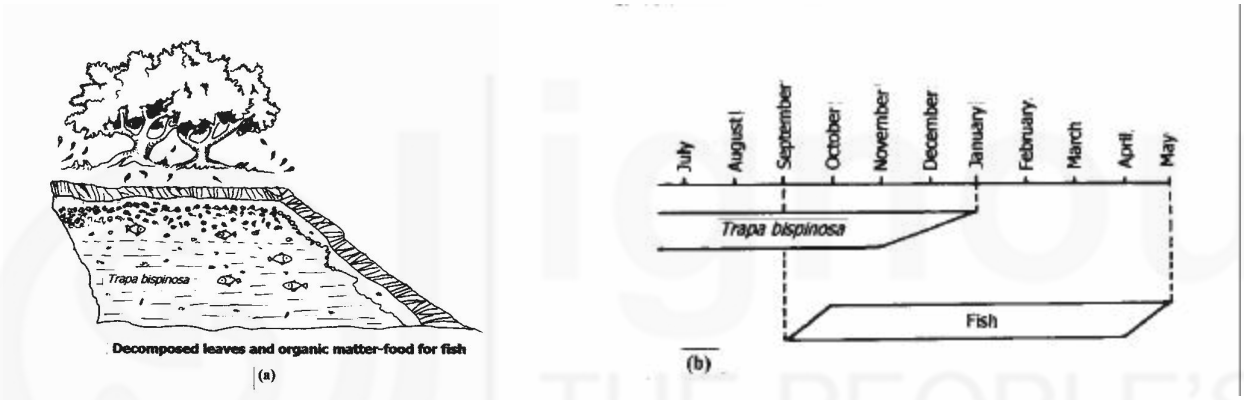


Fig.7.7: a) Design of a *Trapa bispinosa* based fishpond. b) Calendar depicting the sequence and timing of establishing the plant and fish communities in the pond ecosystem (Source: www.fao.org/DOCREP/005**)**

To use *Euryale,* the seeds of *Euryale ferox* sprout in February and the leaves cover the pond fully in May/June. The plants start fruiting in August that burst in October, scattering the seeds at the pond bottom which are collected by scanning the bottom mud. The air breathing fish is stocked in November and harvested in April. The layout of the fishpond for using *Euryale* is depicted in Fig. 7.8:

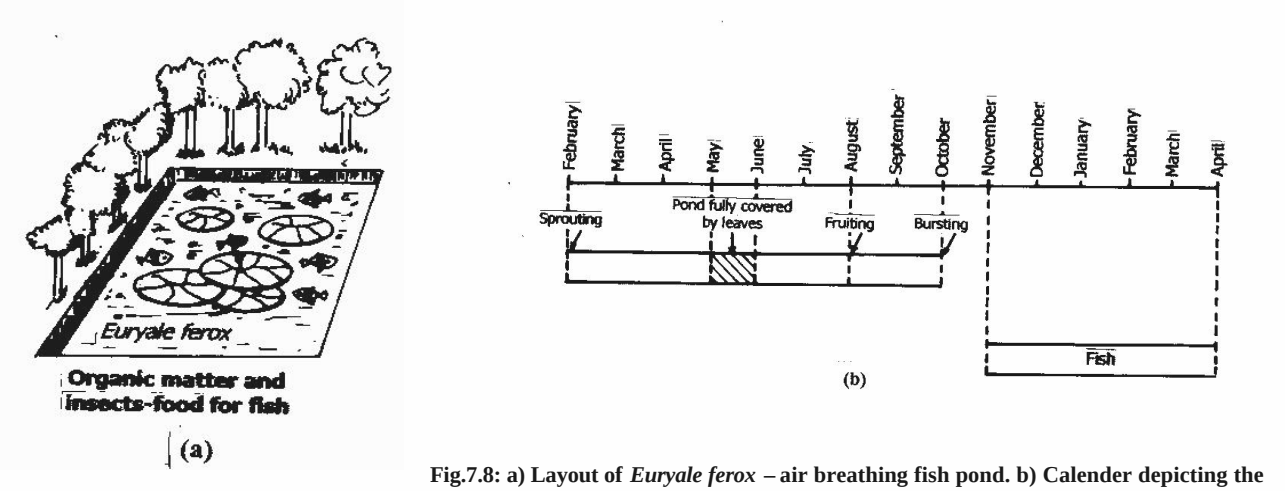


Fig.7.8: a) Layout of *Euryale ferox* – air breathing fish pond. b) Calender depicting the introduction and subsequent stages of life of the above two species (Source: www.fao.org/DOCREP/005**)**

It is important to know that green grass has an important role in feeding fish besides species like *Hydrilla*, *Ottelia*, and *Potamogeton*. Hybrid Napier, once sown on the bank of the pond, can be maintained for about five years, needing little irrigation during summers. A new system utilizing aquatic plants/green grass alone for fish production gives high yields at very low costs (see Fig. 7.9). It is labour-intensive but highly suitable for small, shallow ponds. To use Napier grass, the pond is prepared by draining it in May/June. Seven to ten days later pond is stocked with grass carp, which is fed on *Hydrilla.* Within about a week, the pond is also stocked with thala, rohu, mrigal, silver carp and common carp. Grass carp is gradually weaned from *Hydrilla* to Napier grass. Feeding is done regularly to its satiation. Silver carp, thala and common carp are the first to attain a weight of 1 kg each. From the fifth or sixth month onwards, these are harvested one after another. The fish stock in the pond is replenished with an equal number of fingerlings. Hybrid Napier is planted and manured and irrigated at interval of 10-15 days. The pond can be designed as shown in the figure below:

Fig.7.9: Depiction of the design and various activities in the development and maintenance of Napier grass based multi-species fishpond (Source: www.fao.org/DOCREP/005**)**

SAQ 4

a) What are the management imperatives of the extensive-, semi extensive-, and intensive-aquaculture systems?

b) Why are economic benefits from aquaculture directly dependent on the state of environment? Explain.

c) Detail the best integrated aquaculture management practices.

d) Discuss the pros and cons of using animal wastes for aquaculture purposes.

e) What all would you take into account to calculate the costs of animal wastes and plant materials usage in pond-based aquaculture?

7.5 INTEGRATED IRRIGATION MANAGEMENT

Most of modern agriculture is dependent on irrigation that is artificial addition of water in soils supporting the growing plants. Sources of irrigation water include ground water, nearby watercourses, such as rivers and streams, natural lakes and rivers and artificial reservoirs. Large-scale irrigation projects cause environmental problems and construction of reservoirs changes the local environment. Some likely outcomes of the latter are:

- habitats disappearance;
- changed stream flow patterns; and
- increase in erosion rates particularly in the watershed of the reservoir.

The performance of irrigation and drainage is critical to food production and the farmers' incomes, as well as to the environment. The ultimate goals in managing irrigation water are efficiency, equity and sustainability. Efficiency has been achieved if every drop of water has been properly allocated and used, without any wastage. The goal of equity means that water is fairly distributed among users. Some farmers may have an advantage over others. Those at the head of a canal have an advantage over those living downstream, as they have first access to water. Influential farmers may have better access to water than poor farmers. In some cases, the ideals of efficiency and equity may be in conflict. The goal of sustainability means that the users of today should maintain the quality and quantity of water resources for the use of future generations.

7.5.1 Problems in Irrigation Management

Managing irrigation so as to achieve efficiency, equity and sustainability is very difficult. Market mechanisms are not enough. High prices for water when it is scarcest means that low-income users may lose their access to water. Unrestricted use if prices are low may lead to pollution, waterlogging and overuse of groundwater.

Given the special characteristics of irrigation water, there is a good reason for governments to intervene, and even directly manage irrigation systems. However, when a centralized agency is in charge of planning and operating an irrigation system, the result is often too much bureaucracy. Too much money is spent on staff salaries. As a result, the cost of water is high, and yet the irrigation service is poor. Users are unwilling to pay their irrigation fees. The result is a vicious circle of high costs, poor services and low payment of fees, leading to inadequate funding and further deterioration of services.

One way out of this difficult situation is the participatory approach to irrigation management. Users are involved at all levels, including construction and operations. It seems to give greater efficiency at a lower cost.

7.5.2 Participatory Irrigation Management

The irrigation sector provides a rich source of experiences and lessons in user participation. Participation by farmers in system design and management helps to ensure the sustainability of the system, reduce the public expenditure burden, and improve efficiency, equity, and standards of service. Mobilizing support at all levels and establishing the participatory process, however, involves costs; it also demands knowledge of the expectations of each group of stakeholders and of the essential elements in building effective user organizations.

Participatory Irrigation Management (PIM) covers a variety of different ways in which water users can be involved in the planning, construction, operation and maintenance of irrigation systems. Participation ranges from being informed and able to express views to situations where users and their representatives jointly or solely

hold authority to govern irrigation systems and determine the irrigation services to be provided.

Benefits

Efforts to increase user participation have been spurred by poor performance in efficiency, equity, cost recovery, and accountability of many large irrigation systems managed by government agencies. Greater participation by farmers through water users associations has helped overcome many of these problems.

System performance: The overriding reason for increasing participation in irrigation is to improve system performance. Clear gains in efficiency and standards of service are achieved when the authority to design and management of the irrigation system are transferred to the farmers. System design benefits from the application of local knowledge, and the use of farmers' means minimizes costs and improves services. For example, irrigation user associations can reduce labour costs by paying lower wages than government agencies; local farmers can provide closer supervision of staff than distant agency supervisors; and the losses due to breakages are reduced as the farmers feel a greater sense of ownership.

Public Expenditure: One of the most noted effects (although this has nothing to do with farmers' motives for participation) is the reduction in government staff and expenditure requirements caused by farmer management and contributions of cash, labour, and materials. Farmer associations have proved more effective collectors of user fees than government agencies. It is not unusual for farmers to be willing to pay more than the original user rates after transfer of the system to their control. Increased collection of fees, however, does not motivate farmer participation. Participation must also result in direct benefits to participants.

Sustainability: Building irrigation systems that are wanted, supported, and owned by users themselves provides the best assurance of sustainability. Physical and fiscal sustainability of the irrigation system beyond the project is enhanced when operation and maintenance costs are met from user fees rather than high levels of government subsidy.

Equity: More equitable organizational arrangements and water delivery have been noted when participatory approaches are followed. A contributing factor is the socioeconomic status of the leadership, which tends to be closer to that of the ordinary member, involving more tenants and small farmers than in non-participatory systems.

Spillover Effects: The transformation of water users from beneficiaries to partners in irrigation management can have a widespread impact as farmers become trained and organized. It can increase local ability to coordinate input supplies, for example, and to deal with other government agencies involved in rural development

The following case study from Nepal demonstrates the outcomes of building participation in irrigation.

Nepal

Nepal has a long tradition of direct farmer participation and cooperation in irrigation management. About 70,000 farmer-managed irrigation schemes, ranging in size from very small to thousands of hectares, account for 70-80 percent of the country's irrigation. In general these systems achieve high levels of performance over long periods of time without incurring any government expenditure or involvement. Such systems, however, are frequently damaged by landslides and floods beyond the capability of farmers to repair alone. But most are of them can be improved substantially with modern materials and construction techniques.

A special irrigation line of credit was designed to assist these schemes by building on the farmers' traditional capability to organize and cooperate. To participate under the irrigation line of credit, farmers had to form legal farmer irrigation associations, agree

ahead of time to contribute to capital costs, pay full operations and maintenance costs, and maintain full control and responsibility for all the decisions regarding their irrigation schemes. Such stringent requirements had never been attempted before under any project in Nepal. But in practice these requirements simply formalized the farmers' traditional mode of irrigation management and provided an avenue for financial assistance that would strengthen rather than destroy the traditional farmer institutions. The irrigation line of credit approach proved highly successful, has become strongly demand driven, and is now being expanded to government-managed projects.

SAQ 5

a) List the main goals for management of irrigation water.

b) Who can be involved in the scheme of Participatory Irrigation Management? In what ways can they be involved?

7.6 SUMMARY

In this unit you have studied that:

Water is essential for life of human beings and other organisms. Although water exists in substantial quantities on earth however human activities are continuously affecting this resource both quantitatively and qualitatively. Effective management of water use and the associated resources is essential.

Coastal resources hold large quantities of water and these valuable resources have been getting affected by several human activities. An integrated coastal management programme involves integration of government and community, science and management, and policy and legislative framework.

Wetlands are destroyed and converted to agricultural lands for immediate benefits. This is mainly due to lack of information regarding their valuable role in effecting the water storage in the ecosystem. The wetland conservation should include information and awareness raising programmes for public and decision makers, change in agricultural, tax and water policy, enhancing institutional effectiveness and community participation.

Aquaculture although given less importance can give additional income to the farmers. Use of farm and livestock wastes in fishponds is an effective way of waste utilization in a purposeful and economically beneficial activity.

In majority of south Asian countries the agricultural land is predominantly irrigated. Irrigation management requires efficiency, equity and sustainability which is only possible by participation of community in development and implementation of irrigation projects and the related day to day activities.

7.7 TERMINAL QUESTIONS

1. "The integrated coastal management (ICM) approach is both comprehensive and holistic." Discuss this statement with the support of examples and related experiences, if any.

2. What aspects need to be looked into while developing any policy or deciding a management action pertaining to the coastal resource systems? Describe in detail.

3. Tabulate the good practices largely applicable to all the coastal management situations.

4. Discuss the role of wetlands in the regulation of water cycle.

5. 'Wetlands are nature's managers of water reserves'. Justify this statement.
6. "A large number of wetlands have been lost primarily due to inefficient management, and many others are in peril because of indirect effects of human actions." Explain what is meant by 'inefficient management' and 'indirect effects of human actions', qualify them.
7. Devise environment sustainability indices for the various aquaculture systems.
8. Compare an aquaculture system to any natural ecosystem with respect to the following attributes: components, food web structure, nutrient cycling, energy transfer dynamics and overall stability.
9. Why is environmental protection crucial for the economic success of an aquacultural enterprise?
10. The aquaculture industries especially of some Asian countries are viewed with discontent. What are its reasons?
11. What are the important aspects that need to be considered for designing and developing an animal wastes based fishpond?
12. Compare an animal wastes based fishpond with that of a plants materials based one with respect to the following points: simplicity, infrastructure required, inputs of time and efforts, economic returns, and environmental sustainability.
13. In what manner and in which precise areas has the user participation proved beneficial in irrigation management? Elaborate.

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UNIT 8 INDUSTRIAL WASTE MANAGEMENT

Structure

8.1 INTRODUCTION

Enormous quantities of wastes are generated during industrial activities right from collection of raw materials till the end product stage and there is an increasing concern over the disposal of these wastes in an environmentally safe manner. Over the last decade there has been a shift in dealing with wastes from simply disposing off towards adopting waste minimization strategies.

This unit focusses on various industrial waste management strategies along with several issues associated with the management of industrial wastes.

Objectives

After studying this unit, you should be able to:

- define and differentiate between the terms wastes and industrial wastes;
- describe the common ways of waste disposal and different treatments to mitigate its harmful effects;
- evaluate the benefits and risks associated with different methods of disposal and treatment of wastes;
- cite ways of waste minimization; and
- make use of the effluent standards and the emission standards for minimising generation of wastes.

8.2 INDUSTRIAL WASTES

Managing wastes is everyone's business, as we all produce wastes in almost everything we do. What does one mean by the word waste? Wastes can be virtually anything and can be of any consistency solid or liquid or gas. Industrial wastes, too could be in the form of solid, liquid or gas. Depending on their nature they are categorized as hazardous and non-hazardous.

Hazardous Wastes

Hazardous wastes are the ones, which cause or have the potential to cause harm to human beings or to other organisms because of their toxic, corrosive, flammable, explosive, reactive, or pathological nature. Some of the properties of hazardous wastes are self-explanatory, but others deserve further discussion. Toxic wastes can lead to

death or serious injury when inhaled, ingested, or absorbed. The chemical properties of corrosive wastes can cause deterioration of materials and body tissues particularly at the point of contact. Pathological wastes are hazardous because of their potential for spreading diseases. By definition, radioactive wastes are hazardous wastes, but they are usually classified in a separate category because of their stringent handling requirements and slow deterioration rates.

Non-hazardous Wastes

Non-hazardous wastes are those that are neither hazardous in nature as discussed above nor are municipal wastes. They include materials like containers, glasses and several inert chemicals produced during various manufacturing processes.

Waste Generation

The production of a large number of industrial goods involves the extraction and utilization of natural resources, and the disposal of the wastes generated in the process. Wastes are produced at every level in the industrial process from raw material stage to the consumption of the product. The following cycle illustrates the common ways and forms of waste generation at different levels in the industry (Fig. 8.1).

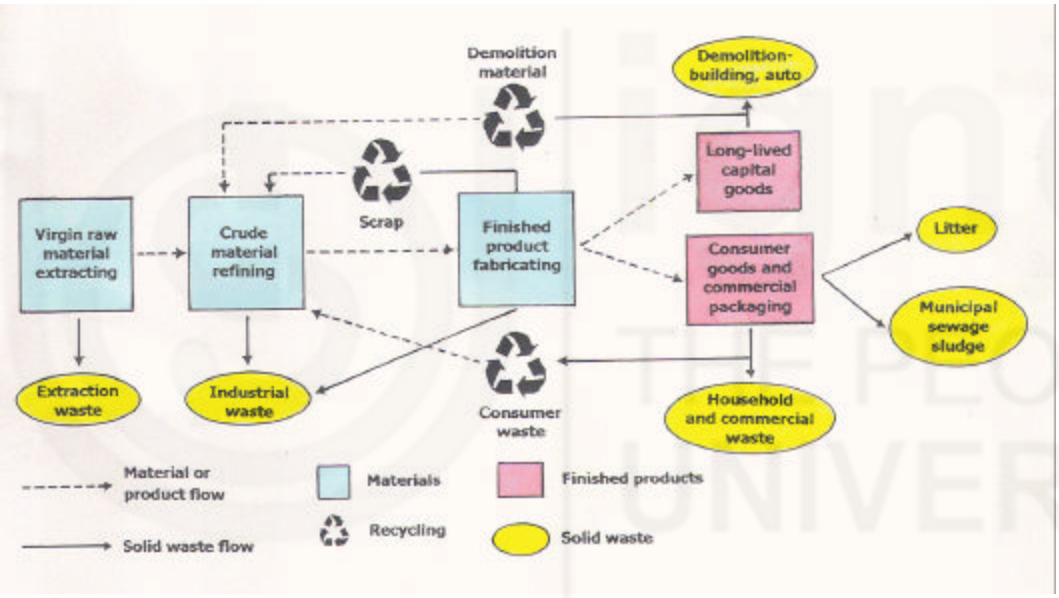

Fig.8.1: Different Levels of waste generation in a typical industrial set-up
(Source: http://www.texasep.ep.org/html/wst/wst.html**)**

Although there are variety of places to put the industrial wastes, none of the management or disposal alternatives have been fail-safe. Serious concerns about both commercial management of industrial wastes and on-site industrial management of wastes need addressal. Some of these concerns are:

- Hazardous and many non-hazardous industrial wastes are inherently dangerous to human health as well as the environment no matter how they are managed.
- Spills and leaks at hazardous and industrial land disposal units are harmful.
- Underground storage tanks invariably result in groundwater contamination.
- Abandoned oil, gas, and water wells located near hazardous waste injection wells could be possible avenues for the underground-injected hazardous wastes to seep up to the surface or into the underground drinking water supplies.

- The continued disposal of non-hazardous industrial wastes at both municipal solid waste landfills and industrial solid waste management facilities and at oil and gas exploration and production sites is not as highly regulated as is the hazardous waste disposal. In fact, municipal solid waste landfills are comparatively well regulated than the non-hazardous industrialsolid waste disposal sites, which often do not require permits, groundwater monitoring, placing the liners, and leachate collection systems despite the dangerous wastes they may contain.

- The specific health effects of many toxic substances are not well understood though increasing incidence of their impact on birth defects has attracted attention.

SAQ 1

a) Define wastes in a broader context.

b) Write ten kinds of wastes generated in your day-to-day life and characterize them using one or more terms like hazardous, non-hazardous, biodegaradeable, non-degaradeable and so on.

c) Differentiate between hazardous and non-hazardous wastes. Give one example of each.

8.3 INDUSTRIAL WASTE MANAGEMENT

Modern environmental management methods have now made it possible to overcome many of the problems which were earlier accepted as inevitable, but which are now seen to impede national development. Such methods emphasize:

- low-waste production processes;
- the use of safer processing chemicals;
- maximum recovery of residues;
- cost effective treatment of residues;
- preventive maintenance;
- good housekeeping; and
- competent operation.

Industrial solid wastes can be managed either on site – at the facility where it is generated, or transported off-site to other commercial facilities.

A set of priorities for effective management of industrial solid wastes, whether non-hazardous or hazardous, in decreasing order of preference are as follows:

1. Reduction at source;
2. Recycle and reuse;
3. Neutralization and destroying hazardous characteristics;
4. Burning;
5. Injection in underground water; and
6. Disposal on land.

We now discuss each one of them briefly.

8.3.1 Reduction at Source

The best means of waste management is to reduce the amount generated at the source itself. This approach along with waste minimization approach, often called pollution prevention, has become popular in the recent years.

The pollution prevention approaches emphasize reducing the environmental and financial costs associated with managing hazardous waste. Pollution prevention is based on two concepts:

1. The production of waste results in both loss of energy from the production process and loss of valuable resources; and

2. Once the waste is produced, money, manpower, and additional materials must be spent to manage the waste.

Approaches to waste reduction include:

a) **Source reduction**, which means reducing the amount of any hazardous or non-hazardous substance entering any waste stream or released into the environment prior to recycling, treatment and/or disposal.

b) **Waste minimization**, which means a practice that reduces the environmental or health hazards associated with hazardous waste, pollutants or contaminants. Processes like, recycling, neutralization, detoxification, and reuse are employed to achieve this objective.

c) **Source separation,** requires keeping hazardous waste separately from non-hazardous waste, thereby preventing all the waste from being managed as hazardous waste. It does not necessarily reduce the total volume of waste, but only segregates its hazardous components.

d) **Recycling and reuse**, which is the process of removing a substance from a waste and returning it to productive use. Recycling can happen at a plant, where the waste is re-used within the production process itself. Waste can also be recovered from off-site.

e) **Substitution of raw materials**, which involves replacing a raw material that results in hazardous waste with the one that results in less hazardous waste or none at all.

f) **Manufacturing process changes**, which either eliminates a process that produces waste or changes the process so that waste is no longer produced.

g) **Substitution of products**, which means eliminating the use of a hazardous material. For example, by substituting creosote-preserved wood posts with concrete posts, the problem of hazardous waste leaching from the posts can be overcome.

Source reduction techniques can be better illustrated by Table 8.1.

Table 8.1: Some measures for reducing waste-producing sources in industries (Source: United States Environmental Protection Agency, 1988**)**

Type of Source Reduction Measure	**Description and Example**
Product Changes	**Reduce waste/toxicity associated with a product's use**
1. Product substitution	Substitute water-based paints for solvent-based paints
2. Product concentration	Concentrate powder detergents thus requiring less packaging
Source Control	**Reduce waste/toxicity associated with a product's manufacture**
1. Input material changes	Reduce waste/toxicity of materials used in the production process
a) Material purification	Use a higher grade of crude oil during refining, thus reducing the amount of impurities that must be removed
b) Material substitution	Substitute water-based cleansers for solvent-based cleansers
2. Technology changes	Reduce waste through process and equipment modifications
a) Process changes	Improve the efficiency of chemical reactions
b) Equipment changes	Use mechanical scraping systems for cleaning rather than solvents
c) Process automation	Automation can optimize product yields by automatically adjusting process parameters
3. Good housekeeping practices	Reduce waste by means of procedural and administrative measures
a) Management and personnel practices	Offer employees education programmes, bonuses and awards to encourage them to reduce production of wastes
b) Waste stream segregation	Facilitate recycling by preventing mixing of different waste types, particularly the hazardous and non-hazardous wastes
c) Inventory control	Use input materials before expiry dates
d) Loss prevention	Check for spills and fix leaks from equipment
e) Cost accounting	Recover waste treatment and disposal costs directly from the departments or groups that generate the waste

SAQ 2

a) Discuss the shifts in industrial waste management in the light of modern environmental management methods.

b) In your opinion, what are the priorities for management of solid industrial wastes?

8.3.2 Recycle and Reuse

A variety of industrial wastes can be recycled for use as different products. There are three ways in which industrial waste recycling occurs:

- at the facility itself (on-site recycling),
- at commercial facilities which gather waste streams from several companies (off-site recycling), and
- when the waste products from one company are used as inputs in the production process of another company.

Benefits of recycling include:

- Less hazards to human health due to less generation of toxic wastes.
- Prevention of environmental degradation by enormous cut down on the waste materials;
- Promotion of efficient use of scarce natural resources.
- Reduced need for waste disposal facilities and reduction in waste disposal costs.
- Cost savings to industries by adoption of processes with reduced waste disposal and raw material costs.

The conventional approach of industry has been to take raw materials and energy to produce some form of product (with value). Ancillary wastes (without values) as depicted in Fig. 8.2 were generated in the process. In the past, these wastes have been disposed off as cheaply as possible.

Fig.8.2: A conventional model of manufacture
(Source: http://www.safesci.unsw.edu.au/gens8005/module.9**)**

With significant attention focussing on industrial processes, some industries have recognised that waste costs can be reduced through recycling and reuse (see Fig. 8.3).

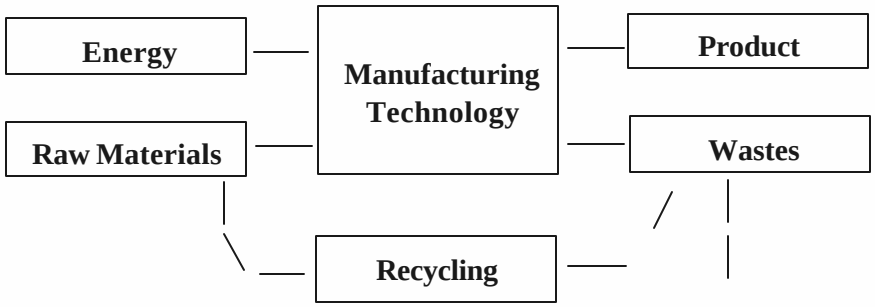

Fig.8.3: Model of industrial manufacture with integrated recycling process (Source: http://www.safesci.unsw.edu.au/gens8005/module.9**)**

Further, the hazardous qualities of wastes can be reduced through their treatment (Fig. 8.4). However, these "end of pipe" solutions can be expensive, and they are not linked with the manufacturing processes that generate the wastes in the first place.

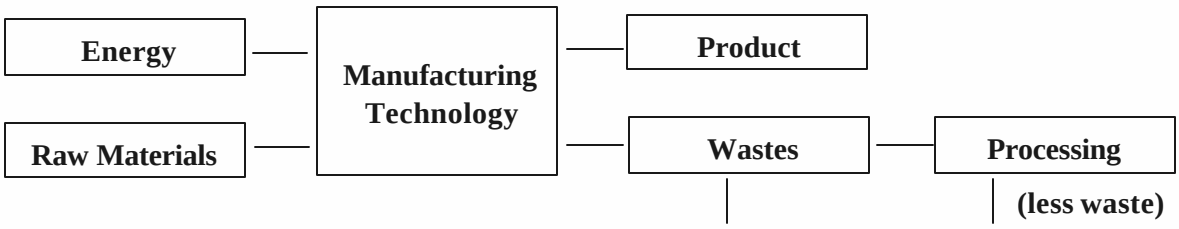

Fig.8.4: A model of industrial manufacture with "end of pipe" processing of wastes (Source: http://www.safesci.unsw.edu.au/gens8005/module.9**)**

Therefore, more recently, the term "cleaner production" has been given to manufacturing processes which look at the whole manufacturing cycle, from selection of raw materials, selection of less polluting technology through to pollution control and waste minimisation regime (see Fig. 8.5).

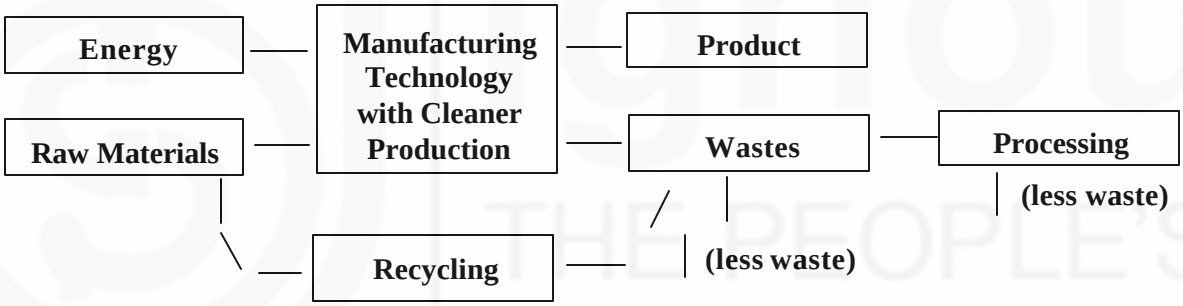

Fig.8.5: A model of industrial manufacture with cleaner production which include recycling and end of pipe waste treatment (Source: http://www.safesci.unsw.edu.au/gens8005/module.9**)**

8.3.3 Neutralization and Destroying Hazardous Characteristics

A variety of new and emerging technologies can neutralize and destroy the hazardous characteristics of industrial wastes. One new encouraging technology is known as **supercritical water oxidation**. The process is simple, but expensive. Water is heated, pressurized and mixed with organic compounds, which get dissolved. Later, oxygen gas is added to the mix and the harmful substances are burned away. What is left is harmless. This gigantic pressure cooker, unfortunately, is very expensive, and work is in progress to cut down the costs.

Other technologies currently being used in the market include:

- *Bioremediation:* This process uses microorganisms to clear the wastes such as the oil spills.
- *Carbon adsorption:* This is a process in which toxic substances adhere to a specially treated carbon surface.
- *Dechlorination:* This process chemically replaces chlorine with hydrogen or hydroxide ions, leaving chlorinated substances non-toxic.

- *Neutralization:* This process either makes an acid substance less so by adding alkaline substances, or makes a basic substance more acidic by adding acid.

- *Oxidation:* This process adds oxygen to substances such as sulfurs, phenols or cyanides, rendering them non-hazardous.

- *Precipitation:* This process separates solids from a liquid waste so that the solid portion can be managed more safely.

- *Vitrification:* This refers to the process that subjects materials to high voltage converting them into glass-like or non-crystalline forms.

8.3.4 Burning

In wastes management hierarchy, burning or combustion or incineration is preferred over the land disposal and underground injection methods as it reduces or sometimes eliminates hazardous characteristics of wastes. The other benefits of incineration include:

- reduction of weight and volume of wastes, which can then be land-filled in a smaller space, and thus increase the life of the landfill site.

- practically all the modern incineration facilities are designed to generate electricity to be sold to offset some of the costs of disposal.

- in the case of energy generation from wastes, the facility also provides energy for the generation process.

This process, however has the following drawbacks:

- Often, the trash does not burn completely besides giving out health affecting emissions. Despite being equipped with air pollution control devices, exhaust stacks emit toxic fumes into the air as burning oxidizes and vaporizes the assortment of metals, plastics, and hazardous materials that form part of the municipal waste.

- The incineration facilities are expensive to build, and their siting has the same problem as the landfills: no one wants to live near one, justifyingly so, as health is of prime importance.

- The incineration ash is often loaded with metals and other hazardous substances and must be disposed off responsibly in secure landfills.

- To rationalise the cost of its operation, the combustion facility must have a continuing supply of wastes. For that reason, the facility enters into long term agreements with municipalities. These agreements though necessary can lessen the flexibility of the community's solid waste management options.

Even if the incineration facility generates electricity, the process wastes both energy and materials, unless it is complemented with recycling and recovery. A number of incineration facilities compete directly with recycling for burnable materials such as newspapers and represent a major impediment to recycling in some municipalities.

8.3.5 Injection in Underground Water

Underground injection wells are used for the disposal of wastes in deep geological formations (see Fig. 8.6). It remains a controversial method. Some people believe that injection wells, when operated correctly, are safe; however, many environmental groups are concerned about the repercussions on a heavy reliance on this technology,

particularly the commercial facilities which utilize this technique to manage a wide variety of hazardous wastes. This method requires the hazardous wastes must be in liquid form before they can be injected underground.

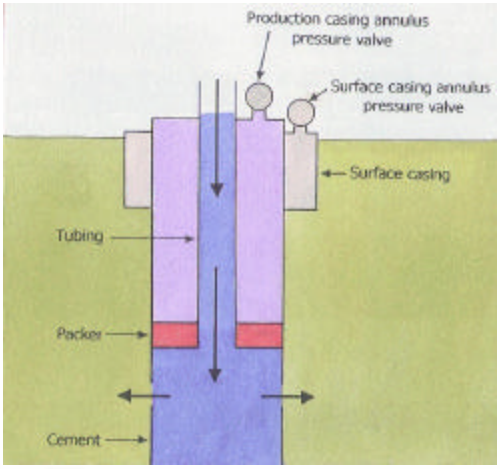

Fig.8.6: A diagrammatic representation of waste disposal operations by groundwater injection method (Source: General Accounting Office, Hazardous Waste: Controls Over Injection Well Disposal Operations, Washington, 1987**)**

It is agreed that waste disposal through properly constructed and operated injection wells is safer and less likely to contaminate surface water or potable groundwater than are landfills and other forms of land treatment. The injection of hazardous wastes into aquifers that serve or could serve as groundwater supplies for communities is not allowed. It is pertinent to know that there are several pathways by which wastes injected underground could contaminate water resources, and the most prevalent ones are:

- injection of wastes above aquifers containing drinkable water;
- leakage of wastes through inadequate confining beds;
- leakage of wastes through confining beds due to hydraulic fracture or faults;
- displacement of saline water into a potable aquifer;
- upward migration of waste liquids from the injection zone along the outside of the well casing;
- escape into potable aquifers due to well-bore failures; and
- vertical migration and leakage to land and aquifers through abandoned oil, gas and other forms of wells.

To avoid these problems periodic groundwater monitoring in the area of injection well is recommended. However, some environmental groups also argue that wastes could migrate and spread beyond the zone of injection well over to wider areas in the long term. Such forewarnings should be considered and examined.

8.3.6 Disposal on Land

The hazardous wastes are disposed off on land by the following four ways: in landfills, in surface impoundments, in land treatment units, or in waste piles (Fig. 8.7). Landfills are controversial for a simple reason that past and present experiences has shown that such facilities eventually leak hazardous materials, which contaminate both the nearby soil and surface and groundwater.

a) **Landfills** are disposal facilities where hazardous and other solid wastes are placed into the land. Landfills designed according to the laid down rules whereby they must contain systems to collect contaminated surface water run-off as well as have synthetic liners below and around the landfill.

b) **Surface impoundments** are depressions or digged areas where solid wastes can be stored, disposed off or treated. Pits, ponds, lagoons and basins are all forms of surface impoundments.

c) **Waste piles** are accumulations of solid wastes, sometimes used as disposal sites and sometimes as storage facilities.

d) **Land treatment** is a disposal process in which solid wastes are placed on top of or mixed into the soil. Land application or lands farming facilities, are examples of land treatment. These are increasingly becoming popular especially with the researchers searching for effective and environmentally safe ways of wastes disposal.

Problems with land disposal

Wastes disposed off at land undergo many physical and biological changes of which some are desirable or and others are undesirable.

The changes causing concern include:

- Leachate generation and groundwater contamination;
- Methane production;
- Incomplete decomposition;
- Open dumping, which is also aesthetically undesirable;
- Settling and compacting of wastes, which degrades the quality of land.

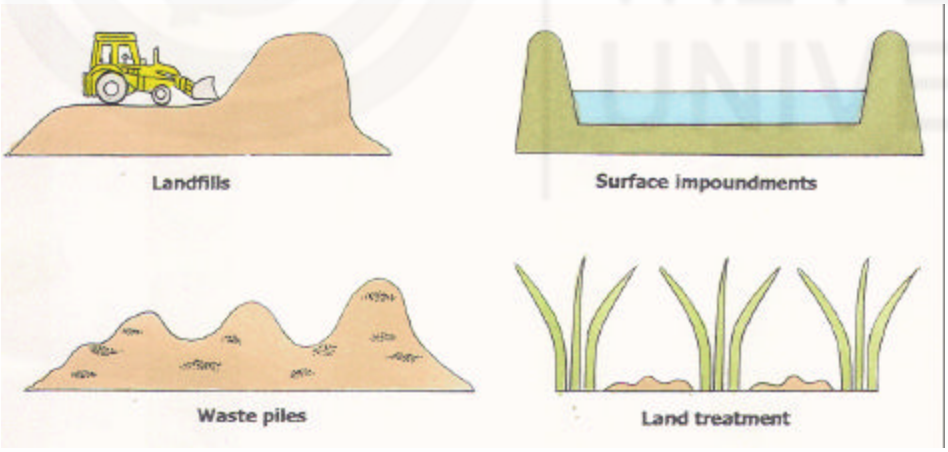

Fig.8.7: Diagrammatic depiction of different types of waste disposal on land

SAQ 3

What are the outcomes and applications of the following approaches adopted by industries for managing solid wastes:

i) Reduction at source;

ii) Recycling and reuse;

iii) Neutralization;

iv) Burning;

v) Use of injection wells; and

vi) Disposal on land.

8.4 POLICY AND REGULATORY MEASURES

As virtually everything could become a waste and consequently a pollutant, only some general guidelines on how to manage the wastes are discussed here.

A **waste management policy** at the enterprise level should comprise the following steps:

- *Identification and control:* know waste streams and classify them according to their harmfulness and their possibilities of reuse and recycling as the basis for further actions.
- *Prevent and reduce:* Search for all possibilities to eliminate or reduce wastes at their source.
- *Recycle and reuse:* make best use of the existing wastes, use them for resource saving.
- *Dispose:* develop safe methods of disposal.

Any management strategy that includes the four steps explained above, can effectively deal with wastes and pollution thus improve environmental performance in a cost effective way.

The **legal** and **regulatory frameworks** within particular countries affect decisions and actions taken for waste management. In countries where environmental agencies and policies have been established for the protection and enhancement of the quality of environment, standards may well be available against which environmental management decisions can be judged or tested. A well developed system of regulatory emissions standards or objectives may place constraints on the environmental management of an organization, but will also provide a basis for measuring performance.

Environmental regulations are a means towards three basic objectives:

- To protect and conserve the environment as well as maintain environmental quality (air, water and land).
- To protect human health.
- To regulate resource consumption on the national level. The regulations can be differentiated in three categories.

Basic and enabling regulations defining objectives and powers of legislative and executive bodies.

Environmental quality and anti-pollution regulations.

Resource conservation or resource management.

Environmental quality and anti-pollution regulations are further divided into air quality, water quality, solid waste and toxic materials regulations. They establish the criteria, define pollutants, set permissible limits and regulate control methods. These limits or standards set by the government agencies ideally reflect the state-of-the-art technology available for pollution monitoring and abatement. These standards not only ensure safety and health, but also become a main concern to managers to comply with these standards. You may log on to the website of Ministry of Environment and Forests, Government of India, for getting more details on the subject: **http://www.envfor.nic.in**

The regulatory approach for management of wastes is the most effective if the sanctions (e.g., jail terms, fines) associated with contravening those regulations are sufficient to counter industry's perceived avoided cost of continuing with its current, wasteful practices.

Besides the command and control approach of managing wastes the second approach is 'Polluter pays', which implies charging the industries that generate wastes. This principle is widely implied as the waste is increasing day by day so it becomes expensive for the larger industrial units to pay for the effluents. **Effluent charge** is the most effective tool for compliance with standards. This charge is calculated on the basis of pollution load, i.e., the kilograms of pollution carried in industrial effluents and heavy enough to exceed the cost of installing and operating cleaner production methods.

Motivation and Barriers

There are a number of factors that can motivate industry to reduce, reuse and recycle its wastes. Implementing a waste minimization programme has been shown to help reduce production and waste disposal costs. It may also improve a company's corporate image or facilitate compliance with existing or future pollution regulations. Finally, it can be beneficial for the environment in a number of ways, e.g., by reduction of pollution on-site, at waste disposal sites, and the reduction in energy and raw material inputs used.

There are also a number of barriers that can hinder the implementation of waste minimization programmes. These pertain to the following categories:

1. Economic;
2. Information;
3. Technological;
4. Regulatory;
5. Attitudinal; and
6. Physical.

The first four barriers are more prevalent in the developing countries while the last two are encountered both in the developing as well as in the developed countries.

The major **economic barrier** is the cost of purchasing, maintaining and operating waste minimization equipment. Other economic barriers include lack of a market for recycled or reusable materials, and the high cost of waste disposal.

Information barriers include lack of awareness about waste minimization incentive programmes, technologies, markets, and the amount and type of waste generated by a company.

A **technological barrier** exists if technologies for recycling a specific waste stream do not exist or if product specifications are too stringent to allow the use of recycled or reused products and materials.

Finally, **lack of pollution control regulations** and their enforcement also act as a barrier to waste minimization initiatives.

An example of **attitudinal barrier** is when the management is reluctant to take risks and is unwilling to consider changes in existing manufacturing processes or procedures for fear of affecting the product quality. Organizational inertia is another reason why firms are reluctant to undertake a waste minimization programme.

There are two main types of **physical barriers** to the implementation of waste minimization programmes. The first one is the problem of having insufficient quantities of wastes to justify internal use or external collection. This barrier is particularly significant for small scale industrial firms that generate lower volumes of

wastes than medium and large firms. Another physical barrier arises from the lack of sufficient storage space to accumulate wastes for collection. Again, this tends to be a significant problem for small and very small firms.

The effect of waste minimization barriers can vary in their influence depending not only on the size of a firm but also on the type of its industrial activity and on its ownership. Variations in an industry group may exist because of differences in raw material inputs, differences in the types of waste materials generated, differences in production processes, and differences in product specifications.

There are several ways in which a government can attempt to overcome the above-mentioned barriers and encourage industrial waste minimization activities. These include the provision of technical assistance programmes, the creation and enforcement of pollution control regulations, the dissemination of information about the waste minimization programmes and the opportunities, the provision of financial incentives, and award recognizing the significant achievements in waste minimization. In developing countries, the implementation of many of these types of waste minimization incentive programmes can only be made possible with the backing of foreign aid.

The dissemination of waste minimization information can be undertaken directly by the government authorities, or governments can provide funding to universities, non-government organizations, or business associations for such programmes. A wide range of activities could be supported in an information dissemination programme, including education and training activities, the creation of a waste exchange, and the distribution of technical information bulletins.

SAQ 4

a) The knowledge about which aspects of an enterprise is essential for framing its waste management policy?

b) Highlight the need for having a regulatory framework for managing industrial wastes.

c) What are the barriers that dissuade industries in taking waste minimization initiatives?

d) Suggest ways and means by which industries could be encouraged to implement waste minimization programmes.

8.5 SUMMARY

In this unit you have studied that:

Wastes generated from industries are heterogeneous in nature and they could be in the forms of solids, liquids, sludges and gases. In the wake of heightened environmental concerns about waste generated by industry, end of pipe approach to manage waste is largely adopted which concentrates on the safe disposal or treatment of the generated wastes. This approach is expensive and has not significantly benefitted the environment.

The new approach is called cleaner production approach, which attacks the environmental problem at its roots. It requires reduction of waste at source; adopt reuse and recycling methods thus reduce waste generation, conserve natural resources and energy.

To overcome the problem of waste, industry should take voluntary action before time otherwise it would be enforced to do so by the government. The waste policy of industry should emphasize on prevention and reduction of waste, recycling and reuse.

Many countries, which have environmental agencies, have set standards for the discharge of wastes and for effective compliance adopted market-based approach of effluent charging. However some of the barriers in management of industrial waste can be overcome by effective government policies.

8.6 TERMINAL QUESTIONS

1. List the concerns that compel to search for alternative ways of waste management.
2. Which emphasis-areas in the modern environmental management methods have helped to overcome several industrial waste management problems that were earlier considered inevitable?
3. What factors govern the decision that the wastes from a particular industry are to be managed on-site or off-site?
4. Suggest some criteria for selecting the most efficacious management strategy for a particular kind of industrial solid waste.
5. Mention the aspects that you would consider in devising a management strategy to improve environmental performance of an enterprise especially with regard to the wastes generated and the pollution caused.
6. Do you think that having a 'one-fits-all' wastes management policy is the right approach for the following scales of industry? Argue.

   i) Cottage industry
   ii) Small-scale industry
   iii) Public sector Undertaking

7. Despite having a regulatory framework for waste management, the industrial wastes and pollution related problems are on the rise in and around the industrial areas. Present your analysis focussing on the shortcomings and deficiencies in the regulatory framework, and suggest the remedial actions.
8. Are you for or against the 'Polluter Pays' approach of wastes and pollution management particularly in the industrial context? Elaborate.
9. 'Implementing waste minimization programmes by industries are beneficial to all – the industry, consumers, and the environment, both in short as well as long term'. Discuss how?

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NOTES

UNIT 9 ECONOMIC DIMENSIONS

Structure

9.1 INTRODUCTION

In the previous block you have studied about various dimensions of environmental management approaches pertaining to four major sectors, viz. agriculture, forestry, water resources and industrial processes outcomes. In the unit 9 of this block we will discuss the various economic dimensions for addressing environmental concerns.

The idea of integration of economic concepts in environmental management is not very old. Economic instruments are now considered as the best approaches to control pollution and resource exploitation. This unit will introduce you to the basic concepts of environmental economics and focus how these could be applied in the analysis of environmental issues. The unit discusses: causes of environmental degradation; use of desirable resources and minimisation of pollution; how resources could be used. The economic dimensions of environmental management are: internalisation of externalities, discount factor, cost benefit analysis, cost effectiveness analysis and market based incentives and disincentives.

Objectives

After studying this unit, you should be able to:

- explain reasons for environmental degradation;
- explain as to how internalisation of external cost could prevent resource exploitation;
- discuss the role of discount factor in limiting the growth and sustainable development;
- describe cost benefit analysis and how it could be applied;
- describe cost effective analysis and its limitations and drawbacks; and
- discuss market based approaches to control pollution.

9.2 ENVIRONMENTAL ECONOMICS: AN INTRODUCTION

Not long ago, the idea of environmental economics seemed to have many a superficial concern, something not related to the everyday world of commerce, industry or most of people's lives. This idea has now changed. The total costs of dealing with environmental issues are very large. By accepting the importance of environmental issues, we have agreed to bear these costs and therefore, we cannot ignore the issue of the economics of environment.

Our economic analysis involves two different kinds of environmental issues: the use of desirable resources, such as fish in the ocean, oil in the ground, or forests on the land; and minimisation of undesirable pollution. Environmental decision-making often involves analysis of both economic factors and intangibles, such as aesthetic factors. Of the two, the intangibles are more difficult to deal with because they are hard to measure and to value. Nonetheless, evaluation of the intangibles is becoming more important in the local, regional and national land use planning. The purpose of environmental economics is to develop a method of aesthetic evaluation that provides good guidelines, and is easy to understand, and quantitatively credible.

As discussed earlier, our economic analysis of environment involves the use of desirable resources and the minimisation of undesirable pollution.

9.2.1 Resources

Some biological resources, such as the forestland are on the publicly owned lands that are accessible to everyone. A society that controls resources such as public lands and waters has a number of social mechanisms to achieve its environmental goals. Laws and regulations are the method; by which use of resources by individuals or companies can be limited by setting quotas or by regulating use through licenses or a society may simply rely on individual motivation, on the assumption that what people find best for themselves will also be best for the society. This approach provides the individual complete freedom of action.

Those who are concerned about the environment often wonder why individuals do not choose to act in a way that leads to the protection of the environment and maintains biological resources in a renewable state. When individuals get benefited from the resource, it would seem to be in their best interests not to damage or destroy it. One explanation is provided by the economic analysis, which shows that the profit motive, by itself, will not always lead a person to act in the best interest of the environment. When a resource is shared, an individual's personal share of profit from exploitation of the resource is usually greater than the individual's share of the resulting loss. This is called "tragedy of the commons." There are many examples of commons, both past and present, but the important one today is deep oceanic sea beds. The high seas have always been considered as areas open to all and not the property of any single nation. Another example is Antarctica. Although there are some national territorial claims on this continent, most of the continent is common. Without some management or control, all natural resources treated like commons will inevitably be destroyed.

Another reason the individual tends to over exploit the natural resources held in common is low growth rate of resources. It is quite reasonable and in fact quite practical if one considers only direct profit and harvest resources as much as s/he can. The problem of commons makes several points clear.

1. If we want to conserve resources, we must think beyond the immediate and direct economic advantages.

2. Policies that seem ethically good may not be the most profitable for an individual.

9.2.2 How Resources can be Used?

Most economists look at resources as means to an end, rather than having value in them. Resources have to be used to be of value e.g. if you bury your saving in a jar in the ground it will last longer but may not be worth much when you dig it up. If this saving is invested productively, it will have much more value in the future than now. Further, a window of opportunity for investment may be open now but not later. How do we determine the value (or price) of environmental goods and services? Some of the most crucial environmental factors that may shape our future are not represented by monetary values in the marketplace. Certain resource allocation decisions are political or social. Other resources are simply ignored. Groundwater, sunlight, clean

air, biological diversity, and other assets that we all share in common are often treated as public goods (benefits) that anyone can use freely. Our economic system typically has not changed for using the absorptive capacity of the environment to dispose of wastes despite ample evidence that this capacity can be exhausted.

In theory, these resources are self-renewing, but many vital environmental assets are threatened by human activities. If we damage basic life support systems of the biosphere, we cannot simply substitute another material or service for the ones that have become limited. The crux of this question is how we should manage resources in a market system. Let us now look as to how our economic system handles the internal and external costs and the discount factor.

9.2.3 Internalising the Externalities

Internal costs are the expenses (monetary or otherwise) that are borne by those who use a resource. Often, internal costs are limited to the expenses involved in gaining access to the resource and turning it into a useful product or service.

External costs are the expenses (monetary or otherwise) that are borne by someone other than the individuals or groups who use a resource. External costs are often related to public goods and services derived from nature. Some examples of external costs are the environmental or human health effects of using air or water to dispose of wastes. Since these effects usually are diffuse and difficult to quantify, they do not show on the ledgers of the responsible parties. They are likely to be ignored in private decisions regarding the costs and benefits of a purchase or a project. One way to use the market system to optimise resource use is to make sure that those who reap the benefits of resource use also bear all the external costs. This is referred to as internalising costs.

An externality is an effect not normally accounted for in the cost revenue analysis of producers. Air and water pollution provide good example of externalities. Consider the production of nickel from ore at the smelters, which has serious environmental effects. Traditionally the economic costs associated with the production of commercially useable nickel from an ore are the direct costs borne by the producers and passed directly on to the user or purchaser. In this case the direct cost includes the costs of purchasing the ore, of energy to run the smelter, of building the plant and of paying employees.

On the other hand, the costs associated with the degradation of the environment from the emissions from the plant are traditionally considered externalities and are called indirect costs. Some environmentalists suggest that indirect cost should be included in the cost of production through taxes or fees. In this way, the expense would be borne by the corporation that benefits directly from the sale or would be passed on to the users. Others suggest that these costs should be shared by the entire society and therefore paid for by the general taxation of citizens.

9.2.4 Discount Factor

“A bird in hand is worth two in the bush.” All of us are familiar with this saying which suggests that it is better to have something now than in the distant future. This economic concept, the future value compared with the present value, is another important idea for environmental studies. Economists refer to this concept as discount factor. The discount factor is the ratio of future worth to present worth. Economists observe that market determines a discount factor that is often, but not always, less than 1. A discount factor less than 1 means that something promised in the future has less value than something given today. The market determined discount factor is the result of the interaction of the consumer’s preferences for present instead of future consumption.

As an example, suppose that you find yourself thirsty in a desert and meet two people; one offers to sell you a glass of water now, and the other offers to sell you a glass of

water if you can be at the well tomorrow. How much is each glass worth? If you believe you will die today without water, the glass of water today is worth all your money and the glass tomorrow is worth nothing. This is an extreme example of a discount factor.

In practice, things are rarely so simple and distinct, but we all know that we are mortal, so we tend to value personal wealth and goods more if they are available now than in future. Modern concerns with the environment have placed a new emphasis on the discount factor. Conservationists often argue that we have a debt to future generations and must leave environment in at least as good condition as we have found it. They argue that future environment is not to be valued less than the present.

Different attitudes towards the discount factor pose a dilemma for environmental studies. Firstly, economists argue that it is difficult, if not impossible, to make a sound economic analysis when the discount factor is greater than one. Secondly, many people argue that humans really do place a higher value on a possession in hand today than on one promised tomorrow. The concept of discount factors however important as we seek the environment.

SAQ 1

Explain the following concepts:

1. Commons;

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2. Tragedy of Commons;

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3. Internalising the externalities;

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4. External cost;

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5. Discount factor;

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9.3 COST BENEFIT ANALYSIS

One way to evaluate the outcomes of large-scale public projects is to analyse the costs and benefits that accrue from them in a cost benefit analysis. A cost benefit analysis compares the estimated costs of a project with the benefits that will be achieved. Such an analysis is often used as a means of rationally deciding whether to proceed with a given project. All costs and benefits are given monetary values and compared by means of what is commonly referred to as a benefit cost (or cost benefit) ratio. A favourable ratio for a project means that the benefits outweigh the costs. Such a project is said to be cost effective, and there is thus an economic justification for proceeding with it. The analysis usually involves considering several options for accomplishing the project and selecting the option with the best cost benefit ratio. If costs are projected to outweigh the benefits, the project may be revised, dropped, or shelved for later consideration.

This process assumes that values can be assigned to the present and future resources, given proper criteria and procedures. It is one of the main conceptual frameworks of resource economics. This process is controversial, however, because it deals with vague and uncertain values and compares costs and benefits that are as different as apples and oranges. As shown in the Fig. 9.1, several different tributary paths come together to determine the final outcome of this process. The easiest equation is to quantify the direct costs and benefits to the developer or investor who has proposed the project; i.e., the out of pocket expenses and the immediate profits that will result from this investment. These direct monetary costs and benefits are usually the most concrete and accurate components in the analysis. It is important that they do not outweigh the other factors which are more difficult to ascertain but are equally important.

The other branch of the flowchart involves analysis of more diffuse, non-monetary factors such as environmental quality, ecosystem stability, human health impacts, historic importance of the area to be affected, scenic and recreational values, and potential future uses. These are difficult values to quantify. It is even more difficult to express them in monetary terms.

How much are beauty or tranquility worth? What are the benefits of ethical behaviour? How much would you pay for good health?

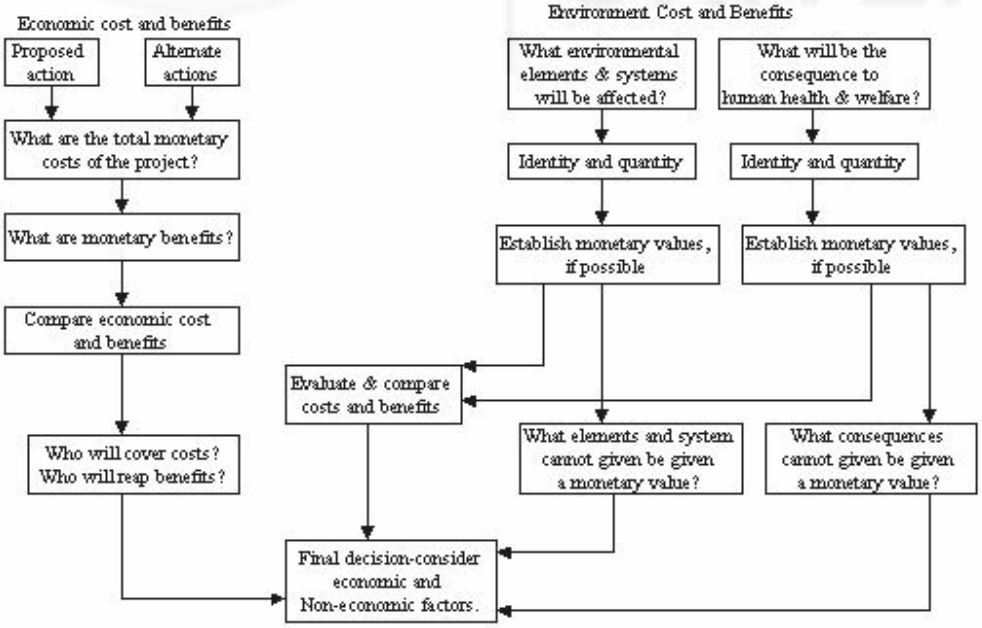

Fig.9.1: A Flow-chart for a cost benefit analysis
(**Source:** Cunningham & Saigo, 1995)

Some costs and benefits simply cannot be expressed in monetary terms. These invaluable (in a positive sense) factors bypass the mathematical stages of comparison and are considered, in the final decision making process, which is more political than mechanical. The distributional considerations include; as to who will bear the costs of the project and who will reap the benefits? If there are two different groups of people, as they usually are, questions of justice that arise must be resolved.

Criticisms and complications of this process include the following:

- *Absence of standards:* Each person assesses costs and benefits by his or her own criteria, often leading to conflicting conclusions about the comparative values of a project. It has been suggested that an agency or influential group set specifications as to how factor should be evaluated.
- *Inadequate attention to alternatives:* To really understand the true costs of a project, including possible loss of benefits from other uses, it is essential to evaluate alternative uses for a resource and alternative ways to provide the same services. These steps are often slighted.
- *Assigning monetary values to intangibles and diffuse or future costs and benefits:* Some critics of this process claim that we should not even try. They believe that attempting to express all value in monetary terms suggests that only monetary gains and losses are important. This can lead to the "slippery slope" argument that everything has a price and that any behaviour is acceptable as long as we can pay for it.
- *Acknowledging the degree of effectiveness and certainty of alternatives:* Sometimes speculative or even hypothetical results are given specific numerical values and treated as if they were hard facts. We should use risk assessment techniques to evaluate and compare uncertainties in the process.
- *Justification of the status quo:* Agencies may make decisions to go ahead with a project for political reasons and then manipulate the data to correspond to the preconceived conclusions.

Cost benefit analysis, however, intends to build efficiency into policy so that the society does not have to pay more than it is necessary for a given level of environmental quality. If the analysis is done properly, it will take into consideration all the costs and benefits associated with a regulatory option. In doing so, it must address the problems of externalities.

Cost and benefit analysis works well only if all the costs and benefits of a polluting activity are included in the calculations. Let us assume this is possible. What would happen if everyone had to pay the true costs of their use of environment as they used resources or degraded the air or water? Such charges are often called green fees. The two groups that frequently oppose each other are the economists and the environmentalists; both agree that such a policy would go a long way towards solving many of our environmental problems.

Economists point out that in a free-market economy, the market will guarantee that resources will be used in the most efficient way. This means that business and people who use, say, 100 gallons of gasoline and have to pay a levy that reflects the true costs of that gasoline will be highly motivated to keep their use of gasoline to an absolute minimum. They will adopt alternative modes of transportation and more efficient vehicles. The green fee could be imposed as a tax on gasoline, and to ease its impact on the economy, the fee could be implemented gradually until it brings the price of gasoline to its true level. Environmentalists say that the people who do the damage pay for their environmental impact, something which the environmental groups have been calling for all along. They insist that some of the revenues collected should be used to mitigate the impact of pollution and resource use, but if this were to be accomplished, the outcome would move over society in the direction of sustainability.

Sardar Sarvar dam on the Narmada, as well as all big dams, presents classical case which illustrates the various dimensions of cost benefit analysis. Some of the costs are intangible and can not be easily assessed in any techno-economic appraisal, as the construction of major dams, involve immense cost and long period of time, profoundly change the face of nature. They tend to alter the hydrological system; usually entailing deforestation in the submersion area and in the surroundings; the displacement of the local people who may benefit little or not at all.

At the same time benefits also involve some intangible gains such as in semi-arid areas canal waters are used not only for irrigation but also to wash clothes; easier accessibility to water may enable young girls who spend long hours fetching water for domestic chores to attend school instead. More water could also improve health by reducing commonly prevalent skin diseases. So the project would involve financial cost benefit analyses as well as environmental impact assessments. It is argued that such analyses however themselves can not determine whether a big dam is worth building or not. The society has to decide what kind of future it wants and what price it is willing to pay and what probability of risks it is willing to bear. There has to be some clarity regarding empirical situation which is markedly absent in the environmentalist debate.

However, human and environmental considerations have altered the conventional cost-benefit ratio, as greater public pressures and legal interventions are ensuring better rehabilitation of displaced people and compensatory afforestation. There is a strong feeling and demand for reassessment with regard to big dams. People are not likely to benefit automatically if big hydroelectric dams are no longer built either because of opposition of environmentalist or a cut in resources. Rural clarification, street lighting in villages and urban slums and household lighting are important needs that well have to be met.

9.3.1 Cost Effectiveness

We know that with modest degree of clean up, the benefits of a project can outweigh the costs. In the clean up efforts, at some point, the costs of controlling pollution could exceed the benefits. Consequently while it is argued that we should strive for 100% control, demanding more than 90% control may involve enormous costs with little or no added benefits. At the point when control of a particular pollutant reaches 90%, it makes more sense to allocate funds and efforts to other projects where greater benefits may be achieved for the money spent. Optimum cost-effectiveness that meets the efficiency criterion for public policy is achieved at the point where benefits outweigh the cost. Cost effective analysis provides an economic justification for proceeding with the project or activity.

In reaching the goal of cost effective analysis, problem arises in comparing the cost and benefits. Even after valid cost and benefits estimates are obtained, the comparison is often complicated as during the initial stages of control, costs are high and the observable benefits are usually few or none. As time passes, however, costs generally level off, while benefits increase and accumulate. Consequently, whether benefits outweigh cost or vice versa depend on whether one takes a long term or short term view. A situation that seems cost ineffective in short term may be extremely cost effective in the long term. This is particularly true for the problem such as acid rain or ground-water contamination from toxic wastes. In these instances, the consequences of delaying control may seriously affect large geographic areas and many millions of people, and they may be irreversible.

Those who bear the cost of pollution control and those who receive most of the benefits are frequently different groups of people. For example, industry and its stakeholders may bear the costs of curtailing effluents into a river, while people who enjoy sport fishing gain the benefits. Obviously, the two parties are more than likely to reach different conclusions regarding the cost effectiveness of a particular action.

9.3.2 Market-based Incentives and Disincentives

What is the most efficient and economical way to eliminate pollution? Some people argue that we should say to polluters, "Stop it! You can't dump garbage into the air or water anymore". While this approach has a certain moral appeal, it tends to force all businesses to adopt uniform standards and methods of pollution control regardless of cost or effectiveness. This approach can also lead to an adversarial climate in which resources are used in litigation rather than pollution control.

Furthermore, the "command and control" approach tends to freeze technology by eliminating incentives for continued research and development. Industry is discouraged and even prohibited from trying new technologies or alternative production methods. These problems can be overcome, as many economists believe, by using market mechanisms to reduce pollution rather than by rigid rules and regulations. Since there may be a one hundred fold variation in the cost of eliminating a specific pollutant from different sources of the equipment use, environmental factors and other considerations, like market based incentives such as pollution charges or tradable permits can be more cost effective and flexible.

Economic incentives and disincentives are the two major categories of instruments that can be harnessed in support of the environmental policies. Each, in turn, can influence the environment in two ways:

- Through stimulating adjustment to the allocation of scarce economic resources between sectors; and
- Through encouraging the adoption of improved resource management practices.

SAQ 2

1. What are the advantages and disadvantages of regulatory approach vs. a market based approach to control pollution?

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2. Discuss cost-benefit analysis. Give illustrations.

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3. What Intangible cost and Intangible gains can accrue from big hydroelectric dams?

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4. Discuss the impact of big Dams on environment.

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9.4 ECONOMIC INCENTIVES

Economic incentives can be one of the major engines for development of eco-friendly projects. These incentives include:

Grants

These can be used to promote resource uses that are both environmentally and economically sound. This also applies in the case of management practices. Such incentives could be targeted either towards meeting physical requirements in pursuit of efficiency (for the purchase of equipment) or towards making an investment in human capital (perhaps for the training of extension workers). In the past positive environmental results have been achieved through the use of grants and allocations for specific projects.

Subsidies

Subsidies in support of commodities and inputs are a common form of incentive through which the government seeks to benefit a specified, usually private sector of the economy. Both developed and developing countries have been extending subsidies to various sectors of the economy. For example U.S. high subsidies to its agriculture and steel sector. As temporary vehicle for speeding the adoption of desirable practices, subsidies undoubtedly have a useful role to play.

On the other hand, certain subsidies have undoubtedly had an adverse impact. Price control on agricultural commodities and the subsidised distribution of food imports over the past few decades have contributed to poor agricultural practices, leading to poor soil conditions especially in the developing countries. In short, the benefits accruing from a subsidy are linked to particular resource uses and management practices that are promoted, either directly or indirectly. In designing a subsidy programme, particular care clearly needs to be taken so as to avoid any possible adverse indirect effects. The governments can subsidise environment friendly technologies.

Fiscal Relief and Concessions

Fiscal relief and concessions represent a third avenue for resource use and sustainable development programmes. Thus, the scope for tax incentives is restricted to the formal and organised sectors, which constitute a relatively small part of the national economy. To encourage the demand for products, the government could provide indirect tax exemption; a sales or excise tax could be waived, for instance, to assist particular resource use practitioners.

Tariffs or Quotas

A fourth type incentive is the imposition of tariffs or quotas in order to protect environmental benign producers. In an economy that is in the process of being gradually liberalised, these instruments could pay a marginal role at best. It may however, be worth considering whether export incentives for environmentally recommended produce could be incorporated into current programmes for infrastructural investments. Such an opportunity could be provided by the fruit and vegetable sector.

Prizes

A highly visible form of incentive is the institution of much publicised prize, awarded to those adjudged as the most successful in undertaking environmentally progressive measures. Rules for award schemes need to be carefully drawn up. A panel of adjudicators also needs to be established and briefed before such a high profile incentive could become effective.

Disincentives

Economic disincentives are almost opposite of the incentives, namely levies, taxes, restricted tariffs/quotas and penalties or fines. Better resource use is sought through negative and punitive measures. The same net effect is achieved by rescinding subsidies that have outlived their usefulness or become subject to abuse.

Table 9.1: Categories of economic incentives and disincentives

Types of instruments	Type of application	
	Sectoral resource allocations	Resource management practices
Incentives		
Grants	*	*
Subsidies	*	*
Fiscal Relief/Concessions	*	*
Tariffs and quotas	*	
Prizes		*
Disincentives		
Levies	*	*
Taxes	*	*
Restrictive tariffs	*	*
Penalties or fines		*

SAQ 3

1. Discuss the nature of incentives and disincentives which a government can give to promote environmentally and economically sound resource use.

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Let us summarise what we have studied so far.

9.5 SUMMARY

Although scientific solution of environmental issues are part of the over-all environmental management, however, the market based approaches and economic analysis of environmental issues are very effective tool for managing the environment. Economic analysis of environmental issues tell us that resources should be utilised in an effective manner rather than conserving them. Resources may be common property or privately owned. The kind of ownership affects the method available to achieve an environmental goal. To avoid overexploitation of the common resources, internalisation of external cost in product is a good strategy. Discount factor is another method to affect our willingness to pay for an environmental quality.

If costs of all the resources used could be estimated, cost benefit analysis of a project could tell us whether a project is feasible for environment or not. A major problem with this approach is that some of the costs and benefits could not be expressed in monetary terms. Moreover there are no set standards for estimating the costs and benefits. If a project has more benefits than its cost, then the project is said to be cost

effective. This analysis is very complicated and complex as it involves comparison of costs and benefits. However it is proved to be beneficial for some projects. The market based approach of incentives and disincentives for pollution control is a very effective tool for changing the behaviour of individual and industry to control pollution.

9.6 TERMINAL QUESTIONS

1. Explain the various factors responsible for environmental degradation.

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2. Discuss the following in your own words:

   a) Environmental management

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   b) Cost benefit analysis

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   c) Approaches to control pollution

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UNIT 10 TECHNOLOGICAL DIMENSIONS

Structure

10.1 INTRODUCTION

The previous unit has introduced you to the basic concepts of environmental economies and focused as to how these could be applied in the analysis of environmental issues. In the present unit we will discuss the role of technology in the development and to check environmental deterioration, resource depletion and its generation.

Science and technology confer great benefits but they also cause great harm. The dominant patterns of production and consumption are altering climate, degrading the environment, depleting resources, and causing a massive extinction of species. Dramatic rises in population has increased the pressure on ecological systems and have overburdened the social systems. To meet the demands of increasing population, technology has come forward. There are two opinions about relationship between Technology and environment. One is that the technology is the main cause of environmental deterioration and other is that the technology is the solution to environmental problems. In this unit we will explore the both points of view. It is well recognised that three types of technologies contribute to economic development. Technologies that contribute to deterioration of the environment and use significant natural resources; technologies that have little or no effect on the environment; and technologies that restore or improve the environment and draw upon the natural resources without significant long-term depletion.

Objectives

After studying this unit, you should be able to:

- explain as to how we create greater economic and social well-being for more people around the world without deteriorating the environment and depleting the resources that future generations will need for their well being; and
- discuss the role of technology in making a sustainable future possible.

10.2 TECHNOLOGY AND ENVIRONMENT

Since the early 1970s, the challenge for a sustainable future has been seen in the following relationship:

Environmental impact (negative) = Population × Standard of living × Technology

The above equation for environmental impact is incomplete. Technology need not be a detriment. It can, in fact, make a sustainable future possible. It is well recognised that three types of technologies contribute to economic development.

- Technologies that contribute to the deterioration of the environment and make use of significant natural resources (T1).
- Technologies that have little or no effect on the environment (T2).
- Technologies that restore or improve the environment and draw upon natural resources without significant long-term depletion (T3).

How do we create greater economic and social well being for more people around the world without deteriorating the environment and depleting the resources, which future generations will need for their well-being?

Environmental impact = Population × Affluence × Technology

Our challenge, therefore, is to address the what(s) and the how(s) of the T2 and T3 technologies and the underlying sciences upon which these technologies are built.

What

- What are the technologies that we want to encourage and develop?
- What are the technologies that can bring true benefits to society while meeting mankind's needs?
- What kind of research do we want to fund?
- What are the technologies that can be developed locally?
- What are the technologies that can be transferred readily to the regions of the work where they can be used best?
- What are the sciences that we want to explore?
- What are the technologies that are useful for the future?

How

- How do we deliver the value of these technologies?
- How can we use the technologies for the maximum benefits?
- How can technology be transferred around and perfected locally?
- How do we overcome the barriers to such transfer of technology?

Perspectives

Some perspectives towards arriving at solutions to the above challenges are listed below:

- To make sustainable development a reality, industry must lead and innovate. The industry, as society's producer, has a special role in ensuring sustainable development. It cannot view environment and business as two different domains or competing issues. It is the industry that can turn technical solutions and opportunities into reality.
- Sustainable development requires a step-by-step change in the way we do things, and these changes must be built from the ground up. Sustainable development is not a direct process; rather it needs to be built up and is derived from a myriad of independent actions.

Here the case of DuPont may be quoted as an example of achieving step by step changes toward the goal of sustainable development. It required a rethinking of virtually every single industrial process and product. A step-by-step change was required in the way it thought about every aspect of environmental protection in every individual new product and process development, and in every way it integrated business growth with environmental objectives. It also made the management challenge the mindsets, the thinking and the actions of all those involved in DuPont. The challenge was to strive for the goal of Zero for all injuries, illnesses, incidents, an emissions, or zero wasted resources, whether natural, human, or capital, in every individual activity undertaken. It has learnt over the years that sustainable development can take place in only one household at a time, and, one manufacturing plant, one chemical process, one industrial product, one community, one region at a time.

- Economic vitality is required for long-term environmental protection and sustainable development. Long-term environmental protection will only take place in the context of economic growth and vitality. Economic vitality is part of local sustainability. A community has to be competitive educationally, economically, and in other ways to attract investments, which provides jobs and income, Economic growth, environmental protection, and strong social systems must be addressed together as part of a vision of sustainability.

- There are many science and technology options that will lead to economic growth and be compatible with sustainable development, but it will take a commitment on the part of the industry, an understanding on the part of society for these to be pursued. Energy from renewable resources, sustainable agriculture with low use-rate herbicides or with biotechnology; advanced materials making communications faster and easier based on recyclable resources, inherently safe and non-polluting manufacturing processes (zero waste) are some of these options. We are moving into an era where knowledge not labours, raw materials, or capital is a key resource. As it reduces the need for raw materials, labour, space, capital, and other inputs, knowledge becomes the ultimate substitute – the central and continually renewable resource of an advanced economy – in an economy committed to sustainable development. The software industry in India is an excellent example. Communicating the knowledge in the most effective way becomes an important challenge. Here materials such as fused silica optical fibers, optical switches, and wave-guides will play an ever-increasing role in communications tools increasing the ease, power, portability, and ability to store and manipulate information, while decreasing the weight, mass, and total resources used.

- Expenditures on environment-related technologies will change. Near-term investments in remediation and restoration will be for cleaning up target sites. Intensified expenditures in technologies to avoid environmental harm will reap rewards. By 2024, many industries will approach a zero-discharge goal, but some control technologies may still be required to deal with residual discharges. Well into the 21st century, we will have moved from a mindset of clean up and control to one based on anticipation, avoidance, and assessment.

- There are many options for transferring environmentally related technologies and technologies which support sustainable technologies that, in turn, support sustainable development. Public policy and some new business models will be required to deliver the benefits of these technologies around the world. Some of the options include donations (nylon for water purification to combat the guinea worm disease, intellectual property to universities or government based research); exchanges (natural products or microbes as the basis for pharmaceuticals); a low-royalty or joint venture technology transfers is a way that builds the local economy.

- These and a number of difficult issues related to the ‘what’ and ‘how’ of science and technology need to be addressed to further sustainable development.

10.2.1 Relationship of Technology with Socio-economic Factors

The supply of a particular natural resource available for human use is not determined so much by the absolute amount present on the earth as by economic, social, and technological factors. Let us look more closely at relationship.

Supply depends on:

- which raw materials can supply a service using present technology;
- the availability of those materials in various quantities;
- the costs of extracting, shipping, and processing them;
- competition for those materials by other uses and processes;
- feasibility and cost of recycling of the already used material; and
- social and institutional arrangements.

In a market system, most of the considerations previously mentioned are expressed in terms of market price for goods or service – the amount it sells for. The available quantity of a resource or opportunity usually increases as the price rises. For example in 1978 the Congressional Office of Technology Assessment estimated that at $ 11 per barrel some 21 billion barrels of oil were available in the United States if the price were to double to 42 billion barrels. The reason for this increase was not that new oil was being created but that it became worthwhile to drill into lower quality and more remote oil fields as prices rise. If the prices were to go even higher, furthermore, substitute fuels such as *oil shales* and tar sands that are not now economical to extract might become competitive with oil. The effect would be as if a whole new resource has been created.

In economic terms, the relationship between the available supply of a commodity or service and its price is described by supply/demand curves. Demand is the amount of a product that consumers are willing and able to buy at various possible prices assuming they are free to express their preferences. Supply is the quantity of that product being offered for sale at various prices, other things being equal. As the price rises, the supply increases and the demand falls. The reverse holds as the price decreases.

In a mature market of willing and informed buyers and sellers, supply and demand should come into market equilibrium. Ideally, if all parties in the market act independently, competition should result in high efficiency and the best possible products at the lowest possible price. Adam Smith, in his 1776 economic classic *The Wealth of Nations*, described this as an “invisible hand” that leads buyers and sellers who intend only their own gain to promote the public good more effectively than they know or intend. Not all buying and selling decisions follow classic supply and demand curves, however. Some choices depend on other factors. When sellers increase the quantity available faster than price increase, or if buyers increase their purchases more rapidly than prices are falling, we say that the product has price elasticity.

10.2.2 Market Efficiencies and Technological Development

In a frontier economy, procedures for gaining access to resources and turning them into useful goods and services tend to be primitive and inefficient. As markets develop, experience accumulates in obtaining and working with a particular resource. Specialisation and experimentation lead to discovery of new, and efficient technology, making it possible to produce larger quantities of goods at lower prices. At each successive stage in this development process, a larger quantity of product is available at a lower price. The effect is that the standard of living increases at least in economic terms.

Population Effects

Growing population can offset advances in science and technology. As the number of workers increases, a point may be reached at which there are not enough jobs to employ everyone efficiently. As a result, the productivity per person will decline and wages will fall. The pressure on resources created by more mouths to feed and more bodies to clothe intensifies this predicament. As more people use more resources, we must look to less accessible or desirable supplies. The prices of raw materials increase, as do the prices of goods and services provided by those resources; thus, the cost of living goes up and the standard of living declines. This "iron law of diminishing returns" led Thomas Malthus to predict that unrestrained population growth would inevitably cause the standard of living to decrease to a subsistence level where poverty, vice, and starvation would make life permanently drab and miserable. This dreary prophecy has led economics to be called "the dismal science."

Growing population also places a strain on the economic development by diverting the capital necessary for growth. In a rapidly growing country, a large proportion of the population is made up of children who require social overhead expenditure, such as new housing, schools, and roads that contribute little to development. Creating new jobs to employ a growing population can trap capital in conventional industries; this, in turn, will reduce the investments in new technology that might provide a real improvement in the standard of living. This diversion of investment capital is called the population hurdle.

On the other hand, growing population also can create markets that encourage specialisation, innovation, and capital investment that result in efficiency. They can bring young, energetic, and better trained workers into the workforce and make changes in the traditional way of doing things. Some demographers argue that while growing population causes problems, they also result in more human ingenuity, energy, and cooperation to solve those problems. Where are we now in the process of economic development and population growth? Are we on a curve of diminishing returns, or are we benefiting from economy of scale in terms of human population and environmental problems?

Factors that Mitigate Scarcity

Human social systems can adapt to resource scarcity (a shortage or deficit in some resource) in a number of ways. Some economists point out that scarcity provides the catalyst for innovation and change (Fig. 10.1). As materials become more expensive and difficult to obtain, it becomes cost efficient to try to discover new supplies or to use the ones we have more carefully; thus, we may be better off in the long run because of these developments.

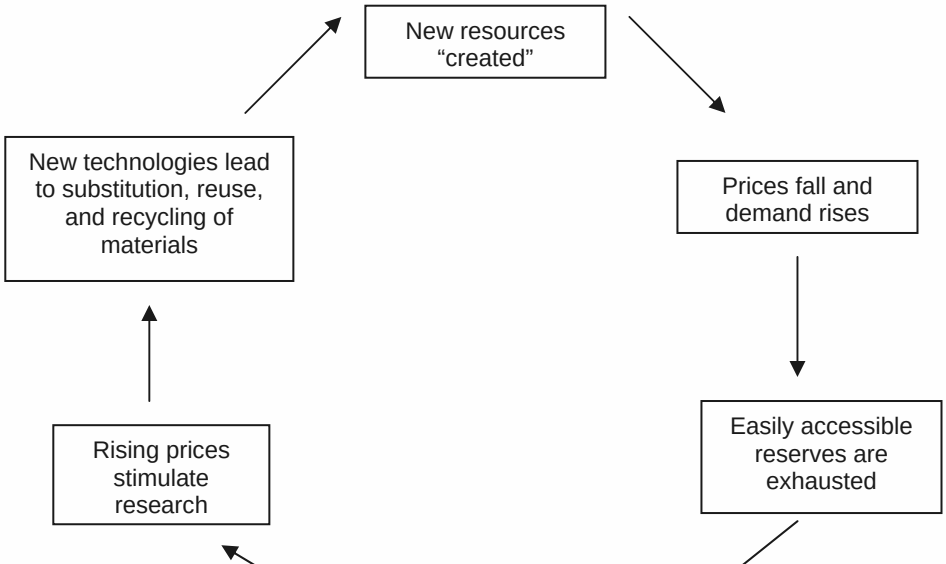

Fig.10.1: Scarcity provides the catalyst for innovation and change

Scarcity/development cycle

Paradoxically, resource use and depletion of reserves can stimulate research and development, substitution of new materials, and an effective creation of new resources.

Several factors can alleviate the effects of scarcity:

- Technological inventions can increase efficiency of extraction, processing, use, and recovery of materials.
- Substitution of new materials or commodities for scarce ones can extend existing supplies or create new ones. For instance, substitution of aluminum for copper, concrete for structural steel, grain for meat, and synthetic fibers for natural ones remove certain limits to growth.
- Trade makes remote supplies of resource available and may also bring unintended benefits in information exchange and cultural awakening.
- Discovery of new reserves through better exploration techniques, more investment, and looking in new areas becomes rewarding as supplies become limited and prices rise.
- Recycling becomes feasible and accepted as resources become more valuable. Recycling now provides about 37 percent of the iron and lead, 20 percent of the copper, 10 percent of the aluminium, and 60 percent of the antimony that we consume each year in the United States.

10.2.3 Increasing Environmental Carrying Capacity

Economist Julian Simon says that in spite of recurring fears of natural resource scarcity, the mitigating factors listed above have made every commodity cheaper in real terms as far back as we can find records. In fact, responding to the growing scarcity of resources actually enables us to increase the carrying capacity of the environment for humans. There has been about a 500 percent increase in real per capita GNP during this century even though the average working hours have declined, population has tripled, and the easily accessible local resources largely have been used up.

Will this economic progress be sustained, however? Ecologist Paul Ehrlich contends that the increasing levels of population and consumption will inevitably lead to scarcity and rising prices as more of us try to share less and less. In 1980, Ehrlich made a wager with Simon. They bet on a package of five metals – chrome, copper, nickel, tin, and tungsten – priced at $1,000 in 1980. If the 1990 combined prices, corrected for inflation, were higher than $1,000, Simon would pay the difference. If prices had fallen, Ehrlich would pay. In 1990, Ehrlich sent Simon a check for $576.07; prices of these five metals had fallen 47.6 percent. In fact, prices for most metals have fallen substantially over the past century. Would you care to bet on whether this pattern would hold for the next century? Most countries have not felt a similar increase in the wealth enjoyed by the United States in the past century.

However, it may be pointed out that fall in the prices of raw materials except oil, particularly metals is a constant phenomenon and is one of the real cause of economic miseries of the many raw material producing developing countries and their rising

debt. And despite the efforts since the 1970's to help stabilise raw material prices, there has been no success. At the same time the prices of capital goods and machinery's are rising. And guess who is responsible for it? It is the TNCs who control the extraction and processing of these raw materials. Their monopoly control over these make them manipulate low price level for the raw material. The demand for a New International Economic order of the 1970s highlighted the problem of declining raw material prices.

10.2.4 Environmental Technology

The concept of sustainable development is a human invention, or a formulated rediscovery of the 20th century. Nature itself has always been sustainable, *i.e*. it has been self-regulating and balance-oriented. Humans have increasingly intervened in this self-regulation, largely through the technological advances equated with progress. The result is an absolutely unnatural, exponential expansion of the human species (exponential growth, longer lifespan, etc,). In the future attempts at sustainable development, one is likely to reduce the human effects on natural systems and interactions while at the same time strive to make the western standard of life available to people. How realistic and wise this approach is needs to be examined.

When referring to environmental technology, one usually talks about the natural sciences – the basis of many discoveries and realisations that has led to the steady downfall of the environment. Natural sciences have guided us down a path through the industrial revolution to where we now stand with our all-governing economy and no sense of direction. At this point, we depend on this pathway – the natural sciences – again to undo the damage. We believe in the modern, environmentally-just technologies, sustainable standards of life, i.e. satisfy needs of growth-oriented population only through the renewable resources. Environmental technology founded on science and engineering plays an integral role in the necessary change to a so-called sustainable, human balance. Questioning the conditions of our technological progress would have unthinkable effects on our current way of life, associated with complex economic and material interconnections.

A critical question that needs to be addressed is whether following this path narrow-mindedly is sufficient and whether it makes sense to continue such unadapted ways of life. Even if we make use of the currently known environmental and resource-saving techniques with the greatest possible financial stake, it would at best be enough to control increasing growth. The effort would place us at a status quo, *i.e.* we would still be living off our capital instead of our interest. Technological possibilities have limits, even with factors of 3,4, or 10 in, for example, the energy sector, since our current way of life rests on material flow. However, the most important question in this context deals with the social readiness to invest all available powers and funds in a technological revolution. A look at our daily political and economic happenings reveals an incapability to think beyond the constraints of the system and act – instead of just react on what environmentalists know and can do today. How reliable is it then to bet on the technological and scientific path in solving our problems? Is it not just an illusion when we speak of improving our own standard of life thanks to these techniques, while at the same time – due to an inner uneasiness – proclaiming that all people in the future will not only be provided for, but will also be taking part in the so-defined wealth?

Is there only one path to the technological revolution or are there plausible alternatives? Where do the social sciences remain in this discourse on the future? Where are the voices of philosophy, ethics, and theology in the planning of the sustainable society? Was it not these areas that influenced the evolution of humans over centuries and that actually acted as the higher authorities over the natural sciences and life in general? How do you reconcile technocracy with democracy and rationality with emotional aspects? How do you reconcile the rapidly increasing dependence on technological systems and constraints with ideals of freedom, independence, happiness, and joy?

10.2.5 Technology and Resource Use

It would be foolhardy to think that all our future resource needs will be met by technological innovations. What all required is the need to change the consumption pattern of resources and the behaviour pattern regarding the use of material resources. At present there is terrible resource utilisation disparity between the rich and poor countries. The stabilised population of the developed world uses very high per capita consumption of resources. Thus a single American makes sixty fold greater contribution to global warming than does an additional Mexican, and a single Canadian's contribution is equivalent to 190 Indonesians. The disparity is equally glaring within the developing countries.

The underlying thinking behind the Agenda 21 as stated at the Rio Earth Summit in 1992 is that science and technology can overcome the environmental problems and thus allow us to continue expanding resource extraction and use, producing products, and raising the material standards of living of earth's people indefinitely. Our scientific understanding has its own limitations to draw definite conclusions.

The problem is that people wish to work within the current system of social interaction and commerce, and retaining their developed and inherited system of values and life styles. "Business as usual" is the ethic that can destroy the world, if it is not substantially modified soon. We must stop using the Earth as if we were the last generation.

A German scientist takes the case of energy use. According to him there is now, an untamed human hunger for energy. This is a danger far greater than that posed by population growth. Even if it were possible to provide food and water to 6 billion people today and may be even 10 billion or more by 2050, there still is the question of what these people would do, this question surely cannot be solved on a purely technological basis. In his opinion, the current worldwide energy turnover of 13 terawatts corresponds to a performance equivalent of 130 billion energy slaves. One energy slave corresponds to one quarter of a horsepower or an average human performance of 100 W in a 12-hour working day. The population of 6 billion people – of which approximately one-third has no, and another one-third has little; access to commercial energy-implicitly requires 22 times more energy slaves.

How many energy slaves can our bio system endure in the future? How can we create democratic conditions when on an average, an American requires 110, a western European 60, a Chinese a modest 8, and a Bangladeshi only 1 such energy slave. And to think that each European's 60 energy slaves continue to work for them while they are in bed! Approximately 250 energy slaves are needed to operate a medium-range car; a total of 700 for a model of the S-class seems a bit extravagant.

Can we get this situation under control with a technology revolution even if it is run at full speed? Is a switch to renewable energy sources conceivable with what we know? We know that the world energy consumption rose by a factor of 80 in the 20th century with a relatively small six fold increase in the world population, and that in 1999 alone, we burnt the same amount of fossil fuels as was produced in a million years. How much of fossil energy would we need just to perform the switch to renewable resources and what type of economic system would allow such action?

10.2.6 Appropriate Technology for Sustainable Development

The debate whether the developing countries should opt for advanced western technologies or they should adopt more appropriate, low level technology suiting their requirements has been going on for a long time, though sometimes wrongly perceived.

Appropriate technology need not necessarily be low level and less sophisticated. Even an advanced technology can be appropriate technology. What is expected of the decision makers in the developing countries is not the choice of one appropriate technology but rather make an "appropriate choice out of wide range of technologies". Review their development priorities, resource capabilities and probable

effect on income distribution, unemployment, and environment. The country should make appropriate choices in accord with these considerations. Some kind of discretion is essential. Some time low level, inferior material based technologies are required instead of technologies involving heavy investments and high quality materials. The ideal way would be to choose a wide range of appropriate technologies sector by sector, industry by industry and product by product. However, there are limitations, either they may not have the money to exercise this option of choosing and may have to accept the technologies which are offered to them. Normally, technologies may be coming in a package and breaking the package may not be easy one.

So any development strategy adopted by a developing country must follow the considerations, like satisfaction of basic human needs, endogenous self-reliance through social participation and control, and harmony with nature. They must decide the priorities and should have a thorough research as to what technologies are needed. Different countries have different levels of scientific development and therefore, diverse technology absorption capabilities.

It must be assumed that all existing technologies and all future technologies are not necessarily consistent with development. What is important is to see what kind of development is sought for and at what social cost. Third world technology aspirations are supposed to centre around the following: 1) access to the full range of actual and potential technologies; 2) a fair price structure in international technology marked; 3) purchase of technology in ways that favours optimum use of local resources instead of buying packages imposed upon the buyers as “all or nothing” by the outside technology supplier; and 4) reduction of their dependence on outside technology innovations who enjoy near monopoly in R&D.

However, these aspirations are not compatible among themselves. A high degree of technology autonomy may hinder their access to full gamit of existing technologies. A policy of optimal use of local materials, skills, finance capital and limit technology to “core” technology can limit their negotiating pressure which poor countries can apply on the pricing system.

Many TNC’s refuse to sell to those who ‘break the package’. The suggestions for the creation of “Technology Bank” from which poor countries could choose appropriate technologies at a reasonable price and without any strings attached hardly took off because of the negative response of the technology controllers.

SAQ 2

1. Discuss the relationship between technology with socio-economic factors.

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2. In what ways the scarcity of resources can be overcome. Discuss.

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3. What role in your view technological innovations can play in meeting the resource needs of future generations?

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4. What is an appropriate technology? Discuss the role of appropriate technology in achieving sustainable development.

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10.3 ROLE OF ENVIRONMENTAL SOCIOLOGY

The above example illustrates that the future of humankind on this planet will not be possible through technological innovation alone. Behavioural change and cuts in material and resource consumption is necessary, and this is where social sciences can play a major part. Social sciences deal more with emotions and social attitudes than with matter and material functions, as opposed to natural sciences. Economics is also a subject that cannot be ignored for it influences our lives today like no other area of science. While economics has made itself fairly independent and risen to a rank above even technological and industrial development, the remaining social sciences have been degraded primarily to adjustment-helpers in a materialistic world. They are no longer leading agents in the questions of ethics, morals, or human consciousness. Instead, they exist to standardise people in this world, correct deviant behaviour, and to create tame citizens and good consumers with increasing needs. It is necessary that social scientists constructively begin dealing with plans for the future. Here, like for the natural sciences, the conversion of accumulated knowledge to practice is needed. The difficulties for the social sciences lie in the fact that there is no industry supporting them for knowledge or access to any concrete goods. They lack the economic lobbies, which have long since replaced political hegemony. This makes the knowledge that social scientists produce limited in its economic value and results in little financial support for research.

However, social sciences can fire crucial impulses that can lead to a quasi non-material, sustainable future. It will not cost the environment anything, whether material or energy, to change humankind. The sustainable path of the future will consist of adapting humans to the environment and not vice versa. Based on findings from psychology and from behavioural and social research, all subjects that seem to be over-looked in concrete future planning – alternatives to theories based solely on technological innovation – do exist. Cognitive knowledge is not enough to change human behaviour. Behavioural change is only possible when an emotional, close-to-home component is added to cognitive realisation. Theory without practice is insufficient if learning processes have to be transferred. The fact that we often do not react until we are immediately confronted with catastrophe is a truism that needs to be abolished. Creating space for new behaviours to be tested in realistic, everyday situations can do this. Social research in practice requires room for experimentation within the setting of the leisure industry where new environmentally friendly lifestyles – less energy and material – intensive – can be tested. In the process, factors

such as social complexity and entanglement of individuals in society stand to be considered.

The results of a question in a recently concluded socio-psychological study by the OECD (Organisation of Economic Cooperation and Development) in 19 developed and developing nations show that we have already driven past the point where economic growth and technological progress equate to better living standards in the so-called highly developed nations. That this point has not been reached in the developing countries is comprehensible. However, it is surprising that the developing nations such as Chile that still have high levels of poverty with an economic growth rate of seven percent, have already passed this turning point. This shows that well-meaning technological development in hand with economic growth is not enough. In this case, demands need to be made of the economic sector, which should finally illustrate practicable alternatives to this one-sided growth model.

10.3.1 Co-operation between the Socio-environmental Sciences and Technology

Planning for a sustainable future has to be observed from more than just the rather short-term perspectives of natural and engineering sciences. These areas of study exist mainly to convert and use innovations in a corrective manner in cases where damage due to overuse of resources is evident. It is the responsibility of the social sciences to deal with the long-term work of forming new social attitudes that take our past mistakes into consideration. Cooperation is thus the key. However, this does not mean that this process has to fulfill the high demands of the so-called Trans-disciplinarily. People can simultaneously work on socially relevant discipline-oriented questions within the individual disciplines and find optimal solutions synergistically. A common junction for the sciences could be found in the use of system – theoretical approaches in finding new individual or institutional steering processes. It is interesting that the systems theory came out of the respective perspectives and methodologies of both natural and social sciences almost simultaneously and independent of each other. It is thus quite surprising and disappointing that this theory has been rather overlooked, especially since it focused strongly on converting theory into social practice.

10.3.2 The Time Factor

Speed and the rapid transfer of knowledge into technology and products have defined our era. Now we are adding the factor of our endangered future as humans. The resources we have used so far are running out. The environmental analyses of the economic sector call for quick action and for reorganisations. The OECD study mentioned earlier shows that we are moving towards increased progress without increasing the quality of life, which is tightly linked to the amount of the so-called free time, which we have less and less. Another social study in Switzerland showed that between 1900 and 1990, we gained only three minutes of so-called free time and this in conjunction with increasingly less work time. People today are extremely challenged and overtaxed. The pace is fast; content and more time are necessary. We lack the time to digest what we are hit with daily to take part in the rapid process of knowledge transfer. We live in democracies but rarely find time to participate in the democratic decision processes – even of the scientific or futuristic kind. Everything needs to slow down. This statement seems to contradict the threats that come our way and the science and technology that they incite. But even here, it would be better to move slower if it is possible. We want to avoid technological blunders like the ones we are faced with today. Losses of time and reparation costs are too high. We have not only committed ourselves to science and technology but also to social contracts such as the playing rules of democracy. These demand learning processes and this means time – time which can then be used by scientists to find stronger support for the results of their research. One does not believe that the speed of scientific, technological, and economic progress will lead to the goal of a sustainable society faster; on the contrary, one feels that slowing down all our lives will be an integral component of a future sustainable humanity.

10.3.3 The Responsibility Factor

The analyses have been made, the facts for the most part are known, and alternatives in the technological sectors found. What we are missing is the transfer of all the knowledge and realisation into plans of action. The sciences need to deal more with the question of how and with this the question of global responsibility. Scientists need to find ways to bring their results to decision makers, politicians and economists, and to reach the citizens of this world. Research results must be integrated in the education, in the languages various audiences can comprehend. What we see and in product commercialisation can also be realised with different content in scientific outreach if the funding is available and all aspects of human nature are taken into consideration. For this we not only need more time but also circumspection and willingness to cooperate. Science has to take on a leading role in communicating results and then integrate signals from the public in its research plans. There is an enormous gap between knowledge and action that should be approached as a research topic by science as a whole, if we want social and behavioural changes to occur.

10.3.4 The Human Angle

Science and technology are necessary but not sufficient for a sustainable future. The products of a perfect technology must interact with humans and the nature of this interaction is often unexpected. For example, a grocery bag made of plastic produced by a factory using perfect technology, can be used in one of three ways. In a society used to recycling, a consumer uses the plastic bag to bring groceries home and then places it in the bin for recycling. On the second group, the bag is thrown away after use. The wind picks it up and disperses it over the landscape and as the bag is not biodegradable, it harms the environment. In the third case, the society is so poor that a plastic bag fetches some money and now is picked from the streets or the countryside and taken to a collection booth for recycling. This example illustrates the complexity of sustainable development. We cannot, therefore, project as to how society will respond to a particular technology. For sustainability to succeed, we must all become sensitised to its value, i.e. we must view it as a virtue.

10.3.5 Education is the Key

Sustainable is a virtue and, like any virtue, it has to be encouraged, perhaps taught, and assimilated at all levels, Hence, education is the key. Thus the government, the universities, industry, and the society at large, including families, play a role. Information technology can play a key, but not an exclusive role, in education. It is often stated that the developing world needs technology and not science. It is also assumed that the developed part of the world knows what is good technology. Some aspects of these assumptions are dubious, given the complexity and the diverse levels of economic development.

The decision needs to be taken on what and how a technology has to be developed by the local community, city, country, or a continent. This scientific and technological information leads to knowledge and perhaps to wisdom to make the right decision.

SAQ 3

1. Explain the role of social sciences in changing the human behaviour towards resource use.

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2. Do you think science and technology only can help in securing a sustainable future?

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10.4 ENCOURAGEMENT OF REGIONAL-LEVEL DEVELOPMENT

Over 80% of the world's output by scientists and engineers come from countries that represent only 20% of the world's population. In order to ensure sustained development in a region, local scientists and engineers have to develop the culture of working on new methods rather than duplicating what has already been done elsewhere. If this culture does not evolve, then the region needs to import technical know-how. It is frequently in the interest of the industry in the developing countries to keep the country closed to overseas competition. This approach, though profitable to the local industry, prevents or slows the industrial development of a nation. It is the industry that can produce wealth, and in a competitive world, that requires research and development (R&D) in industry. The industrial budget for R&D in the developing countries is at best a small percentage of the total funding. This is in contrast to a country like the US or Japan where more than half of the R&D is funded by the industry. Countries in which the industry has taken the initiative to compete with world standards with government help have developed rapidly. Korea is one such example in the area of information technology.

The problems of sustainable development in the developed and the developing world are more often rooted in local economic, political, and social issues. Thus a worldview is important but local institutions that develop, promote, and implement policies at all levels, hold the key. International organisations, whether public, private, profit, or non profit, have an important role in flattening the knowledge level across the world. However, this will only happen if there is a tangible material benefit to both sides in the transaction. Idealistic pronunciations are good, for they set the standards to rise, but they rarely are, a basis for action.

The growth in population and development of the world are on the rise and will continue to be so in the foreseeable future. Material development has to increase at a much faster rate than the population. The population growth and demand for food, energy, or material wealth is non-linear. Thus science and technology can be the catalysts for an accelerated growth but, ultimately, only good governance can provide a constructive driving force.

10.4.1 Six Perspectives: A Response

The following arguments can be made in response to the six perspectives raised in the beginning of this unit:

i) To make sustainable development a reality, the industry must lead and must innovate. Industry can play an important role. Driven by competition and responsibility to shareholders, industries are relatively efficient and, increasingly, socially responsible and accountable. However, in the absence of societal

pressure, few companies deviate from optimising their profit margins; thus societal expectations and corporate behaviour are inextricably linked together.

ii) Sustainable development requires a step-by-step change in the way we do things and must be built from the grassroots. This is a succinct summary of responsible and effective corporate thinking, and DuPont is setting a good example in this regard.

iii) Economic vitality is required for long-term environmental protection and sustainable development. While human beings appreciate the wonders of this world only when their hunger pangs are gone, and when their diseases are under control. Sustained development is about the future if the present is not a crisis in existence. This is often a source of conundrum for the leaders of the developing world.

iv) There are many science and technology options that will lead to economic growth and that are compatible with sustainable development. Good information is a precursor to knowledge. Information is cheap and mostly free. With the advent of the internet, information is widely and easily available.

v) Expenditures on environmentally related technologies will change as we move into the future. This is a good believable scenario.

vi) There are many options for transferring the environment related technologies and technologies that support sustainable development. There are indeed many ways of providing this transfer. For promoting sustainable development, international organisations can also help set up or strengthen local institutions that provide advice suitable to different local conditions.

10.4.2 The Context

In this unit the arguments were made to convince about the positive role of environmentally sensitive technology for a sustainable future; but, a further discussion is needed on those technologies that need to be developed, and how their impact can be beneficial to a wide segment of society, both rich and poor alike. At the same time, it is heartening and worrying to discuss these issues. Heartening because only a few years ago it was rare to find business people discussing matters of concern for sustainable futures, and worrying because of the tremendous challenges that they pose.

An important question in this context is what would happen if the buying power of the world's poor were to increase even to five dollars a day? And how would businesses be able to cope with the temptation of this new wealth while wishing to protect the environment? This is perhaps the most difficult problem to address; how can business avoid the temptation to use this new power to simply pollute and waste more in order to sell more. The major challenge is the way in which businesses can find a healthy equilibrium between what they think is their shareholders' desire and what the needs of the planet's stakeholders are:

Corporate support for development of biotechnology will be applauded by scientists and technologists, but this development must take into consideration the need felt by the society at large to be fully informed about the benefits and risks of biotechnology. Thus, those involved in the biotechnology will have to go beyond R&D into the arena of providing the public with transparent and easy-to-understand information in a timely and constant manner. The growing chasm between the rich and the poor and the challenge that the reduction of this chasm provides to all is another issue of grave concern.

10.4.3 Finding Solution

We owe it to future generations to work together on all these issues to find solutions that are compatible with the requirements of sustainable development. The business community should increase its efforts to organise itself so that more than just individual businesses with the courage to act on behalf of future generation are involved. However, this is insufficient. Businesses, once organised involving a critical mass, must forge partnerships with others; with those involved in R&D and with those making policy. Only through collaboration and full support and participation of a wider segment of society, can all of the goodwill expressed on these issues realised.

Partnerships of organisations and concerns around a common goal can be effective. The effort that the international scientific community undertook a year before the 1992 Earth Summit in the conference on An Agenda of Science for Environment and Development into the 21st century. This was the first time that scientists – physical, chemical, biological, medical, and social – and engineers came together to contribute their knowledge to the issues of grave common concern. The outcomes provided important inputs to the Rio Conference including the chapter on Sciences for Environment and Development in Agenda 21; it also resulted in a solemn commitment on the part of the international scientific community as a whole to work together so that improved and expanded scientific research and the systematic assessment of scientific results, combined with a prediction of impact, would enable policy options in environment and development to be evaluated on the basis of sound scientific facts.

This relatively new commitment on the part of scientists arose in response to the growing realisation of the extent to which human activities on our planet increasingly threaten the earth's environment, and the growing recognition by governments that scientific knowledge of the earth system is a necessary ingredient for policy-making. Changes in the earth system extend across national boundaries and scientific disciplines. Thus, the scientific programmes have, by necessity, become international and interdisciplinary. However, a systematic investigation on a global scale has become feasible only recently. Given the high cost and the lack of adequate human resources in any national programme to carry out these investigations, the coordination and cohesion of the international research programmes and observation systems have been vital, as they will benefit all. All of the mega science and technology projects that are in place today have included networking, sharing of facilities, information, and ideas.

What characterised all these activities is that they involve thousands of scientists throughout the globe driven by the common language of science, a shared curiosity to understand our planet, and the belief that science is a truly international endeavour. A major effort still remains to be undertaken in the way the scientists and technologists communicate the process and results of their work to the public at large. Although the scientific model cited above is not a perfect one, it is a step in the right direction. Other organisations are also moving in this way. The World Resources Institute, for example, has gone a long way in involving the business and other communities to work for a sustainable future.

The six perspectives provided set out the broad parameters within which the technological support for sustainable development would occur. These perspectives help industries like DuPont, Shell, British Petroleum, Tata Chemicals, etc. to view sustainable development both as a long-term vision and goal, as well as a business opportunity to be exploited. These companies, and many other large enterprises like them, are beginning to provide leadership in competitive markets as champions of sustainable development. Apart from the business opportunities that sustainable development provides to these companies, the public expectation of responsible corporate behaviour is another major driver in their move towards commitment to unsustainable development. In the absence of any other accepted term, they are labelled as brand – equity conscious enterprises. However, for every brand-equity conscious enterprise that exists, particularly in the developing world, there are a thousand other smaller enterprises which lack both vision as well as the need to live

up to public expectation. These organisations are mainly SMEs (small and medium enterprises). They are constrained in both technological and managerial capabilities, and often their financial surplus is far less than the kinds of investments required in adopting technologies that help them move towards sustainable development. Therefore, they lack appropriate technological products and packages in the market.

The assessment in many small-scale sectors, including glass, brick, and silk reeling sectors, reveals a complete lack of scientific and engineering inputs in the development of technologies that are in use. Consequently, these sectors are inefficient in the use of energy, labour, and capital, and are heavily polluting as well; in recent years, the judicial interventions by the Supreme Court of India forced these enterprises to face a stark choice – upgrade or shutdown. This is a Hobson's choice since the absence of technological products and packages provide them with no real option. Under such circumstances the scientific, engineering, and technological support required by these low-capacity users is immense, and the current mechanisms are completely unable to provide this support.

10.4.4 A Long Road Ahead

There is a strong commitment to adopt various processes and methodologies that help in sustainable development among many of the industrial and business houses of the world, whether they be DuPont, IBM or Tata Chemicals. Over a period of time, driven by competition as well as the public expectation of corporate responsibility, technological improvements are leading to more sustainable development oriented technology. Technologies today use less resources and are more productive in terms of capital or labour inputs, and, in general, a vast number of these processes would also move towards zero output. Yet, if this trend promotes sustainable development, why is one still talking about it?

The first reason is that the time frame for response has changed dramatically. The speed with which the ozone treaty was negotiated and then the implementation schedule was put into place is one such example. The time for responses is shrinking, and this creates particular problems as the entire product cycle from identification of technology and concepts, to the development of pilot plants demonstrations, marketing, and upgradation of technology needs to fit into a much shorter timescale. It is the same case with climate change. Though technologies promoting sustainable development would be adopted by industries the world over, yet, conscious efforts of global politics must speed up the process.

Perhaps a more crucial issue for sustainable development is the efforts of large brand equity conscious enterprises, who because of competition and public expectation invest in sustainable development. Many a method of the technology and science that can help in sustainable development have not even been touched. This is the field of low-capacity units like SMEs, which continue to use archaic technologies. Judicial interventions have occurred in India and Pakistan. One of the most significant interventions was in Agra, where the Taj Mahal is located. A whole set of enterprises, including small-scale industries have been asked to upgrade, relocate, or close down. These industries have no technological packages available in the market suitable to their scale. Even if such packages are available, whether it is for the low capacity users, or for the brand-equity conscious users, adopting new technologies is difficult.

Knowledge diffusion is constrained by capacities and capabilities. The adoption of new technologies requires new capacities and capabilities. For example, in the process of ozone-depleting substances, a whole set of operating principles were developed for using substitutes for chlorofluorocarbons; however, it took users time to understand the implications. There are examples, even in India, of users, who adopted one particular substitute, only to find a year or two later that this did not meet their needs, that they were not able to use it efficiently, and that they had to make a second switchover. It is not the availability of information that is important, but the knowledge about these technologies and about how to adopt, use, and upgrade them

needs to be disseminated. That is the key not only to adopting technological change but also to generating technological change.

10.4.5 What Needs to be Done?

The first thing to do is to develop a series of 'needs assessments' in the context of the issue of sustainable development and to promote technological diversity. For example, the project for the phase out of ozone depleting substances, different national programmes looked at the needs of the various users, and identified the kinds of financing and credit requirements. The need of the hour is to put into place appropriate policy interventions, both at the public and the corporate governance levels, in order to create and expand markets for new technologies. In doing so, the development of strong linkages between scientists, technologists, users, and the industry need to be ensured. The types of delivery mechanisms which would need to be put into place must also be studied so that the knowledge about the technologies can be disseminated, their installation and adoption aided, the required credit and technical service provided, and the up gradation of those technologies assisted.

In other instances, particularly with low capacity users, public support for product development is essential. In SMEs, for example, where wood is burnt directly to get heat, using biomass is economical and also makes sense from the point of view of sustainable development. Yet, time and again, specific products had to be created for these users and time, effort, and managerial inputs are required before these small-scale industries could adopt these new products. Such situations call for public support. Whether it is low capacity users or public infrastructure services like water supply, while the delivery mechanisms can and should be based in the private sector, the development of products needs direct public intervention.

In this perspective, one, therefore, needs to examine the measures that need to be adopted to enable technological cooperation, which would be extremely essential for promoting sustainable development the world over. In the case of the phase out of ozone depleting substances, an international cooperative called the Industry Cooperative for Ozone Layer protection was formed. It comprised a number of large industries, the brand equity conscious enterprises. These industries, which would otherwise compete in the marketplace, not only shared experiences about the adoption of new technologies, but also provided help and expertise to other users globally, including India. This, helped in preventing the mistakes of making the wrong choices because industry partnerships are essential as they help to upgrade the capacity and the capability of the users.

Finally, it is possible to create perfect technologies but the main issue is what would happen when these technologies reach the actual end users. And, as far as sustainable development is concerned, it is extremely essential to shift the focus of scientific and technological processes to meet the needs of low capacity users, as technology is for people, not the other way around.

SAQ 4

1. Explain different perspectives on technological support for sustainable development.

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2. Discuss the various ways in which technology can be used for the achievement of sustainable development.

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3) Explain corporate responsibility towards sustainable development.

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Let us summarise what we have learnt so far.

10.5 SUMMARY

The unit lays out a framework for assessing the role of science and technology in moving towards a sustainable future, and works out at what level and the know-how to accelerating the process. The six perspectives provided set out the broad parameters within which the technological support for sustainable development would occur. These perspectives lead to industries to view sustainable development both as a long-term vision and goal, as well as a business opportunity to be exploited. Knowledge diffusion is constrained by capacities and capabilities. There need to be a strong commitment to adopt the processes and methodologies that help in sustainable development among many of the industrial and business houses. The adoption of new technologies requires new capacities and capabilities. This relatively new commitment on the part of scientists arose in response to the growing realisation of the extent which human activities on our planet increasingly threaten the earth's environment, and the growing recognition by governments that scientific knowledge of the earth system is a necessary ingredient for wise policy-making.

10.6 TERMINAL QUESTIONS

1. Explain the technological factors that contribute to deterioration of the environment.

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2. Write a note on the relationship of Technology and Society and its impact on Economy.

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3. Explain the following in your own words.

   a) Market efficiencies and technological development.

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   b) Environmental carrying capacity.

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4. How do you develop nexus between technology and environmental pollution?

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UNIT 11 SOCIO-CULTURAL DIMENSIONS

Structure

11.1 INTRODUCTION

In Unit 10 we have discussed the role of technology in the development and how with the use of technology we can check environmental deterioration, resource depletion and its generation. In the present unit we shall discuss the socio-cultural dimensions of various issues related to environment.

As such the main focus of this unit will be on the explanation of the socio-cultural dimensions of integrated environmental management in rural and urban areas, including following: community mobilisation and participation, people's involvement and empowerment, women development, gender and feminism and involvement of male and female communities in integrated environmental management.

In this unit, you will be introduced to the basic concepts of community and community mobilisation, participation, people's involvement, empowerment and women development, gender and feminism; the process of community mobilisation and participation in the integrated environmental management; the status of women, gender and feminism; and the mechanism of people's involvement in integrated environmental management through their empowerment.

Objectives

After studying this unit, you should be able to:

- define and understand the terms and basic concepts of community, participation, mobilisation, empowerment, women development, gender and feminism;
- describe the composition and elements of the community and the process of community mobilisation, constraints and their solutions;
- discuss the process of participation and the mechanism of people's involvement in the development projects, especially integrated environmental management;
- describe the role of the social organisers and community activists/mobilisers, to launch and accomplish the task of community mobilisation;
- explain the status of women, impact of gender and feminism on the women development; and
- list the ways to involve the male and female community members in the integrated environmental management.

11.2 COMMUNITY, PARTICIPATION AND COMMUNITY MOBILISATION

We all live in a community. There are different things that bind us together. Let us try to identify some of these. For example, some of the common factors that bind us to our communities, or that we may have in common with the other people living around us, include:

- Beliefs and values
- Language
- Territory
- Religion
- Culture
- Occupations

SAQ 1

Write about your community:

- Name of the community ……
- Languages spoken …….
- Festivals celebrated ……..
- Religions ……..
- Beliefs and values …….
- Political groups/parties …….
- Surrounding villages/areas ……
- Occupations ……...
- Social services available ……...
- Demographic and socio-economic features …….
- Issues ……
- Social and Natural Resources ……

The social life led by people is affected by the kind of community in which they live. The community is as old as humanity – or even older. It is defined in different ways by various sociologists and social scientists, but most of these definitions contain a number of common and overlapping characteristics. In order to orient the learners, some of the prominent definitions are given as below:

1. **Community** means fellowship in Greek language. Reflecting on the meaning of the word:

   Aristotle asserted that people came together in a community setting for the enjoyment of mutual association, to fulfill basic needs, and to find meaning in life.

   Thomas Hobbes, on the other hand, saw community as the natural process of people coming together to maximise their self-interest. He felt that self-interests could be best satisfied in a group dwelling.

2. **G.D. Miitchell**, in *A New Dictionary of Sociology* (1987 edition), defines community as: "Originally the term *community* denoted a collectivity of people who occupied a geographical area; people who were together engaged in economic and political activities and who essentially constituted a self-governing social unit with some common values and experiencing feelings of belonging to one another".

3. **P.B. Horton and C.L. Hunt** define it thus: "A community is a local grouping within which people carry out a full round of life activities".

4. **Hillary**, 1955; **Jonassen**, 1959, defined community in a greater detail as: "A community includes (1) a grouping of people, (2) within a geographic area, (3) with a division of labour into specialized and inter-dependent functions, (4) with a common culture and social system that organise their activities, (5) whose members are conscious of their unity and of belonging to the community, and (6) who can act collectively in an organised manner".

5. From our perspective: "A community is defined and best described by the following elements: (1) people, (2) within a geographically bounded area (3) involved in a social interaction and (4) with one or more psychological ties with each other and with the place they live".

There are different **types of communities**, such as primitive, rural, modern, urban, simple, complex, farming, non-farming, settled and mobile, etc.

11.2.1 What Roles can the Community Play?

Our most valuable resource in the community is our own people. They can make decisions about the development of the village. Cooperation among community people is important to develop the community's self-sufficiency and reliance.

The community has an important role to identify and use available resources in the village or urban settlement, and to plan and act accordingly. Where there is a mechanism of local self-government, important decisions are usually made at the local level by the local people themselves.

SAQ 2

What are the main roles, which your community can play in any participatory development project?

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11.2.2 What is Participation?

Participation is a process of consultation and willingness to share something and to do something collectively. Participation is a process, in which, everything, from the concept to planning, implementation, monitoring, evaluation, operation and maintenance, should be in the ownership of the people/communities.

Participation is the act of being involved and of involving individuals or groups in making choices and decisions, in planning, in taking actions, in controlling and sharing the benefits. Participation reduces dependency by creating confidence, self-sufficiency and trust.

In order to elaborate the concept and process of participation, let us review some of the characteristics of the participation:

- Participation is a way of life.
- Individuals are like the components of machinery.
- Participation demands equality in decision-making.
- Change in the attitude is required for participation.
- Commonality of interest provides basis for participation.
- Combined thinking and struggle promotes participation.
- Participation is need based.
- Two-way learning process leads to participation.
- Someone has to initiate the process of participation as an activist.

11.2.3 Facilitation of Participatory Activities

In participatory activities, facilitators keep a low profile after introducing a task or activity and ultimately they become invisible and withdraw their support at an appropriate time. The tasks should be simple and the need for instructions should be minimal. This necessitates much time preparing the materials and thinking through the process. However, during the actual activity, good facilitators let the process be controlled and taken over by the group to the greatest extent possible. Tasks that are open ended allow the emergence of local perspectives, beliefs, values, reality rather than eliciting the “one correct answer”.

11.2.4 How to Empower Participants?

When the intention is to empower the participants, it is helpful to keep the following questions in mind in designing and conducting activities:

- Is the task open-ended or over structured?
- How much time and instruction is needed to clarify the task?
- Who is controlling the process?
- Who plays the dominant role in managing the task?
- Who is controlling the outcome?
- Does the task search for the correct answer?
- Who is talking the most? (Facilitator or Participants)
- Does the task generate discussion, thinking, energy, excitement and fun?
- Does the activity lead to changing perspective, group spirit or discussion of “what next”?

11.2.5 How to Promote Participation for Mobilising People?

In order to mobilise the people/communities for conducting any participatory development activity/project, focus on the following:

- Involve people's time/money to ensure their interest. *Not only voice but also money.*
- Listen, do nothing yourself. Learn where to support.
- Consult and take collective decision without hierarchy.
- Follow-up.
- Identify common interests.
- Promote solutions.
- Through leadership but reaching the poor and the marginalised.
- Allocate work; promote leadership, and convene meetings.
- Provide appropriate technology to solve and manage collective social and economic problems.
- By giving equal chance of opinion to all the members of the community or group.
- Call meetings, select activities/people by using criteria, given below:
    - Take burning issue to mobilise the people.
    - Organise people around their rights.
    - Form community organisations or development committees.
    - Mobilise, be punctual, and make no promises (giving false hopes).
    - Set personal examples through actions and deeds.

11.2.6 What is Community Mobilisation?

Community mobilisation is a process whereby a group of people has transcended their differences to meet on equal terms in order to facilitate a participatory decision-making process. In other words it can be viewed as a process, which begins a dialogue among members of the community to determine who, what, and how issues are decided, and also to provide an avenue for everyone to participate in the decisions that affect their lives. It facilitates the people for participation in the social, human and community development process. To achieve the objective of community mobilisation, social organisation methods are employed. These methods facilitate the process of organising the peoples in groups and small community based organisations (CBOs), to achieve or fulfill the community needs.

11.2.7 Why is Community Mobilisation Necessary?

Proper management of the resources is the best possible way for the development of the community. We call this "community mobilisation", where people plan and do things. They take charge, transforming their community and their lives.

Community mobilisation allows people in the community to:

- Identify needs and promote community interests.
- Promote good leadership and democratic decision-making.
- Identify specific groups for undertaking specific problems.
- Identify all the available resources in the community.
- Plan the best use of the available resources.
- Enable the community to better govern itself.

SAQ 3

List out some of the different reasons for mobilising any community.

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11.2.8 Identification and Mobilisation of Local Resources

The resource mapping is a tool, used for getting complete information about any village or any other rural or urban site. Such maps are drawn with the help of local people, covering whole area under study. These maps are drawn generally on ground, by using different techniques of PRA and PLA and later transferred to charts. All sorts of local resources and activities like houses, institutions, religious places, water sources, natural resources and manpower etc., are shown in these maps. These maps also indicate various demographic and socio-economic features and indicators, such as, available physical and social services, number of people living per-household, educational status, available skills, occupational, professional and other significant activities, income, etc., of the mapped area.

What might we find on the resource map of any village or urban area? There may be:

- The number of houses and the location of each house in the village/urban area.
- The number of people in each household.
- The number of children (male and female) going to school and the number of children not going to schools for each house.
- The number of literate and illiterate adults (male and female).
- The occupation and income of each family.
- The skills available in each family.
- The infrastructure of the village/urban area, e.g., preschool centre, school, community centre, places of worship, youth clubs, shops, health centres, roads etc.
- Natural resources, like rain and water bodies, forests and vegetation, mountains, minerals and others.
- Crops and seasons for sowing and harvesting.
- Any other significant geo-physical, cultural and historical features of the village/urban area.

Having completed the resource map, we can sit together with community members and discuss the issues involved. This discussion will help us identify and better understand the issues and resources available in the community.

SAQ 4

Prepare a resource map of your village/urban area.

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This process of developing the village/area resource map is called “micro planning”. Besides ‘resource mapping’, we can use other ways to get information about any area. For example, we can use:

- Surveys
- Participatory needs identification
- Focus group discussion
- Interviews
- House-to-house visits
- Secondary data (newsletters, reports, books etc.)
- Observations

11.2.9 How can We Plan from the Information Obtained?

With the information obtained, we can plan, mobilise resources and assign responsibilities for each task. In this way we can find appropriate solutions to the problems. For example, if the village/urban area has a problem with adult literacy, the following actions could be taken:

- Forming a village/urban area education committee.
- Establishing a literacy centre after identifying a location.
- Identifying local persons who can help in different activities at the centre.
- Motivating village/urban area people make contribution in money and kind to repair the literacy centre building.
- Conducting various activities to encourage adult learners to come to the centre.
- Collecting used books, writing boards and other teaching/learning materials for learners.

11.2.10 Who can help us Mobilise the Community?

For community mobilisation, a community support mechanism would be required. We can look for support for any programme in many places and in different ways, including all or some of the following stakeholders:

- Individuals
- Voluntary groups
- Local government
- Corporate sector/ Business groups
- School groups (teachers/students)
- Religious institutions / groups
- Political parties/activists
- Local NGOs
- Identical projects working in the area/neighbourhoods.

SAQ 5

Identify the major stakeholders in your area, who may contribute in developing a support mechanism for community mobilisation.

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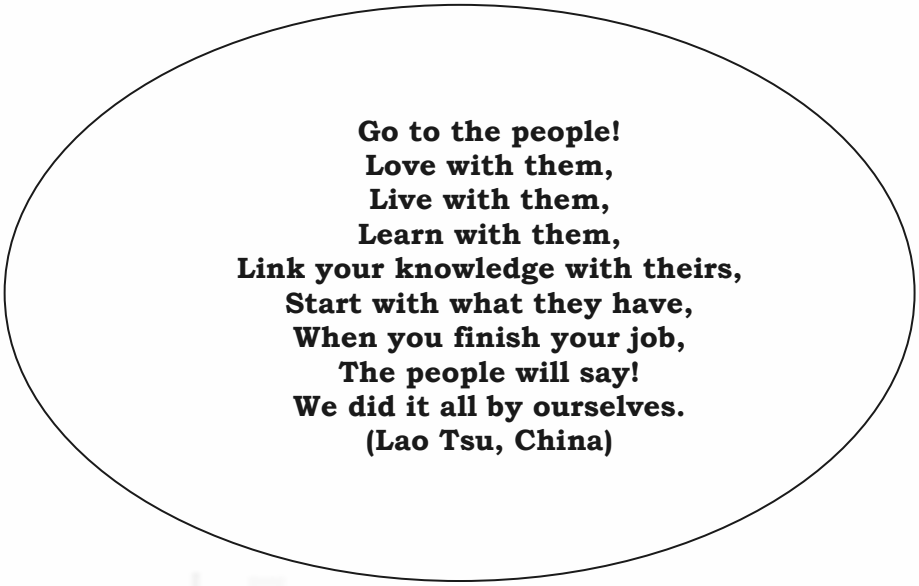
11.3 PEOPLE'S INVOLVEMENT AND EMPOWERMENT

11.3.1 People's/Community Involvement and Empowerment

People's/Community involvement and empowerment achieved by field workers, are commonly known as social organisers and community mobilisers/activists, using participatory methods. A proverb adapted from the words of a great Chinese thinker, **Lao Tsu**, elaborates the process of participation and community mobilisation in the words given below:



The community members are central to all community based and participatory development programmes. If community members do not take interest and participate in these programmes, then the programmes cannot be successful. The role of the community in ensuring people's participation in the community-based programmes is very important. A favourable environment can help to achieve this objective.

11.3.2 Ways to Involve the Communities

Let us look at some of the ways adopted and things done by different facilitators (social organisers and community activists) in different places, to involve the local communities in various development programmes:

- Awareness raising campaigns
- Study circles
- Establishing information centers
- Conducting village meetings
- Organising village fairs
- Organising field days
- Support and games
- Electronic and print media
- Person to person discussion
- Peer group meetings
- Songs and jingles
- Rallies and other festivities
- Extension lectures
- Puppet shows
- Film shows
- Use of audio/video aids
- Multimedia
- Debates, speech contests and quizzes
- Posters and banners
- Wall writings and paintings
- Door-to-door campaigns
- Human chains
- Radio talks

- Television programmes
- Processions and walks
- Folk arts, especially dances
- Magic shows
- Street theatre and plays
- Video shows and cassettes
- Interactive learning programmes
- Interactive computer programmes
- Wall newspapers
- Pamphlets and handouts
- Display boards
- Role modeling
- Exhibitions and shows
- Formation of clubs and societies/associations.

SAQ 6

Can you identify few ways of involving the people and communities in any community-based Integrated Environment Management Programme in rural/urban areas of your country?

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11.3.3 Three Levels of Community Involvement and Mobilisation

The community mobilisation could be accomplished at three levels:

I. By the Individual

The individual (she/he) decides how to launch the process to protect her/his interests or how to achieve the development objective, when and where to seek consultation and advice for achieving success.

II. By the Family

The parents decide on the protection of their children's rights and fulfillment of needs and make the choice of ways and means to be used for achieving the objectives.

III. By the Community

The people in the community decide what sort of problem to respond to and what sort of ways and means to be used for achieving the objectives.

11.3.4 Role of Facilitators in Community Mobilisation

The facilitators and social organisers play the most important role in the community mobilisation, involvement and empowerment of the people in any community based development programme. Some of the activities, which the facilitators/social organisers can carry out, include:

- helping communities in visualising the activities;
- helping them in need assessments and resource mapping activities;
- facilitating the formation of community organisations;
- inviting the local development officials to the community organisations (COs) and community-based projects;
- collecting and distributing information/materials about different development schemes that are suitable for the communities;
- responding to the community members who want help with projects they are undertaking;
- helping the CO members to develop project proposals and accompanying them when they go to various development departments/agencies;
- organising various events for community involvement (as listed above) with the officials of development departments;
- organising field days to highlight the issues and to introduce desired activities and for awareness raising among the people;
- organising field and exchange visits to other model projects /centres of different development departments, agencies and projects;
- sending community members for skill training conducted by different development departments and agencies;
- organising camps and campaigns for community development; and
- enrolling community members in various relevant organisations and institutions to enhance their awareness and orientation level.

The facilitators/social organisers can inform and guide the CO officials and other community members. Their role is that of a link between the community and other development programmes. The community based project office has to be the place to which the village/area where community members come to find answers to development issues.

This is why the facilitators/social organisers have to know about the different development programmes in the community/neighbourhoods such as environment rehabilitation and management, public health, irrigation, agriculture, banking and loans, micro-credit and enterprise development, small scale industry and women's empowerment etc. The knowledge of these will not only help the individual community members but will also help the whole village/area. Thus, the facilitators/social organisers can become the window through which the community members can get information. So it is important that the facilitators/social organisers have a good network of contacts.

11.3.5 How to Involve Local Representatives and Policy Makers?

The local representatives of the communities, policy makers and other concerned members of the communities and departments may be involved in the development activities and projects through formation of Community Organisations (COs) or Village Development Committees (VDCs) or Urban Area Development Committees (UADCs).

These COs or Committees can be mostly representative of the whole village or urban area. Such organisations can be made up of:

- Elected members of different local bodies.
- Village head or ward heads in urban area.
- Representatives of different communities living in the village or urban area including the marginalised groups.
- Representatives of the directly involved stakeholders.
- School teachers and other influential/activists.
- Facilitators/social organisers.
- Policy makers and officials of the development departments and agencies.
- Political leaders.
- Religious leaders.

These community organisations/committees can include 7-5 members and take up all the development activities starting from needs identification and project development to the implementation and monitoring and evaluation of the project outputs and impact assessment.

Sometimes there are a number of pre-existing community groups working in the communities such as the Social Welfare Societies/Associations, Women's Associations and Mother's Club, Parent-Teachers' Associations, School Management Committees, Student and Workers Associations, Consumer Societies, and Church Groups, etc., which can potentially serve as the basis for such a mobilisation strategy. Based on the articulated development goals and objectives of the community, there is a potential for new groups to be established to formulate strategies to address pressing problems in the community. In this regard, some of the central areas to be addressed may be: (1) Education and Health, (2) Employment and Poverty Alleviation (3) Physical Infrastructure Development (4) Land Tenure and Land use (5) Agriculture and Livestock, and (6) Natural Resource Management, etc.

11.3.6 Mobilising and Involving Marginalised Groups in the Participatory Development Process

In every rural or urban community, there are some groups that have been left out of the development process for one reason or the other. These groups have, over the years, been socially, economically and politically sidelined. These groups need special attention so that they can be brought into the main stream of the society again. Some of these groups are:

- Women
- Children

- Economically deprived groups
- Tribal/indigenous people
- Disabled persons
- Minority groups, including religious, socio-cultural, political, ethnic, linguistic and other ignored communities and groups.

The marginalised groups are often left out, not only of the educational process but also of most development programmes in general. Adult illiteracy and the percentage of children not attending school are high in these groups. As a result, many of them have not been able to receive knowledge from the education system. In addition, this exclusion may also have deprived these groups of their independence, opportunities for informed decision-making, and the capacity for self-reliance and social interaction.

Another problem is that such marginalised groups are often unable to find an appropriate platform to address their problems. Through their involvement and participation in the community organisations, they may find the much-needed opportunities and use their collective strength to solve problems. Many communities, especially the women groups, have learnt new skills and have been able to increase their income after having chances for participation in the development process. Besides that, coming together has enabled these groups to fight social and economic exploitation.

SAQ 7

Can you identify some of the marginalised groups living in your community?

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11.3.7 Obstacles Hampering Community Mobilisation Process

It is evident that there are a number of obstacles, serving to prevent a mobilisation process from occurring. On the one hand there are quite strong networks in the communities in terms of interdependence or cooperation amongst friends, families, and neighbours. Unfortunately, in most of the communities there is little formal organisation and strategising around community organisations, which could potentially serve as a means to address their needs.

This sense of immobility arises from a number of factors:

1. The misperception among the community members that politicians and bureaucrats will alleviate their problems for them (yet the problems of corruption and poor administration are evident).

2. A lack of expertise amongst the community to facilitate such organisation.

3. A lack of will and interest amongst the community members to enhance the required skills for facilitation of such social organisation.

4. Illiteracy, social problems, especially lack of access to social and economic resources/services and poverty among the majority of people living in rural areas and among the marginalised groups in the urban areas.

5. The unwilling nature of the community as a whole to give up individual interests to form a broader perspective.

6. An extreme shortage of available resources to facilitate the community mobilisation process.

SAQ 8

Can you identify some obstacles, which are preventing the community mobilisation process from occurring in your society/country?

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11.3.8 Solutions to Resolve the Problems

The solutions to resolve such problems are rooted within the resource capacities and social organisational structures of the communities. The Organising structure presented here to resolve the problems related to the community mobilisation is based on the concepts of self-help, encompassing various distinguishing features of community development theory, practice, and ideology. While it is not assumed that all of the problems of the communities can be resolved by community's efforts alone, it is seen as a means of achieving broader community participation and effort. Through this means, it is suggested that the living conditions, facilities and services of the community will improve upon, along with the empowerment of the community.

SAQ 9

Can you add-up some more solutions?

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11.4 WOMEN DEVELOPMENT, GENDER AND FEMINISM

The majority of the women, especially in the underdeveloped and developing countries, have been treated as a marginalised group. This situation leads to frustration among the women and ultimately resulted in the movements for women's liberation and empowerment, equal rights for women and their participation in the development process.

Women's movements are those, which arise as conscious, organised efforts of groups of women (often supported by men) to change the system of economic, cultural and political inequality. While, the women individually struggle against their sub-ordinate position under many conditions, such organised movements have arisen with the development of imperialism and capitalism, as part of the efforts to carry through the democratic evolution. Their efforts often centre on the correction and/or replacement

of existing social, economic and political institutions in order to serve the needs of their new urgencies and priorities. Thus a movement per se is an effort and the organisation is the means to achieve the specific goals.

11.4.1 Gender and its Impact on Women Development

Gender *refers to the significance a society attaches to biological categories of female and male.* Gender is a basic organising principle of society that shapes how we think about ourselves and guides how we interact with others. But while gender concerns differences, it also involves *hierarchy*, because it affects the opportunities and constraints we face throughout our lives.

The inequality inherent in gender is no simple matter of biological differences between the two sexes. Females and males do differ biologically, of course, but the various researches suggest that the physical and mental abilities of men and women are more alike than we may think.

Biologically, the sexes differ in limited ways with neither one naturally superior. Nevertheless, the deeply rooted *cultural* notion of male superiority may seem so natural that many assume it is the inevitable consequence of sex itself. But society, much more than biology, is at work here, as the global variability of gender attests.

Global comparisons show us that, by and large, societies do not consistently define most tasks as either feminine or masculine. As societies industrialise, giving people more choices and decreasing the significance of muscular power, gender discrimination becomes insignificant. Gender, then, is simply too variable across cultures to be considered a simple expression of biology. Instead, as with many other elements of culture, what it means to be female and male is mostly a creation of society.

11.4.2 Feminism and Feminist Movements

Feminism is *the advocacy of social equality for men and women, in opposition to patriarchy and sexism.*

11.4.3 Feminist Movements

Some social movements have been around for a very long time. Three of them, in particular, appear to be as old as the institutionalised beliefs and practices they oppose. These social movements are:

- Gender equality;
- Labour; and
- Democratic Rights.

The “first wave” of the feminist movement in the United States began in the 1840s as women who opposed slavery, drew parallels between the oppression of African Americans and the oppression of women. Their primary objective was to secure the right to vote, which was finally achieved in 1920. But other disadvantages persisted and a “second wave” of feminism arose in the 1960s, and continues even today.

11.4.4 Basic Feminist Ideas

Feminism views the personal experiences of women and men through the lens of gender. How we think of ourselves (gender identity), how we act (gender roles), and our sex’s social standing (gender stratification), are all rooted in the operation of our society.

Although people who consider themselves feminists disagree about many things, most of them support the following five general principles:

1. The Importance of Change

Feminist thinking is decidedly political, linking ideas to action. Feminism is critical of status-quo, denoting change towards social equality for men and women.

2. **Expanding Human Choice**

   Feminists maintain that cultural conceptions of gender divide the full range of human qualities into two opposing and limited spheres: the female world of emotions and cooperation and the male world of rationality and competition. As an alternative, the feminists propose a "reintegration of humanity" by which each human can develop *all* human traits.

3. **Eliminating Gender Stratification**

   Feminism opposes laws and cultural norms that limit the education, income and job opportunities of women. For this reason, the feminists advocate provision of equal rights to women.

4. **Ending Sexual Violence**

   Today's women's movement seeks to eliminate sexual violence. Feminists argue that patriarchy distorts the relationships between women and men, encouraging violence against women in the form of rape, domestic abuse, sexual harassment, and pornography.

5. **Promoting Sexual Autonomy**

   Finally, the feminism advocates women's control of their sexuality and reproduction. Feminists support the free availability of birth control information. Most feminists also support a woman's right to choose whether to bear children or terminate a pregnancy, rather than allowing men – as husbands, physicians, and legislators – to control women's sexuality. Finally, many feminists support gay people's efforts to overcome the many barriers they face in predominantly heterosexual culture.

11.4.5 Types of Feminism

People pursue the goal of sexual equality in various ways, yielding three general types of feminism, as given below:

1. **Liberal Feminism**

   Liberal feminism is based on the classic liberal thinking that individuals should be free to develop their own talents and pursue their own interests. They support the ideas like equal rights for men and women, reproductive freedom for all women, respect for family as a social institution, and removal of legal and cultural barriers rooted in gender by collective efforts of men and women.

2. **Socialist Feminism**

   Socialist feminism evolved from the ideas of Karl Marx and Friedrich Engels, partly as response to Marx's in attention to gender. From this point of view, capitalism increases patriarchy by concentrating wealth and power in the hands of a small number of men. They reject the reforms sought by liberal feminism as inadequate. They believe that only a socialist revolution that creates a state-centred economy to meet the needs of all and a collective pursuit of men and women for their personal liberation are solutions to address the gender disparity.

3. **Radical Feminism**

   Radical feminism, too, finds the reforms of liberal feminism inadequate. Moreover, they claim that even a socialist revolution would not end patriarchy. They think that gender equality can be realised only by eliminating the cultural notion of gender itself. Radical feminists look toward new reproductive technology to separate women's bodies from the process of child bearing, to

change the existing family system, which is responsible for gender disparities. They support the idea of an egalitarian and gender-free society.

11.4.6 Opposition to Feminism

Feminism provokes criticism and resistance from both men and women who hold conventional ideas about gender. Some of the main reasons for opposition include: maintenance of status-quo to protect male privileges; protection of traditional family institution; and to continue the traditional roles of men and women.

Opposition to feminism is primarily directed at its socialist and radical variants; otherwise, there is a widespread support for the principles of liberal feminism.

11.4.7 Looking Ahead: Gender in the 21st Century

Remarkable technological, socio-economic and cultural changes have occurred during the last century, leading to the restructuring of the social system and role of men and women. Many factors have contributed to this transformation. Perhaps, the most important, of them, was the industrialisation, which broadened the range of human activity and shifted the nature of work from physically demanding tasks that favoured male strength to jobs that require human thought and imagination, putting the talents of women and men on an equal footing. Additionally, medical technology gives us control over reproduction, so women's lives are less constrained by unwanted pregnancies.

Many women and men have also deliberately pursued social equality. And as more women assume positions of power in the corporate and political worlds, social changes in the 21st century may be as great as those we have already witnessed.

Gender is an important part of personal identity and family life, and it is deeply woven into the moral fabric of human society. Therefore, efforts at change will continue to provoke opposition. While changes may be incremental, the movement towards a society in which women and men enjoy equal rights and opportunities seems certain to gain strength.

11.5 INVOLVING MALE AND FEMALE COMMUNITIES IN INTEGRATED ENVIRONMENTAL MANAGEMENT

Since their inception and application, participatory management approaches have proved that community participation in integrated development projects, not only facilitate the management and strengthen the development process, but also help in achieving better results. Similarly, the male and female communities can play an effective and productive role in the integrated environmental management, if they are involved in the development activities, throughout the project cycle, starting from visualisation and planning to the implementation, monitoring and evaluation and assessment of the impacts of the project interventions.

The male and female communities may be involved in the integrated environmental management projects, following the seven steps given below:

1. Mobilising community through establishing contacts with the community members;

2. Organising males and females into Community Organisations (COs) and/or Environment Management Committees (EMCs).

3. Provision of legal status to the COs and EMCs by registering them under appropriate national laws;

4. Capacity building of the COs and EMCs, through awareness raising and training, especially in the management and social organisation/mobilisation skills;

5. Selection and training of community-based, male and female Environment Management Extension Workers (EMCWs), to provide guidelines and services to the communities;

6. Establishing linkages with the local government and other like agencies, projects and NGOs, for learning through experience sharing;

7. Developing record-keeping, documentation, and reporting system.

Let us summarise what we have learnt so far.

11.6 SUMMARY

Community plays a crucial role in the management of local problems, to achieve self-sufficiency and self-reliance, and plan available resources for best results. Community can achieve its projected developmental goals through local level participatory management. However, for participatory management of the local problems mobilisation of the community is imperative. A number of organisations like voluntary groups, school groups, religious institutions, local NGO's and political parties can help mobilise the community. Communities can be involved in the local problems – rural or urban through a variety of ways such as awareness campaigns, establishing information centres, organising village fairs and festivals etc. The community can be involved and mobilised at three levels, individual, family and community and facilitators play an important role in this process of mobilisation. It would be useful to involve the local representatives and policy makers in the development activities of the rural and urban areas. One aspect which must not be ignored is the mobilisation of the marginalised groups particularly the women. As women play an important role in the development of the rural areas acceptance of gender equality and gender sensitisation is absolutely necessary.

11.7 TERMINAL QUESTIONS

1. Define and discuss the following terms and concepts:

   - Community

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   - Types of communities

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   - Participation

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   - Community mobilisation

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- Three levels of community involvement and mobilisation

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- Role of facilitators in community mobilisation

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- Gender and its impact on Women Development

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- Feminism and Feminist Movements

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- Basic Feminist Ideas

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- Types of Feminism

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2. What roles can the community play?

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3. How do the participatory activities facilitate to empower participants?

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4. How can participation for mobilising people be promoted?

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5. Why is community mobilisation necessary?

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6. How can local resources be identified and mobilised?

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7. Who can help us mobilise the community?

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8. How are People/Community involved in the development process and empowerment?

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9. Explain the methods used by the facilitators to involve the communities in the development process?

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10. How can the local representatives and policy makers be involved in the community-based activities?

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11. Why are the mobilisation and involvement of marginalised groups necessary in the participatory development process?

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12. Discuss the obstacles hampering community mobilisation process and also describe the solutions to resolve them.

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13. Describe seven steps for involving male and female communities in the integrated environmental management.

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UNIT 12 ETHICAL AND MORAL DIMENSIONS

Structure

12.1 INTRODUCTION

In Unit 11 we have focused the basic concepts mobilisation, participation, people's involvement of community, empowerment and women development, gender and feminism the process of community mobilisation and participation in the integrated environmental management. In this unit we will discuss about many social problems in terms of ethical and moral dimensions in respect of environmental management.

Many environmental problems are in fact social problems in terms of moral and ethical values. Building a just, stable, harmonious world for the future generations should be the central organising principle for civilisation. Our ideas about nature have varied through the whole history of environmentalism.

This unit reviews the environmental ethics, our views and beliefs about nature and environment, issue of environmental equity dealing with the environmental crisis, environmental justice and its principles, racial discrimination at the policy and public level in managing the environment, and teachings about environment in the major religions practiced in South Asia.

Objectives

After studying this unit, you should be able to:

- discuss different ethical approaches and attitudes towards nature and environmental management;
- explain the importance of equity for environmental management;
- discuss the necessity of justice in dealing with environmental crisis;
- describe the effects of discrimination policies and plans for managing environmental management; and
- explain the teachings of different religions about environmental management.

12.2 ETHNICAL USE OF NATURAL RESOURCES

The release of noxious gases into the atmosphere, the destruction of forests and the over-exploitation of natural resources have caused irreversible environmental damage throughout the world. In some cases the damage is so severe that life-support systems, both local and global, are being threatened. Unless we curb our rapacious desire for more and more material possessions and unceasing economic growth, continued ecological damage will be unavoidable. To solve our environment problems, there should be a change in the way we think about and the way we interact with our environment.

Ethics, seeks to define as to what right is and what wrong we have done on a universal basis. For example stealing, lying, cheating, killing and indifference to the well-being of others are considered to be unethical. Preserving human life, concerns for others, honesty and truthfulness are considered to be ethical.

Moral values reflect the dominant belief of a particular culture about what right and wrong. For example killing a person is wrong but during the wartime, killing a human being is not considered as an immoral act. It is difficult to define what is wrong and what is right because of the differences in cultural and religious beliefs. Some individuals consider it unethical, immoral to unnecessarily waste resources while others argue that maximising consumption is a moral act because it promotes the economic growth, that is a source of jobs and funds for helping the poor and protecting the environment.

When we use the term "Environmental Ethics" we refer it to as a discipline that studies the moral relationship of human beings, and also the value and moral status of the environment and its non-human contents.

Why do we need a new set of ethics for the environment? The answer includes three factors.

1. *New effects on nature:* As our modern technological civilisation affects nature greatly, we must examine the ethical consequences of these new technological actions.
2. *New knowledge about nature:* Modern science demonstrates as to how we have changed and are in the process of changing our environment in ways not previously understood, thus raising new ethical issues. For example, until the past decade, few people believed that human's activities could be changing the Earth's global environment. Now, however, scientists believe that burning fossil fuels and clearing forests have increased the amount of carbon dioxide in the atmosphere, and that this causes changes in our climate. Hence the emphasis is on a global perspective.
3. *Expanding moral concerns:* Some people argue that animals, trees, and even rocks have normal and legal rights and that it is a natural extension of civilisation to begin with the environment in ethics. These expanded concerns lead to a new need for a new ethic.

For most of human history, ethics has concentrated on "human rights", the rights of individuals, of families and ethnic groups. However ethics now include the rights of animals, plants and the environment beyond the human rights to rule and use them.

12.3 THREE VIEWS ABOUT NATURE

There are essentially three views of nature:

1. The Western (European and North American),
2. The Sineatic (Chinese, Korean and Japanese) and
3. The Indian (a combination of Hindu, Buddhist and Jain philosophies).

In the past the western view considered that nature was alien and hostile to human beings; it had to be conquered, and subsumed under human control.

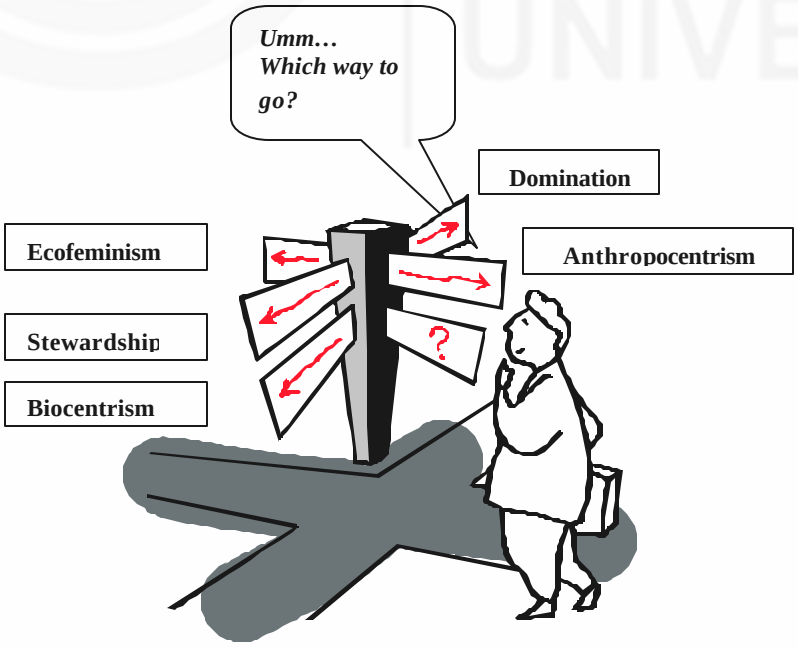
The Sineatic concept of nature is that it is beautiful and perfect, but it has to be transformed to be loved. Nature creates an aesthetic awe. "Rather than being hostile, man is a part of nature, in the Sineatic view, man has his place in nature".

Finally, the Indian spiritual tradition combines perspectives on nature from Hinduism, Buddhism and Jainism. In this case, nature is a mother. She cannot be tamed by her children. She is a Goddess.

Environmental ethics makes the distinction between intrinsic value and instrumental values of things. Instrumental value is the value of things as *means* to further some other ends, while the intrinsic value is the value of things as *ends in them* regardless of whether they are also useful as means to other ends. For example think of a person who is a teacher, beside teaching, those who acquire knowledge from them, s/he also have intrinsic value, value in her or his own right independently of her or his prospects for serving the ends of others. Same is the case when we think of a medicinal plant that has instrumental value because it provides the ingredients for some medicine or as an aesthetic object for human observers. But if the plant also has some value in itself independently of its prospects for furthering some other ends such as human health, or the pleasure from aesthetic experience, then the plant also has intrinsic value. As the intrinsic value is that which is good as an end in itself, it is commonly agreed that something's possession of intrinsic value generates a *prima facie* with direct moral duty on the part of moral agents to protect it or at least refrain from damaging it.

12.4 ATTITUDES TOWARDS NATURE

In whatever way we treat the environment reveals about our beliefs, about ourselves and the world around us? Some people regard human beings as merely one of the many species of animals; others view human being's role as caretaker or stewards of nature. This differing points of view often lead to contradictory environmental polices. Let us see some of the popular points of view towards environment.



12.4.1 Anthropocentrism

The people having an anthropocentric or human centred attitude towards nature either assign more intrinsic value to human beings or they assign significantly greater value to human beings than any other non-human things. According to anthropocentric attitude, protection or promotion of human interests or well-being at the expense of nonhuman things turns out to be nearly always justified. Aristotle maintains that 'nature has made all things specifically for the sake of man' and that the value of nonhuman things in nature is merely instrumental. The Bible says:

> "God created man in his own image, in the image of God created him; male and female created he them. And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over fish of the sea, and over fowl of the air, and over every living thing that moveth upon the earth" (*Genesis* 1: 27- 8).

Although many people trace the roots of domination in these biblical injunctions, however others argue that these verses are misinterpreted and wrongly translated. The original, they claim, meant something more like stewardship than conquest and domination. However, in the early 1970s, with the emergence of environmental ethics as a new discipline, a challenge was posed to anthropocentrism. Environmental ethics questioned the assumed moral superiority of human beings to other animals to other species on earth and the rationales for assigning intrinsic value to natural environment. However, that some theorists working in the field see no need to develop new, non-anthropocentric theories. Instead, they advocate what may be called *enlightened anthropocentrism* (or, perhaps more appropriately called, *prudential anthropocentrism*). Briefly, this is the view that all the moral duties we have towards the environment are derived from our direct duties to its human inhabitants.

12.4.2 Stewardship

Many tribal or indigenous people, both hunters and gatherers and those in traditional agricultural societies, have a strong sense of stewardship or responsibility for a particular part of nature. As custodian of resources, they see their proper role as working together with human and nonhuman forces to sustain life. Humanity and reverence are essential in this worldview, where humans are seen as partners in the natural process rather than masters-not outside of nature but part of it. Stewardship requires a person to consider the entire universe as her or his extended family, and all living organisms are members of the household. In this humane view, stewardship need not reject science or technology. If we are part of nature, then our intelligence and discoveries are parts of nature too. As stewards of our environment, we have a duty to use the power of science and technology to improve rather than destroy or degrade the world.

12.4.3 Ecofeminism

Many feminists argue that neither anthropocentrism, nor stewardship is sufficient to solve environmental problems or to tell us how we ought to behave as moral agents. They argue that all these philosophies have come out of a patriarchal system based on domination and duality. This worldview assigns prestige and importance to some things but not others. It claims that men are superior to women, minds are better than bodies, and culture is higher than nature. Feminists see an important connection between patriarchal domination, exploitation, and ill-treatment of woman, children, minorities and nature.

Ecofeminism is radically a new vision. It is rooled in women's biological, procreative and maternal role. Ecofeminism finds instant rapport with Eastern concepts of 'Mother Nature'. According to some experts on the subject, 'The Capitalist, patriarchal World system' is founded upon and sustain-itself through three 'colonisations' – of women, of foreign people and their lands and of nature. The

ecology of nature is linked to the biology of women's bodies, and the exploitation of nature to the exploitation of women's wombs. It is anti-modern science and economic growth as both are characteristic of a violent male ethos. It envisions a work of subsistence life style, in harmony with nature and pervaded by 'feminist principle'. For the greater good of both man and woman ecofeminism seeks to forge a 'new sexual and reproductive ecology'.

Ecofeminist, a pluralistic, nonhierarchical, relationship oriented philosophy suggests that humans could reconsider their relationship to nature in nondominanting ways and this is proposed as an alternative to patriarchical systems of domination. Ecofeminism is concerned not so much with rights, obligations, ownership and responsibilities as with care, appropriate reciprocity and kinship. It promotes a richly textured understanding or sense of what human life is and how this understanding can shape people's encounters with the natural world.

According to this philosophy, when people see themselves as related to others and to nature, they will see life as bounty rather than scarcity, as a network of personal relationships rather than isolated egos. However, Ecofeminism has been subjected to severe criticism for its impracticability and its peculiar biases and distortions. It is argued all development is not patriarchal and anti-women.

12.4.4 Biocentrism and Ecocentrism

Many modern environmentalists criticise stewardship as being too anthropocentric. They instead favour the biocentric attitude that claims that all living organisms have values and rights regardless of whether they are useful or not. Aldo Leopold, in his famous essay on the Land ethic , included the whole biotic community as part of the land. Leopold pointed out that the history of civilisation has been accompanied by a gradual extension of inherent values and rights, first to men, then to women, children and minorities and more recently to nonhumans such as corporations and states. Leopold argues that values should be extended to the recognition of inherent worth to other organisms as well.

Some philosophers assert that even nonliving components of the landscape such as rocks, rivers, mountains or ecological processes such as succession or the hydrological cycle have a right to exist in their natural state without human interference. This attitude is described as ecocentric because it claims moral values and rights for both organisms and ecological systems. People having anthropocentric approach believe that the environment is in perfect balance until the evolution of modern humans who have disrupted the web of life in their quest to dominate nature; a quest which is leading to their own destruction if they do not relearn to live in harmony with the natural world.

SAQ 1

1. Discuss various views on Nature.

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2. What is Environmental Ethics?

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3. Define and discuss the following:

   i) Anthropocentrism;

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   ii) Ecofeminism;

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   iii) Ecocentrism.

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12.5 ENVIRONMENTAL EQUITY

An ideal of equal treatment and protection for various racial, ethnic, and income groups under environmental statutes, regulations, and practices are applied in a manner that yields no substantial differential impacts relative to the dominant group – and the conditions so-created. Although environmental equity implies elements of "fairness" and "rights", it does not necessarily address past inequities or view the environment broadly, nor does it incorporate an understanding of the underlying causes and processes.

There are three categories of environmental equity issues:

12.5.1 Procedural Inequity

This issue addresses the questions of fair treatment: the extent that governing rules, regulations, and evaluation criteria are applied uniformly. Examples of procedural inequity are "stacking" boards and commissions with pro-business interests, holding hearings in remote locations to minimise public participation, and using English-only material to communicate to non-English speaking communities.

12.5.2 Geographical Inequity

Some neighbourhoods, communities, and regions receive direct benefits, such as jobs and tax revenues, from industrial production while the costs, such as the burdens of waste disposal, are sent elsewhere. Communities hosting waste-disposal facilities receive fewer economic benefits than communities generating the waste.

12.5.3 Social Inequity

Environmental decisions often mirror the power arrangements of larger society and reflect the still-existing racial bias in these States. Institutional racism has influenced the noxious facilities and has let many black communities become "sacrifice zones".

12.6 ENVIRONMENTAL JUSTICE

The right to a safe, healthy, productive, and sustainable environment for all, is the one where "environment" is considered in its totality to include the ecological (biological), physical (natural and built), social, political, aesthetic, and economic environments. Environmental justice refers to the conditions in which such a right can be freely exercised, whereby individual and group identities, needs, and dignities are preserved, fulfilled, and respected in a way that provide for self-actualisation and personal and community empowerment. This term acknowledges environmental "injustice" as the past and present state of affairs and expresses the socio-political objectives needed to address them. *"Environmental justice has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity and /or socioeconomic status."*

This concept applies to governmental actions at all levels – local, state and central as well as private industry activities. Providing environmental justice goes beyond the stated definition and includes a guarantee of equal access to relief and meaningful community participation with government and industry decision-makers.

'Principle of environmental justice' as adopted at the People of Colour Environmental Leadership Summit in October, 1991 are:

1. Environmental justice affirms the sacredness of Mother Earth, ecological unity and the interdependence of all species, and the right to be free from ecological destruction.
2. Environmental justice demands that public policy be based on mutual respect and justice for all peoples, free from any form of discrimination or bias.
3. Environmental justice mandates the right to ethical, balanced and responsible uses of land and renewable resources in the interest of a sustainable planet for humans and other living things.
4. Environmental justice calls for universal protection from nuclear testing, extraction, production and disposal of toxic/hazardous wastes and poisons and nuclear testing that threaten the fundamental right to clean air, land, water, and food.
5. Environmental justice affirms the fundamental right to political, economic, cultural and environmental self-determination of all peoples.
6. Environmental justice demands the cessation of the production of all toxins, hazardous wastes, and radioactive materials, and that all past and current producers be held strictly accountable to the people for detoxification and the containment at the point of production.
7. Environmental justice demands the right to participate as equal partners at every level of decision-making including needs assessment, planning, implementation, enforcement and evaluation.
8. Environmental justice affirms the right of all workers to a safe and healthy work environment, without being forced to choose between an unsafe livelihood and unemployment. It also affirms the right of those who work at home to be free from environmental hazards.
9. Environmental justice protects the right of victims of environmental injustice to receive full compensation and reparations for damages as well as quality health care.
10. Environmental justice considers governmental acts of environmental injustice a violation of international law, the Universal Declaration on Human Rights, and the United Nations Convention on Genocide.

11. Environmental justice must recognise a special legal and natural relationship of native peoples to the government through treaties, agreements, compacts, and covenants affirming sovereignty and self-determination.

12. Environmental justice affirms the need for urban and rural ecological policies to clean up and rebuild our cities and rural areas in balance with nature, honouring the cultural integrity of all our communities, and providing fair access for all to the full range of resources.

13. Environmental justice calls for the strict enforcement of principles of informed consent, and a halt to the testing of experimental reproductive and medical procedures and vaccinations on people of colour.

14. Environmental justice opposes the destructive operations of multi-national corporations.

15. Environmental justice opposes military occupation, repression and exploitation of lands, peoples and cultures, and other life forms.

16. Environmental justice calls for the education of present and future generations, which emphasises social and environmental issues, based on our experience and an appreciation of our diverse cultural perspectives.

17. Environmental justice requires that we, as individuals, make personal and consumer choices to consume as little of Mother Earth's resources and to produce as little waste as possible; and make the conscious decision to challenge and reprioritise our lifestyles to insure the health of the natural world for the present and future generations.

It is sometimes thought that environmentalism is an elitist movement, for those who have money and leisure, and who can afford to worry about maintaining open spaces for recreation, and preserving economically valueless species as a matter of principle. It is said that from the point of view of the poor, providing jobs and a good standard of living should have higher priority than a clean environment, which is a luxury that comes after other needs are met.

However, others believe that the environmental consequences of our use of natural resources fall disproportionately on certain disadvantaged racial, ethnic, and socioeconomic groups. For instance, a good case could be made that hazardous waste sites are usually located in disadvantaged communities, and in disadvantaged nations, and that the people in these locations bear the consequences of the use of hazardous materials, without reaping the benefits proportionately. The environmental justice movement is concerned with such issues.

SAQ 2

How can we preserve, protect and sustain the environment and create an appropriate relationship with nature, while at the same time enjoying the benefits of industrial and technological developments.

12.7 ENVIRONMENTAL RACISM

Race, not class or income, is the strongest determinant of who is exposed to environmental hazards. Although poor people in general are more likely to be exposed to pollution as living in polluted neighbourhoods rather than rich people however, middle class will be exposed more than other groups.

Environmental racism is "Racial discrimination" in environmental policy-making, enforcement of regulations and laws, and targeting of communities of colour for toxic waste disposal and siting of polluting industries. According to Reverend Benjamin E. Chavis, Jr., Ex-Chairman of the NAACP, racial discrimination can be intentional or

unintentional and is often a manifestation of "institutional racism". This term acknowledges the political reality that created and continues to perpetuate environmental inequity and injustice.

People of colour around the world are subjected to disproportionately high levels of environmental health risks in their neighbourhoods and on their jobs. Minorities, who tend to be poorer and more disadvantaged than others working in the dirtiest jobs where they are exposed to toxic chemicals and other hazards. More often they live in urban ghettos, and pockets of rural poverty that have shockingly high pollution levels and are increasingly the sites of unpopular industrial facilities such as toxic waste dumps, land fills, smelters, refineries and incinerators.

12.8 RELIGIOUS TEACHINGS ABOUT ENVIRONMENT

World religions and individual spiritual traditions can provide a framework for changing our attitudes. World religions teach us that the land, rivers, mountains, minerals, oceans are held in trust for God, but can be wisely used for the general welfare of the humanity. Put another way, our religion tell us that we should consider ourselves only as trustees of the universe, and as trustees we are authorised by God to use natural resources, but we have no divine power over nature and the elements. From the perspective of many religions, the abuse and exploitation of nature for immediate gain is unjust and unethical.

Religions and culture can awaken that dimension of human mind which is not involved in scientific or technological reasoning. Religion can help humanity to realise that limits must be imposed on our dominance of and control over the animate and inanimate world, and that our arrogant manipulation of nature has backfired. Religion recognises that our lives cannot be measured by material possession alone, and that the ends of life go beyond conspicuous consumption.

All religions and cultures have something to offer to conservation and environmental protection. From each religion, several injunctions or exhortations can be brought forth to form a code for environmentally sustainable development. No religion says that we have the right to destroy our habitat, and no religion sanctions environmental destruction. On the contrary, penalties and admonitions are mentioned for those who do so. This is amply demonstrated in the codes of all the religions. A brief review of teachings about respect of nature and conservation of natural resources as given by Hinduism, Jainism, Buddhism, Christianity, Islam and Sikhism is given in the following sections.

12.8.1 Hinduism

In Hinduism one finds a most challenging perspective on respect for nature and environmental conservation, and the sanctity of all life on this planet and elsewhere is clearly ingrained in this religion. Only the supreme God has absolute sovereignty over all creatures, including humans. Human beings have no dominion over their own lives or over non-human life. Consequently they cannot act was viceroys of God, nor can they assign degrees of relative worth to other species. The sacredness of God's creation demands that no damage may be inflicted on other species without adequate justification. Therefore all lives, human and non-human, are of equal value, and have the same right to existence.

According to Hindu scriptures people must not demand or take dominion over other creatures. They are forbidden to exploit nature; instead they are advised to seek peace and live in harmony with nature. The Hindu religion demands veneration, respect and obedience to maintain and protect the harmonious unity of God and nature. This is demonstrated by a series of divine incarnations, as enunciated by Dr. Karan Singh in the Assisi Declaration:

The evolution of life on this planet is symbolised by a series of divine incarnations beginning with fish, moving through amphibious forms and mammals, and then on into human incarnations. This view clearly holds that man did not spring fully formed to dominate the lesser life forms, but rather evolved out of these forms itself, and is therefore integrally linked to the whole of creation.

Almost all the Hindu scriptures place strong emphasis on the notion that not killing His creatures or harming His creation can receive God's grace. Many trees and plants were worshipped during the time of Rig Veda (about 1500 BC) because they symbolised the various attributes of God.

Environmental awareness war realised even in the pre vedic period. There are references to 'Tree Worship' in Mohanjodaro and Indus civilisations etc. Environmental awareness was more manifest among humans during the Vedic period. The concept Aranyani The queen of forests identical to the concept of tree Goddesses of Indus people. Aranyanis are worshiped as the presiding spirit of forests, conceived as women is praised, honoured by herbs and described as mother of wild animals (Rigveda). There are instances of attribution of divinity to plants and are found in Rigveda and Atharvaveda.

Ancient Indians looked to the universe as an integrated whole – man, animal, plants life and all other materials were seen as an interlinked phenomenon – all activities interrelated. The following Sloka explains the complete harmony.

"Winds brings forth nectar, so do the waters. Let our herbs be sweet with nectar. Let night be sweet and the let the morning be sweet. Let environment be sweet which nurses as parents, trees be sweet and so be the sun and our cows" (Rigveda 1-9 – 6-8).

Animals and nature were revered along with Gods. Hanuman and Ganapatti are the most powerful deities, Peepal, Ganga, Himavan, Tulsi, Banyan trees are considered holy even today.

Vedic man identified at least four major components – Sun, Agni, Prithvi, and Sky that sustained life and therefore worshiped them as deities.

(O king of trees, these are Brahma by your root Vishnu by the middle of our body and Shiva by your front. Thou combine all the deities. We salute you. Disease vanish at your sight and by touch of you the sins Vanish. Ever cool and lasting. We salute you. (Rigveda 1-48-5).

Charrk Samhita, classical literature on Ayurvedic medicines, deals with divine herbs, with deep insight into preservation of environmental balance to benefit personal health and pollution free environment.

Planting of Trees has been proclaimed as conducive to great merit in Puranas. Agni Purana and Varah Purana mention the benefits arrived from trees.

Durga Shaptasati prescribes so long as mother earth is full of trees and forests with hills, she would continue to nurse and rear the human race.

Ecological balance between nature and human beings has been depicted as part and parcel of human life and a sense of reciprocity has been felt. Such reciprocity finds references in Kautilya's Arthasastra for state policies.

Sanctuary for animals and birds was practically implemental during Maurya period.

Sanskrit literature, bounds in reference to forests (Ramayana, Mahabharata).

Even during medieval India – natural parks, gardens were common feature. Planting of saplings along public roads, was undertaken in a big way by Shershah Suri – Trees were planted for food, shelter, medicine, and furniture etc.

Through such exhortations and various writings, the Hindu religion provides moral guidelines for environmental preservation and conservation. From the perspective of the Hindu culture, the abuse and exploitation of nature for selfish gain is considered unjust and sacrilegious.

12.8.2 Jainism

Jainism places great emphasis on the principle that one should refrain from avoidable acts that are harmful to him or others. According to Jainism violence grows out of passion, and one who has passion causes self-injury. Preventing injury to oneself and others is accomplished through control of speech, control of thought, regulation of movement, care in taking things up and putting them down, and examining food and drink, and a vow is taken by Jains to do all of these things.

Ahimsa (non-violence), which is the fundamental tenet of the Jain way of life, is a term that is clearly allied with realism, common sense, and personal worth and responsibility. It touches the deepest and noblest aspects of human nature: '*it adheres to the universal law which states that like, order comes of order, and peace can only be achieved through peace.* It maintains that in all situations the ends and means are one and the same, and that truth, honesty and compassion must be the foundation of any truly civilised community. As enunciated by Amrit Chandra Acharya:

> *One should never think of hunting, victory, defeat, battle, adultery, theft etc., because they only lead to sin. Sinful advice should never be given to persons living upon art, trade, writing, agriculture, arts and rafts, service and industry. One should not without reason dig ground, uproot trees, trample lawns, sprinkle water etc., nor pluck leaves, fruit and flower. One should be careful not to give instrument of himsa (violence), such as knife, poison, fire, plough, sword, bowl, etc., one may not listen to, accept, or teach such bad stories as increase attachment etc., and are full of absurdities. Renounce gambling from a distance. It is the first of all evils, the destroyer of contentment, the home of deceit, and abode of theft and falsehood.*

For the Jains, all should pursue environmental harmony through spirituality and adhering to three precepts can do this:

1. the right belief,
2. the right knowledge, and
3. the right conduct.

12.8.3 Buddhism

At the very core of the Buddhist religion are compassion, respect, tolerance and ahimsa (non-injury) towards all human beings and all the other creatures that share this planet. A Buddhist prayer exemplifies this:

> *"As the mother protects her child even at the risk of her own life, so there should be mutual protection and goodwill which is limitless among all beings. Let limitless goodwill prevail in the whole world – above, below, all around, untarnished with any feeling of disharmony and discord".*

Buddha also set down rules forbidding the pollution of rivers, ponds and wells. As Buddha says in Sutta-Nipata:

> *Know ye the grasses and the trees…. Then know ye the worms, and the different sorts of ants…. Know ye also the four-footed animals small and*

great… the serpents …the fish which range in the water…. The birds that are borne along on wings and move through the air…

Buddhists regard the survival of all species as an undeniable right, because as co-inhabitants of this planet, they have the same rights as humans. In Buddhism the rivers, forests, grass, mountains and night are highly respected and regarded as bliss bestowers. Buddhist thinkers have always had great respect for the sun, moon and other planets, and they recognise grasses, creepers and herbs as bestowers of bliss and objects of adoration.

The teachings of Buddhism have concentrated on the theory of Karma and the theory of cause and effect. They demonstrate that unmindful neglect of these principles of right living may lead to chaos, and thus to environmental crisis. That is why there should be no exploitation of nature beyond what is needed for survival, and if we believe that all life forms are interconnected, our exploitative tendencies towards nature can be controlled. This message that all life is interconnected and should be cared for – is the foundation of the Buddhist ethics of nature. The Dalai Lama expressed this clearly in the following way:

> Have you ever wondered what a beautiful place this world would be if everyone would treat all animals and life in the same manner? And realise the fact that, whether it is more complex groups like human beings, or simpler groups such as animals, the feeling of pain and appreciation of happiness is common. All want to live and do not wish to die. As a Buddhist, I believe in the interdependence of all things, the interrelationship among the whole spectrum of plant and animal life, including the elements of nature, which express themselves as mountains, valleys, rivers, sky, and sunshine.

12.8.4 Christianity

There is a common thread in the Old and New Testaments concerning the concept of nature and the rules governing our responsibility to it. Although certain verses in Genesis (1:26 and 1:28) have been interpreted as giving humans dominion and absolute control over nature, there are places where the responsibility of human beings has been clearly delineated. For example *"And the Lord God took the man and put him into the Garden of Eden to dress it and keep it"* (Genesis 2:15).

The word 'dress' has been interpreted as the duty of man to manage, and the word 'keep' has been interpreted as protecting the natural world from harm. Furthermore the scripture clearly establishes God as the sole owner of the natural world, while humanity is actively responsible for the care of the world:

'The earth is the Lord's and everything in it, the world, and all who live in it'. (Psalm 24:1), and

Every animal in the forest is mine, and the cattle on a thousand hills (Psalm 50:10)

Furthermore, we are advised that we have no rightful ownership over the land: 'because the land is mine, and you are but aliens and my tenants'.

The Bible also confirms that the purpose of creation is to proclaim God's glory because it is His handiwork. Divine life is actively manifested in and through the created world. As such the Earth is not to be considered as a lifeless entity or a means to some higher end. To an extent, a harmonious triadic relationship exists between the divine and humanity, among human beings themselves, and between human beings and nature, and failure to maintain this harmony may alienate humanity from its creator and also from nature.

12.8.5 Islam

In Islam the Holy Quran and the divinely inspired words of Prophet Muhammad (Peace be upon him) form the foundation of and rules for the conservation of nature. The Quranic message is one of unity, harmony, balance and order. The Quran stresses that nature's laws must be observed, and that defined limits should not be exceeded. Man was created so that he could become a manifestation of divine attributes and serve as a mirror to reflect the beautiful image of God. The Quran says:

> *"Surely, your Lord is Allaha, who created the heavens and the earth in six days…. His is to create and to govern (Quran 7:54). And there is not a thing, but we have unbounded stores there of and We send it in regulated quantities (Quran 15:21). Indeed, we have created everything in proportion and due measure (Quran 54:49)"*

Thus everyone has to observe the balance and acknowledge that certain limits should not be exceeded. In other words humanity has only a guardianship role in God's heaven and earth, and not a position of outright ownership; this guardianship has obligations. The Islamic ethic holds that we have a choice in our interaction with nature. People have been given the intellect and the ability to decide what is just and unjust; what is right and what is wrong.

According to Islam the riches of the earth are a common heritage. Everyone may benefit from them, make them productive, and use them for their own well-being and improvement, but our quest for progress and development must not be detrimental to the environment; instead it should ensure conservation.

In both the Quran and the Shariah, the legal codes of Islam, the rights of the natural world are strongly expressed and the abuse of them by humans is condemned. The Quran says:

> *"He set on the Earth, firmly rooted, mountains rising above it, and blessed the Earth and provided sustenance for all, according to their needs."*

12.8.6 Sikhism

Baba Guru Nanak, the founder of the Sikh religion, assigned divine attributes to nature. According to Sikhism, people should respect God's creations and know the eternal truth regarding their place in the universe. God has not granted any special or absolute power to humans to control and dominate nature. To the contrary, the human race is an integral part of nature and is linked to the rest of creation by indissoluble bounds.

God Himself is the source of the birth, sustenance and eventual destruction of all living organisms. It is He who created the universe through His divine will and with His word. According to the Sikh holy book, the *Guru Granth Sahib*, 'From the Divine Command occurs the creation and the dissolution of the universe. The basis of creation was divine will, and the universe was produced by His *Hukum* (command). However it should be noted that God is submerged in creation, as stated in the *Adi Guru Granth Sahib* (p.19)

From Primal truth emanated air

From air emanated water
From water emanated three worlds
And Himself the merged with the creation

Sikhism teaches that the natural environment and the survival of all life forms are closely linked in the rhythm of nature. The history of the Gurus contains many stories of their love and special relationship with the natural environment – with animals, birds, vegetation, earth, rivers, mountains and the sky.

Let us summarise what we have studied so far.

12.9 SUMMARY

Many environmental problems that we face today are the result of our attitudes and cultural beliefs about environment and its management. Environmental degradation is considered as the result of western belief about environment according to which environment is only for human use. For most of human history, ethics has concentrated on human rights (anthropocentrism); it is only recently that ethics has formally begun to define the rights of animals, plants and other organism (biocentrism).

Whatever our beliefs and attitudes may be some mismanagement is done at policy and planning levels where basic condition of equity is not considered and discrimination on racial and class basis is common. Environmental justice seeks to eliminate those conditions in which communities on racial basis or on the basis of their low-income status are exposed to an inequitable share of pollution.

It is clear from the study of teachings of different religions that every religion give due worth to environment. Religions teach us that we should consider ourselves as trustees, not the master of environment. As trustees or stewards of environment, we can use the resources but we should not exploit them.

12.10 TERMINAL QUESTIONS

1. Examine critically the following:

   i) Anthropocentrism;

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   ii) Ecofeminism;

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   iii) Biocentrism;

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   iv) Ecocentrism

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2. What is Environmental Equity and Environmental Justice? Discuss.

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3. What is environmental ethics and how people can be motivated to adhere to it?

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4. Examine the place of environment in the following religions.

   i) Hinduism

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   ii) Buddhisms

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   iii) Islam

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UNIT 13 LEGAL FRAMEWORK

Structure

13.1 INTRODUCTION

During 1960s, a large segment of general public in the developed world became aware of the environmental problems and issues. This awareness led to the creation of new laws, regulations and even new government agencies at the international, regional, federal, state and local levels.

To protect public health and the environment, effective laws have been passed and vigorously enforced in many countries including India. Legislative and regulatory instruments are designed to ensure adherence to set rules and regulations for the protection of the environment. Legislation, laws and regulation play an important role in modifying human behaviour towards consumption of resources and environment. In this unit you will study about provisions in the constitutions of South Asian countries for environmental management, environmental legislation and their role in environmental management. The legal framework for environmental management has many provisions, such as constitutional legislations, laws, regulations, tribunals and public interest litigations (Fig. 13.1). You will learn about each one of these in this unit.

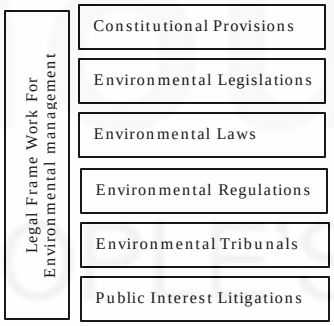


Fig. 13.1: Legislative instruments of environmental management

Objectives

After studying this unit, you should be able to:

- explain legal framework for environmental management;
- describe the components of legal frame work i.e. constitutional provisions, legislations, laws, regulations, tribunals, and public interest litigations; and
- discuss the role of different components of legal framework in managing environment.

13.2 CONSTITUTINAL PROVISIONS

Since the 1972 Stockholm Conference on the Human Environment, the basic principles of environmental management are increasingly being incorporated into political constitutions. Thus, issues such as environmentally sound development, sound use of natural resources, prevention and control of environmental pollution, and the individual's right to a clean environment have found expression in constitutional form. These are often articulated in terms of a State's obligations to its citizens. In addition, however, a duty is often imposed on citizens to safeguard the national environment. This constitutional trend is manifested in most of the developing countries. We recount briefly the constitutional provisions of SAARC nations.

India

The Constitution of India, originally, did not contain any direct provision regarding the protection of natural environment. However, after the United Nations Conference on Human Environment in Stockholm, the Constitution of India was amended, to include protection of the environment as constitutional mandate. The Constitution (forty second Amendment) Act of 1976 has made it a fundamental duty to protect and improve the natural environment by Clause (g) to Article 51A:

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

There is a directive, given to the State as one of the Directive Principles of State Policy regarding the protection and improvement of the environment. Article 48A states

> "The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country".

The Department of Environment was established in India in 1980 to ensure a healthy environment for the country. This later became the Ministry of Environment and Forests in 1985. This Ministry has overall responsibility for administering and enforcing environmental legislations and policies.

Sri Lanka

The Sri Lankan Constitution declares in its Chapter on Directive Principles of State Policy and Fundamental Duties:

> "The State shall protect, preserve and improve the environment for the benefit of the community".

On the other hand, the Sri Lankan Constitution expressly states that Articles 27 and 28 "do not confer or impose legal rights or obligations and are not enforceable in any court or tribunal".

Bangladesh

The Constitution of Bangladesh on the other hand, refers specifically to protecting the cultural heritage when it declares in Article 23:

> "The State shall adopt measures to conserve the cultural heritage of the people and so to foster and improve the national language, literature and the arts that all sections of the people are afforded the opportunity to contribute towards and to participate in the enrichment of the national culture."

And in Article 24:

> "The State shall adopt measures for the protection against disfigurement, damage or removal of all monuments, objects or places of special artistic or historic importance or interest."

Of course the effectiveness of constitutional provisions depends very much on the opportunities for administrative review, which vary from country to country.

Nevertheless, the elevation of environmental concerns to constitutional status is at least a statement of intent, and could enhance the priority to be conferred by Governments on sound national environmental management and sustainable development.

13.3 ENVIRONMENTAL LEGISLATIONS, LAW AND REGULATIONS

The idea of environmental management has always been a part of legislation in one form or the other under various regulations, laws, rules and statutes. The evolution of environmental legislation can be traced from early **resource exploitation legislation** through later **resource management legislation** to more recent legislation conceived primarily from the perspective of **environmental management**. This has resulted in much of the provisions relating to natural resource conservation, pollution control and protection of history, culture and aesthetics being scattered in a wide range of statutes and in some instances, the common and customary laws of countries, developed at different times and in vastly different political, economic and social contexts. One of these is how to achieve the necessary contextual change and harmonise the plethora of existing legal provisions. There are many challenges in developing an adequate legal and institutional regime for environmental management in the context of sustainable development.

The fundamental premises for developing effective legislation are as follows:

- First, the **integrative character of environment** highlights the need for a consensus on the underlying policies and procedures. This presupposes the widest participation of and consultation with all interest groups and accommodation of their respective interests and concerns to the best extent possible. This is particularly so in the contemporary environmental legislation which affects such fundamental national interests as national planning and development, control of agricultural and industrial pollution, conservation of the country's natural resource base and seeks to bring about various national, sub national and local institutions. A consultative and participatory approach to policy and legislative development is therefore essential for effective legislation.

- The second has to do with achieving a **judicious balance between environment and development** in the particular context of developing countries. Many laws prohibit, often subject to well-defined exceptions, various types of activities, which are considered inimical to accepted norms of society. Environmental pollution on the other hand is an inevitable by-product of productive economic activity; something that cannot be entirely prohibited without causing serious economic dislocation. It could, and indeed must, be minimised, controlled and managed, by prohibiting or regulating environmentally harmful activities. In the final analysis, it is the success of the development process that is the only guarantee against spiraling environmental degradation and unsustainable use of natural resources, poverty, and unemployment as well as social and political dislocation.

- Thirdly, the legislative and institutional strategies must be **endogenous and must be firmly set within each country's national milieu**. The country specific character of national environmental legislation has been repeatedly stressed in Agenda 21 and reaffirmed in the Rio Declaration on Environment and Development. Principle 11 of the Declaration states, "environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply".

In the following subsections you will study about national and international legislations.

13.3.1 National and International Legislations

A survey of national environmental legislation reveals an important range of judicial mechanism for environmental management. These include anti-pollution laws, the codification of environmental and natural resources laws, and framework of

environmental laws. They range from provisions in the Penal Codes, sectoral legislation on matters such as land use, agriculture, industry, forestry, wild life habitat, and more organic legislation dealing with principles of and institutional arrangements for environmental management. The choice of a legislative technique largely reflects the historical evolution of a country's environmental policy and the nature of its legal system.

The function of national legislation is to:

- Reflect the particular policies and schemes considered by the legislature to be most appropriate for achieving the desired goals;
- Establish the institutional machinery for giving effect to those principles and schemes; and
- Empower the related institutions to function efficiently within the framework of the established policy parameters.

Environment Legislation in India

Existing Indian environmental legislations can be grouped into the following four categories:

a) Water Acts
b) Air Acts
c) Forest and Wildlife Acts
d) General Acts

To provide an overview of environmental legislations, a few important legislations of each category with their brief description are provided in Table 13.1.

Table 13.1: Selective list of environment related legislations

Legislation	Brief Description
a) General	
The Environment (Protection) Act of 1986	Authorises the Central Government to project and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and /or operation of any industrial facility on environmental grounds.
The Environment (Protection) Rules of 1986	Lays down procedures for setting standards or emission or discharge of environmental pollutants.
Hazardous waste (Management and Handling) Rules of 1989	Objective is to control generation, collection, treatment, import, storage and handling of hazardous waste.
The Manufacture, Storage and Import of Hazardous Chemical Rules of 1989	Defines the terms used in this context, and sets up an Authority to inspect, once a year, the industrial activity connected with hazardous chemicals and isolated facilities.
The Manufacture, Use, Import, Export and Storage of hazardous Micro-organisms/ Genetically Engineered Organisms or Cells Rules of 1989	These were introduced with a view to protect the environment, nature and health, in connection with the application of gene technology and organisms.

The Public Liability Insurance Act and Rules of 1991 and Amendment (1992)	It was drawn up to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident while handling any hazardous substance.
National Environmental Tribunal Act of 1995	This has been created to award compensation for damages to persons, property and the environment arising from any activity involving hazardous substances.
The National Environment Appellate Authority Act of 1997	This has been created to hear appeals with respect to restriction of areas in which classes of industries etc. are carried out or prescribed subject to certain safeguards under the EPA (Environment Protection Act).
Biomedical Waste (Management and Handling) Rules of 1998	It is a legal binding on the health care institutions to streamline the process of proper handling of hospital waste such as segregation, disposal, collection and treatment.
Recycled Plastic Manufacture and Usage Rules of 1999 & Recycled Plastic Manufacture and Usage Amendment Rules of 2002	Rules are introduced to prohibit the usage of carry bags or containers made of recycled plastic for foodstuffs. Rules also lay down procedures for the manufacture of virgin and recycled plastic carry bags and recycled plastic containers.
b) Forest and Wildlife	
Indian Forest Act of 1927 and Amendment (1984)	This is one of the many surviving colonial statutes. It was enacted to consolidate the law related to forest, the transit of forest produce and the duty levi able on timber and other forest produce.
Wildlife Protection Act of 1972, Rules of 1973 and Amendment (1991)	Provides for the protection of birds and animals and for all matters that are connected to it whether it is their habitat or the waterhole or the forest that sustain them.
The Forest (Conservation) Act of 1980 and Rules of 1981	Provides for the protection of and the conservation of the forests.
c) Water	
The Easement Act of 1882	Allows private rights to use a resource, i.e., groundwater by viewing it as an attachment to the land. It also states that all surface water belongs to the state and is a state property.
Indian Fisheries Act of 1897	Establishes two sets of penal offences whereby the government can sue any person who uses dynamite or other explosive substance in any way (whether coastal or inland) with intent to catch or destroy any fish or poisons fish in order to kill.
The River Board Act of 1956	Enables the states to enroll the Central Government in setting up an Advisory River Board to resolve issues in inter state cooperation.
Merchant Shipping Act of 1970	Aims to deal with waste arising from ships along the coastal areas within a specified radius.

	The Water (Prevention and Control of Pollution) Act of 1974	Establishes an institutional structure for preventing and abating water pollution. It establishes standards for water quality and effluents. Polluting industries must seek permission to discharge waste into effluent bodies. Central Pollution Control Board (CPCB) was constituted under this Act.
	The Water (Prevention and Control of Pollution) Cess Act of 1977	Provides for the levy and collection of cess or a fees on water consuming industries and local authorities.
	The Water (Prevention and Control of Pollution) Cess Rules of 1978	Contains the standard definitions and indicates the kind of and location of meters that every consumer of water is required to affix.
	Coastal Regulation Zone Notification of 1991	Puts regulations on various activities, including construction. It gives some protection to the backwaters and estuaries.
d)	**Air**	
	Factories Act of 1948 and Amendment in 1987	This was the first to express concern for the working environment of the workers. The amendment of 1987 has sharpened its environmental focus and expanded its application to hazardous processes.
	Air (Prevention and Control of Pollution) Act of 1981	Provides for the control and abatement of air pollution. It entrusts the power of enforcing this act to the Central Pollution Control Board.
	Air (Prevention and Control of Pollution) Rules of 1982	Defines the procedures of the meetings of the Boards and the powers entrusted to them.
	Atomic Energy Act of 1982	Deals with the radioactive waste.
	Air (Prevention and Control of Pollution) Amendment Act of 1987	Empowers the Central and State Pollution Boards to meet with grave emergencies of air pollution.
	Motor Vehicles Act of 1988	States that all hazardous waste is to be properly packaged, labelled and transported.

International Legislations

Similar to national legislations, there is no international legislative body with the authority to pass legislations, nor are there international agencies with the power to regulate resources in a global scale. The International Court at Hague in the Netherlands, has no power to enforce its decisions. Powerful nations can simply ignore the Court. As a result, international legislation must depend on the agreement of the parties concerned. **Certain issues of multinational concern are addressed by collection of policies, agreements, and treaties that are loosely called International Environmental Legislations.** Most of the international legislations are international agreements to which nations adhere voluntarily. These agreements are generally finalised through international conventions or treaties. **Nations that have agreed to be bound by the conventions are known as Parties.** Convention provides a framework to be respected by each party, which has to adopt its own national legislations to make sure that convention is implemented at national level. To support the conventions, protocols are also framed. **A protocol is an international**

agreement that stands on its own but is linked to an existing convention. For example, the climate protocol shares the concerns and principles set out in the climate convention. It then builds on these by adding new commitments, which are stronger and far more complex and detailed than those in the convention. The **United Nations has a very important role in developing and implementing conventions.**

Major International Environmental legislations exist in the following **five** areas:

Pollution of international watercourses,

- Marine pollution,
- Atmospheric pollution,
- International transfers of hazardous waste, and
- The risks of nuclear energy.

Key international environmental treaties in these areas are listed below:

Box 13.1: Key international environmental treaties

International watercourses

- 1992 Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes.

Marine pollution

- 1973 Convention for the Prevention of Pollution from Ships (MARPOL).
- 1982 UN Convention on the Law of the Sea (UNCLOS).
- 1992 Paris Convention for the Protection of the Marine Environment of the North-East Atlantic.

1958 Geneva Conventions on the Territorial Sea and Contiguous Zone, the High Seas, Fishing and Conservation of the Living Resources of the High Seas, and the Continental Shelf.

Atmospheric pollution

- 1979 ECE Convention on Long-Range Transboundary Air Pollution-protocols on sulphur dioxide (SO_2), nitrogen oxides ($NO_?$), and volatile organic compounds (VOCs).
- 1985 Vienna Convention for the Protection of the Ozone Layer (Montreal Protocol and London and Copenhagen Amendments).
- 1992 UN Convention on Climate Change, Kyoto Protocol ratified in 2005.

Hazardous waste

- 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.
- 1991 Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa.

Nuclear energy

- 1986 IAEA Convention on Early Notification of a Nuclear Accident.
- 1986 IAEA Convention on Assistance in the Case of a Nuclear Accident.
- 1994 IAEA Convention on Nuclear Safety.

Others

- 1991 ECE Convention on Environmental Impact Assessment in a Transboundary Context.

International legal instruments can be divided into two fundamental categories: **binding** and **non-binding**.

Binding instruments may be called **treaties** or **conventions**. *Protocols* are binding instruments by which parties to a treaty or convention may undertake additional obligations. Whatever label has been chosen, the essential point to keep in mind is that a treaty, convention or protocol is only binding on states that have specifically agreed to be bound by its provisions. States are not bound by majority decisions unless they have specifically agreed to do so (this has been done, for example, in the European Union). States can express their consent to be bound by an international instrument by way of ratification or accession. States that have ratified or acceded to a particular instrument are called parties.

Non-binding instruments may be called resolutions, recommendations or declarations. Again, whatever the label, the essential point is that these instruments are not legally binding, even for states that have voted for them.

- 1992 UN Convention on Biological Diversity.

India has a fairly good record of participation in international efforts at environmental protection, having ratified over forty Multilateral Environmental Agreements (MEAs) relating to various components of environmental protection. Some of the major areas of environmental protection that India is active in at the international level are listed in Table 13.2.

Table 13.2: India's participation in multilateral environmental agreements

Sl. No.	Issue/Area	International Legal Instrument	Date of Signature	Date of Ratification
1.	Protection of Wetlands	Convention on wetland of international importance especially as waterfowl habitat, 1971	-	1.10.1981 (a)
2.	Setting Protection of Heritage	Convention concerning the protection of the world cultural and natural heritage, 1972	-	14.11.1977
3.	Protection of endangered species	Convention on international trade in endangered species of wild fauna and flora, 1973	9.7.1974	20.7.1976
4.	Conservation of migratory species	Convention on the conservation of migratory species of wild animals, 1979	23.6.1979	4.5.1982
5.	Protection of the ozone layer	Vienna Convention for the protection of the ozone layer, 1985	-	18.3.1991
		Montreal Protocol on ozone depleting substances, 1987	-	19.6.1992
6.	Protection from hazardous wastes	Basel Convention on transboundary movements of hazardous wastes and their disposal, 1989	15.3.1990	24.6.1992
7.	Preventing climate change	United Nations Framework Convention on climate change, 1992	10.6.1992	1.11.1993
		Kyoto Protocol to the UNFCCC, 1997		
8.	Conserving biodiversity	Convention on biological diversity, 1992	5.6.1992	18.2.1994
		Cartagena Protocol on biosafety, 2000		
9.	Combating desertification	Convention to combat desertification, 1994	14.10.1994	17.12.1996
10	Protecting the Antarctic Environment	The Antarctic treaty, 1959		
		Convention on the conservation of Antarctic marine living resources, 1980	-	17.6.1985
		Protocol on environmental protection to the Antarctica treaty, 1991	2.7.1991	26.4.1996

11.	Preventing marine pollution	Convention for the prevention of marine pollution by dumping ships and aircrafts, 1972 (MARPOL) Protocol relating to the international convention for the prevention of pollution from ships, 1978 United Nations Convention on the law of the seas, 1982	10.12.1982	29.6.1995

SAQ 1

a) Why are national legislations considered better regulatory mechanisms for environment management as compared to international legislations?

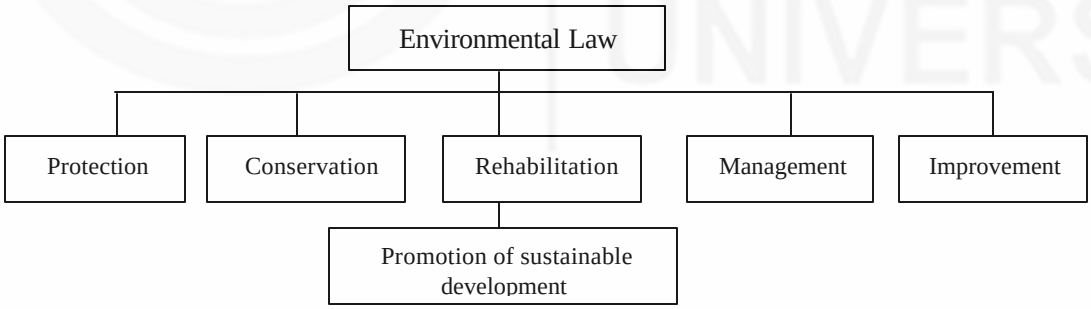
b) Write one important difference between conventions and declarations.

13.3.2 Environmental Law

Law is one of the key instruments of social regulation. This is achieved by establishing certain norms of conduct and creating required machinery to enforce these norms. In the field of environmental management, both international and national laws have been extensively applied, especially in the past thirty years or so, for **prevention of pollution, natural resource conservation** and **use**, and **protection of the cultural and aesthetic environment.**

Environmental law includes but is not limited to water, vegetation, forests, rivers, disposal areas for industrial, biological, chemical and nuclear wastes on land, the oceans, seas and marine life, the air enveloping the earth and the outer space.

So the goals of environmental law can be depicted as follows:



You would really appreciate how the environmental law was developed. The development of environmental law is given as Appendix I at the end of this unit.

Characteristics of Environmental Law

An environmental law differs from other types of laws in many ways.

- It is not restricted to factories and work-related disputes only as labour laws are.
- It is not concerned only with personal interest or harms like criminal laws are.
- It encompasses the entire range of societal activities.
- It goes beyond the human society to the natural environment.

Environmental Law Classification

The basic and generic classification of the environmental laws can be broadly done into the following branches, which give coverage to the fields we have at present and which we foresee in future:

- Conventional Environmental Law
- National Law
- International Law

Conventional Environmental Law

This branch is based on practices, precedents and conventional behaviour with respect to environmental problems and their solutions based on historical backgrounds. In many cases it falls within the envelope of the laws of nature on the subject to which this universe is obligated by its creator. They form the basis of any man-made laws to safeguard, secure and control the environment. Any interference by human race in this cycle results in chaos; confusion and unequilibrium in the natural process which in turn result in calamities and tragedies for human race.

National Laws

With the advent of the industrial revolution and the scientific progress attained during present time, national governments are aware of the importance of environmental elements for the health of human beings and progress of these nations have enunciated environmental policies and laws controlling the environment and safeguarding its natural resources, national wealth and well being of its nationals. Many industrially developed western countries have developed laws in their countries to improve environmental conditions, control the pollution, eliminate the sources of pollution and research and study in field of environmental science and engineering.

International Environmental Law (IEL)

International Environment Law (IEL) is the principal vehicle for international collaboration between members of the international community for the purpose of environmental protection. International law is the body of rules which are legally binding on states in their interaction with each other (Jennings and Watts, 1992). IEL comprises various 'soft law' instruments such as Declaration and Guidelines and over 200 Multilateral Environmental Agreements. A few important ones are listed below:

- Stockholm Declaration on the Human Environment, 1972;
- The World Conservation Strategy, 1980;
- The World Charter for Nature, 1982;
- The Hague Declaration, 1989;
- The Rio Declaration on Environment and Development, 1992; Agenda 21;
- The Forest Principles; and
- The Johannesburg Declaration on Sustainable Development, 2002.

The Agenda 21 adopted at Rio de Janeiro is a major step and we describe it briefly.

UNCED Agenda 21

In 1992, the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro adopted a declaration and a global agenda for management of the environment into the next century (Agenda 21). The UNCED process classified several important concepts of environmental management that have immediate relevance to the marine environment. Some important environmental concepts to be legitimised by UNCED are the ideas of ecologically sustainable development (ESD), the precautionary approach, and integrated ocean management.

At present, there is no binding international charter which contains general principles of international environmental law. During the preparations for UNCED, attempts were made to draft an Earth Charter which would have served this purpose. However, no agreement could be reached on the desirability of such an approach. Nevertheless, there is now such an abundance of international instruments with regard to environmental issues that it is certainly possible to identify a number of basic principles on which these instruments are invariably based:

- the polluter pays principle
- the principle of non-discrimination
- the precautionary principle
- the principle of common but differentiated responsibilities
- the principle of intergenerational equity.

Most of these are reflected in the Rio Declaration on Environment and Development. A brief account of these principles is given below in the Table 13.3.

Table 13.3: Basic principles underlying international instruments

Principle	Description
The polluter pays principle	The polluter should bear the expenses of carrying out the antipollution measures decided by the public authorities. The costs of these measures should thus be reflected in the costs of goods and services which cause the pollution.
Principle of non-discrimination	Polluters causing transboundary pollution should be treated no less severely than they would be if they caused similar pollution within their own country.
Precautionary principle	Lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.
Principle of common but differentiated responsibilities	States should divide the costs of measures to protect the environment on the basis of the fact that they have made different contributions to global environmental degradation.
Principle of intergenerational equity	States are obliged to take into account the long-term effects of their actions affecting the environment. This principle attempts to emphasise that attention should not only be paid to long-distance effects but also to the long-term effects of human activity.

SAQ 2

Describe the principles on which IEL is based.

13.3.3 Environmental Regulations

Regulations are designed to modify human behaviour. In other words, governments use regulations to make people act or behave in a prescribed manner that will lead to the realisation of desired goals. As a consequence, regulatory policies are based on assumptions about human behaviour. Regulations are generally equated with setting of standards and guidelines for acceptable behaviour. However, they are not the same as standards and guidelines. **Standards imply strict and rigid rules of behaviour in which the quality of law and fair treatments are applied. Guidelines are associated with flexibility and are applied in unique and unusual circumstance.**

Regulations involve direct sanctions and penalties and therefore it is assumed that people will modify their behaviour to comply with the regulations rather than incur the penalties. Regulations, standards and guidelines embrace both reliable, predictable behaviour and unreliable, unpredictable, unique circumstance.

In the field of environmental policy, the formulation of regulations, standards and guidelines relies extensively on scientific and technological knowledge. Social and pure sciences are of major importance in establishing causality, which in many cases forms the basis of regulation decisions. Pure science is invaluable in determining the specific types of activity that cause environmental problems, e.g., emission of sulphur dioxide fumes into the atmosphere causes acid rain. Social science plays an important role in the regulatory process by determining the best way of changing behaviour. In other words, when specific types of activity produce a known hazard, social science can determine the optimum means of modifying behaviour to avoid the problem.

It is important to consider another critical part of regulatory process; the **implementation and enforcement of regulations**. Without effective means of implementation and enforcement of regulations they become meaningless. Implementation therefore involves a variety of activities by government that aims to bring about a change in behaviour, including information and determination activities, public meetings and seminars, training and education, collecting information on a voluntary or a compulsory basis, notifying authorities of certain plans or actions, research and analysis, monitoring, inspecting, issuing orders and ensuring they are obeyed, imposing fines, revoking permission or licenses, and prosecution.

13.3.4 Factors affecting Implementation of Regulations

Factors that influence the implementation of regulations include;

- *Public and private behaviour:* Implementation involves more than just what public officials say and do. Private behaviour is of major concern because of the limited ability of regulatory agencies to perform all the necessary activities to implement, monitor and enforce regulations. For example, individual initiatives such as notifying the police or another relevant authority, registering complaints and reading pertinent information are essential if regulations are to be implemented and enforced effectively.

- *Inherent institutional impediments*: The implementation of regulation is also affected by the inherent institutional impediments that plague governmental operations and activities. These problems, coordination, delegation of authority and regional considerations, affect the manner in which environmental regulations are implemented.

Environmental Rules and Notifications: Current Scenario of India

I. Pollution Control

- The Water (Prevention and Control of Pollution) Rules, 1975 – Schedules
- Central Board for the Prevention and Control of Water Pollution (Procedure for Transaction of Business) Rules, 1975
- The Water (Prevention and Control of Pollution) CESS Rules, 1978 and Annexures
- The Air (Prevention and Control of Pollution) Rules, 1982 and Schedules
- The Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983 and Form
- The Environment (Protection) Rules, 1986 and Schedules
- Environment (Protection) Third Amendment Rules, 2002

- Hazardous Wastes (Management and Handling) Rules, 1989
- The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
- Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules, 2000 - Draft Notification
- Bio-Medical Waste (Management and Handling) Rules, 1998
- Hazardous Wastes (Management and Handling) Amendment rules 2000
- Hazardous Wastes (Management and Handling) Amendment Rules, 2002
- Municipal Solid Wastes (Management & Handling) Rules, 2000
- Battery (Management and Handling) Rules, 2000
- The Noise Pollution (Regulation and Control) Rules, 2000
- The Noise Pollution (Regulation and Control) Rules, May 2002
- Re-cycled Plastics Manufacture and Usage Rules, 1999
- Re-cycled Plastics Manufacture and Usage Amendment Rules, 2002
- The Recycled Plastics Manufacture and Usage (Amendment) Rules, 2003
- Ozone Depleting Substances (Regulation) Rules, 2000

II. Some Important Notifications

- Delegation of Powers to the Central Pollution Control Board
- Environmental Impact Assessment Notifications
- Public Hearing Notifications
- The Coastal Regulation Zone Notifications
  Coastal Regulation Zone Notification dated May 21st 2002
  Coastal Regulation Zone Notification (As Amended Upto 2001)
  Aquaculture Authority – Notifications
- Eco-Labelling Notifications
- Notification Concerning Open Burning Oil
  Notification Concerning Ban on Import of Hazardous Wastes
- Constitution of Appellate Authorities

III. Laws relating to Forest and Wildlife

- The Forest (Conservation) Rules, 1981
- Guidelines for diversion of forest lands
- Forest (Conservation) Rules, 2003
- The Wild Life (Transactions and Taxidermy) Rules, 1973
- The Wild Life (Stock Declaration) Central Rules, 1973
- The Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules, 1983
- The Wild Life (Protection) Rules, 1995
- The Wild Life (Specified Plants – Conditions for Possession by Licensee) Rules, 1995
- Recognition of Zoo Rules,1992

IV. Liability

- The Public Liability Insurance Rules, 1991

V. Laws relating to Environmental Tribunals

- The National Environmental Tribunal Act, 1995
- The National Environment Appellate Authority Act, 1997

VI. Relevant Provisions of other Environment-related Laws

- Provisions of Indian Penal Code
- Provisions of Criminal Procedure Code
- Provisions of Factories Act, 1948

VII. Animal Welfare

- No.59 of 1960 – The Prevention of Cruelty to Animal Act, 1960

VIII. Biodiversity

- The Biological Diversity Act, 2002
- Draft Biological Diversity Rules, 2003

IX. Others

- 2-T Oil (Regulation of Supply and Distribution) Order, 1998
- The Environment (Protection) (Second Amendment Rules), 1999 – Emission Standards for New Generator Sets

SAQ 3

a) What are regulations?
b) How do they differ from standards and guidelines?
c) Which factors influence the implementation of regulations?

13.4 ENVIRONMENTAL TRIBUNALS

Laws and regulations play an important role in environmental management but require institutional mechanisms for implementation and enforcement. As a citizen you can seek relief in the courts from unjust laws or actions in two ways:

1. By bringing a civil suit, asking for payment of damages that were caused by a private individual, corporation or governmental agency and that injured you or your property.

2. Ask for a judgment by the court about the constitutionality of laws passed by government or the adequacy and legality of regulation established by an administrative agency. If the court finds a law or regulations to be improper, it can issue an injunction to stop implementation or application of that law or regulation and may even direct what the new regulation should be.

In the 1960's and 70's, the judicial branch of our government was highly responsive to environmental and social concern especially in first world countries.

Thus environmental tribunals established by many countries have become an important part of legal framework for environmental management.

However there are several problems faced by citizens who want to seek relief in these courts. Some of these are highlighted below:

1. You have to show that the law or action you oppose is illegal.

2. You have to establish that you have standing in court (a right to be heard). To do so, you must prove that you are directly affected.

3. Suits are expensive; a major suit might cost hundred or thousands of rupees in legal fees, court fees, witness etc.

4. It may take years beforea suit finally settled, and by that time it may be too late to save the resource.

5. You have to prove that the defendant (an agency, corporation, or individual) is responsible for the harm that you allege. A corporation admits that you produce a toxic chemical, but you have to show, beyond reasonable doubt, that it was their chemical that caused the problem.

6. Counter lawsuits are often brought against environmental activists by business, developers and governmental agencies whose project they oppose.

In India, though environmental tribunals have not gained momentum, yet Environmental Tribunal Act and green benches are important milestones in this direction.

National Environmental Tribunal in India

The National Environmental Tribunal Act has been enacted to provide for strict liability for damages arising out of any accident occurring while handling any hazardous substance and for the establishment of a National Environment Tribunal for effective and expeditious disposal of cases arising from such accidents, with a view to giving relief and compensation for damages to persons, property and the environment and for matters connected therewith or incidental thereto.

Box 13.2: Green benches in India

Green benches are those constituted by the Chief Justice of the respective High Courts either on their own or on directions from the Chief Justice of the Supreme Court to constitute exclusively a bench (quorum consisting of more than one Judge) to deal with matters relating to environment and connected there with. The Green Bench in the respective High Courts deals with matters relating to Environment either on a particular day of the week exclusively or when and where the situation demands immediate action. West Bengal and Tamil Nadu are examples of some states which have constituted Green Benches.

Now-a-days judiciary is playing a vital role in the growth and development of environment precedents. As a watchdog it strives to maintain the sanctity and dignity of the constitution so that it may not remain a mere paper tiger. You will study about public interest litigations in the following section.

13.5 PUBLIC INTEREST LITIGATIONS (PILs)

Environment groups working through the courts have been a powerful force in shaping the direction of environmental quality control since the early development of environmental concerns in 1970's. Their influence rose in part because the courts, appearing to respond to the national crisis of that time, took a more active stand and were less willing to defer to the judgment of agencies. At the same time, citizens were guaranteed an unprecedented access to the courts and through them to environmental policy.

Even without specific legislative authorisations for citizen's suits, courts have allowed citizen actions in environmental cases as part of a trend to liberalize standing requirements. The eighties and the nineties witnessed the increased use of PIL as tool for environmental protection in India. The ability to invoke the original jurisdiction of the Supreme Court and the High Courts under Articles 32 and 226 of the Constitution

is a remarkable step in providing protection to the environment. Moreover, the courts have widened the dimensions of the substantive rights to health and a clean environment. Other issues taken up by the Supreme Court as PILs include solid waste disposal in cities, disposal of hazardous waste, regulation of manufacture and sale of pesticides, depletion of ground water in Delhi, closure of pollution industries along the Hooghly in Calcutta, constitution of Coastal Zone management committees, compassion to animals, privileges of tribal people and fishermen, Himalayan and forest ecosystems, ecotourism, land use patterns, development projects etc. The high courts have ruled on several cases relating to ivory trade, legality of lease for mining in reserve forest, sale of birds in Bombay etc.

PILs have enabled the cause of environmental protection to be taken up by a wide spectrum of people in society- lawyers, lawyers associations, environmentalists, welfare forums and even judges. 'Green lawyers' like MC Mehta and 'green judges' like Justice Kuldip Singh and Justice Krishna Iyer have made immense contributions in strengthening environmental initiatives. We now describe two such cases in Box 13.3.

Box 13.3: Case studies of PILs

India - The Taj Mahal Case

Besides the obvious health and environmental impacts, the almost intolerable levels of air pollution in India's cities are wreaking havoc on country's renowned architectural heritage. International concern has been generated in light of the noticeable deterioration of the famous Taj Mahal in Agra, Uttar Pradesh. Legal history was made in 1993 when Supreme Court of India ordered the closure of 212 industrial units in and around Agra that were found to be in wilful default of air emission standards, and thus thought to be contributing directly to the deterioration of this historic seventeenth-century monument.

By virtue of the fact that public interest litigation is allowed under Section 19 of the Environmental Protection Act (1986), the environmental lawyer M.C. Mehta filed a writ with the Supreme Court of India demanding that suitable order/directions be issued to restrain air pollution being caused by the polluting industries located in the area of the Taj Mahal. Subsequently the Supreme Court ordered the Uttar Pradesh Pollution Control Board (UPPCB) to undertake a survey:

"in order to identify the actual industries and foundries operating in the region and further directed that the board, after complementing the survey should issue notices to all the foundries and industries in that region to ensure that the necessary anti-pollution measures were undertaken by said industries and foundries."

In its report to the Supreme Court, the UPPCB stated that notice had been issued to 511 industries in and around Agra. The court then directed the UPPCB to issue notice to these industries to install anti-pollution mechanisms. Some months later the UPPCB filed an affidavit stating that 212 industries had ignored the notice, and the court ordered the immediate closure of these units. Industries that had filed replies were given time to install pollution-control devices.

A further 29 units that had made no progress towards the installation of air pollution-control systems were directed to close. Hence a total of 241 industries were required to shut down. One hundred and thirty six of these have since installed pollution control systems, and eight have removed the source of air pollution. These 144 industries have been allowed to reopen, but the remaining 97 are still closed. Out of the remaining 270 industries, 257 have installed pollution-control systems and three have removed the source of pollution. Installation of such system is underway in ten industries. Thus out of a total of 511 industries, 393 have installed air pollution control systems, 10 are constructing such systems, eleven have removed the source of pollution and 97 remain closed. In 1994, the Supreme Court

also ordered the Ministry of Environment and Forests to establish a special division to develop a green belt around the Taj Mahal.

Pakistan - Shehla Zia Case

PIL is used in other SAARC countries as well. An illustration is the Shehla Zia case from Pakistan.

It was filed and heard by the full bench judgment of Supreme Court of Pakistan on 12th January 1994. The case was initiated by a group of concerned citizens, against WAPDA in connection with the construction of a grid station near a residential area. Supreme Court on receipt of a letter from four residents of sector F-6/1, of Islamabad, found that letter raised two questions namely

1. Whether any Government agency had a right to endanger the life of citizens without the latter's consent and
2. Whether zoning laws vest rights in citizens, which could not be withdrawn or altered without citizen's consent.

Citizens under Article 9 of the Constitution of Pakistan were entitled to protection of law from being exposed to hazards of electro-magnetic field or any other such hazards, which may be due to installation, and construction of any grid station.

So, the judgment given in this case, is in favour of the citizens, and WAPDA is further directed in future that prior to installing or constructing any grid station and/or transmission line, they would issue public notice in newspapers, radio and television inviting objection and to finalise the plan after considering the objection, if any, by affording public hearing to the persons filing objections. This became a landmark decision in the field of environmental law and set the precedent for succeeding cases brought to the Supreme Court on environmental grounds (Qadar, 2003).

SAQ 4

How can PILs be used as effective instruments for environment management?

13.6 PROBLEMS AND PROSPECTS IN IMPLEMENTING LEGISLATIVE MEASURES

You must be aware that despite so many legislative measures the state of the environment all over the world continues to be gloomy. The rivers and the lakes continue to be polluted with sewage and industrial waste, bio resources continue to disappear. The air quality in some major cities is at an alarming stage. According to the World Health Organisation, at present the Capital city of New Delhi is one of the top ten most polluted cities in the world. Surveys indicate that in New Delhi the incidence of respiratory diseases due to air pollution is about 12 times the national average. All these situations force us to find out the answers of following questions. Where are the problems? What can be done to reverse the process and restore a balanced state of the environment? Let us first identify the basic problems in the enforcement of national environment legislations.

- The analysis of all enactments and provisions at national level reveals that the **nature of most of the existing environmental legislations are essentially punitive not preventive**. Only after the chemicals or substances are discharged into the air or water or soil, the acts apply. The preventive measures are hardly ever evoked and the concerned agencies move into action only after the harm has been done. If we are serious in enforcement of environmental legislations we have to stop this fire-brigade approach – rushing to the spot of fire, after it breaks out.

The strategy should lay equal emphasis on attacking the cause of fires. An ounce of prevention in the field of environment is literally worth a gallon.

- A more serious problem in the implementation of environmental legislation is **overlapping powers of authorities involved in supervising the safety mechanism** and devices of companies, and in granting or refusing No Objection Certificate (NOC). For example, though the Water and Air Pollution Board may refuse to grant NOC, the Municipality may grant a license to an industrial unit based on which it may start its manufacturing activity.

- In some cases, the **statutes of environmental legislations do not lay down any guidelines on the nature of the authority and their specific rights and the obligations**. In the absence of statutory guidelines the agencies can be structurally inadequate, functionally inefficient and thus totally ineffective. It is also possible that the act was passed long time ago but rules were not framed for enforcement and prosecution. In the absence of such rules it becomes very difficult for the environmental agencies to take any action against defaulters. In the recent past, Delhi State Government banned the manufacture and use of coloured plastic bags, without formulating the rules to prosecute defaulters. So when the state environment department found some factories manufacturing the banned bags, it had little clue on what action to take.

- At times, the **casual attitude of enforcement agencies** also affects the enforcement of legislations. This can be illustrated by taking an example of National Environmental Tribunal Act, 1995. This legislation was passed ten years ago for delivering speedy justice to those suffering from accidents involving hazardous substances. But the fact is that the Ministry of Environment and Forests has not yet been able to solve such cases. This is a gross display of apathetic attitude of environmental agencies.

- A common feature of environmental legislation in India is that they **exclude people's participation in their implementation**. The enterprises, which make profits at the expense of the environment, are always well represented and their interests well protected but not those of the common people who suffer the consequences of pollution and degradation.

- Sometimes, the enforcement of legislation is difficult **due to shortage of funds**. Consider, for example, the pollution of rivers in India. It is well known that the major source of pollution of rivers is domestic sewage, which municipalities nonchalantly dump in the nearest rivers. Ninety percent of the pollution of Ganga stems from the 100 odd untreated municipal waste dumping. The colossal cleaning up operation, Ganga Action Plan, has been an exercise in futility since it was not accompanied by a massive effort to prevent the municipalities from dumping their wastes in the river. Every one knows that the technology for treating municipal wastes exists. But the costs are high and most of the municipalities cannot afford it.

- **Public opposition** also makes the implementation of environmental legislation difficult. For example, the Supreme Court of India recently made it mandatory to use CNG for all public transport vehicles in New Delhi. This ruling, however, led to the disappearance of some 15,000 taxis and 10,000 buses from the city creating public protests, riots, and widespread commuter chaos. Similarly, the public did not support the order of Supreme Court regarding ban on all public vehicles that were more than 15 years old.

Thus we can conclude that the Environmental Act is being designed as a "Watchdog" guarding society against pollution. But the question is to what extent have these legislations, together with the Pollution Boards, succeeded in improving the quality of human life? The record of their ineffectiveness is far more voluminous than that of their success. For example, victims of the Bhopal Gas tragedy are yet to be

compensated in spite of a hard protracted struggle. Even after the Bhopal tragedy, many gas explosions, chemical accidents and leakages occurred in many parts of the country, but without any effective action to stop these.

Nevertheless, despite the existing inadequacy of legislations and the complexity of judicial procedures, we should not lose hope. Environmental protection will be controlled to some extent in the country with the passage of these enactments, and the offending companies /agencies will be brought to book by streamlining the enforcement agencies. This is possible if the enforcement machinery and agencies function properly along with public support.

We now summarise the contents of the unit.

13.7 SUMMARY

- Legal framework is the integral part of the environmental management. The obvious objective of the legislations, laws and regulations is to preserve and protect the environment from unnecessary damage. To protect the environment legal framework works through its different components.
- First component is the **integration of concept of environmental management in national constitution** . In South Asian countries, provisions for environmental protection are provided in constitutions whether these are broader or narrower in the scope.
- Second component is the **environmental legislations**. Environmental legislations reflect policies and programmes, establish the institutional machinery, and empower the related institution to work efficiently.
- Third component is the **environmental law**. Environmental law covers all the laws, rules, regulations, and recommendations for the protection of the elements constituting the environment on the earth, seas, air and outer space. It is different from the other laws as it is not restricted to any individual or institution; it deals with whole society and also natural environment.
- Fourth component is **environmental regulations**. Environmental regulations regulate the behaviour of people and involve enforcement of standards, guidelines, and penalties.
- Environmental tribunals are established to hear the cases filed by government institutions, individuals of the society or any organisation.
- Public interest litigations are the powerful tool to control pollution as public is the forceful group to compel any industry or government to modify or stop their activity if causing any damage to environment and human health.

13.8 TERMINAL QUESTIONS

1. In your opinion how far international legislations have been successful in environmental management?
2. Discuss two major problems in enforcement of environmental legislation and how these can be overcome for effective legislation.
3. Environmental tribunals and PILs are playing a significant role in environmental management. Which one of these has been proven to be more effective for environment protection in your country?

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Appendix I: Development of Environmental Law

The development of environmental law can be grouped into four phases as under:

Phase I

Development of environmental law principle: The environmental law principle has been developed in the twentieth century. A basic legal principle applicable to environmental controversies or disputes has been that a nation should not permit action within its territorial jurisdiction to harm the interest of other states. In other words of L. Oppenheim, the renowned writer on international law:

> "A state is, in spite of its territorial supremacy, not allowed to alter the natural conditions of its own territory to the disadvantage of the natural conditions of the territory of the neighbour state……."

Phase II

Recognition of environmental law liability principles as the principle of international law by the United Nations: Even though international environmental law liability principle was established by the 1941 decision of the Trial Smelter arbitration, it was not until the decade of sixties that there emerged an environmental awareness in the minds of general public about the rapidity of damage to the environment. In this regard it is worth noting that when United Nations was established in 1945, no mention was made of the environment as a common concern in its agenda. This awareness led to the creation of new laws, regulations and even governmental agencies on the international, regional, federal, state and local level. The practice of international environmental declaration and action plans started in 1972 with the Stockholm Declaration, which declared environmental protection as the common concern of entire mankind.

Phase III

1992 Earth Summit and its Follow-Up: The third phase is the awakening of consciousness of national leaders i.e. politicians and policy makers, that environmentalism is a force to be reckoned with and that it has a significant effect upon public concerns about the government policies. The beginning of this era was 1992, when national laws were globalised by adoption of several international treaties signed as a follow-up the Earth Summit held in Rio de Janeiro, Brazil in 1992 also known as the United Nations Conference on Environment and Development or the Rio Summit.

Phase IV

2002 Johannesburg Summit and its Implications: The fourth phase of development of environmental law appears to be characterised by the growing realisation by both the business community and the environmental NGOs that partnership and dialogue is the key to finding acceptable solutions to the world's environmental problems and that industry has the means to deliver the required improvements.

UNIT 14 POLICY FRAMEWORK

Structure

14.1 INTRODUCTION

Changing social practice, at the level of the individual and the organisation, is widely seen as a vital component of local, national and international strategies for addressing environmental issues. Apart from the legislations described in the previous unit, numerous policies have been formulated by the government to further the objective of environmental protection. These policies have often been formulated as a response to public pressure, activism of NGOs, legal opinion and directions from the judicial system at various levels.

This unit deals with the need for environmental policy, policy development, policy instruments and criteria for choosing any instrument.

Objectives

After studying this unit, you should be able to:

- explain environmental policy and its development;
- describe different policy instruments;
- outline the benefits and problems associated with these instruments; and
- discuss criteria for choosing given policy instruments.

14.2 ENVIRONMENTAL POLICY AND ITS NEED

In this course and other courses of this programme, you have been acquainted with the nature of environmental problems. We now discuss some of the appropriate means for solving them. There is no single or simple answer to the question of means: it depends on the nature of the issue being addressed and on the response of industry, consumer and pressure groups. Different issues require different solutions. These can take the form of taxes, setting targets and limits, a ban, or an appropriate mixture of policy responses. Industry pollutes because it uses cheap methods of production and waste disposal; resources are depleted because it is to the advantage of each kind to take what they can. If environmental resources are to be used in a sustainable manner, then environmental policy has to find ways of ensuring that the actions of individuals, business and government are themselves sustainable.

The environmental policy, often described as public policy is a specific course of action taken collectively by society or by a legitimate representative of society, addressing a specific problem of public concern that reflects the in terests of

society or a particular segment of society. This definition emphasises a course of action rather than principles. It does not restrict action to government, it refers to collective nature of such action, and does not claim that each and every public policy represents the interests of society as a whole. Enough interests have to be represented, however, so that the policy is supported and can be implemented effectively.

Environmental public policy includes all laws and agencies in a society, which deal with the society's interactions with the environment. Included are the policies that prevent or lower the pollutants of air, water and land as well as those concerned with the use of national resources. Public policies are developed at all levels – local, state, and national. However, in a democratic society, the ultimate responsibility for environmental public policy should reside with the public, and not with the authorities.

The Need for Environmental Policy

The purpose of all environmental public policies is to promote the common good. Exactly what the common good consists of may be a matter of debate, but the **improvement of human welfare would certainly be a central concern**. In addition, many would include the protection of natural world that provides for the continued existence of the ecosystem and species, and the perspective of environmental stewardship.

Human populations and their economic activities have the potential for doing great damage to the environment, and that damage has direct impact on present and future human welfare. The impact of pollution and the misuse of resources are most clearly seen in those parts of the world where environmental public policy is often not established and implemented. Millions of deaths and widespread diseases can be directly traced to degraded environments. The cost to human welfare is imposed on the health, economic productivity, and on the ongoing ability of the natural environment to support human life needs. It is quite obvious that laws to protect the environment are not luxuries to be tolerated only if they do not interfere with individual freedom or economic development. Such laws are part of the essential foundation of justice and they are ignored or downwarded only at great human and environmental cost.

You may like to reflect on these ideas and apply them to your own context.

SAQ 1

How can environment policy supplement/complement environmental legislation while addressing a particular environment related issue?

14.3 DEVELOPMENT OF ENVIRONMENTAL POLICY

Environmental public policies are developed in a socio-political context, usually in response to problems. Some policies are developed at the local level. Some problems, however, are broader in their scope and must be addressed at higher levels of government. When specific problems such as acid deposition and the production of ground level ozone are addressed, the policy often takes a predictable course, called the **policy life cycle**.

The typical policy has four stages in its life cycle:

- Recognition
- Formulation,
- Implementation, and
- Control

Each of the stages can be said to carry a certain amount of political "weight," which varies over time. You would really enjoy studying the life cycle of policy as you move on from one stage to the other.

- **Recognition stage**

  This stage begins with the early perceptions of an environmental problem. Many a times, this perception comes as a result of scientific research. Scientists publish their findings; the media picks up the information and popularises it. The public is involved, and the political process gets underway. Eventually, the problem gets attention from some level of the government, and the possibility of addressing it with public policy is considered.

- **Formulation stage**

  Once the problem enters the public domain, debates about policy options occur and reach the corridors of power. The political battles may become fierce, as questions of regulation and who will pay for the proposed changes are addressed. Media coverage, public discussion and people's opinion influence the formulation of the policy. Lobbyists for special interests or environmental groups put pressure on legislators to soften or harden the policy under consideration.

  During this stage, policymakers should be considering what may be called the "Three E's" of environmental public policy:

  - **Effectiveness** (the policy really accomplishes what it intends to do in improving the environment),
  - **Efficiency** (the policy accomplishes its objectives at the least possible cost),
  - **Equity** (the policy parcels out the financial burdens fairly among the different parties involved).

  Often, policymakers are prone to emphasise effectiveness over efficiency and equity at this stage of development, because they are looking for a workable solution and trying to make it into a law as soon as possible.

- **Implementation stage**

  In the implementation stage of a policy, its real political and economic costs are exacted. The policy has been determined, and the focal point moves to a regulatory agency. The emphasis now shifts to the development of specific regulations and their enforcement. Industry learns how to comply with the new regulations. Over time, greater attention may be given to efficiency and equity as all the players in the process gain experience with the policy.

- **Control stage**

  The final stage in the policy life cycle is the control stage. By this stage several years have passed since the early days of the recognition stage. Problems are rarely completely resolved, but the environment is improving, as things are moving in the right direction. Policies (and their derived regulations) are broadly supported and often become embedded in the society, although their vulnerability to political shifts continues. Regulations may become more simplified. The policymakers must now see that the problem is kept under control, and in due time, the public often forgets that there ever was a serious problem.

SAQ 2

In your opinion, at which stage of policy development, the participation of general public is crucial?

14.4 CONSTRAINTS ON POLICY MAKING

Since the discussion on environmental management is taking place in context of sustainable development, we shall look at the issue of policy making also in the same context. In Unit 1 of this course, we have recapitulated the concept of sustainable development. You know that sustainable development is *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*.

Sustainability is a scientific principle indicating the notion of natural systems enduring over time. Development is a social science concept relating to the progress of human systems. Taken together, sustainable development can be defined as a relationship between dynamic human economic systems and larger, dynamic, but normally slower-changing ecological systems, such that human societies flourish in a manner that the effects of human activities do not destroy the health integrity of the environment.

Thus, sustainable development requires **resource conservation** at all levels, **greater equality of access** to natural resources and redistribution of wealth from rich to poor, and that the present generation **desist from those activities which may rob or imperil the future**.

Policies for sustainable development should therefore,

- prevent further destruction of habitats,
- reduce pollution at least to levels which do not violate the Earth's regenerative capacity,
- restrain activities which consign to future generations the problem of clean-up and risk to health or survival,
- deliver a redistribution or resources that will guarantee a commitment to sustainable development.

Environmental policies oriented to meet the goals of sustainable development envision fundamental changes at individual, political and societal level. This imposes certain constraints on policy making.

When we consider environmental policy's place in society, we observe a peculiar phenomenon. Society often acts as a legitimate, institutionalised counterforce. In its attempt to cross sectoral policy boundaries, environmental policy actually occupies a somewhat isolated position: lacks the support of powerful economic interests and is a policy with hardly any mandate.

A second constraint on environmental policy can be tracked down to the process of policy making itself. As we discussed earlier, the awareness of environmental problems is predominantly based on scientific research. Without this research we would not be familiar with the environmental issues. Environmental policy is expected to address these problems. A balance must be restored, the scope and nature of emissions and waste disposal must be limited and the exploitation of natural resources must be reduced. These characteristics of environmental policy show it to act essentially as a correcting mechanism for society. Moreover, it is a mechanism that often operates after the damage has come to light. But more frequently, environmental policy gives rise to a conflict, which then gets bogged down in deadlock.

Political Perspective

Given the far-reaching implications of sustainable development, it is hardly surprising that there will be resistance to fundamental changes. This certainly seems to be true of the wealthier countries, which already consume a substantial share of resources.

Conversely, the poorer parts of the world have a stake in securing fundamental change. The inequality in resource consumption and pollution provides them with a strong moral position in the debate over global environmental change. The claims of developing countries on the Earth's resources are increasing. These countries will be unlikely to surrender the prospect of the material benefits which the rich countries have been enjoying with impunity.

A switch from unsustainable patterns of development is unlikely to occur without good reason. As we have seen, the evidence for some of the global environmental problems is uncertain. A composite index which combines the heat-trapping potential of the major greenhouse gases (CO_2, methane and CFCs) places Brazil, China and India among the top six contributors. On the other hand, the United States, though still the largest contributor, produced only 17.6% of the combined total, whereas its production of a single gas, CO_2 from fossil fuel burning, was over a fifth of the total.

The political positions of the developed and developing countries vis-à-vis environment serve to act as brakes in policy making. Each and every agreement is arrived at after hard prolonged negotiations due to divergent political perspectives of the North and South.

Economic Constraints

Governments are more likely to pay attention to the immediate requirements of the economy than to longer term environmental goals. Governments depend on the support of business to provide economic growth and wealth and on the votes of workers with an interest in prosperity and jobs. Environmental regulations are, of course, be accepted, but only up to a point. Governments are ordinarily unwilling, indeed politically unable, to jeopardize present and palpable economic advantage to avoid a future and uncertain environmental cost. They are resistant to the closure of a plant for environmental reasons, especially if it is likely to result in high levels of local unemployment. They would be particularly unwilling to do so if they fear that others will seize a competitive advantage. The tendency to relieve industry of the burdens of environmental regulation is especially strong in times of recession in all countries. How can these constraints be taken care of?

The contemporary pattern of development reveals vast inequalities which must be reduced if sustainable development is to be politically achievable. If international policies are to be agreed upon and successfully implemented, they will need to be founded on **principles of equity and compensation** for those communities, countries and future generations who experience the environmental costs of economic development. This necessity was recognised in the third principle of the Rio Declaration 'The right to development must be fulfilled so as to equitable meet developmental environmental needs to present and future generations'. We discuss this principle briefly.

The Principle of Compensation

The principle of compensation could be exercised to ensure environmental protection in the following circumstances.

- First, where the right to develop is denied or access to environmental assets is limited or prevented. In such cases compensation may be justified for the loss of property rights which creates hardship.
- Second, it may also be necessary to compensate those communities or countries that experience the negative externalities of pollution. This applies to communities where polluting activities are concentrated, sometimes called 'pollution havens'. It also applies to countries which are in the path of transboundary pollution. For example, the ageing nuclear reactors in Eastern Europe are recognised as posing substantial risks, and Chernobyl has already demonstrated the potential scale of disaster. But these countries are often heavily dependent on nuclear output for

their power supplies and are unable to upgrade, replace or shut down reactors without considerable aid.

SAQ 3

Discuss the role of scientific research in the process of policy making.

14.5 POLICY INSTRUMENTS

The objective of environmental management can be attained through voluntary means as well as through many other policy instruments such as:

- Voluntary means
- Direct regulations
- Economic instruments
- Communication and awareness building instruments
- Institutional mechanisms
- Laws and legislations.

14.5.1 Voluntary Means

People can adapt to different patterns of consumption and change their life style, seeking individually or collectively to develop sustainable practices. Although business is often subjected to legal requirements concerning waste products and so on, there are other voluntary approaches such as ISO 14000 certification, which have been adopted. Voluntary responses are always valuable and it is undeniable that there has been a shift in environmental consciousness. No rules or regulations or government direction will ultimately work unless people are prepared to modify their own behaviour.

For example, the ISO 14000 Standards, and environmental labelling are amongst the quality assurance and control devices that have international acceptance.

ISO is a worldwide federation of national standards bodies, at present comprising 127 members, with its headquarters at Geneva, Switzerland. It was established in 1947 to promote the development of standardisation and related activities in the world, with a view to facilitate exchange of goods and services, and to develop cooperation in the sphere of intellectual, scientific, technological and economic activity. The results of ISO technical works are published as *International Standards*.

The ISO 14000 series consists of:

i) *Organisation and Process Standard*
ii) *Product-oriented Standards*
iii) *Terms and definitions*

However problem with relying on voluntary action alone, important as it is, is that it cannot guarantee a particular outcome and is also likely to fall short of what is required. The environment is a public good and therefore collective action problems are likely to arise. Voluntary actions are unlikely to be enough because there is no guarantee that the sum of individual actions will be adequate and every reason to believe that it will be inadequate. Thus governments intervene because without intervention certain environmental goods will not be provided. You may ask: What sorts of government interventions are possible? We discuss these in the subsequent sections.

14.5.2 Direct Regulations

The first and most easily understood intervention is that of the straightforward regulations and control through an appropriate regulatory body.

The regulation enforcement instrument requires the relevant authorities to take the following four steps:

i) **Set rules and regulations** governing the behaviour of all sectors of industry (including environmental audits, effluents control devices, maximum allowable limits on discharges and so on);

ii) **Establish a set of penalties** under the law for non-compliance with the regulations;

iii) **Continually monitor the actions of targeted industries** so that instances of non-compliance with the regulations are taken care of;

iv) **Make timely use of the judicial process** in seeking the imposition of penalties on defaulting industries. The effectiveness of this approach depends on the premise that even minor violations will not be ignored by the enforcement authorities, that defaulting industries are first given an opportunity to mend their ways before being forced to pay major fines or injunctions, and that the enforcement authority had sufficient budgetary and human resources to enforce the law.

Command and control as the standard regulatory approach is often known to take the form of legislation. Although it tends to be related primarily to industry it could in fact comprise anything from a ban on the use of cars in a city centre to control over the emissions of effluents from a factory, to an outright ban on a particular pollutant. Regulations define acceptable processes, establish emission standards and specify quality objectives.

Traditionally, regulations require the relevant agency to concern itself with activities of an industry or plant. It can take many forms: from complete control over every activity of a firm to a more hands off approach, which assumes that firms are doing what they should unless it can be proved that they are not. Acceptable levels of emissions can be determined and those companies must be punished where they fail to meet them. One problem with this approach is that punishment by definition follows the crime and hence emerges only after the environmental damage has already been done. Further the level of fines may be inadequate to act as a deterrent; it may be cheaper for a company to pay fines than to change its production processes. Another problem is that standards and punishing a firm for exceeding that level creates no incentives for it to seek to reduce its emissions beyond the standard. It receives nothing for doing so.

The use of regulations, is straightforward and uncomplicated; it is readily understood by governments and by the public. The other advantage is that in case of some pollutants, the only acceptable level is zero. If the monitoring regime and appropriate deterrents are in place, simple prohibition through regulation is a sound option. Further it is possible to act quickly: the regulator can step in and ban or reduce an emission where serious environmental damage is occurring or is likely to occur.

Command and control system have their merits, but a key disadvantage is simply that they punish transgressors for doing wrong but what is needed in environmental policy is to encourage potential polluters to do right. This can be ensured through economic instruments.

14.5.3 Economic Instruments

One way of doing this is to establish a system within which polluters have an incentive not only to avoid polluting but also to reduce their polluting activities and in doing so gain a fiscal advantage. Economic incentives enable a polluter to choose how to adjust to the required environmental standard. Some will prefer to pay while other will prefer to install new or modified equipment.

Economists argue that the operation of the market provides a mechanism, which harnesses individually self-interested actions to the good of all. **In economic theory,**

a properly working free market should produce as outcome, which although not intended by any single company or person is, nevertheless to everyone's advantage.

The use of economic instruments is thus concerned with providing internal incentives to polluters and resource users to reduce their emissions or to reduce their inputs. It also seeks to internalise the external costs of pollution and resource depletion.

Market based policies have the virtues of simplicity, efficiency, and (theoretically) equity. All polluters are treated equally and can choose their responses based on economic principles of profitability. There are strong incentives to reduce the costs of using resources or of paying for the right to a certain amount of pollution.

Some polluters and resource users cannot make simple market based choices, because of their poverty or powerlessness. In these cases, the market approach must be modified to include concerns for the disadvantaged distributional justice. This is especially crucial when the resources or processes in question are a matter of economic survival.

Many environmental problems are not readily amenable to market based policies. For example, based on knowledge of the health effects of pollutants, a society may choose to set standards that reflect the health of the most vulnerable members of the population. This is the case with the basic criteria covering air pollutants.

In order to implement the economic based approach, the enforcement authority must:

i) Determine the precise set of charges or prices per unit of discharge of each polluting substance that will induce the necessary abatement actions on the part of dischargers;

ii) Continually monitor the levels of discharges as well as establish a system of self reporting with spot-checks and an environmental auditing mechanism;

iii) Levy a sum equal to the charge per unit of pollutant multiplied by the amount of the pollutant discharged during each reporting period. This approach provides a graduated incentive to industries by marketing pollution itself a cost of production; it also provides incentives for technological innovations.

There are two types of economic instruments used in environmental public policy:

i) Price based mechanism: green taxes
ii) Right based mechanism: tradable permits and quotas

Price based mechanism

This mechanism is a flexible and efficient alternative to traditional command and control techniques. **In principle they reduce compliance costs and they also provide suggestions to polluters to choose how best to adjust to the environmental quality standards.** Polluters facing high pollution abatement costs will prefer to pay the tax; those with low costs will install equipment to avoid paying. Taxes can be imposed in different ways and upon different things. For example **emission charges** are levied on the discharge of pollutants into the air, water or soil; **user charges** are related to treatment or disposal cost; **product charges** are levied on products that are harmful to the environment when used in production processes or when consumed.

Auditing is required to find out whether processes put in place to improve compliance are working, and verify the efficacy of the management reviews in capturing the effectiveness of EMS. ISO 14010, ISO 14011, and ISO 14012 describe general principles of environmental auditing, guidelines to audit EMS, and qualification requirements for environmental auditors.

The **green tax** has the following advantages:

i) They can be administered through the existing tax framework.

ii) Tax provides an incentive for further reduction in emissions, because reducing the amount of emission reduces the amount of tax for which the firm is liable.

iii) There is incentive to commit funds to research and development into new less polluting technology.

iv) Taxes on one pollutant may have the related effect of reducing emissions of associated pollutants.

However there are some problems with green taxes:

i) They are often regressive in impact, e.g., a carbon tax levied on domestic or motor fuel has a high impact on low-income groups, whereas the better off can afford to pay the higher costs because fuel makes up a much smaller proportion of their total income.

ii) It is intrinsically difficult to set it at precisely that level at which people are sufficiently discouraged from using that product to have the desired environmental effect.

iii) Taxes will need to be readjusted frequently to ensure that they maintain the same effects against a background of changing relative costs, currency fluctuations, innovations in research and development, entry into and out of an industry and shifting patterns of consumer demand.

Box 14.1: India mulls environment tax to check polluters

Source: **Copyright 2005, Indo-Asian News Service**
Date: **February 18, 2005**

New Delhi, Feb 18: India is considering an environment tax from the coming fiscal to check industrial polluters as well as civic bodies who fail to treat harmful sewage before it is discharged into rivers and other water bodies.

Pushing the proposal for imposing the environment tax is the ministry of environment and forests, which has taken its cue from some developed countries to encourage and coerce industries to switch to cleaner technology as part of their commitments under the Kyoto Protocol.

The proposal is based on a study done by the Madras School of Economics on rising pollution and the need to address the issue by making not just industries but also civic bodies accountable. If not, they pay a penalty.

"We have proposed to the finance ministry that an environment tax be imposed on polluting industries that fail to address the problem of discharge into the atmosphere or let untreated discharge flow into the water bodies," environment ministry sources told IANS.

"The government policy should act as an incentive for clean technology and inhibitors of unclean technology. We believe incentive and deterrents should be used to ensure compliance of environment norms," said a senior official.

Many of the rivers in the country are so polluted that their water has become unfit for human consumption even after treatment. Protecting water bodies in the country to help improve the water crisis in many parts of the country is a major focus area of the government.

India is also keen to do its share to stem environment degradation with the Kyoto Protocol, of which it is a signatory, coming into force earlier this week.

While India does not have any commitments under the Kyoto Protocol, which places binding commitments on developed nations to reduce carbon emissions to below 1990 levels by 2012 in the first phase, it is keen to promote clean technologies and other steps like afforestation to reduce carbon emissions leading to climate change.

"Our objective is to realise many of the steps laid out in our proposed National Environment Policy. The draft policy recommends bringing in regulatory reforms, enhancing and conserving environmental resources, setting up of environmental standards and, in fact, adopting environmental concerns in all development activities," said the official.

From April, India is also implementing the Bharat II norms for transport fuels on the lines of the Euro II norms, which will see sulphur content brought down to 350 parts-per-million (ppm) in diesel and 150 ppm in petrol. Aromatic hydrocarbons are to be contained at 42 percent of the concerned fuel.

The state-owned oil companies are currently racing against time to ensure compliance with this requirement by the start of the 2005-06 fiscal year.

As per the roadmap frame for transport fuels, the oil companies would have to further improve the quality of fuels to Bharat III and IV norms in stages while the automobile sector would be investing considerable sums to upgrade vehicles to match the new fuel standards.

Right-based mechanism

Right-based approaches, such as tradable quotas and permits, start with end to be achieved and work backwards. Industries are given the right to consume environmental resources and to trade any surplus they do not need. A market is created in the right to pollute or to consume resources; the overall level of emissions or resource use is determined in advance and the quotas or permits are left to find their own price.

This system has the following advantages:

i) Permits can guarantee the achievement of particular targets, because the authorities control the number of available permits.

ii) If permits are leased rather than sold, the authorities are able to tighten the ambient targets by cutting the number of permits available.

iii) There is no need, as there is with the imposition of green taxes, to ascertain both the required standard and the appropriate tax rate. All that is needed is for the proper environment standard to be identified and for permits to be distributed through a fair and acceptable procedure.

There are problems with too many as well as too few permit holders in a market:

i) Under a tradable permit scheme, the administrative costs could be very high if there are a great many polluters. Where there are comparatively few, the costs of administration are low, but a new problem arises if one or two polluters corner the market in permits and refuse to trade them. This acts like a barrier to entry for new firms. The permits could thus contribute to non-competitive behaviour.

ii) A permit scheme is undesirable in both the cases, i.e., when there are a very high number of emission sources. For example, exhaust emission from motor vehicles and when the number of sources is too low. Because in either of the cases, operators dominate the market.

14.5.4 Communication and Awareness Building Instruments

The essence of environmental communication is to convince people that there is really a problem at hand, that this problem requires their urgent attention, that environmental problems do have solutions, and that these solutions do actually work. Any policy for environmental communication should aim at making the cycle of links between the

media, the public and the decision maker self-reinforcing and perpetual as depicted below (Fig. 14.1).

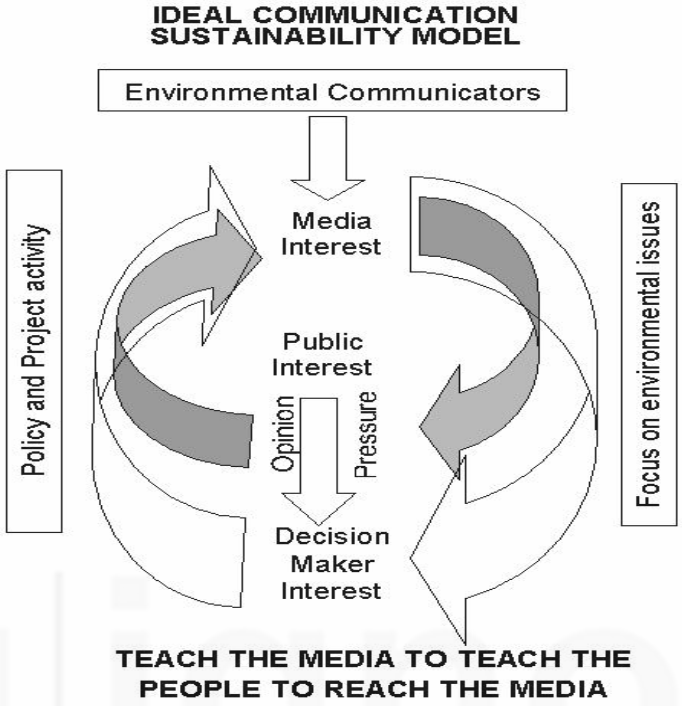

Fig.14.1: Link between the media, public and decision maker

Given the multi-sectoral nature of the environmental issues, environmental communication has to deal with a wide range of audiences, messages and media. While a general programme that seeks to sprinkle seeds of hope every where is important, it must be implemented by a thorough communication programme that seeks to communicate the most appropriate messages to the audience through the most appropriate medium.

The message treatment requires concentrating on such local and regional parameters as language used and customs of members of the same target group living in different parts of the country. A message that is readily accepted in urban areas may be totally ignored in rural ones based on its presentation alone.

The phenomenal growth of radio and television has expanded the reach of the communicator. The potential in video production of special environmental documentaries is, however, much more real and immediate. The opportunities present are of special significance in extension work both with rural audiences and with decision makers, elected representatives and industrial and business communities.

Outdoor publicity, including all forms of hoardings, posters, and other public displays with environmental messages incorporated into advertising can be a useful means of general communication. Endorsement to environmental campaigns by celebrities and public figures and using green songs and theatre could be another priority mechanism for communicating general environmental awareness and focusing on strategic issues such as population, education and conservation ethics.

The search for communicators must extend beyond the media. Teachers, mothers, and religious leaders can serve this role and act along with community opinion leaders as the true catalysts of change. Thus any communication strategy must rely on community opinion leaders individuals within groups who take the lead in first educating themselves on environmental concerns and then conveying their newfound awareness to everyone they are in contact with.

14.5.5 Institutions, Laws and Legislations

There is direct relationship between weakening of traditional institutions and destruction of infrastructure and resources because the social organisation to manage them no longer exists. The weakening of social control has led to such phenomenon as the overgrazing of rangelands and pastures, desertification, deforestation and decaying irrigation infrastructure.

Environmental protection and management can no longer be left to weak and under funded government departments or to several departments with overlapping responsibilities. The issue of integrated pollution control must be addressed responsibly. To this end, all nations have established departments or ministries of the environment as a structural response to the changing perceptions of the environmental challenge. It is not enough to improve the quality and availability of information that affects decision-making. The existing institutions and procedures must also be changed. Environmental considerations must be formally recognised as essential decision-making criteria within government and private sector organisations. Improved decision making, which takes full account of environmental considerations, demands that all these partnerships be strengthened and expanded. We shall take up the role of institutional mechanisms in detail in the next unit.

The idea of environmental protection has always been a part of legislation in one form or the other under various regulations, laws, rules and statutes. To protect public health and the environment, effective laws should be passed and vigorously enforced. Legislative and regulatory instruments are designed to ensure adherence to set rules and regulations for the protection of the environment. For example, through the environmental impact assessment (EIA) process governments can ensure that environmental factors are considered in decision-making. This can be done through the use of such regulatory instruments as prohibition, standards, guidelines, permits and the like.

Envionrmental Impact Assessment (EIA) is an analysis of changes produced by a developmental activity or project or action. There is no one methodology for assessing, the environmental impact that results from a particular action or project.

Institutional arrangements for environmental protection cannot exist without appropriate legal foundations. In general, combining governmental and legal institutions is a very cumbersome arrangement. The result is often a host of laws, rules and regulations, orders, ministries, departments, divisions, parastatal bodies, commissions, boards and councils in a complex web of interrelationships.

Environment policy in India

Apart from the legislation mentioned in the previous unit, numerous policies have been formulated by the Government of India to further the objective of environmental protection. The Government of India has formulated legislation, regulations and policy instruments to address matters concerning environmental issues for sustainable development at sub-regional, regional and international level. These include the National Conservation Strategy and policy statement on environment and development 1992; the policy statement for abatement of pollution, 1992; the national forest policy 1988; and the wildlife conservation strategy, 2002.

The Ministry of Environment and Forests of the Central Government of India is the nodal agency to decide on policy matters. It is worthwhile to briefly look into the various steps taken by the ministry on different aspects of our environment from time to time. Their approach can be grouped into the following categories:

- Pollution prevention and control
- Environmental impact assessment
- Hazardous substances management
- Conservation and survey
- Research and development
- Environmental education and information

SAQ 4

Regulations and market-based instruments are often compared as though there was a closed set of options in which we have to choose either one or the other. By comparing the advantages and disadvantages of both approaches, what do you think which approach is best in your context? Why?

14.6 CRITERIA FOR CHOOSING INSTRUMENT

There are a number of different criteria for choosing between instruments. According to neo-classical economic theory, an *ideal* instrument should:

Provide motivation for further change;

- Be administratively cheap;
- Be economically efficient;
- Be politically acceptable; and
- Have distributional impacts.

This ideal is not achievable, but the following criteria can provide a basis for evaluating the strengths and weaknesses of different types of instruments, and between the ranges of possible instruments within that type.

- **Effectiveness**

  This concerns the ability of the instrument to meet the objective, which has been set with reasonable certainty and speed. It is difficult to predict how much effect a tax, subsidy or voluntary instrument will have. In contrast, regulation and tradable permits are designed to achieve a specified reduction in pollution. A further important factor to consider here is the extent to which the pollution objective is locationally sensitive. An overall objective (about regional or national reductions in carbon dioxide emissions, for example) can be addressed through tradable permits; however, if there is concern about pollution at one location (for example, discharges to a particular river) then only regulation will ensure that the particular problem is addressed.

- **Motivation**

  The instrument should provide a reason for individuals and companies to continue to reduce their pollution beyond the target of the instrument. In this respect taxes, subsidies, tradable permits and some voluntary instruments do better than regulation in which there is no further incentive to change behaviour once the flat fee has been avoided.

- **Administrative Cost**

  Administrative cost refers to the costs of monitoring liability for a particular instrument, and those of ensuring compliance. Any instrument that varies with weights, volumes, or concentrations of pollutants (i.e., taxes or tradable permits) will be far more expensive to monitor than regulation, where the liability depends on whether a simple measure of volume has been exceeded. It is also important to consider the extent to which individuals or companies would be able to break the law or avoid the tax: if they did so, would they be discovered, would they be prosecuted and what would be their punishment? **Policy instruments are clearly better if they are hard or expensive to avoid**

- **Economic Efficiency**

  This refers to the extent to which the instrument minimises the costs of pollution-reduction. The key question here concerns whether or not the instrument makes

polluters reduce their pollution to the same extent. If it does, then it is likely to be inefficient. This can be understood in relation to the different types of instrument. The imposition of a regulation ensures that all individuals or companies reduce their pollution to the same standard. This may be very easy (and cheap) for some polluters and very difficult for others. Because it is very expensive for some polluters to meet this standard, the overall costs to society may be high. If a tax or tradable permits were imposed instead then the individuals/companies could vary the extent to which they responded according to their costs. This would ensure that society's overall costs of pollution reduction would be minimised.

- **Political Acceptability**

  Political acceptability refers to the extent to which the policy instrument fits in with the government's wider priorities – which are, of course, greatly influenced by pressures emanating from a wide range of interest and pressure groups, as well as the mass media and the general public. There are two particular matters, which should be considered here. Firstly, what is the effect of the instrument upon people's liberty? It can be politically unacceptable to ban an activity (for example, smoking) just because it is known to be dangerous. Another important factor, however, relates to the distributional effects of the tax. Are poor people forced to change their behaviour more than rich people? Regulation means that everyone changes their behaviour to the same extent; taxes mean that rich people can use their wealth and pay for continuing pollution. Whether a government views this as fair or not will depend on their political leanings.

- **Distributional Impact**

  Various methods affect different people differently. For example, taxes tend to be regressive in that they have a greater impact on the poor. Thus they might be politically or morally sensitive and must be avoided.

Let us, now summarise what you have learnt so far.

14.7 SUMMARY

- Environmental public policy includes all of the laws and agencies in a society, which deal with the interactions with the environment.
- The purpose of this policy is the improvement of human welfare and protection of the natural world.
- The typical public policy life cycle has four stages; recognition, formulation, implementation and control.
- There are a number of policy instruments available, some of which are; voluntary means, direct regulation i.e. command and control, economic instruments including price based mechanism of green taxes and right based mechanism of permits and quotas, communication and awareness building instruments, institutions and laws and legislations.
- Each instrument has its own merits and demerits, and suitable in different situations. One instrument feasible for a pollutant control might not be suitable in other country situation. Policies are usually mix of different instruments.
- There are some set criteria to choose between the instruments which include effectiveness, motivation, administrative cost, efficiency, political acceptability and distributional impacts.

14.8 TERMINAL QUESTIONS

1. Discuss the political and economic constraints on policy making.
2. How can economic instruments be used effectively in the formulation of policy?
3. In your opinion which criterion is the most important for choosing policy instrument in the context of your country?

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UNIT 15 INSTITUTIONAL FRAMEWORK

Structure

15.1 INTRODUCTION

You have studied in the previous unit that for effective environmental protection and management the government ministries and departments have to be supported by institutional mechanisms, which allow for wider participation of the stakeholders.

In the past decade following the 1992 United Nation Commission on Environment and Development (UNCED) the international community has witnessed phenomenal growth, establishment and strengthening of institutions both at national, regional and global level dealing with different aspects on environment. With the growth in importance on the environmental management, development of institutions to ensure and facilitate effective coordination and management of natural resources at all levels took place.

Institutions at global and regional level refocused their activities and environment became an important activity in a number of them. At national level, likewise, environmental management has been institutionalised with the establishment or designation of national institutions by law.

Keeping in view this aspect of environmental management, in the present unit we discuss the role of institutions in environmental management, at various levels: global, regional, national and local. We also describe certain institutions at all these levels.

Objectives

After studying this unit, you should be able to:

- discuss the need of institutions for environmental management;
- explain the institutional framework currently in place for environmental management at different levels from international to local;
- describe the role of institutions in managing environment; and
- discuss the present scenario of framework of institutions in India.

15.2 NEED OF INSTITUTIONS FOR ENVIRONMENTAL MANAGEMENT

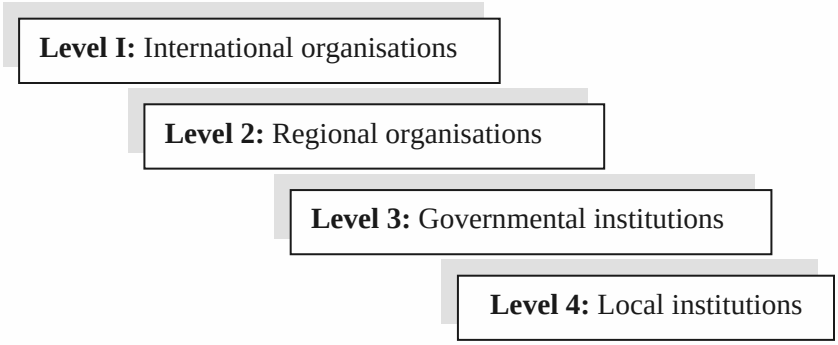
Legal and institutional arrangements for environmental management have gradually evolved and changed as scientific understanding of the dynamics of environmental processes and the impact of anthropogenic activities on such dynamics has increased. Trends indicate a move from sectoral approaches that isolate and exploit the environment, to a holistic ecosystem approach that is concerned with sustainable development and promotes an integrated and coordinated approach to environment and the economy. You have studied about sectoral, ecosystem and coordinated approaches to sustainable development in detail in MED-002. Institutional arrangements have also been influenced by participatory approaches to development and the devolution of power to sub-national levels, including the empowerment of grass-roots communities to decide and act on the political, economic and social issues that affect them. (Details of participatory approaches are dealt with in the course MED-004).

Environmental laws and regulations are considered as indispensable frameworks and basis for the effective implementation of policies and programmes. They establish mandates for institutions as well as define roles and responsibilities for governments, civil society and individual citizens. These rights have the backing of the law and hence, are enforceable.

Since environment is an area that transcends all sectors, it is now accepted that its management requires the coordination of a multitude of stakeholders. In other words, its management requires inclusiveness. Effective management of the environment requires diverse nations and individuals with a wide range of skills to work in harmony. National and international institutional arrangements for environmental management inevitably will compose all stakeholders in the formulation and implementation of environmental laws, including their enforcement. These will include:

- Government institutions,
- Academic institutions,
- Community based organisations and NGOs,
- Professional associations,
- Private Sector, and
- Regional and International Networks.

There are many levels of organisations or institutions, which play role in managing environment from global to local level. These can be better described by the figure given below:



Beside these institutions, several other institutions, like bilateral and multilateral donor agencies, non-governmental agencies and academic institutions also serve as pillars in the building of environmental management. We now discuss these institutions in the following sections.

SAQ 1

Which type of institutions are very active for environmental management in your country and why?

15.3 INTERNATIONAL ORGANISATIONS

International cooperation forms the basis for the enforcement of international environmental agreements and laws, aimed at preventing environmental degradation, and promoting the conservation of natural resources. Several international organisations like the UN, World Bank, GATT/WTO, NGOs, and regional organisations facilitate the implementation of these agreements. We describe their roles in the context of environmental management.

15.3.1 The United Nations

The United Nations performs basically two roles in relation to the environment. It serves as:

- a forum for global negotiations between governments; and as
- an instrument for implementing and executing policies of its members.

Some important functions that UN has performed under the first role are: The UN facilitating its members to conclude several international environmental agreements by organising various Conferences and Summits. It has played a key role in diffusing tensions and conflicts between nations on environmental issues.

Establishment of **United Nations Environment Programme (UNEP)** in 1972 and the Commission on Sustainable Development, represents one of its functions under the second role. The United Nations Environmental Programme (UNEP), set up in the wake of the 1972 Stockholm Conference is not a UN specialised agency but merely a 'programme', without executive powers and with a budget that is to a large extent dependent on voluntary contributions from states. UNEP's main purpose is to promote better co-ordination between existing UN programmes in the field of the environment, rather than to develop its own programmes. Nevertheless, UNEP has gradually managed to carve out a useful role for itself by taking the initiative on such issues as the control of transboundary movements of hazardous waste and the protection of the ozone layer.

The UN Commission on Sustainable Development (CSD) was set up in 1992 as a follow-up mechanism to the 1992 Rio Earth Summit. It is a functional commission of the Economic and Social Council (ECOSOC) and is composed of 53 members elected for three-year terms by the ECOSOC from amongst UN Members. The CSD acts as a catalyst for actions that support the objectives of sustainable development. Its mandate is to monitor and report on the implementation of the Earth Summit agreements such as Agenda 21 and the Rio Declaration at the local, national, regional and international levels. After the *World Summit on Sustainable Development* in 2002, CSD now also monitors the follow-up of the *Johannesburg Plan of Implementation*. CSD meets annually for a period of two to three weeks in order to address issues relating to sustainable development. The relationship between UNEP and CSD has not always been clear, although their mandates are clearly different.

15.3.2 Global Environment Facility (GEF)

The *Global Environment Facility* (GEF) is an international funding mechanism that was set up in 1991 in order to facilitate environmental protection in the developing countries by funding projects and programmes in these countries. The GEF addresses six environmental problems that have been identified as critical for the global environment – **loss of biodiversity, climate change, ozone layer depletion, degradation of international waters, desertification and persistent organic pollutants (POPs)**. The GEF is the designated financial mechanism for the

Convention on Biological Diversity, 1992 and the *UN Framework Convention on Climate Change*, 1992.

The GEF has given $4 billion in grants and generated $12 billion in co-financing with other sources to support over 1000 projects in over 140 developing countries. In 2002-2003, a replenishment of $2.9 billion was agreed upon. The United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP) and the World Bank are the 'implementing agencies' of the GEF i.e. they manage the actual implementation of projects. The GEF secretariat operates from Washington D.C. There are 175 participant countries in the GEF, including India, which joined in 1994. The participating states meet at the GEF Assembly every 3-4 years to assess the progress of GEF projects.

15.3.3 World Environment Organisation

International agreements on environmental issues may take two forms – bilateral and multilateral. When only two countries are signatories in an agreement, it is termed a bilateral agreement. If it involves many countries as signatories it is called as multilateral arrangement.

Proposals for a new *World Environment Organisation* (WEO) have been floated from time to time. At Rio+5 in 1997, a proposal was put forth for improved cooperation amongst environmental organisations in the short term and in the long term for establishing an umbrella organisation for the environment with UNEP at its centre. These proposals stem from the need for environment and sustainable development to have a 'clear voice' at the UN. Current discussion regarding WEO aims to address the fragmentation of the current system and the imbalance between MEAs (Multilateral Environment Agreements) and the WTO. There may be a case for the creation of a new global environmental organisation of some kind but many questions remain to be answered. It is not clear what the mandate of such an organisation would be and whether it would represent any value-addition to the existing system. The basic problems underlying global environmental policy i.e. lack of resources, lack of political will and inadequate policy integration, need to be addressed first. The finer points of the debate are far from resolved and much would depend on the level of political support. Most participants in this debate agree that whatever the shape of the institutional structure, the ultimate aim is an enhanced capacity for global environmental management.

15.3.4 Other Institutions

Other agencies also play a considerable role in environmental protection. These include scientific and technical bodies. For instance, the ***Intergovernmental Panel on Climate Change*** **(IPCC)** studies the scientific aspects of climate change. Standard setting bodies such as the *International Plant Protection Convention*, the *Codex Alimentarius* and the *Office of Epizootics* are involved in setting standard related to human, animal and plant health. Also, institutions not directly involved in environmental protection often have a role to play in the environmental agenda.

The International Maritime Organisation (IMO), the key organisation with responsibility for the protection of the marine environment, has promoted the adoption of numerous conventions in this field. The **Food and Agriculture Organisation (FAO)** has been active on subjects such as deforestation and conservation of fisheries. The **World Meteorological Organisation (WMO)** plays a key monitoring role in the field of climate change and global warming. The **International Atomic Energy Agency (IAEA)**, although not initially much concerned with environmental issues, has begun to adopt conventions on the subject in the wake of the Chernobyl disaster. Similarly, the **World Bank** or **International Bank for Reconstruction and Development (IBRD)** has in recent years begun to pay more attention to the environmental side effects of its lending policies.

International disputes relating to environmental issues tend to be resolved through ad hoc negotiations between the parties concerned. In principle, states are free to resolve such disputes by whatever peaceful means they find appropriate and they are not bound to accept any compulsory settlement procedure. Accordingly, **The International Court of Justice** in The Hague does not have automatic jurisdiction to adjudicate international environmental disputes but can only do so with the consent of the states involved. In an apparent attempt to attract more

environmental cases, the court recently decided to establish a standing specialised chamber composed of seven judges to deal specifically with such cases.

SAQ 2

Describe the role of UN agencies in environmental management.

15.4 INITIATIVES BY REGIONAL ORGANISATIONS

The European Union (EU) represents a success story of regional cooperation in the field of environmental protection. The *Treaty of Rome*, 1957 establishing the European Economic Community (EEC) makes no explicit reference to 'environment'. So the primary aim of EEC (as embodied in Article 2 of the Rome treaty) was of promoting economic growth. The *Single European Act*, 1986 (SEA) formally introduced environmental policy within the scope of the Rome Treaty. The development of Community environmental policies began in 1972 and since then, a large body of Directives, Regulations and Decisions has been developed. The environmental principles enforced by the EU include the preventive principle, subsidiarity principle, integrative principle, polluter pays principle, etc. (You have studied about these principles in Unit 14) of this course.

In 1992, the *Maastricht Treaty* amended Article 2 of the *Treaty of Rome* placing environmental concerns alongside economic growth. Article 2 of Rome Treaty now provides for 'sustainable growth respecting the environment'. There is no hierarchical distinction between the two objectives. Community Environmental Policy today comprises over 300 legislative acts relating to all aspects of environment. Directives are the principal legislative instruments, mandating the achievement of a result, but leaving it to the Member state as to how it will do so. The European Court of Justice has also contributed significantly to the creation of the community environment doctrine by gradually establishing and expanding the Community's claim over environmental matters. **Community jurisdiction now extends to directives on atmospheric pollution, wildlife protection, bathing water quality**, etc. Thus, EU quite explicitly incorporates environmental concerns.

The *North American Free Trade Agreement*, 1994 (NAFTA), creating a free trade area sencompassing Mexico, Canada and US, has a strong environmental component. NAFTA explicitly addresses certain trade-related aspects of domestic and international environmental regulation. Parties are encouraged to utilise the revenues from trade and economic growth to enforce their substantive environmental standards more effectively. The NAFTA test itself integrates certain environmental considerations into its test. Also, environmental concerns are addressed separate in a agreement–the *North American Agreement on Environmental Cooperation* (NAAEC). Environmental concerns have been central to NAFTA since its inception. The preamble of NAFTA expressly recognises environmental objectives. There is specific provision in the NAFTA extending protection to certain listed MEAs such as the Basel Convention and CITES. NAFTA also prohibits parties from lowering their environmental standards to attract investments. NAAEC commits NAFTA parties to a series of obligations to advance the environmental sustainability of NAFTA-related trade. NAAEC is primarily concerned with effective enforcement of domestic environmental law in each party and creation of new institutional arrangements for cooperation between them.

Within the framework of the *Association for South East Asian Nations* (ASEAN), numerous environmental legal instruments–agreements and declarations–have been adopted. These include **agreements on transboundary pollution, conservation of nature and natural resources, environment and development, sustainable development, heritage parks and reserves and the ASEAN environment in general**. Working groups have been set up on MEAs, nature conservation and biodiversity, and coastal and marine environment. A *Regional Haze Action Plan* was adopted at ASEAN and 2003 was designated the Environment Year.

The regional organisations have also grown in pace with the global organisations. There are few regional organisations on environment in South Asia perhaps, due to the following reasons.

- South Asia is a densely populated, developing area leading to greater risks of environmental deterioration.
- The process of political and legal integration is under development stage.
- Cooperation in environmental matters needs homogeneity of economic and political systems.

15.4.1 South Asia Co-operative Environment Programme (SACEP)

South Asia Co-operative Environment Programme (SACEP) is an inter-governmental organisation, of eight countries, namely; Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, who have ratified its Articles of Association. The establishment of SACEP in 1982 was the result of the initiative taken for the management of South Asian environment by United Nation Environment Programme (UNEP): Regional Office for Asia and Pacific in the late seventies. The mission of SACEP is to promote and support conservation and management of the environment, both natural and human, in the member states of the South Asian region in a cooperative manner to achieve sustainable development.

All member countries of SACEP belong to the developing world, and five have been classified as least developed covering one twentieth of the Earth's surface and a home to about one fifth of the world's population. Most of these nations share many similar environmental problems, stemming from poverty, over population and its consequences on natural resources. According to the World Bank, during the past decade, South Asia has been the second fastest economically growing region in the world, and their development efforts have put increasing pressure on natural resources and the environment. Significant natural resource concerns in South Asia include depletion of water quality and quantity, dwindling forests and coastal resources, and soil degradation resulting from nutrient depletion and salinisation.

In most of these countries, much work has been undertaken for the protection and management of the environment in the face of the need for accelerated development. They are also party to several international agreements, covering many aspects of economic development and environmental conservation. However, the progress and achievements in the field of environment in these nations was not much known to each other. Therefore, SACEP fulfilled a long felt need for a regional arrangement for the sharing of information and knowledge as well as for a common effort on tackling environmental problems.

The SACEP was established to fulfill a vision based on following five assumptions:

i) The types and scales of environmental degradation taking place in the South Asian Region are positively dangerous not only to economic development but also to the survival of the humans inhabiting it.

ii) The greed of the rich and the needs of the poor continue to cause irrevocable damage to the fragile ecosystems and their ability to regenerate themselves.

iii) There is an urgent need to reduce environmental degradation and pollution, while giving equal emphasis to the elimination of the root causes of environmental degradation such as poverty, over population, over consumption and waste production.

iv) Environment and development are two sides of the same coin and therefore integration of environmental concerns into development activities should be recognised as an essential prerequisite to sustainable development.

v) The ecological and development problems of the South Asian Region transcend national and administrative boundaries; hence co-operative action is needed to effectively deal with them.

The functions performed by SACEP are:

a) To promote cooperative activities in priority areas of environment of mutual interest;

b) To ensure that these activities result in benefit individually or collectively to the member states;

c) To extend support as needed through exchange of knowledge and expertise available among the member countries;

d) To provide local resources towards implementation of projects and activities; and

e) To encourage maximum constructive and complementary support from interested donor countries and other sources.

It should be noted that this was the first regional organisation to be established in the sub region even before the coming into being of the South Asian Association for Regional Cooperation (SAARC) a couple of years later. Due credit should be given to the leaders of South Asia for their far sightedness in establishing this specialised agency.

Since its inception, SACEP has promoted sustainable development in the region by implementing a number of projects and programmes in the fields of environment education, environment legislation, biodiversity, air pollution, and the protection and management of the coastal environment with the assistance of various bilateral and multilateral funding agencies. UNEP's Environment Assessment Programme for Asia Pacific (UNEP-EAP.AP) made use of SACEP as a sub-regional partner in the field of environment assessment, reporting, data management and capacity building by establishing South Asia Environment and Natural Resources Information Centre (SENRIC) with the assistance from Asian Development Bank.

In consultation with member governments, the following areas have been selected for priority attention.

a) Capacity Building and Awareness Raising,

b) Systematic Information Exchange and Intra-regional Technology Transfers,

c) Environmental Management for Training and Institutional Development for Training,

d) Regional Co-operation in Management Plans for Mountain Ecosystems, Watersheds and Coastal Resources, and

e) Wildlife and Wildlife Habitat Conservation in the Region.

15.4.2 Other Institutions in Asia-Pacific Area

Towards the enforcement of the process of sustainable development, several institutes were established at the regional level in the Asia-Pacific area.

South Asian Preferential Trade Agreement (SAPTA): The South Asian Preferential Trade Agreement was enforced in December 1995 by the members of SAARC. This was an attempt to strengthen regional trade links in the South Asian region and to initiate the developmental process in the countries especially Bangladesh, Bhutan, Nepal and Maldives which are considered the least developed nations. Till date there have been three rounds of trade negotiations and trade concessions were offered on goods and services. Beginning with 226 commodities in the first round, trade concessions increased to 3456 commodities in the third round of negotiations.

Asian Development Bank (ADB): The Asian Development Bank was established after a resolution was passed on economic cooperation by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in 1965. Its goals include

- promoting economic growth,
- reducing poverty ,
- improving the status of women,
- development of human resources, and
- bringing out management of natural resources and environment.

ADB

- Provides loans and equity investments for the economic and social development for its members;
- Provides technical assistance for developmental projects; and
- Promotes public and private capital investment for development.

United Nations Economic and Social Commission for Asia and Pacific (ESCAP): The United Nations Economic and Social Commission for Asia and Pacific (ESCAP) was established in March 1947 and promotes social and economic development in Asia and the Pacific region. Its main goals include

- trade policy and promotion,
- industry and technology,
- rural development,
- environment and natural resource management, and
- communications.

The Commission has set up several institutions for realising these goals such as the Asia Pacific Centre for Transfer of Technology (APCTT) and the Regional Coordination Centre for Research Development of Coarse Grains, Pulses, Roots and Tuber Crops in Humid Tropics of Asia and the Pacific (CGPRT).

Asia Pacific Centre for Transfer of Technology (APCTT): It was established in 1977 for facilitating transfer of technology in the Asia Pacific region. It has two areas of activities:

1. Development to strengthen technological capabilities;
2. Facilitating technology transfer services to business contracts.

Its main focus is on the development of environmentally sound technologies (ESTs) for sustainable development and also of the small and medium scale enterprises. It has been successful in implementing several developmental projects, organising several training programmes and bringing about technology transfer agreements between several countries.

Regional Coordination Centre for Research Development of Coarse Grains, Pulses, Roots and Tuber Crops in Humid Tropics of Asia and the Pacific (CGPRT): Established in April 1981, CGPRT is a subsidiary body of ESCAP. The centre provides the member countries with technical services and facilities for enhancement of production, utilisation and trade of these crops. It strengthens the research and development activities towards solving the problems of food scarcity and unemployment in the Asia Pacific region.

SAQ 3

a) List five assumptions based on which SACEP was established.

b) Name the institutions in the Asia-Pacific area which have been enforcing the process of sustainable development.

15.5 NATIONAL AND LOCAL INSTITUTIONS

Many institutions at national level as well as at local level and many NGOs have contributed significantly towards environment and sustainable development through helping, assisting and coordinating with international organisations both locally and globally. We will discuss about some of the important institutions in this section.

15.5.1 Government Institutions

Government institutions perform the function of ensuring compliance with environment legislations and regulations. Every country has its own institutional arrangements that involve ministries, courts and councils. In general, combining governmental and legal institutions is a very cumbersome arrangement. The result is often a host of laws, rules and regulations, orders, ministries, departments, divisions, parastatal bodies, commissions, boards and councils in a web of interrelationships.

This is not to suggest that a single ministry or department should be responsible for all pollution control. Decentralisation is sometimes better than a highly centralised governing body. In many countries, for example, it has been decided that fisheries departments rather than environmental protection department should deal with marine pollution. Prior to the introduction of sophisticated analytical methods, fish were the best indicators of pollution: they died or left polluted areas. Fisheries officers and the fishermen who deal with fish on a daily basis often make the best marine policemen since they know the local fishing areas, the movement of local water and the behaviour of marine life in the areas, and they know when something goes wrong.

The centralisation of all forms of pollution control is neither necessary nor desirable; but if several ministries or departments are involved there must be some means of ensuring that their efforts are coordinated and do not duplicate or, worse, contradict each other. Having two ministries perform the same or similar functions with respect to the environment is not an efficient use of government resources, and it confuses the public, as they do not know which standards or rules to follow. Duplication also creates legal problems since a person cannot be convicted twice for the same misdemeanor, even the offence may have been committed under two separate pieces of legislation governed by two ministries.

There are three options to make the role of national institutions effective:

1. **Leave responsibility for environmental protection and management with the existing ministries, but to strengthen the present laws**. This option will bring about least change in administration of the government. However as environmental pollution control would generally be split between several ministries, the situation would become more complicated and duplication as well as jurisdictional disputes could occur.

2. **To create a powerful central agency or ministry with over all responsibility for the environment**, in effect a super environmental agency or ministry. It requires radical changes in terms of the organisation of government administration and the distribution of power among various ministries. Hence this option would be more easily implemented and more effective in small nations.

3. **Third option is a compromise between the first two**. It involves the introduction of a comprehensive environmental law, as well as an environmental ministry or department to set national standards on air and water quality and oversee the management of the environment in general. The new law could cover all existing environmental responsibilities to maintain and even strengthen their powers in their particular jurisdiction. The environmental law performs a backstopping as well as audit function for other ministries with existing responsibilities, but would operate as the primary law in new environmental areas. This option would also entail a much more active role being played by the central environmental policy agency, both as a decision making body and as the final arbiter of sectoral and jurisdictional differences.

15.5.2 Local Institutions

Local institutions work at provincial, or district level for managing environment and facilitating people. At provincial level it includes environment protection departments, whose prime function is to follow and monitor the environmental effects of projects.

At urban centres several development authorities are working. These authorities are established to address the development needs of the local people at local level and to take care of the basic facilities, like housing, water, sanitation, solid waste management, etc.

In small cities and rural areas the municipal committees and union councils are made responsible for addressing environmental concerns of the communities in their jurisdiction. Poor co-ordination and communication between various public sector institutions leads to duplication and overlapping of work.

However, the public faces problems due to inefficiency of these local institutions. The inefficiency of these departments could be attributed to factors such as:

- lack of skilled manpower,
- limited outreach facilities,
- absence of accountability and limited awareness of the major issues,
- lack of training,
- lack of professional confidence and
- meagre wages.

15.5.3 NGOs

Environmental non-governmental organisations have contributed significantly in promoting sustainable development through helping, assisting, bargaining and coordinating with international organisations both locally and globally. Before the 1972 Stockholm Conference the NGOs had been playing a very limited role within the United Nations unlike at the present. The UNESCO has been instrumental in the establishment of International Union for Conservation of Nature (IUCN). The World Wild Life Fund for Nature (WWF) became the first fund raising NGO in 1961.

The IUCN prepared the World Charter for Nature, and the United Nations adopted it in 1982. It had also prepared and adopted the World Conservation Strategy, 1980, which was the beginning for the development in the Brundtland Report, 1987.

Major international NGOs like **WWF, Greenpeace**, **Friends of the Earth** (FOE) enjoy greater access to UN deliberations. WWF has 23 representatives of national organisations of developed and developing nations. One of the principal activities of the WWF is financing operations of conservation throughout the world. WWF and IUCN prepare annually a common strategy for financing programmes towards conservation leading to sustainable development. IUCN has a membership of states as well as NGOs. It offers policy advice and technical support to various MEA secretariats. It plays a role in assessing new natural World Heritage sites. It also monitors the state of the world's species in the 'IUCN Red list'.

Greenpeace, an international NGO with an activist mindset, has a presence in 40 countries across the world. Greenpeace played an important part in ensuring the ending of sea dumping of nuclear waste in 1987. Its campaigns include those on climate change, forests, oceans nuclear threat, toxic chemicals, sustainable trade etc. Greenpeace uses research, lobbying and diplomacy as well as high-profile, 'on-the streets' events, to draw attention to environmental problems and to raise the level and quality of public debate. **Earthwatch Institute** promotes sustainable conservation of natural resources and cultural heritage by creating partnerships among scientists, general public, educators and businesses. The **Natural Resources Defence Council** also works on a range of issues such as climate change and biodiversity conservation.

Other influential environmental NGOs are **World Resource Institute**, **World Watch Institute, International Institute for Environment**, **The Center for Our Common Future**, **The Third World Network**, and **The Independent Sectors Network**.

15.5.4 Academic and Research Institutions

South Asian region has been particularly neglectful of education. There is no denying the efficiency of this instrument for moving towards sustainable development, although being predominantly focused on the younger generation, its impacts are long term. Specific training measures can also help expand the critical knowledge mass among adults. Training that takes the labour force out of the productive jobs should be specifically oriented towards the needs of the trainee, given the more focused worldview of most adults and the frustration that can follow if the person trained cannot apply newly learnt skills.

Research and technology are critical for all development, not just sustainable development. They can help a country compensate for resource deficiencies or exploit to the full any advantage it might have. The lack of staff to conduct world-class research in South Asian countries is one of the constraints in the field of environment.

The objectives of the education on sustainable development are to help individuals and groups within a society to:

- Be aware of and be sensitive to the total environment and its allied problems;
- Acquire basic knowledge about the environment, its associated problems and humanity's critical presence and role in it;
- Learn skills for anticipating, avoiding and solving environmental problems;
- Develop the ability to contribute to and evaluate environmental policies, measures and programmes, and
- Develop a sense of responsibility and urgency leading to direct participation in appropriate actions.

To facilitate the creation of a sustainable development constituency, strategic initiatives need to be taken at three distinct levels of formal education.

- In Schools,
- In Colleges, and
- In Universities.

In addition, the non-formal sector has an important role to play.

15.6 DONOR AND FUNDING AGENCIES

The World Bank and its affiliates, International Development Associations, International Finance Corporations and Multilateral Investment Agency, are actively involved in the process of sustainable development. World Bank group has singular responsibility for funding poverty alleviation programmes in the developing countries. It has undertaken a policy change and structural change in its investment decisions since1987.

There are two factors responsible for these changes:

- The Brundtland Report 1987,
- The Publication of the Committee Paper on Banks Environment Strategy.

World Bank has established a "Standard Procedure for Environmental Assessment" to make investment decisions. Since 1994 the World Bank has adopted the following agenda in its policy decisions and programmes to:

- Help member nations set priorities, build institutions and implement programmes for sound environmental stewardship;
- Ensure that potential adverse environmental impacts from bank-financed projects are addressed;
- Help member countries build on the connections among poverty reduction, economic efficiency and environmental protection; and to
- Address global environmental challenges through participation in the Global Environmental Facility.

15.7 INSTITUTIONAL ARRANGEMENTS FOR MONITORING AND ENFORCEMENT IN INDIA

Institutional arrangements for monitoring the state of the environment exist at both governmental and non-governmental level. These have been working quite successfully, though much needs to be done.

15.7.1 Government Institutions

Recognising the severity of environmental problems, the Government of India established a National Committee on Environmental Planning and Coordination (NCEPC) in 1972. Its mandate was to advise the Government on environmental problems and make recommendations for their improvement. The NCEPC was thereafter replaced by the National Committee of Environmental Planning (NCEP) to discharge the following functions:

- Preparing the annual 'State of the Environment Report' for the country;
- Establishing an Environmental information and communication system to propagate environmental awareness through the mass media;
- Sponsoring environmental research; and
- Arranging public hearings or conferences on issues of environmental significance.

In 1980, the Government appointed the Tiwari Committee, which recommended the formation of Department of Environment for ensuring environmental protection. On this basis, a full-fledged Department of Environment was created on November 1, 1980 under the charge of the Prime Minister. The Department of Environment is the nodal agency in the administrative structure of the Central Government for planning, promotion and coordination of environmental programmes. Since January 1985, it forms a part of the newly created Ministry of Environment and Forests. This Ministry, is now the nodal agency for planning, promoting, coordinating and supervising the implementation of various environmental and forestry programmes. It has the overall responsibility for administering and enforcing environmental legislations and policies. The Ministry has also been designated as the nodal agency in the country for the United Nations Environment Programme (UNEP), International Centre for Integrated Mountain Development and looks after the follow-up of the United Nations' Conference on Environment and Development (UNCED). Within the overall frame work of its mandate, the activities of the Ministry are:

- Conservation and survey of flora, fauna, forests and wildlife;
- Afforestation and regeneration of degraded area;
- Prevention and control of pollution;
- Protection of environment;
- Environmental impact assessment;
- Dissemination of environmental information;

- Eco-regeneration;
- Assistance to organisation in implementation of environmental and forestry programmes;
- Promotion of environmental and forestry research;
- Extension, education and training to augment the requisite workforce;
- Coordination with Central Ministries, and State Governments;
- Environmental policy and legislation;
- International cooperation; and
- Creation of environmental awareness among all sections of the population.

The Ministry has many Divisions, Departments and Boards, to implement its objectives and environmental legislation, such as Botanical Survey of India, Zoological Survey of India, National Museum of Natural History, Indian Forest Services, Central Pollution Control Board (CPCB), Forest Survey of India, National Afforestation and Eco-development Board, etc. Of these, we will briefly acquaint you with the role of CPCB in environmental protection.

The Central Pollution Control Board (CPCB)

The Central Pollution Control Board (CPCB) was constituted in September 1974 under the provisions of The Water (Prevention & Control of Pollution) Act, 1974. The main functions of CPCB, as spelt out in The Water (Prevention and Control of Pollution) Act, 1974, and The Air (Prevention and Control of Pollution) Act, 1981, are:

i) To promote cleanliness of streams and wells in different areas of the States through prevention, control and abatement of water pollution; and

ii) To improve the quality of air and to prevent, control or abate air pollution in the country.

Functions of the Central Pollution Control Board

- To advise the Central Government on any matter concerning prevention and control of water and air pollution and improvement of the quality of air;
- To plan and execute a nation wide programme for the prevention, control or abatement of water and air pollution;
- To coordinate the activities of the State Boards and resolve disputes among them;
- To provide technical assistance and guidance to the State Boards, carry out and sponsor investigations and research relating to problems of water and air pollution, and for their prevention, control or abatement;
- To plan and organise training of persons engaged in programmes on prevention, control or abatement of water and air pollution;
- To organise through mass media, a comprehensive mass awareness programme on prevention, control or abatement of water and air pollution;
- To collect, compile and publish technical and statistical data relating to water and air pollution and the measures devised for their effective prevention, control or abatement;
- To prepare manuals, codes and guidelines relating to treatment and disposal of sewage and trade effluents as well as for stack gas cleaning devices, stacks and ducts;

- To disseminate information in respect of matters relating to water and air pollution and their prevention and control;
- To lay down or modify or in consultation with the State Governments concerned, the standards for stream or well, and lay down standards for the quality of air; and
- To perform such other functions as and when prescribed by the Government of India.

Activities of CPCB: Major activities of CPCB can be categorised under the heading:

"Pollution, Assessment, Monitoring & Survey"

1. Assessment of Ambient Quality
    a) National Water Quality Monitoring Programme (NWMP)
    b) National Air Quality Monitoring Programme (NAMP)
    c) Coastal Ocean Monitoring and Prediction System (COMAPS)
    d) Ground Water Quality Surveillance
2. Status of Municipal Solid Waste Management in India
3. Status of Municipal Water Supply, Waste Water Generation, Collection, Treatment and Disposal in India
4. Assessment of Industrial Pollution
5. Assessment of Diffused Sources of Pollution
6. Epidemiological Studies
7. Quality Assurance/Quality Control in Air and Water Quality Monitoring
8. Court Matters
9. Training Programme

15.7.2 People's Movements and NGOs in India

The *Chipko* (which literally means hug) movement is one of the best-known examples of people's environmental movements in India. This movement emerged in the hills of Uttar Pradesh in the early 1970s, at about the same time that the international community was recognising environmental protection as a high-priority objective in the Stockholm Conference.

The strength of this movement lay in its simplicity. The local population decided that the only way to protect their forest resources from commercial exploitation by big contractors was to simply 'embrace' the trees. They would place themselves between the trees and the logger's saw making it impossible for felling to proceed. Based on the Gandhian philosophy of *satyagraha*, this movement had universal appeal and led to many such similar protests against commercial logging throughout the hilly regions.

A local NGO, *Dashauli Gram Swarajya Sangh* (DGSS) helped the villagers organise their protest. The movement, led by Sunderlal Bahuguna and Chandi Prased Bhatt, received wide publicity.

The *Chipko* movement inspired the *Appiko* movement in South India in the early 1980s. The *Appiko* movement in the Uttara Kannada was a response to a commercial forest policy that promoted the raising of monoculture plantations of teak and eucalyptus. This was to be at the cost of tropical natural forests containing mixed species that were valuable not only for the local people for fodder, fuel etc. but also for ecological ends such as prevention of soil erosion and water retention.

The upsurge in people's movements has resulted, in many instances, in bringing about alterations in policy decisions. For instance, most of the movements opposing indiscriminate logging for commercial purposes came together to oppose the Draft Forest Bill of 1982, forcing the government to reconsider its decision and not bring the Bill to Parliament for ratification. The incorporation of popular demand in policy-making was reflected in the *National Forest Policy*, 1988 and the *Circular* on *Joint Forest* Management, 1990. Under popular pressure, these moved away from focusing on the *commercial* value of forests towards recognising the *conservation* value of forests, and the value of people's participation in forest management. Thus people's movements have proved successful in asserting people's rights to mange forests. In this endeavour, environmental movements have been greatly strengthened by the able assistance of environmental NGOs as well.

In the late 1990s, after a long struggle, the displaced people of the Tawa dam on the Narmada river, successfully procured fishing rights, on a five-year lease, in the reservoir on a cooperative basis, displacing in turn the public sector corporation and the private contractors operating in the area earlier. The *Tawa Matsya Sangh*, a cooperative of tribal fishermen displaced by the dam, was formed after the struggle.

Another issue that has witnessed large-scale popular protests is that of large dams, which cause loss of forests and agricultural lands. One of the oldest agitations against dams is the one against the Tehri Dam on the Bhagirathi River in the Himalayan region. The *Tehri Baandh Virodhi Sangarshan Samiti* is led by the famous Chipko Andolan leader, Sunderlal Bahuguna.

The Koel-Karo hydroelectric power project, initiated in 1973, also witnessed opposition from the tribal populations in the Jharkhand region in Bihar. The *Jan Sangharsh Samiti* and the *Jan Sanyojan Samiti* were formed and later united as the *Koel-Karo Jan Sangathan.*

In the case of the Silent Valley Hydroelectric Project in Kerala, when it became clear that the project would considerably damage the tropical rainforest of the region, the *Kerala Sastra Sahitya Parishad* (KSSP) organised several mass petition campaigns. The local population and many local organisations were involved in the *Save the Silent Valley Movement*. The government, in response to this popular protest, abandoned the project in 1984. A similar successful protest against the Bedthi Dam in Karnataka resulted in the government abandoning the project in the early 80s. The most high-profile movement against big dams in India is the *Narmada Bachao Andolan* (save the Narmada Movement) against the Sardar Sarovar Project on the Narmada river. The protest was started in Gujarat in the 1980s under the leadership of Medha Patkar. Though the movement has not been successful in stalling the project completely, it did lead to the revocation of funding by the World Bank and the Japanese Government.

Urmul Trust was established in year 1986. Urmul Trust represents a family of organisations working towards social and economic change in the lives of the people in the harsh, inhospitable and interior regions of western Rajasthan. Their mission is to lead the poor towards self-reliance by making available to them a package of development services that they themselves decide on, design, implement, and eventually finance.

Recent years have also seen a proliferation of environmental NGOs in India. Over 1000 NGOs in India are devoted exclusively to environmental protection. The *National Alliance for People's Movements* has brought together several such organisations. The Indian offices of various international NGOs such as WWF-India, Greenpeace-India, Oxfam-India etc. work on research relating to environmental protection and sustainable development. There are also Indian groups such as the Centre for Science and Environment (CSE), The Energy Resources Institute (TERI), the Consumer Unity and Trust Society (CUTS) contributing to national level policy-making. Besides these larger groups, there are numerous grassroot NGOs such as Tarun Bharat Sangh, Urmul Trust, The Kubda Milk Producers Cooperative Ltd. (Gujarat) and Sanjeev Seva Samiti (Rajasthan) spread out across the country that are contributing in strengthening environmental initiatives.

Let us summarise what you have learnt so far:

15.8 SUMMARY

- Many formal institutions, intergovernmental at various levels exist today, and are prime movers in environmental policy development and implementation. Such institutions have mushroomed at the global and regional levels and have direct implications at the national level. The most important being ineffective implementation because of lack of human, financial, scientific and technical resources. Equally significant are increasing trends to evade laws and regulations put in place. Clearly, therefore, enhanced and streamlined institutions are needed.

- The institutional framework for environmental management works at different levels including international, regional, national and local level. Beside these non-governmental organisations, donor and funding agencies and academic institutions work in parallel to the other government institutions for managing environment.

- In India, Ministry of Environment and Forests is the nodal agency in the administrative structure for planning, promotion and coordination of environment programmes. The ministry has many divisions, departments and boards to implement its objectives. Various NGOs are also actively involved in environment protection.

- Lack of coordination, lack of skilled staff, meagre wages, absence of accountability, limited resources are among the few reasons of inefficiency of institutions in South Asia region.

15.9 TERMINAL QUESTIONS

1. What is the need of institutions for environmental management and which types of institutions can serve better for sustainable development in your context?
2. Name two important NGOs of international repute and describe their principal activities.
3. Describe the activities of any one NGO active in your area.

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UNIT 16 SOCIAL FRAMEWORK

Structure

16.1 INTRODUCTION

So far, we have provided you an overview of laws, regulations, policies and institutions engaged in environment protection and sustainable development. The question that follows is: What can we do at the individual and societal level? How can we influence the course of action so that instead of heading towards crisis and disaster, we enjoy a happier life? You will agree that an environment friendly approach would depend very much on our attitudes, behaviour and life styles. The steps we can take to change our attitudes at the individual and social level for managing environment are important components of conceptual framework for environmental management. In the present unit, you will study about the role of public and private sector in managing environment, involvement of communities in managing process, need of environmental education and methods to disseminate environmental awareness in society. In this discussion, you will have to identify what role you can play as an individual for environmental protection and management. It would be a gratifying conclusion to the course if you are able to chart a course of action for yourself and implement it!

Objectives

After studying this unit, you should be able to:

- explain the role of private sector and civil societies in environmental management;
- discuss the need to improve social awareness for environmental management;
- describe the role of individual/communities in environment protection; and
- enumerate different ways to disseminate environment awareness among different strata of the society.

16.2 ROLE OF PRIVATE SECTOR AND CIVIL SOCIETIES IN ENVIRONMENTAL MANAGEMENT

The Public Sector, the Private Sector and the Civil Society are three sections at the societal level that can play an active role in environmental management.

These categories are not strictly exclusive and separated from each other; various blends exist as indicated in the figure below (Fig. 16.1).

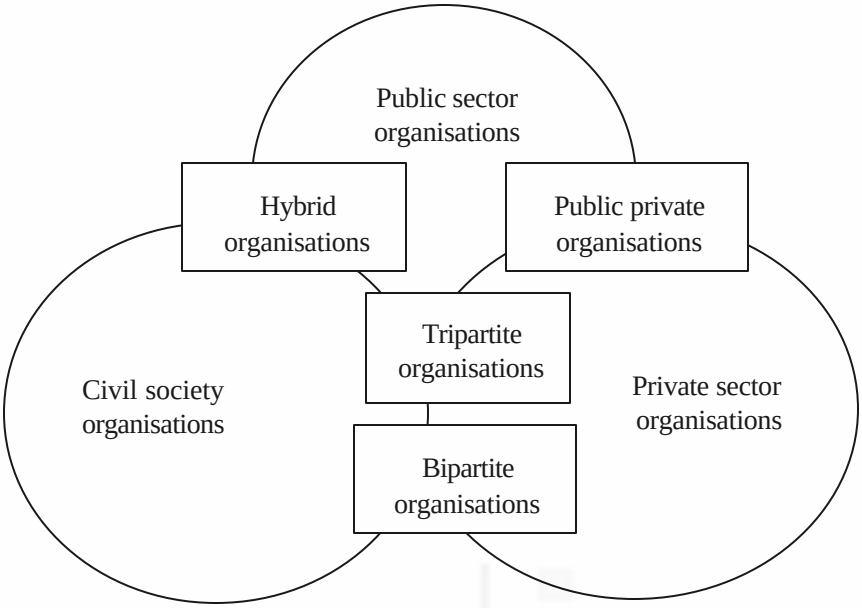

Fig.16.1: Interaction of different societal sectors (Source: IADB, 2001**)**

The relations between these three main categories are mainly determined by the specific political organisations of the country in which they exist. Most environmental goods and services consist of a mixture of public and private goods for which different sectors have certain responsibilities. As a consequence, environmental management function can conceptually be allocated to the three different categories of social organisation as indicated in Table 16.1.

Table 16.1: Allocation of functions to each category of social organisation

Public sector	Civil society (Claimed functions)	Private sector (Claimed functions)
• Legislation and justice regarding international/ supranational issues. • Coordination and policy coherence (international, national and intersectoral). • Disaster preparedness. • Legislative framework, regulations and quality standards. • Control and enforcement. • Development and application of economics and market instruments.	• Advocacy (international) and (political) lobbying; getting issues on the political agenda. • Awareness raising and education. • Monitoring and early warning (watchdog function). • Co-ordination and networking (international, national, intersectoral). • Fund-raising for environmental objectives. • Implementation of (innovative) environmental activities.	• Research and development of environmentally sound technologies. • Technical implementation of environmental regulations and activities. • Provision of environmental expertise (e.g., control). • Co-management and co-decision making (covenants and codes). • Monitoring and environmental auditing.

• Finance for environmental programmes and investments to support private sector. • Strategic planning, mainly at sectoral and national levels, and research. • Spatial planning. • Information supply (public disclosure), environmental education and research. • Environmental capacity development. • Implementation of environmental activities, e.g. environmental infrastructure.	• Research and provision of environmental expertise. • Co-management (with private and /or public sector) and co-decision making (e.g. in norm setting and legislation).	

Source: (IADB, 2001)

An environment process can be viewed as a conscious, goal oriented process driven by normative principles. The process needs to be iterative or recursive to keep environmental management adjusted to the changing dynamics of human society and the environment. A good process results in the improvement of environmental qualities in line with societal preferences.

Citizen participation and legitimacy is necessary for the process of environmental management as it:

- Ensures legitimate responsibilities during the environmental management process,
- Generates ownership among all parties involved, and
- Stimulates social network for exchange, interactive learning and conflict resolution processes.

SAQ 1

How are the functions of social organisations in context of environmental management interrelated?

16.3 NEED TO IMPROVE SOCIAL AWARENESS FOR ENVIRONMENTAL MANAGEMENT

There is a Chinese proverb which says "If you plan for one year, plant rice, if you plan for 10 years, plant trees, if you plan for 100 years, educate people". The creation of social awareness for environmental management has to follow this strategy if the situation is to be improved. So far, environment as a subject has been very commonly discussed by the media which often invokes the dooms day scenario. Such sensational approaches often hit the headlines. However, an attitude which would facilitate awareness about the preservation and regeneration of environment has been lacking by and large. Positive developmental stories are few and far between.

There is a need to develop a strategy for the management of environment. This should be expressed in a language which will appeal to the common man in a creative manner

by establishing the relevance of environmental education in their day-to-day lives. Some of the basic human needs are food, shelter, clothing, health care, education and recreation. The concern about environmental education arising from food production, enhanced ways of earning livelihood, effect of technology on day-to-day life and the impact of all these developments on health would be more relevant to a common man. These could help identify the priority areas for spreading social awareness.

16.3.1 Agricultural Productivity

No one questions the role of forests in maintaining the environment, but at the same time no one has even questioned the need for agriculture. The concern about environment has come up here because of the rapidly changing balance between the forested and cultivated land. In India, today, we have 145 million hectares of cultivated land while the protected forest area is believed to be 35 million hectares. When human beings took to agriculture, there was very little fear of adverse effect on environment. Traditional agriculture has been based largely on renewable resources of energy e.g., solar energy, rain fall, animal residues, waste products and the microbial activity which decomposes them.

The concept of industrial inputs in agriculture like chemical fertilizers, pesticides and farm machines was totally absent prior to the industrial era. The growing food needs have been met by improving productivity through energy and resource intensive agriculture. Even though these new methods of agriculture are causing problems, we can not possibly revert back to the traditional system without compromising food security. What are the possible solutions? To answer this question, you must have an idea of the process which has led to the present situation.

1. Land use patterns

In India, the land use planning has been guided by economic considerations. Due to pressures of expanding population, soil is cultivated more and more intensively which poses a threat to productivity. Careless use has resulted in damage to the soil and consequent reduction in quality and quantity of woodlands and forests. The problem has been further aggravated due to soil erosion and deforestation. For various reasons, the top soil is also lost or damaged year after year. This has an adverse effect on agricultural productivity.

At present no consolidated and reliable statistics and information are available to implement a well planned policy of land use.

2. Water resources

Water is an integral input for agricultural productivity besides being a major life support system. Its misuse can cause degradation as well as erosion, affecting lives of people and crop yields.

India provides a diversified picture of water resources. Most of the north Indian rivers are augmented by melting of snow but southern rivers do not have this advantage. These are dependent on land surface management. Nearly 70% of the area in India is subjected to water stress, i.e., water scarcity or floods. This is further aggravated due to the following factors:

i) ignorance about the nation's limited water capacity; the common man, even people who matter, consider it to be abundant and unlimited.
ii) the concept of water conservation and management is still alien to us.

3. Irrigation patterns

Irrigation schemes have been developed as an answer to unpredictable rain fall patterns in India. On the one hand, one is not sure about returns in terms of yield, i.e., financial returns commensurate with investment. On the other hand, large areas which have become submerged under reservoirs got waterlogged or were

destroyed by urbanisation, construction of roads, etc. This has resulted in less cultivated area, displacement of local persons and other problems related to forced migration.

4. Nutrient and pest management

All these aspects of process of increasing agricultural productivity have affected the environment and the people involved. A farmer or a villager, the immediate persons to the affected, are as much involved in the processes of destruction and regeneration, as is the planner at the national level. Hence the concern has to be seen at global as well as at the microlevel. Solutions to all these problems exist. Better ways of managing land, water, nutrients and pests are known and are being tried out (see the course MED-007). The need is to disseminate these practices through various means. How can you contribute in this?

16.3.2 Industry

The industrial mode of development has resulted in consumption of valuable natural resources at a faster rate on the one hand, and the production of pollutants on the other. The consequences are:

1. Increased waste production and pollution

As industrialisation increases, the use of polluting materials grows at a fast rate. The developing countries suffer from the problems of ill-management of polluting products. The developed countries suffer from the affluents causing the pollution. Examples are the large number of vehicles on the roads, throwing of waste industrial products in the rivers, no proper system of dealing with toxic substances, and disproportionate volume of consumer wastes like plastic containers, tins, e-waste, etc.

2. Cost of pollution

Not only is pollution a problem in terms of public health, it also creates problems in terms of the expenditure on pollution abatement and loss of quality and quantity of resources. It is a common experience that the green belts around industrial areas are becoming a luxury. Either one suffers from the ecological imbalances or the extinction of rare species or one pays the cost of maintaining national parks and wildlife sanctuaries to maintain the balance.

16.3.3 Health

If one takes the above argument further, the health concerns have been created because of industrial development on one hand and the ecological imbalances caused by the need for higher agriculture productivity on the other. Although the ends are not bad, the means to achieve them have been ill-planned and ill-conceived. Some of the concerns in health have arisen because of the polluted air, unhealthy living places and unhealthy food that one consumes. Development, modernisation and urbanisation lead to complexity of life and increase in psychological strain affecting the community health in turn.

1. Urbanisation

The worldwide tendency of people to crowd together has resulted in high population densities in many cities. People have migrated from rural areas in search of alternative sources of livelihood. This unplanned growth has resulted in poor quality of life. The urban population has grown much faster than the facilities for water, light, housing and food. Job scarcity over the years has further added to the unhealthy living standards. Concentration of wastes on the outskirts of cities has resulted in the accumulation of wastes which could not be decomposed in a natural manner. This has created polluted air and many health hazards.

2. Higher incidence of diseases

Poor environmental sanitation and inadequate supply of safe drinking water is a major factor leading to diseases in the cities, specially in slum areas. Migrants who come to live in cities are suddenly confronted with an environment very much different from rural areas. This has also caused many emotional problems resulting in high rate of crimes, delinquency and mental diseases.

3. Malnutrition

As mentioned earlier, unhealthy living conditions and uncertain sources of income have caused problems of malnutrition in the urban sectors, contributing to health problems. This is further aggravated when developing countries do not have a national system of health. As a result, the medical services are also not available or inadequate.

In addition to the areas of agriculture, industry and health, other areas that need attention are**: environment ethics, environmental laws, public administration and environment, forests, woodlands and grasslands, wildlife, birds, population dynamics, urban settlements**. Most of these matters have been discussed in earlier units in this course. Social awareness is necessary in all these matters.

16.3.4 Planning Intervention

Maintaining the quality of life amidst population explosion, increased consumption and increased waste accumulation calls for disciplined human decisions. Human interventions are inevitable at all levels from the local to the national. These interventions cannot be ad hoc and left to chance. It must be emphasised that these need to be guided by the following perspective:

i) Ethics of relationship of human beings with the environment should be such that the general welfare supercedes self-gains and conservation is preferred to abuse.

ii) The direct beneficiaries of the intervention should be held responsible for the control of degrading effect and restoration of degraded environment.

iii) The general public should be made conscious of any unavoidable effects that may result from encroachments on environment and should be helped to tackle them so that the adverse effects may be min imal.

The question that follows is: What role can the people play in these interventions?

16.4 HOW CAN PEOPLE BE ENGAGED

In MED-004 you have studied about role of participation of different societies and communities in attaining sustainable development. You have also learnt about the environmental problems at global level. You could choose to be depressed by the present status of the environment, or could feel encouraged and inspired by the literally thousands of people in all walks of life who are actually aware of the problems and making outstanding efforts to bring about solutions. In this section, we discuss how people can be engaged in the environmental management process. The process would involve:

- Public participation,
- Information disclosure,
- Communication,
- Awareness raising,
- Education, and
- Training.

Some innovative mechanisms that could be adopted for the purpose of engaging people are:

- Co-management arrangements,
- Covenants (e.g., voluntary agreements between governments and private sector organisations),
- Partnership,
- Joint fact finding,
- Participatory monitoring, and
- Private enforcement.

Every pathway towards solution that has been discussed in earlier units represents the work of thousands of dedicated professionals and volunteers ranging from scientists and engineers through business people, lawyers, public servants as well as farmers, workers and people from other walks of life. Still, the forces aligned with the traditional, non-sustainable directions are formidable. Thus the outcome is still unsure.

Will only time tell? Lester Brown, President of World Watch Institute states :

> "Until now the Environmental Revolution has been viewed by society much like a sporting event, one where thousands of people sit in the stands watching, while only a relative handful are on the playing field actively attempting to influence the outcome of the contest. Success in this case depends on erasing the imaginary sidelines that separate spectators from the participants so we can all get involved. Saving the planet is not a spectator sport."

Indeed, we are involved whether we realise it or not. Simply by our existence on the planet, every thing we do, the car we drive, the products we use, the waste we throw away, virtually every choice we make and action we take, has a certain environmental impact and a certain consequence for the future. Therefore, it is not a matter of having an effect but of what and how great that effect will be.

It is a matter of each one of us asking ourselves: Will I be part of the problem or part of the solution? The outcome will depend on how we respond to the challenges ahead.

There are four levels at which we may participate to work towards a sustainable society:

- Individual lifestyle changes,
- Political involvement,
- Membership and participation in non-governmental environmental organisations, and
- Career choices.

16.4.1 Life Style Changes

Life style changes in the urban context may involve such things as switching to more fuel-efficient cars, walking or using bicycles for short errands, recycling papers, cans and bottles; retrofitting homes with solar energy; starting a backyard garden, composting and recycling food and garden wastes into your soil, choosing low impact recreation, living closer to your workplace and any number of additional things, which you may like to list.

There are three concepts underlying all such activities that need to be highlighted:

- Waste management,
- Recycle and reuse,
- Consuming environment friendly products.

- **Waste management**

  One of the prime reasons for our destructive impact on the Earth is our consumption of resources and disposal of wastes. Technology has made consumer goods and services cheap and readily available. While consuming resources the first question we should ask ourselves is: Do we really need to consume so much? How much should we leave for other generations?

  Most local governments and urban agencies have, time and again, identified solid waste as a major problem that has reached proportions requiring drastic measures. We can observe three key trends with respect to solid waste – increase in shear *volume* of waste generated by urban residents; change in the *quality* or make-up of waste generated; and the *disposal* method of waste collected, by land-fill, incineration etc.

  It is critical to adopt a broad approach in developing a working framework for solid waste management (SWM). This covers the social, economic, technological, political and administrative dimensions. For example, the social dimension of SWM involves waste minimisation; the economic dimension of SWM involves waste recycling; the technology dimension of SWM involves waste disposal; and the political and administrative dimensions cut across all the three issues of minimisation, recycling and disposal.

  But SWM is not an isolated phenomenon that can be easily compartmentalised and solved with innovative technology or engineering. It is particularly an urban issue that is closely related, directly or indirectly, to a number of issues such as urban lifestyles, resource consumption patterns, jobs and income levels, and other socio-economic and cultural issues. All these issues have to be brought together on a common platform in order to ensure a long-term solution to urban waste.

- **Recycling and reuse**

  Recycling and reuse of materials are methods by which energy and resources can be saved considerably. Recycling of paper, glass and aluminium and steel cans is well known. Innovative techniques and uses of other materials like wire spools, consumer plastics, waste household paint, waste motor vehicle oil, etc., are being implemented. Given below are tables that give some examples of recycling and reuse of some materials (Table 16.2) and ways to reduce consumption of resources (Table 16.3).

Table 16.2: Methods of recycling and reuse of some materials

Material	Recycling and Reuse
Organic wastes	Kitchen food wastes are composted in backyards or community land. Sewage or paper mill sludge or animal waste after treatment can be used as a fertiliser or spread on land as soil amendment.
Old clothing and textiles	People sell them or donate to charity. Clothing that is not reusable may be reprocessed into rags or mixed into asphalt to make roof shingles.

Food grease	Fast food restaurants discard food grease that can be processed into poultry and cattle feed ingredients or used as lubricating oil.
TV sets and telephones	Picture tubes are recycled and phones are also recycled.
Building materials	Wood and other materials from buildings can be reused. Discarded tyres, plastic bottles, metal cans, concrete from incinerator ash and insulation from old newspaper are incorporated into an aggregate that is used in concrete for road building.
Toilets	Crushed discarded toilets are made into an aggregate that is used in concrete for road building.
Telephone poles	Poles are chipped into small pieces and composted using microorganisms that degrade creosole and pentachlorophenol present in them. The cleaned wood is then sold to paper mills.
Fluorescent lamps	Techniques have been developed to recover and recycle the mercury and aluminium and other compounds.
Radioactive materials	The metal from old radioactive used pumps is recycled to new pumps for use within the industry.

Table 16.3: Methods of reducing consumption of resources

Purchase less

- Ask yourself whether you really need more stuff.
- Avoid buying things you do not need or would not use.
- Use items as long as possible (and do not replace them just because a new product becomes available).

Reduce excess packaging

- Carry reuseable bags when shopping and refuse bags for small purchases.
- Buy items in bulk or with minimal packaging; avoid single serving foods.
- Choose packaging that can be recycled or reused.
- DO NO USE POLYTHENE BAGS.

Avoid disposable items

- Use cloth napkins, handkerchiefs and towels.
- Bring a washable cup to meetings; use washable plates and utensils rather than single use items.
- Buy pens, razors, flashlights and cameras with replaceable parts.
- Choose items built to last and have them repaired; you will save material and energy while providing jobs in your community.

Conserve energy

- Walk, bicycle or use transportation, turn off (or avoid turning on) lights, water, heat and air conditioning when possible.
- Put up clotheslines or racks in the backyard, or basement to avoid using a clothes dryer.
- Carpool and combine trips to reduce car mileage.

Save water

- Water lawns and gardens only when necessary and with recycled/waste water.
- Use water-saving devices and fewer flushes with toilets.
- Don't leave water running when washing hands, food, dishes and teeth.
- Engage in water harvesting projects.

- **Consuming environment friendly products**

Obviously we can never reduce our consumption levels to zero. We can however, make sound informed decisions about the products we buy to select those that are least environmentally damaging in production, use and disposal. As consumers, demand environment friendly products, manufacturers, food producers and merchants are moving to safer, more humane and more sustainable consumer items. Although each of our individual choices make a small impact, collectively they can be important.

A word of caution is on order: **Some claims made by green marketers are of questionable validity**. Consumers must look closely to avoid "green scams," many terms used in advertising are vague and have little meaning. For example:

- "Nontoxic" suggests that a product has no toxic effects on humans. Since there is no legal definition of the term, however, it can have many meanings. How non-toxic is the product? And to whom? Substance not poisonous to humans can be harmful to other organisms.

- Biodegradable, recyclable, reusable or compostable may be technically correct but not signify much. Almost everything will biodegrade eventually, but it may take thousands of years. Similarly, almost anything is potentially recyclable or reusable; the real question is whether there are programmes to do so in your community. If the only recycling or composting programme for a particular material is half a continent away, this claim has little value.

- Natural is another vague and often misused term. Many natural ingredients, lead or arsenic, for instance are highly toxic. Synthetic materials are not necessarily more dangerous or environmentally damaging than those created by nature.

- Organic can connote different things in different place. On items such as shampoos and skin care products, organic may have no significance at all. Most detergents and oils are organic chemicals whether they are synthesised in a laboratory or found in nature. Few of these products are likely to have pesticides residues anyway.

- Environment friendly, environmentally safe and 'would not harm the ozone layer' are often empty claims. Since there are no standards to define these terms, anyone can use them. How much energy and non-renewable material are used in it? How much waste is generated and how will the item be disposed off when it is no longer functional? One product may well be more benign than another, but be careful who makes these claims.

Products that claim to be environment friendly are being introduced in the markets at greater speed than ever before. To help consumer informed about choices they should be made aware that there are several programmes that involve eco-labelling. One of the oldest programme began in 1978 in Germany with the name "Blue Angel."To date 2,000 products display the Blue Angel Symbol.

Box 16.1: Environmental labelling

Manufacturers communicate environmental attributes of their products through environmental labelling. This is also referred by names like 'green labelling' or 'eco-labelling'. Environmental or green labelling programmes have been introduced in several countries to help consumers identify environment-friendly products. These labels are in different formats and they display various kinds of product-specific information. Germany (formerly West Germany) was the first country to launch environmental labelling of products by introducing the 'Blue Angel Labelling Programme' in 1978. Later on other countries such as Austria, Canada, Denmark, France, Germany, India, Japan, Korea, New Zealand, Norway, Singapore, Spain, Sweden, and United States also started their green labelling programmes.

There is a global network of countries (GEN) that have eco-labelling schemes. The Central Pollution Control Board (India) is also a member of GEN since March 2000. The purpose of green labelling is to steer consumers towards green or environment friendly products, and also encourage the manufacturers to develop such products. However, debates are on about the dangers of misusing eco-labelling criteria as a trade barrier by the industrialised countries against the developing nations.

Labels for washing machines generally are based on the use-related environmental impacts. Public comments are also considered while making final decisions about the awarding criteria. Then the criteria for awarding green labels are published, and the manufacturers are encouraged to apply for the labels.

Green labelling typically involves charges and is valid for a fixed duration.

Environment labels by themselves may not change consumer behaviour. However, integrated campaigns consisting of promotion, education and incentives are found to be effective in changing consumer behaviour. More aware consumers will take into account environmental labels, along with environmental quality, and brand while making purchasing decisions.

You may ask: What difference our individual choice will make? Why should we select environmental friendly products?

The answer is: Every little step matters and contributes to combat threats to human health, environment and sustainability.

As citizens of the Earth, we need to "Think Globally, Act Locally": We need to change our personal behaviours and take action to improve our surrounding environment. It seems impossible to stop consuming in the soc iety. Consumption does not always damage the environment, but depends on the ways that we are consuming. Thus, our contributions, however small, can add to the big picture and make a significant impact. We can also come together and involve the community in consumer awareness campaigns about which you will learn in Sec. 16.6.

Green consumerism is a direct action through which we could urge producers and the government to alter the process of production and the framework of operation. One of the objectives of Green Consumerism is to alter the operational model in the current economy. However, it is obvious that the "Green Products" that are now produced and promoted, follow the same system of production and promotion as the traditional one. They still make huge amount of wastes and severe pollution. Examples include heavy packaging, as well as energy wastes to transportation.

Thus your act of selecting an environment friendly product implies that you are compelling the producer and manufacturer to manufacture and add environmental concerns to the manufacturing process. Taking personal responsibility for our environmental impact can have many benefits. Recycling, buying green products, and other environmental goods not only set good examples for your friends and neighbours, they also strengthen your sense of involvement and commitment in valuable ways. In doing so, we must, however, recognise, that there are limits, to how

much we can do **individually** through our buying habits and personal actions to bring about the fundamental changes needed to save the Earth. There are other ways in which we can influence the course of action. We spell some of these below.

16.4.2 Other Options

Political Involvement ranges from supporting and voting for particular candidates to expressing our support for particular legislations through letters or phone calls. Citizens should make clear to the elected representatives that they need clean air, water and other such facilities and should force the regulatory bodies to pass regulations for ensuring environmental protection.

Membership in non -governmental organisations can enhance both lifestyle change and political involvement. As a member of an environmental organisation you will receive and can help disseminate knowledge and information for increasing the awareness about specific environmental problems in your surroundings and their solution. Specifically you could spread information regarding significant legislations so that you may focus your political efforts at the most effective time and place. Also, your membership and contribution serve to support lobbying efforts of the organisation. A lobbyist representing only him or her has relatively little impact on legislators. On the other hand if the lobbyist represents a million-member organisation that can follow up with many phone calls and letters the impact is considerable.

Environmental Careers is another option in these times. You may choose to devote your career to implement solutions to environmental problems. Environmental careers go far beyond the traditional occupations of wildlife or park management. There are scores of lawyers, journalists, teachers, scientists, engineers, medical personnels, entertainers and others focusing their talents and training on environmental issues or hazards. There are innumerable business and job opportunities in pollution control, recycling waste management, ecological restoration, city planning, environmental monitoring and analysis, non chemical pest control, production and marketing of organically grown produce and so on.

Fig. 16.2 summarises individual actions that can be taken towards environmental management for sustainable development.

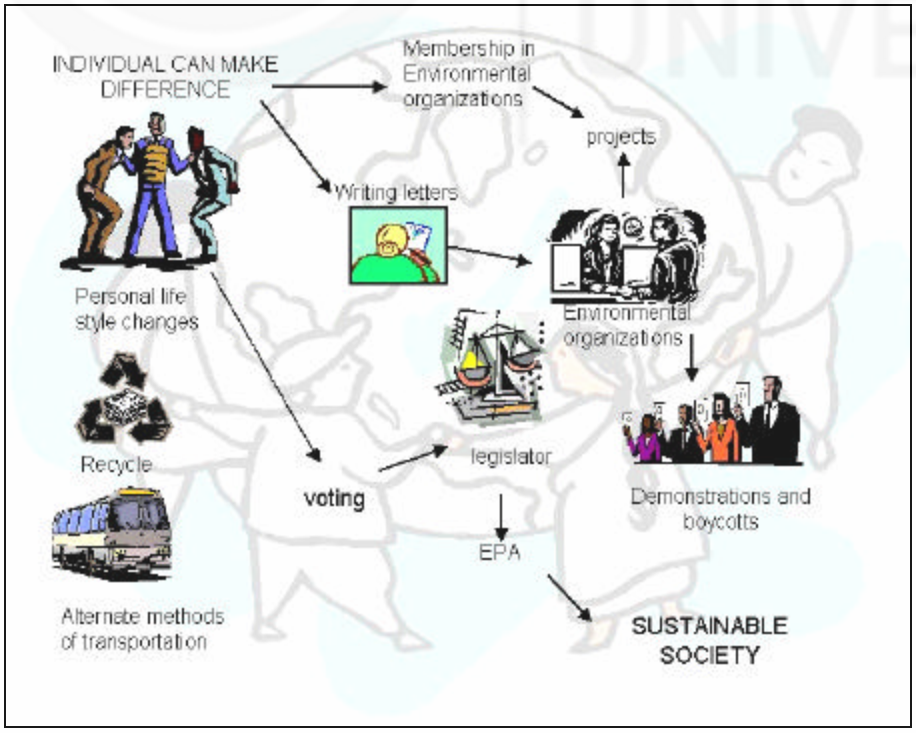

Fig.16.2: Individual actions towards sustainable development

SAQ 2

There are good reasons to be pessimistic about what we are doing to our environment, but there are also signs of progress and reasons for optimism. Where do you stand on this spectrum?

SAQ 3

Identify non-governmental organisations in your region that are working towards environmental protection and ensuring sustainable development.

i) What specific projects are under way?
ii) What roles are local governments and your elected representatives playing in the process?
iii) How can you be involved in these organisations?

16.5 METHODS TO DISSEMINATE ENVIRONMENTAL AWARENESS

Another important thing when dealing with environmental issues is the environmental education. Environmental education is necessary for the management of environment as it:

- Improves the understanding among the general public of the natural and man-made environment and their relationship between humans and their environment, including global aspects of environmental problems, and
- Encourages post secondary students to pursue careers related to the environment. Environmental literacy can help create a stewardship ethic, a sense of duty to care for and manage wisely our natural endowment and our productive resources for the long haul.

Environmental education will prepare us for facing the challenges that will come across in the present century. As in the present century it will not be enough for few specialists to know what is going in the surroundings while the rest of us live in ignorance.

Education for environmental awareness is essential for the younger generation as well as for the older generation. It also needs to cover both urban and rural populations. The beneficiaries at the grassroot level are as much a clientele for environmental education as are the policy makers, the decision makers and the project implementers. Hence, environment education needs to be conveyed to these different categories of people through formal education systems, non-formal education systems and the use of mass media.

16.5.1 Among Students through Education

Education in India is mainly a state subject and the responsibility is that of the Ministries of Education at the Centre and the States. The education system is divided into two major stages, namely, school and university education. Let us see what is the place of environment education at these two levels.

Stage-wise content

School stage: Four components are required to build up the social awareness about environment education at the school level. These are awareness, exposure to real life situations, concepts of conservation and sustainable development. These four considerations can be further adjusted in terms of the requirements at primary, secondary and higher secondary levels.

Awareness involves making the individual conscious about the physical, social and aesthetic aspects of environment. One has to appreciate the fact that humans are only one of the numerous species on the Earth; they are linked with the life support systems with six elements: air, water, land, flora, fauna and sunlight. These elements are crucial to the well being of human kind as well as other species.

Real-life situations bring people closer to the environment. These conditions are location-specific, with different environment aspects being emphasised in different areas.

As far as conservation and sustainable development are concerned, the main focus would be on utilisation of resources and not on exploitation. Utilisation stands for long-term sustainability of the resources. Contrary to the earlier notion of resource like water, soil and air being unlimited, the emphasis is now on their finite nature and thus the limits to the growth of living systems. Sustainable development aims at utilisation of resources not only by the present generation but their preservation for the future generations also, so that life can be sustained for a long period of time. Population growth and planning also form a part of this thinking.

At the primary stage of education, greater emphasis could be laid on awareness followed by real-life situation and conservation. This would prepare the child to understand the need for sustainable development at a later stage. The focus could be on sensitising child to environment. From the lower secondary stage onwards, the emphasis on awareness will begin to decrease in favour of increased knowledge about real-life situations, conservation and sustainable development. And at the higher secondary stage, conservation should get a priority over other factors. The methodologies may range from observation to practical experiences and action-oriented feedback. The school as well as college education on environment may be summarised as follows (Table 16.4).

Table 16.4: Summary of school and college education on environment

Stage	Objectives	Content	Teaching strategy
Primary	Awareness	Surroundings from home to outdoor situations	Audio-visual and field visits
Lower Secondary	Real life experiences, awareness and problem identification	As above and general sciences	Classroom teaching, practicals, and field visits
Higher Secondary	Conservation, assimilation of knowledge, problem identific ation and action skills	Science based and action oriented work	Classroom teaching, practicals, and field work
Tertiary/College	Sustainable development, based on experience with conservation	College/University based on Science and Technology	Classroom teaching, practicals and action oriented field work

For the school stage, National Council of Educational Research and Training (NCERT) has done substantial work in designing syllabi, developing suitable text books and support materials like guide books, charts and video tapes.

University Stage: University education has three major components – teaching, research and extension, the last being the weakest link. Various aspects about environmental education which can be emphasised at the post-graduate level may be grouped as follows:

- **environmental engineering** including subjects like architecture, civil engineering,
- **town planning** including human settlements, slum improvement,
- **industrial design conservation and management** dealing with land use, forestry, agriculture, energy, wastes, etc.,
- **environmental health** which will take care of public health and hygiene,
- sanitary and chemical engineering,
- occupational health and safety related **biomedical sciences**,
- **ecology** covering topics like human ecology, social planning, community organisation.

There is a need to design new courses in these areas with proper advocacy systems to attract more and more people to multi-disciplinary education. More important is to share this knowledge with the community at large.

16.5.2 Among General Population through Various Media

So far we have been dealing with the clientele which are well defined and within the boundaries of formal education system. But there is a need to cut across the boundaries of illiteracy and reach the masses. This can be done only through the channels of adult education. Though programmes for adult education are already in progress and are duly emphasised by the New Education Policy, the time has come to emphasise environmental education for sections like women, tribals, agricultural labour, slum-dwellers and residents of drought-prone areas. The neoliterates from these groups will help to spread the environmental message to the grassroots level. Voluntary agencies have played an important role in adult education apart from the Directorates of Adult and Continuing Education. Some methods for creating environmental awareness are:

i) Incorporation of topics in regional languages and local dialects in the primers of adult education programmes.

ii) Information packs like posters, slides and audio-visual materials which can be utilised by the adult education centres as well as by the workers of other developmental agencies like agricultural extension services and primary health centres.

iii) Special exhibitions and programmes in rural areas at the time of fairs and festivals.

Ours is still a society where information spreads through personal encounter and by word of mouth. The audio-visual media have certain limitations. But media provide a platform for the views of community leaders and opinion makers who in turn influence the beliefs and attitudes of others. The environmental education in formal and adult education programmes needs to be supported by the media. For a literate population, one alternative is the print media like newspapers and magazines. Electronic media can cater to all sections of the population. For example, the programmes by Doordarshan on "Virasat" exposed the public to the negative effects of development and ecological imbalances and did have some educational inputs in terms of the causes and solutions. Similarly, the programme "Race to Save the Planet" provided a global overview of the environment. What we need today is a media policy where a deliberate attempt is made to:

- create awareness about environmental matters,
- enable exposure to real life situation,

- acquaint with the conservation needs, problems and effort, and
- acquaint with the philosophy and practice of sustainable development.

16.5.3 Among Functionaries and Opinion Leaders Involved with Environmental Management

There are various kinds of people engaged as functionaries in environment management. They may be government officers at various levels and in various departments like irrigation, power, agriculture, industry, health, town planning and so on. There are voluntary organisations also working actively in these areas. Politicians and social workers also get involved in environmental issues from time to time. Those functionaries and leaders who are concerned with critical decisions should be given necessary orientation and training from time to time through carefully designed courses at their training institutions or in specialised institutes.

The National Institute of Rural Development can play an important role as far as rural functionaries are concerned. The University Departments of Environment Studies/Sciences can also undertake such orientation or training programmes for specific groups. All state governments have their staff training colleges and programmes. Environmental education should become a necessary part of their curricula. The Department of Environment of the government should have a list of clientele group for systematic orientation. They should plan a series of publications for mailing to these people regularly. It should be the responsibility of the functionaries and opinion leaders to first get educated in these matters and pass this information on to other levels.

Ministry of Environment and Forests, Govt. of India has created an information system called **ENVIS.** Its main centre is located in Delhi in the Ministry of Environment and Forests and it has other centres spread in different parts of the country. These centres have been entrusted with the responsibility to collect, compile and provide information on different aspects of environment to the users.

ENVIS can also provide information on a large number of topics related to environment as given in Table 16.5. This is, in fact, a major success. Functioning of ENVIS is being improved steadily.

One of the publications of the ENVIS is "Paryavaran Abstracts" which gives information about published work of Indian scientists. Paryavaran Abstracts, brought out quarterly, serves as a good source of information regarding researches in the field of environment, before a full-fledged database on the subject becomes available.

Table 16.5: ENVIS centres and areas of their activities

Institutions	Area
Central Board for the Prevention and Control of Water Pollution, New Delhi (CPCB)	Pollution control (water & air)
Industrial Toxicology Research Centre, Lucknow (ITRC)	Toxic chemicals
Society for Development Alternatives, 22, Palam Marg, Vasant Vihar, New Delhi (SDA)	Environmentally sound alternatives, appropriate technology
Environmental Service Group, B/1, LSC, J Block, Saket, New Delhi (ESG)	Media and Parliament related to environment
Institute for Coastal & Offshore Research, Andhra University, Visakhapatnam (ICOR)	Coastal and offshore ecology; Remote sensing for environmental mapping; and Eastern Ghats ecology

Tata Energy Research Institute, 90, Jor Bagh, New Delhi (TERI)	Renewable energy resources and environment
Centre for Environmental Studies, College of Engineering, Anna University, Madras (CES)	Eco-toxicology, Bio-degradation of wastes; Environmental impact assessment and systems analysis
Centre for Theoretical Studies, Indian Institute of Science, Bangalore (CTS)	Western Ghats ecology
Environmental Planning & Coordination Organisation, Department of Environment, Bhopal (EPCO)	Environmental management
National Institute of Occupational Health, Meghani Nagar, Ahmedabad (NIOH)	Occupational health

National Management Information System (NMIS) of the Department of Science and Technology is planning to create a **database** on such research personnel in the near future. The NMIS has, however, compiled a database on Research and Development projects, which also gives information about the scientists involved in various projects.

The Ministry of Environment and Forests, Govt. of India, has one full division called Education and Information Division. Its main role is to create awareness among all classes of people, help in informal education related to environment and provide information related to environment. There is one important programme known as National Environment Awareness Campaign which has been organised every year since 1986. The campaign aims at creating environmental awareness at the national level. **Environment Month** is the period of maximum activity under this programme. Funds are provided to voluntary organisations, universities, schools, colleges, government agencies to conduct programmes for environmental awareness. These organisations create awareness through rallies, exhibitions, padyatras, drama, dance and film shows, essay competitions, painting and drawing contests, seminars, workshops, etc.

In addition to the National Environmental Awareness Campaign, the Ministry of Environment & Forests provides funds for organising eco-clubs in educational institutions, for holding seminars and workshops, for making films on environment and various other activities which can create awareness. State Governments also allocate funds for this purpose. Communication media like Doordarshan, and All India Radio also highlight and project the importance of environment. As a result general consciousness towards environment has grown during the last few years. Now, we find that environmental issues are discussed even by common people. The Ministry of Environment and Forests, Govt. of India, has also brought out a Directory of voluntary organisations working in the field of environment under its ENVIS programme.

However, the present level of awareness is still inadequate. Our country is very big and it has a large number of environmental problems and challenges. To cope with these successfully, we need much better awareness, among every class of citizens. Illiteracy among the massed is a big obstacle in achieving this goal. It is easier to make a literate person aware of any problem than an illiterate person. Another reason is that the whole subject of environment is very new and it would require some time for the environmental awareness to reach the masses. Inadequacy of communication facilities and funds for the purpose are additional factors.

Propagation of environment awareness programmes needs a lot of searching and hunting. This process can be summarised as given in Fig. 16.3.

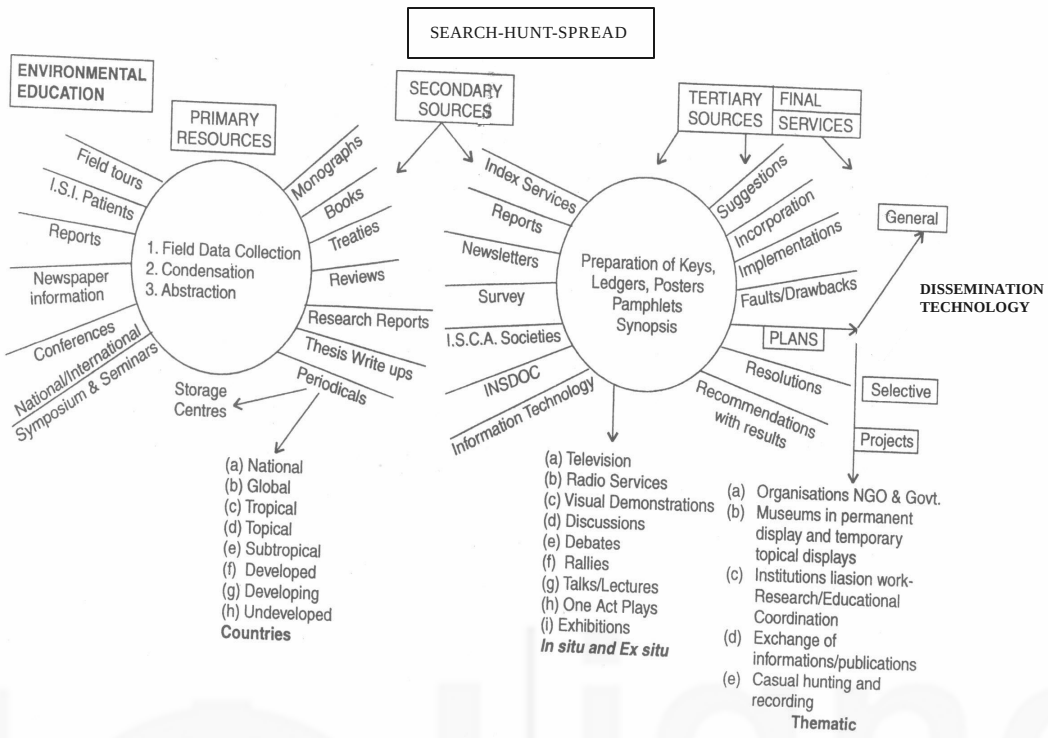

Fig.16.3: Searching and hunting the information for analysis and propagation

16.6 COLLECTIVE ACTIONS

Although it is effective to change your behaviour and activities towards sustainable patterns, it is more productive and more satisfying to work collectively for the purpose. Collective action multiplies individual's power as

- You get encouragement and useful information from meeting regularly with others who share your interests.
- When working individually it is easy to get discouraged by the slow pace of change.
- Having a support group helps maintain enthusiasm.

However, there is a broad spectrum of environment and social action groups. Some will suit your particular interests, preferences or beliefs more than others.

Options that can be used for collective action include the following.

Student Environment Groups

Organisations for secondary and college students could be among our most active and effective groups for environmental change. By teaching them ecology and environmental ethics at elementary and secondary school levels and by training them about environmental problems and their solutions and involving them in community projects, the purpose of environmental management could be served very effectively.

As Margreat Mead once said,

> "Never doubt that a small, highly committed group of individuals can change the world; indeed, it is the only thing that ever has."

Organising an Environmental Campaign

It is the most effective tool to bring the attention of the national and international planners, decision makers and managers towards a particular issue. It is a very dynamic process in which you must constantly adapt to changing conditions. Some basic principles apply in most situations for organising the environmental campaign:

i) What do you want to change? Are your goals realistic, given the time and resources you have available?

ii) What and who will be needed to get the job done? What resources do you have now, and how can you get more?

iii) Who are the stakeholders in this issue? Who are your allies and constituents? How can you make contact with them?

iv) How will your group make decisions and set priorities? Will you operate by consensus, majority votes or informal agreements?

v) Have others already worked in this issue? What successes or failures did they have? Can you learn from their experience?

vi) Who has the power to give you what you want or to solve the problem? Which individuals, organisations, corporations or selected officials should be targeted by your campaign?

vii) What tactics will be effective? Using the wrong tactics can alienate people and be worse than taking no action at all.

viii) Are there social, cultural or economic factors that should be recognised in this situation? Will the way you dress, talk or behave offend or alienate your intended audience? Is it important to change your appearance or tactics to gain support?

ix) How will you know when you have succeeded? How will you evaluate the possible outcomes?

x) What will you do when the battle is over? Is yours a single-issue organisation, or will you want to maintain the interests, momentum and network you have established?

Using the communication media to get your message out is an important part of the modern environmental campaign.

SAQ 4

In what ways can environment groups and environment campaigns serve as effective tools of disseminating environmental education?

We now summarise what you have learnt in this unit.

16.7 SUMMARY

- The focus of environmental management has now been changed from engaging enterprise and regulations to involvement of public sector and civil society in solving environment problems.
- Citizen participation and legitimacy in the process of environmental management ensures legitimate responsibilities during the environmental management process, generates ownership among all parties involved and stimulates social network for exchange, interactive learning and conflict resolution processes.

- Considering ourselves as the part of the problem, develop the sense of responsibility among individuals to also participate in the management process.
- There are four levels at which an individual may participate to work toward a sustainable society i.e. individual lifestyle changes, political involvement, membership and participation in non-governmental environmental organisations and career choices.
- For changing attitude of individual, environmental education is an effective tool. However, individual efforts could do less for the environmental problems at international and global level.
- Student groups and environmental campaigns are effective collective actions, if organised properly.

16.8 TERMINAL QUESTIONS

1. Why is there a need to improve social awareness for environmental management? In your opinion, which areas are of special concern?
2. What are the most powerful methods to disseminate environmental information among students?
3. What concrete steps are being taken by the government of your country to create awareness regarding environment management?

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