INSTITUTE OF DISTANCE EDUCATION
Rajiv Gandhi University

MAEDN-508

Environmental Education and Quality of Life

MA EDUCATION
4th Semester

Rajiv Gandhi University
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ENVIRONMNTAL EDUCATION AND QUALITY OF LIFE

MA [Education]

Fourth Semester

MAEDN 508

RAJIV GANDHI UNIVERSITY

Arunachal Pradesh, INDIA - 791 112

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About the University

Rajiv Gandhi University (formerly Arunachal University) is a premier institution for higher education in the state of Arunachal Pradesh and has completed twenty-five years of its existence. Late Smt. Indira Gandhi, the then Prime Minister of India, laid the foundation stone of the university on 4th February, 1984 at Rono Hills, where the present campus is located.

Ever since its inception, the university has been trying to achieve excellence and fulfill the objectives as envisaged in the University Act. The university received academic recognition under Section 2(f) from the University Grants Commission on 28th March, 1985 and started functioning from 1st April, 1985. It got financial recognition under section 12-B of the UGC on 25th March, 1994. Since then Rajiv Gandhi University, (then Arunachal University) has carved a niche for itself in the educational scenario of the country following its selection as a University with potential for excellence by a high-level expert committee of the University Grants Commission from among universities in India.

The University was converted into a Central University with effect from 9th April, 2007 as per notification of the Ministry of Human Resource Development, Government of India.

The University is located atop Rono Hills on a picturesque tableland of 302 acres overlooking the river Dikrong. It is 6.5 km from the National Highway 52-A and 25 km from Itanagar, the State capital. The campus is linked with the National Highway by the Dikrong bridge.

The teaching and research programmes of the University are designed with a view to play a positive role in the socio-economic and cultural development of the State. The University offers Undergraduate, Postgraduate, M.Phil and Ph.D. programmes. The Department of Education also offers the B.Ed, programme.

There are fifteen colleges affiliated to the University. The University has been extending educational facilities to students from the neighbouring states, particularly Assam. The strength of students in different departments of the University and in affiliated colleges has been steadily increasing.

The faculty members have been actively engaged in research activities with financial support from UGC and other funding agencies.   Since inception, a number of proposals on research projects have been sanctioned by various funding agencies to the University. Various departments have organized numerous seminars, workshops and conferences. Many faculty members have participated in national and international conferences and seminars held within the country and abroad. Eminent scholars and distinguished personalities have visited the University and delivered lectures on various disciplines.

The academic year 2000-2001 was a year of consolidation for the University.   The switch over from the annual to the semester system took off smoothly and the performance of the students registered a marked improvement. Various syllabi designed by Boards of Post-graduate Studies (BPGS) have been implemented. VSAT facility installed by the ERNET India, New Delhi under the UGC-Infonet program, provides Internet access.

In spite of infrastructural constraints, the University has been maintaining its academic excellence. The University has strictly adhered to the academic calendar, conducted the examinations and declared the results on time. The students from the University have found placements not only in State and Central Government Services, but also in various institutions, industries and organizations.   MaMy students have emerged successful in the National Eligibility Test (NET).

Since inception, the University has made significant progress in teaching, research, innovations in curriculum development and developing infrastructure.

The formal system of higher education in our country is facing the problems of access, limitation of seats, lack of facilities and infrastructure. Academicians from various disciplines opine that it is learning which is more important and not the channel of education. The education through distance mode is an alternative mode of imparting instruction to overcome the problems of access, infrastructure and socio-economic barriers. This will meet the demand for qualitative higher education of millions of people who cannot get admission in the regular system and wish to pursue their education. It also helps interested employed and unemployed men and women to continue with their higher education. Distance education is a distinct approach to impart education to learners who remained away in the space and/or time from the teachers and teaching institutions on account of economic, social and other considerations. Our main aim is to provide higher education opportunities to those who are unable to join regular academic and vocational education programmes in the affiliated colleges of the University and make higher education reach to the doorsteps in rural and geographically remote areas of Arunachal Pradesh in particular and North-eastern part of India in general. In 2008, the Centre for Distance Education has been renamed as "Institute of Distance Education (IDE)."

Continuing the endeavor to expand the learning opportunities for distant learners, IDE has introduced Post Graduate Courses in 5 subjects (Education, English, Hindi, History and Political Science) from the Academic Session 2013-14.

The Institute of Distance Education is housed in the Physical Sciences Faculty Building (first floor) next to the University Library. The University campus is 6 kms from NERIST point on National Highway 52A. The University buses ply to NERIST point regularly.

Outstanding Features of Institute of Distance Education:

 (i) At Par with Regular Mode

Eligibility requirements, curricular content, mode of examination and the award of degrees are on par with the colleges affiliated to the Rajiv Gandhi University and the Department(s) of the University.

 (ii) Self-Instructional Study Material (SISM)

The students are provided SISM prepared by the Institute and approved by Distance Education Council (DEC), New Delhi. This will be provided at the time of admission at the IDE or its Study Centres. SISM is provided only in English except Hindi subject.

 (iii) Contact and Counselling Programme (CCP)

The course curriculum of every programme involves counselling in the form of personal contact programme of duration of approximately 7-15 days. The CCP shall not be compulsory for BA. However for professional courses and MA the attendance in CCP will be mandatory.

 (iv) Field Training and Project

For professional course(s) there shall be provision of field training and project writing in the concerned subject.

 (v) Medium of Instruction and Examination

The medium of instruction and examination will be English for all the subjects except for those subjects where the learners will need to write in the respective languages.

(vi) Subject/Counselling Coordinators

For developing study material, the IDE appoints subject coordinators from within and outside the University. In order to run the PCCP effectively Counselling Coordinators are engaged from the Departments of the University, The Counselling-Coordinators do necessary coordination for involving resource persons in contact and counselling programme and assignment evaluation. The learners can also contact them for clarifying their difficulties in then respective subjects.

SYLLABUS

Objectives :
1. To make the students aware of the sustainable development.

2. To make the students understand the role of media for creating awareness on environment

3. To inculcate in students the skills of organizing learning experiences and evaluation evices for environmental education.

4. To develop in students a sense of appreciation, protection and proper utilization of environmental resources and develop in students an 'Eco-friendly Attitude' and environmental values.

Course outline:

Unit-I. **Environment and Quality of life:**
- Population growth, poverty, nutrition, health and sanitation, pollution, global warming.
- Eco-politics, sustainable development, bio-diversity
- Modern life style, and its impact on environment
- Values and ethics of life

Unit-II. **Role of Media:**
- Mass Media - Its use and abuse for environmental education - T.V., Cinema, Radio, News papers, Journals, Magazines, Reports
- Methods - Dialogue, Debate, Discussion, Drama, Seminar, workshop, symposium, field survey, field trips, quiz, projects, exhibition, Models, charts, books, eco-clubs, meetings, speeches, songs, street play, etc.

Unit III. **Evaluation in Environmental education**:
- Concept of Evaluation in Environmental education
- Types Evaluation in Environmental education
- Tools of Evaluation in Environmental education

Unit-IV. **Research and Development in Environmental Education:**
- UNESCO-UNEP Environmental Education Programmes
- Role of UGC/universities, NCERT, SIE, and NGOs for Environmental Education
- Emerging Areas of Research in Environmental Education.

Practicum
(i)   Identification and reporting of the most immediate environmental problems faced by the locality.
(ii)   Celebrating the environmental days
(iii)   Organization of seminar/debate/workshops

CONTENTS

UNIT 3   ENVIRONMENT AND QUALITY OF LIFE

UNIT 4   RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL EDUCATION

INTRODUCTION

The large-scale exploitation of natural resources has resulted in the depletion of almost all of the available resources. Unchecked population growth and rapid industrialization has accelerated the process of deterioration of natural resources. The world finally woke up to the collective damage done over the centuries, after experiencing drastic climatic change and other related incidents, such as unpredictable rains, earthquakes and floods. Environmental education, thus, lays emphasis on spreading awareness and education regarding the need to preserve and protect our natural environment.

This book highlights the increasing importance of our environment and the need of educating the people for protecting the environment. Environment, as you know, is the sum of water, air and land and the inter-relationships among them and also with all the living organisms. Natural resources play a vital role in sustaining life on the earth. Natural resources are usually classified into two, namely renewable and non-renewable resources. If one has to understand the environment, one has to first have knowledge about ecology and ecological balance. Biodiversity is the variation of life forms within a given ecosystem, biome or the entire earth. Biodiversity is often used as a measure of the health of biological systems. A study of different types of pollution and their impact on the environment will make you contemplate your future actions in conserving and utilizing the available resources in a prudent manner. This book will make you aware of the various actions taken by the government and non-government organizations and certain international programmes that help to safeguard the environment.

This book - *Environmental Education -* has been designed keeping in mind the self-instruction mode (SIM) format and follows a simple pattern, wherein each unit of the book begins with the *Introduction* followed by the *Unit Objectives* for the topic. The content is then presented in a simple and easy-to-understand manner, and is interspersed with *Check Your Progress* questions to reinforce the student's understanding of the topic. A list of *Questions and Exercises* is also provided at the end of each unit. The *Summary, Key Terms* and *Activity* further act as useful tools for students and are meant for effective recapitulation of the text.

This book is divided into eight units:

Unit 1: Elaborates on the role of media in the field of environmental education

Unit 2: Explains the concept of evaluation in environmental education

Unit 3: Deals with environment and quality of life

Unit 4: Recognizes the scope of research and development in environmental education

UNIT1 ROLE OF MEDIA

1.0 INTRODUCTION

Mass communication, deals with messages addressed from one to many, mediated by the elements of mass media such as radio, television, film, newspaper, magazine and books. It is the means of transmitting information, ideas and opinions from a mass communicator to a complex audience, technologically. The use of mass media is essential in the process of teaching and learning to realize various socioeconomic, cultural and national goals. Media contributes to the efficiency as well as effectiveness of the teaching-learning process.

In this unit, you will study about the role played by media in spreading awareness about environmental education.

1.1 UNIT OBJECTIVES

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

- Explain the role and functions of mass media
- List the types of mass media
- Discuss the mass media approach to educational technology
  - Identify the concept of educational broadcasting applied in spreading environmental education
  - Discuss the role of radio as a form of mass media
  - Explain the role of television in spreading education about environment
  - Explain different educational broadcasting projects in India
  - Discuss the methods of spreading awareness about environmental education

1.2 MASS MEDIA: ITS USE AND ABUSE FOR ENVIRONMENTAL EDUCATION

A message can be communicated to mass audience through many media. Mass media is a collective concept that refers to all media technologies, including the Internet, television, newspapers, film and radio, which are used for mass communications. In the Indian context, they coexist with important traditions such as folk dance, drama and puppetry. In other words, the term mass media stands for dissemination of information, ideas and entertainment by the use of communication media. In the later part of the 15th century when printing press was invented, this invention enabled publication of books and newspapers on a large scale.

In the age of science and technology, the role of mass media cannot be overestimated in the developed as well as developing countries in the context of information, entertainment and instruction. The developed countries are more advanced and well-equipped in respect of mass media than the developing countries. This is because of their better economic conditions and technical knowledge.

1.2.1 Role of Mass Media

Contemporary authors would like to re-emphasize that the role of mass media cannot be overestimated. It is difficult to spend a single day without the use of mass media. Mass media is a tremendous source of information for individuals as well as society. The role of mass media has been encapsulated in the following points:

(i) **Mass media can bring change:** Media is the most significant channel which informs the public, provides information and amusement, generates political ideas, mobilizes political and social action groups, and generally helps to shape the public policy agenda and priorities. The attitudes and habits of people can be changed with the use of mass media. For example, media plays a pivotal role in spreading awareness about the need for conserving our natural resources. Likewise for eradicating polio there are special programmes and messages disseminated through the media. The media inform people about the importance of administering polio drops to children and about days that are declared as 'polio days'.

The concept of development of a country is again a matter of change, when old practices and equipment are changed, and new and more efficient means are used. Mass media plays an important role in communicating this change. By giving the necessary information and sometimes skills, media can help bring about this change. A mass medium like television can demonstrate and show how things work, for example, one can learn cooking by watching cookery shows on television.

(ii) Mass media have made the world smaller and brought people closer:

Media technology has been able to bring human beings closer. Increased communication and access to information have made the world seem like a smaller place. We are exposed to a broad range of ideas and thought from all kinds of people from all over the world. Media helps in putting together ideas for spreading information and knowledge about environment from all corners of the world. People across the world have been brought closer with the help of media. For example, watching a cricket match between India and England in New Zealand live on television. This gives a feeling of being a part of the crowd in that stadium. Thus, media technologies allow us to virtually take part in occasions and activities in other parts of the world. Events, happy or sad, happenings anywhere can be seen live. Sometimes the entire world seems like one big family. This is how the term' global village' emerged. Wherever we go to any part of the world, we see the same products such as soft drinks, television, washing machine, refrigerator, etc. We also see the same type of advertisements. Similarly, the World Wide Web and the Internet have brought people and countries much closer. In fact, they have blurred the boundaries between people.

(iii) Mass media promotes distribution of goods: Mass media are used by the consumer industry to inform people about their products and services through advertising. Without advertising, the public will not know about various products (ranging from soup, oil, television sets, cars, etc.) and services (banking, insurance, hospitals, etc.), which are available in the market as well as their prices. Thus, mass media help industries and consumers.

1.2.2 Functions of Mass Media

Mass media are devices presenting units of knowledge through auditory or visual stimuli, or both, with a view to help learning. They present concrete knowledge and help in making a learning experience appear real, living and vital. The specific functions of mass media have been listed below:

- **Surveillance of environment:** Mass media has been doing the job of collecting and distributing information inside and outside a particular environment. This information flow has paved the way for unity and coherence in the society.

- **Correlation of parts of the society:** After collection and distribution of information, mass media goes ahead with proper interpretation of the same. Thereby, it prescribes a conduct to the society and comments on social value.

- **Transmission of social heritage:** Mass media has been helping in sustaining the society by transmitting social and cultural values from one generation to another.

- **Educating the masses:** The masses have been educated about the various policies of governments and rights and responsibilities through mass media. For example, the media from time-to-time has been informing to the public various laws and Acts that are enacted in India with reference to environmental education.

- **Entertainment:** The entertainment function of the mass media assumes a very important role in the present stressful life. It provides emotional relaxation, intrinsic and cultural enjoyment (i.e., provision of momentary escape from problems) and kills boredom.

- **Mobilization:** It helps to advance national development by bringing people together This is very important not just in India but in developing communities everywhere

1.2.3 Mass Media in Education

Texts and technologies from the media have a significant impact on the understanding and behaviour of individuals. Thus, it can assume an integral role in the functioning of a healthy society. Media affects nearly all aspects of our lives—it acts as a major socializing power, it is a carrier of ethnicity and customs of the society, it is a source of information, education and entertainment, etc. In a democratic set-up, it is ai important factor in political communication; and last but not the least, it is a communicator of ideological values and norms, attitudes and beliefs.

According to John Dewey, education is not only about teacher and students buti includes the social environment too. The use of mass media is one such example which states that education cannot be limited to the confines of the classroom. It has» broken all barriers of colour, region and economical diversities to reach out to all categories of people. Humans educate themselves from various mass media sources, such as, television, radio, newspapers and magazines, news sites and blogs.

The role of mass media in education has been highlighted through its following functions^

- **Providing a variety of information:** The job of the media is to disseminate) information, which is rapidly absorbed by the people.
- **Providing vocational information:** Media help in providing vocational an<§ professional information to a larger group of the community.
- **Spreading awareness and civic responsibility:** The media makes people aware of their social responsibilities and duties towards the nation along withj their rights.
- **Educational programmes:** Media adds value to education by airing and) publishing educational programmes.
- **Role as a non-formal agency:** Media is called non-formal agency which has a^ wide coverage on educational items in a systematic way.

Mass media are the cheapest and quickest means of educating the people. A teacher^ must use educational media and methods effectively in the classroom.

Environmental education involves a multidisciplinary process that focuses on! critical analysis of environmental issues by gathering information; organizing information; interpreting information to draw conclusions and make inferences. People need to understand that any policy decisions especially decisions on environment related issues have profound influence on their lives and the lives of future generations. And media plays a crucial role in educating and making people environmentally conscious. The mass media plays a pivotal role in educating and shaping public opinion as well as influencing the policy decisions. Common man is the most effective agent of change. Once the civil society is familiar with the complex environmental and development related issues, it will gain the confidence to act appropriately leading towards sustainability.

The 'Environmental Education, Awareness and Training (EEAT)' is a flagship scheme of the Ministry for enhancing the understanding of people at all levels aboul the relationship between human beings and the environment and to develop capabilities/ skills to improve and protect the environment. This scheme was launched in 1983-84 with the basic objective to promote environmental awareness among all sections of the society and to mobilize people's participation for preservation and conservation of environment.

EEAT Scheme has the following objectives:

- To promote environmental awareness among all sections of the society
- To spread environment education, especially in the non-formal system among different sections of the society
- To facilitate development of education/training materials and aids in the formal education sector
- To promote environment education through existing educational/scientific/ research institutions
- To ensure training and manpower development for environment education, awareness and training
- To encourage non-governmental organizations, mass media and other concerned organizations for promoting awareness about environmental issues among the people at all levels
- To use different media including films, audio, visual and print, theatre, drama, advertisements, hoarding, posters, seminars, workshops, competitions, meetings etc. for spreading messages concerning environment and awareness
- To mobilize people's participation for preservation and conservation of environment

The objectives of this scheme are being realized through implementation of the following programmes launched over the years:

- National Environment Awareness Campaign (NEAC)
- National Green Corps (NGC)
- Seminars/Symposia/Workshops/Conference
- Other Awareness Programmes like Vacation Programmes, Quiz/Essay/Debate/ Poster/Slogan competitions, training programmes, etc.

1.2.4 Types of Mass Media

Today there are different types of mass media. In fact, mass media refers to different types of useful materials, devices and symbols that make the study of a subject more meaningful and interesting. A few types of mass media are discussed below.

(a) **Print media:** Print media comprises newspapers, magazines, brochures, journals, newsletters, books, and even leaflets, reports and pamphlets. Photography, though a visual media, can also be mentioned under this category, since it is an important mass medium which communicates via visual representations. Though, there are newer and more sophisticated forms of electronic media, still the majority of people prefer the print media for various communication purposes. In the form of government bulletins, newspapers are a worldwide medium. Since the industrial revolution, newspapers have been printed and used for communication. The content of the print media varies according to the target audience or market. Content in newspapers slightly differs from that in magazines, tabloids and newsletters. These mediums serve the purpose of showcasing advertisements,news or entertainment-related information to audiences.

(b) **Electronic media:** This form of mass media mainly includes television and radio. Others included in this category are movies, CDs and DVDs as well as new electronic gadgets. The most popular among these are:

(i) **Radio:** By changing the way information was conveyed or transferred^ radio marked a new beginning. Radio is one of the most effective mediuiti* because this communication medium can transfer or transmit live voicei over long distances. A large section of population still depends on radio as a source of important news and information.

(ii) **Television:** In the late 1930s, when televisions emerged, nobody could imagine the kind of influence they would have on our lives. This ever-changing medium started with entertainment and news initially. Gradually! advertisements entered entertainment and news; this gave viewers a chance to learn about different products/services. 'Web TV has given %giew way of accessing the Internet, by providing browsing information andwatchin| videos on large LCD screens. Different programmes on televisions are in? the form of talk shows, cooking shows, serials, movies and so on.

(iii) **Video Compact Discs:** VCDs can be used for a variety of educational purposes for which radio is less suitable or convenient. Recordings of conversations, interviews, language uses and discussions can be replayed several times for analysis and many other uses. VCDs, combined with text, allow simultaneous use of sound and vision with the freedom to move from one medium to another as per convenience and the ability to rewind and repeat as necessary. This enables students to have complete control over the medium.

(a) **New-age media:** With the advent of the Internet and other new technologies, a range of high-technology mass media has emerged. This is much faster than old-school mass media and also has a widespread range. New-age media often refers to mobile phones, computers and the Internet. Several new opportunities for mass communication have been opened up by the Internet in the form of email, websites, blogging, Internet TV, etc. Internet technology has revolutionized the way in which information is accessed and paved the way to transfigure all that was considered to be either hidden or inaccessible. Practically speaking, the Internet has made it possible to contact others worldwide, nationally and locally; to send emails and be part of chat rooms and conferences; blogging with discussion boards, opinion polls and forums; webcam viewing; sending and receiving images and files; downloading from the Internet through websites; signing up to a social networking websites; radio stations with live streaming; video streaming and lots more. It has phased out conventional norms, with people of all age groups owning either laptops or PCs today. The news can also be viewed via satellite, with reporters covering onsite events and sending their reports via the Internet to broadcasting news networks. The Internet is both user-friendly and hi-tech. The user is able to access a whole new domain to get information within minutes. For example, like-minded people form groups on social networking sites such as linkedin and vow to take steps to save and protect their surrounding environment.

CHECK YOUR PROGRESS

1. What is 'mass media'?
2. Name the different types of mass media.

1.3 EDUCATIONAL BROADCASTING

In a limited sense, educational technology means the use of mass media and audiovisual aids in education, or technology in education. It often projects a picture of educational hardware—teaching machines, film-projectors, slide-projectors, language laboratories, tape recorders, satellite television, computers, etc. The approach provides different kinds of tools to help people critically analyse messages, offer opportunities for learners to broaden their experience of media, and help them develop creative skills in making their own media messages. The mass media approach is the answer to many challenges faced by Indian education system in the present context. Mass media is needed for adult, informal and alternative education programmes, developmental

activities and agriculture and family planning messages. They are capable of extending educational opportunities to neglected sectors of the community through community radio and television. They can extend teaching situations in the classroom and can tackle obstructions in several aspects of the teaching-learning process. There are several forms of mass media, which have been mentioned earlier. However, a few need elaborate discussions owing to their importance in the changing educational scenario. Within this milieu, broadcasting needs to be understood as a concept and a process because it is the software section of different hardware equipment like radio and television.

The term 'broadcasting' covers transmission of programmes by several types of distribution systems. The commonest of these, particularly in developing countries, consists of transmitters broadcasting from towers to conventional aerials and receivers for radio and television. In some countries, however, educational broadcasters have access to other systems, ranging from satellite and microwave to closed-circuit cable systems. Historically, there have been several different types of electronic media broadcasting:

- **Telephone broadcasting (1881-1932):** This is one of the earliest forms of electronic broadcasting. Telephone broadcasting started with the introduction of'theatre phone' systems. These were distribution systems based on telephone that allowed subscribers to listen to live opera and theatre performances through telephone lines. Later in the 1890s, telephone broadcasting grew to include telephone newspaper services for news and entertainment programming. These were primarily located in large European cities. These telephone-based subscription services were the first examples of electrical/electronic broadcasting and offered wide variety of programming.

- **Radio broadcasting (experimentally since 1906, commercially since 1920):**
Radio broadcasting is an audio (sound) broadcasting service. Radio waves are broadcasted through air, from a transmitter, to a radio antenna and then to a receiver. Different stations located at different places can be linked through radio networks to broadcast common radio programmes, either in broadcast syndication, simulcast (simultaneous broadcast) or sub-channels.

- **Television broadcasting:** The 'telecast', experimentally began in 1925, and commercially since 1930.

- **Cable radio (also called cable television (since 1932):** Both of them are broadcasted via coaxial cable, serving principally as transmission mediums for programmes produced at either radio or television stations, with limited production of cable-dedicated programming.

- **Direct-broadcast satellite (from circa 1974) and satellite radio (from circa 1990):** These are meant for direct-to-home broadcast programming (as opposed to studio network uplinks and downlinks). They provide a mix of traditional radio or television broadcast programming, or both, with dedicated satellite radio programming.

- **Web casting of video/television (from circa 1993) and audio/radio (from circa 1994) streams:** This offers a mix of traditional radio and television station broadcast programming, dedicated to Internet radio-web cast programming.

Some of characteristics of broadcasting are as follows:

- Bound by a fixed schedule
- Governed by scarcity of time
- Ephemeral (non-repeatable and non-retrievable)

- Produced in series

- Aimed at the average target viewer

- Permits only a limited range of interpretation in limited time

The field of mass communication has opened new vistas in education and development. Educational broadcasting has an important role to play in promoting education and development. The work of radio and television in education includes broadcasting of programmes that aim to teach directly and indirectly. They are used in both formal and informal learning. The broadcasters, for example, may specifically have programmes that are designed to be used by teachers in schools to enhance their students' learning in particular subjects. These programmes are therefore intended for formal learning situations. Programmes aimed directly at students, within the formal education system, can be considered along a continuum from enrichment, through learning resource. They meet special needs to direct teaching and curriculum. Direct teaching through television and radio has been used in formal school systems of developing countries in three related, but slightly different ways: (i) to expand the range of the school system and enable pupils who would otherwise have had no formal schooling beyond a certain age; (ii) to improve the quality of instruction in schools, and (iii) to reform the national school curriculum, in such a way that both subject matter and method of teaching are radically changed. Further, there is another category that includes programmes which have a largely indirect purpose, such as drama programmes designed to stimulate class discussion or to broaden the range of reading interests. Nowadays, street plays are organized by college students for spreading awareness about protecting our environment. For example, students display that people should not waste water while brushing their teeth or taking bath.

Students learning by correspondence and broadcasting, as in United Kingdom's Open University or Republic of Korea's Air Correspondence High School, are also in a formal learning situation, although they study at home. The programmes prepared for them to complement correspondence tuitions may sometimes have a direct instructional purpose and sometimes an indirect purpose of maintaining interest in the course.

There are also educational programmes for children and adults that are not related to any specific course. These programmes are designed for informal learning, but they may be quite instructional. They may again serve indirect learning purposes by stimulating interest in the development of microeconomics or by building confidence to improve personal standards of literacy through participation in local classes.

In general, educational broadcasting exhibits five dominant characteristics:

- It assists cumulative learning.
- Its programmes are arranged in series.
- In consultation with external educational planners, they are explicitly planned.
- They cannot be self-sufficient and so other types of learning materials, such as textbooks and study guides usually accompany them.
- Teachers' evaluate the use of broadcasts for making learning more effective.

Educational broadcasting can become a major instrument of education as well as a significant component of distance and alternative learning systems, for various categories of learners. It has been specifically recommended in the draft guidelines of the National Workshop of Educational Broadcasting (UNESCO's-APEID, 1980) as:

- A means of motivation, inspiring people towards national development.
- A major component of the informal education system, providing an alternative approach to education for out-of-school children and adults.
- A direct instructional medium dispensing the need for an intermediary.
- An enrichment for informal system of education.
- A training component for teachers/instructors and supervisors.
- A means of imparting vocational training for agricultural, industrial and professional (medical and engineering) skills.

Educational broadcasting gives learners the option to move away from syllabus-oriented approaches by emphasizing direct teaching and reduction of load in the classroom. For a larger number of illiterates and semi-literates, the broadcasting medium would be a pivotal medium of information, education and communication development. Besides, it can contribute in improving the quality of the education system through training of manpower. The role of educational broadcasting in meeting the needs of a large nation like India, which has the world's second largest population, can be imagined. This has been well-understood by the Government of India and hence efforts are being made to make responsible use of broadcasting to spread education. Two major efforts of the government are discussed below:

(a) **National Guidelines for Educational Broadcasting, 1983:** The Ministry of Human Resource Development issued National Guidelines for Educational Broadcasting (NGEB) in 1983. These guidelines define the role of educational broadcasting for both radio and television. It is, among other things, expected to act as a major component of the non-formal education system, providing an alternative approach to the education of out-of-school children, youth and adults. Acknowledging the priority of making elementary education universal, NGEB states that 'educational broadcasting should be integrated within the total educational system and the responsibility for policy and management of educational broadcasting should be with the educational authority'.

The guidelines further recommend taking cognizance of localized needs, differences in language and culture and other similar phenomena to be so organized that it can be made regional and local.

(a) **National Policy of Education, 1986:** The National Policy of 1968 marked a significant step in the history of education in post-Independence India. It aimed to promote national progress, a sense of common citizenship and culture, and to strengthen *national* integration. It laid stress on the need for a radical reconstruction of the education system, to improve its quality at all stages, and gave greater attention to science and technology, the cultivation of moral values and a closer relation between education and the life of the people. It emphasized the use of educational technology to overcome dualism in structure and spread education to the most remote areas. Educational technology is to be employed to multiply the reach of training to teachers and improve quality, sharpen awareness of art and culture, and inculcate values. And this would be done with the help of the available infrastructure. Both formal and informal sectors would be covered under this. Other measures envisaged by NPE for use of education technologies are:
- Extension of TV and radio transmission
- Expansion of programme production facilities
- Provision of radio receivers in primary/elementary schools
- Implementation of programmes for computer manpower development
- Introduction of computer science courses at the higher secondary level, extension of

computer literacy programmes, etc.

3. What does the term 'broadcasting' cover?
4. What are the four dominant characteristics of educational broadcasting?
5. How does educational broadcasting help learners ?

DID YOU KNOW

Save Ganga Movement was started in U.P. and in the adjoining states of India in an attempt to clean the Ganga river.

1.4 ROLE OF RADIO IN EDUCATION

The late 19th century saw the development of radio technology and it came into popular usage during the early 20th century. Since its origin, radio has been playing an imperative role in the field of communication. Though sometimes overshadowed by television, radio represents a medium capable of reaching across to a wide geographic audience at low production cost with proven educational results (Couch, 1997). The potential audience for radio is very large in comparison to other forms of mass media.

Radio in India

The Radio Club of Bombay broadcasted the first radio programme in India in June 1923 (Sharma, 2002). Afterwards, a broadcasting service was set up (that began broadcasting in India in July 1927) on an experimental basis in Mumbai and Kolkata. Simultaneously, with two privately owned transmitters, in 1930, the Government of India took them over and started the Indian Broadcasting Service. In 1936, this name was changed to All India Radio (AIR). Later, the name was again changed to Akashvani and since then it is known by this name. AIR is a separate department now and is the biggest media organization of the Ministry of Information and Broadcasting. In the year 1947 the AIR network only had six stations located at Delhi, Mumbai, Kolkata, Madras, Lucknow and Tiruchirapalli. These stations had a total of 18 transmitters; six on medium wave and the remaining on short wave. Radio listening on medium wave was confined to urban areas. As against a mere 2,75,000 receiving sets at the time of Independence, now there are about 111 million estimated radio sets in about 105 million household in the country. At, present, the broadcast scenario has drastically changed with 198 broadcasting centers, including 74 local radio stations, covering nearly cent per cent of India's population. As of today, AIR network broadcasts nearly 2,000 programme hours everyday in 24 languages and 146 dialects. It reaches 97.1 per cent of the population, which includes substantial population in rural area and covers 89.7 per cent of the geographical area of the country. AIR is serving as an effective medium to inform and educate people, besides providing them healthy entertainment.

1.4.1 Educational Characteristics of Radio

R. A. Sharma (2006), in his *bookEducational Technology,* has identified the educational characteristics of radio as follows:

- *Easy accessibility:* Being a comparatively low-cost aid, radio is accessible to a large number of people. Thus, it can be used as a home-based means of communication.

- *Wide **coverage:*** The radio broadcast facility is available almost throughout the country. This feature has enabled radio to extend learning to large geographical areas, including rural locations.

- ***Low capital cost and operating** costs:* The technology involved in radio broadcasting is relatively cheaper. Compared to other forms of electronic media, it is quite economical and needs less production facilities.

- *Easy **learner reception:*** One can listen to radio broadcasts even at work. This covers a wide audience of people who are involved in manual jobs.

- *Easy **production:*** Production of creative radio programmes is simpler compared to a TV or video programme production. No complicated mechanisms or sophisticated instruments are needed for such productions. The manpower involved is also less.

- ***Feasible mode of learner enrichment:*** The most essential function of any form of media in education is enrichment. This function is easier to materialize with the help of radio and with relatively little expense.

  - *Cheap mode of direct instruction:* Radio has been successfully used for direct instruction. This, however, demands intensive and systematic use of radio.

1.4.2 Major Educational Projects of Radio in India

All primary channels of All India Radio (AIR) broadcast educational programmes on a regular basis, at fixed time slots. These educational programmes are meant for different categories of people, including students and teachers of primary, middle, secondary and senior secondary schools. Further, they are generally produced in collaboration with national educational agencies like NCERT (National Council for Educational Research and Training) and CIET (Central Institute of Educational Technology). The main projects that describe the progress of radio in education in India are:

(a) **School broadcast project:** As mentioned earlier, before the advent of AIR, there were occasional broadcasts for schools from Mumbai and Kolkata. In 1937, organized school broadcasting started from Kolkata. Funds were allotted to schools to buy radio sets. The radio programmes were broadcasted from Delhi, Kolkata, Chennai and Mumbai. Initially, curriculum did not strictly govern school programmes. Gradually, with time and experience, AIR tried to make its radio broadcasts more curriculum-oriented. However, due to the absence of common syllabi and time tables in schools, even within the same state, these programmes could not succeed in their aim. At present, AIR is assisted by various agencies in planning its educational programmes, particularly programmes for the young and primary and secondary level students. CIET, a wing of NCERT, is one such organization which regularly produces programmes for primary classes. These programmes are broadcasted by Jaipur and Ajmer stations of the AIR.

(b) **Adult education and community development project:** Radio was used for communicating with people living in rural areas and for promoting innovation through broadcasts in the year 1956. The programme was called 'Radio Forum' (defined as a listening-cum-discussion-cum-action group) and was tried in 144 villages within the vicinity of Pune. This kind of programme was originally designed and tried in Canada. UNESCO helped the Government of India to try the programme in the Indian environment. Radio forums of 20 villagers were formed and organized in all these 144 villages. The members listened to a 30-minute radio programme on some agricultural or community development practice, then discussed it and decided whether to take any action on it in their own village. The programme

was a success and as a result, many action programmes were planned and put into practice. Researches have shown that people who participated in forums gained substantially in processing information and contributing to constructive decisions.

(c) **Farm and home broadcast project:** This project began in 1966 and was again directed at farmers and villagers. These broadcasts were designed to provide information and advice on agricultural and allied topics. The aim of these programmes was to educate farmers and provide them assistance in adopting innovative practices in their fields, in their own context and relevant to local needs. Occasionally, farm radio schools were conducted by experts, proved to be very effective for farmers and other villagers.

(d) **University broadcast project:** With an aim to expand higher education among different strata of society, this project was started for university students in 1965. The programmes under this project were of two types: general and enrichment. General programmes included topics of public interest and enrichment programmes supported correspondence education offered by universities in their respective jurisdictions. Different institutions and bodies like School of Correspondence Studies (University of Delhi) and the Central Institute of English and Foreign Languages (Hyderabad) are well known for preparation and broadcast of their programmes through AIR.

(e) **Language learning programme:** In 1979-80, Language Learning Project, popularly known as 'Radio Pilot project' was started jointly by AIR and the Department of Education, Government of Rajasthan. The programme aimed at teaching Hindi to school going children in 500 primary schools of Jaipur and Ajmer districts on experimental basis. The results of the project found that the programme was successful in improving the vocabulary of children. Encouraged with the success of this project, a similar project was repeated in Hoshangabad district of Madhya Pradesh with some modifications. However, this programme had limited success.

(f) **IGNOU-AIR Broadcast:** Since January 1992, AIR stations of Mumbai, Hyderabad and Shillong started radio broadcasts of IGNOU (Indira Gandhi Open University) programmes, in collaboration with IGNOU. The main target group of this project was obviously the students of open/conventional universities. Shillong later discontinued the programme. Consequently, AIR Mumbai and AIR Hyderabad are the only two broadcasting stations of these programmes.

(g) **IGNOU-AIR Interactive Radio Counselling (IRC):** Another project for students of open/conventional universities was started in May 1998. This is another successful project. In order to bridge the gap between institutions and learners by instantly responding to their queries and also to provide academic counselling in the respective subject, IGNOU in collaboration with ATR Bhopal started this project in May 1998. It began as an experimental programme for one year. With the success of the experiment, it was extended to eight other AIR stations (Lucknow, Patna, Jaipur, Shimla, Rohtak, Jalandhar, Delhi and Jammu). At present, interactive radio counselling is provided every Sunday for one hour from 186 radio stations of AIR. This includes two Sundays on the national hook-up. A toll-free telephone facility is available from 80 cities (effective from February 2001), which enables learners to interact with experts and seek clarification. The 2nd and 4th Sundays of every month are slotted for programmes of various regional centres of IGNOU and state open universities respectively. The slot of 5th Sunday (if any) has also been given to region-based programmes of IGNOU. This programme is gaining popularity day by day.

(h) **Gyan Vani (Educational FM Radio Channel of India)**: Another proj ect f or the students of open/conventional universities was launched in November 2001. Gyan Vani is the educational FM radio channel of India. It is a unique decentralized concept of extending mass media for education and empowerment, suited for the educational needs of the local community (Sharma,

2002). This channel is operating now on test transmission mode through Allahabad, Bengaluru and Coimbatore FM stations of India. Gyan Vani stations operate as media cooperatives with day-to-day programmes contributed by different educational institutions, NGOs and national level institutions like IGNOU, NCERT, UGC, m, DEC, etc. Each station has a radius of about 60 km, covering the entire city/town plus the surrounding environment with extensive access. It serves as ideal medium addressing the local educational developmental and sociocultural needs (IGNOU, 2001). Gyan Vani is not only for the conventional educational system, but also a prime tool in making education available to all. It was developed with an objective of taking education to the doorsteps of the people. A commercial FM radio set also transmits Gyan Vani. Gyan Vani, in addition to giving hardcore education, has also been engaged in spreading awareness on several issues including the following:

- Panchayati Raj functionaries
- Women empowerment
- Consumer rights
- Human rights
- Rights of the child
- Health education
- Science education
- Continuing education
- Extension education
- Vocational education
- Teacher education
- Non-formal education
- Adult education
- Education for the handicapped
- Education for the downtrodden
- Education for tribals

(i) **Radio-vision (multimedia through digital radio):** The technique of radio-vision allows the subject to be presented through two channels, audio and visual. This technique was pioneered by the BBC. Explanation is given through recorded narration and visuals are presented in the form of still filmstrips, charts, slides, models, etc. These are the institutes where it is not possible to access televised educational programmes. In such institutes, radio-vision can be a good substitute. Radio-vision has its own advantages:

- Is economical
- Can cater to different categories of learners
- Is easy to produce such programmes at the institutional level or in learning centres
- Provides visual support to the concept that is taught

In 1975-76, the National Council of Education Training and Research, carried out a small experiment on the use of radio-vision technique, by using it as one of the components of the multimedia package. A series of charts and picture cards were presented to about 24,000 participating teachers in 2,400 centres, along with verbal explanation provided through specially prepared radio broadcasts. The results were found to be encouraging. In the year 2000, another pilot project was carried out at IGNOU, with UNESCO support for testing the feasibiUty of using the new digital technology for cost effective transmission of audio-visual courseware. The project proved that FM radio transmitters and satellite radio transponders can be used successfully to transmit, downlink, and download multimedia courseware

(j) Radio-text: A 'radio-text' environment can be created well by using radio along with textual data transfer via computer networks, simultaneously. A computer network usually provides the data broadcast facility through an FM radio station at the teaching end. The main points of the radio broadcast are sent through textual mode to the receiving end via a computer network. The learning end has a radio and a computer screen to receive textual data. Since both audio and text are broadcasted simultaneously; the learner at the receiving end gets high quality and low cost teaching. An experiment on the use of radio-text at Yashwant Rao Chavan Maharashtra Open University, Nasik, resulted in the satisfaction of more than 80 per cent of the learners. It was also used for peer-group discussion at the receiving end, after the broadcast. This indicates that radio-text could be used for a variety of objectives.

(k) **Campus radio stations:** In December 2002, the Ministry of Information and Broadcasting released its 'Community Radio Guidelines'. Though nominally, community radio policies restrict radio licences under this scheme to 'well-established educational institutions'. Later, India's first campus-based community radio station was launched in 2004 (Anna University's 90.4 Anna FM). Around 15 such stations are in operation today. Most of the campus licences have gone to universities, engineering colleges and mass communications institutions. Transmitting across a range of 5-10 km, their " FM radio stations are expected to serve the community beyond the campus walls and to produce programmes 'on issues related to education, health, environment, agriculture, rural and community development', according to the government's Community Radio Guidelines.

(1) Community radio: A number of NGOs today are innovating methods to take non-formal education methods to every nook and corner. Since January 2002, cable-operated school audio has been in operation in Budhikote village of Karnataka. A similar cable-audio service is being operated by a development communication NGO in the same village, called 'Namma Dhwani'. Educational programmes were aired through cables twice a week to local schools.

In Gujarat's Kutch region, an independent organization of rural women, the Mahila Vikas Sangathan (KMVS) has been working on education for adolescent girls as well as members of its Sangathan and development of context specific educational curricula on different issues for literates and neo-literates. Back in 1999, KMVS had launched a weekly radio programme, *Kunjal Panchchi Kutch Ji,* which sought to spread the message of literacy and build art information network. The 30-minute programme was broadcast in the local Kutchi dialect over AIR's local stations in a region with vast distances and poor communications.

(m) Satellite radio for education: EDUSAT is the satellite exclusively devoted to meet the demands of educational sector. It was launched on September 20, 2004, by Indian Space Research Organization (ISRO) to meet ever increasing demand for an interactive satellite-based distance education system for the country. It has revolutionized classroom teaching through IP-based technology. EDUSAT has five KU band transponders providing spot beams, one KU beam transponder providing national beam and six extended C-band transponders providing national coverage beams.

Consortium for Educational Commission (CEC) is one among the five primary users of this educational satellite. ISRO has adjudged the CEC as 'the best EDUSAT National Beam User' in July 2008.

At present, there are over hundred Satellite Interactive Terminals (SITs) and Receive only Terminals (RoTs) under CEC EDUSAT network, installed at various colleges, academic staff colleges and universities across the country. Many more are being added with the purpose of providing quality higher education to the remote areas through satellite network. CEC EDUSAT

network is empowering students through cutting edge technology and caters the needs of students across the country.

EDUSAT live transmission: In the live transmission, CEC acts as the teaching end. Subject experts deliver lectures live. These lectures are received by various SITs and RoTs. They are known as 'classroom end'. The 'teaching end' can be shifted from one SIT to another. Thus, the students can benefit from experts located in various Educational Institutions across the country.

The expert can address the queries of the students in the live mode. The students can interact and ask questions using the following three methods.

CHEERS (Children's Enrichment Experiment through Radio)

CHEER Programme was meant for pre-school children of socially deprived classes studying in Anganwadis in the age group of 3-6 years. It was carried out in four states viz Andhra Pradesh, Orissa, Haryana and Uttar Pradesh respectively from Visakhapatnam,Cuttack, Rohtak and Lucknow for a year starting from 2nd October 1992. It was a joint venture of All India Radio, Department of Women and Child Development and National Council of Educational Research and Training (NCERT). The serial attracted the target audience and policy makers alike with a continued demand to replicate the experiment in other languages. The serial was repeated from All India Radio, Lucknow and also extended to Union Territory of Andaman & Nicobar Islands from Port Blair (in Hindi) from 02.10.1995. On persistent demand from the State Government of Andhra Pradesh, CHEER programme was repeated once again from AIR, Vishakhapatnam with effect from 2 October 1996. All these reflect the popularity gained by the serial among target audience.

A baseline study was conducted by NCERT in Haryana to find out the impact of the CHEER programme which revealed the following facts:

- Nearly 50 per cent of the Anganwadi Workers were listening to the programme regularly
- Half of them commented the programme to be clear and interesting
- A very negligible i.e. nearly 4 per cent and 33 per cent of the AWWs were conducting the pre and post broadcast activities respectively, that also without prior planning.
- Guide books were not supplied in time and even radio sets were provided only after a year of completion of the programme
- Lack of coordination among the implementing agencies and the schedules was responsible for not getting the full impact

The success of such serials and their positive impact on listeners led radio to go for many more such serials on different problems and finding out some solutions. In all these programmes outside agencies acted as collaborators and the serials are successfully implemented.

1.4.3 Benefits Associated with Radio

Radio can be used as an effective and interesting tool in education both for formal and on-formal education. Where conditions have permitted, it has become well established and widespread; yet, it seems that insufficient educational use is made of this virtually universal method of distribution. People often seem to have been deterred by the greater efficiency of other media which, however, have the major defect, compared with radio of being unable to cope for such widespread distributions. The very low cost and adequate reliability in all climates mean that radio broadcasting should more and more be recognized as a particularly suitable medium for educational purpose. Radio, in reality, has been used extensively as an educational medium both in developed and

developing countries since inception. Its educational programmes supported in a wide range of subject areas in different countries. Educational radio has also been employed within a wide variety of instructional design contexts. In some cases it is supported by the use of printed material, by local discussion group, and by regional study centres. It is sometimes so designed to permit and encourage reaction and comments of the listeners. Evaluations are also carried out with the feedbacks received.

Radio is cheap, most easily accessible and its signals cover almost the whole country. However, on an average there are only 4.4 radio/transistors sets per 100 persons. Eighty per cent of radios are in urban homes, and only about six million sets of radios are with 525 million rural population. Furthermore, the frequency of listening to the radio is relatively low: only 35 per cent of the interviewees declared to listen to the radio regularly, most of them ranking between half an hour and two hours per day.

In addition to the relatively small number of people listening to the radio the role of radio in creating environmental awareness cannot be considered an important one due to the fact that there are only very few regular environmental programmess, although there is an instruction by Supreme Court for all media that programmes on environment should be broadcast. Motivated by the Ministry of Environment &Forests, Delhi FM is broadcasting two weekly programmes on environment, 'Kinare-Kinare' and 'Ao Dilli Savaren'.

Pollution of environment is only unsystematicalry tackled in programmes designed for special target groups, e.g. rural population, industrial workers, programmes for women or children. The issues mentioned and the way they are dealt, are adjusted to the target group and the background of the programme:

• Science programmes focus on scientific explanations and new technical developments

• Children's programmes have a more educational and motivational approach

• City programmes are addressing local problems like air, water and noise pollution and so on

The national level of broadcasting news on environment are very scarce, if news on environment are broadcast this is most often at the regional level.

In sum, radio is well below its potential in creating environmental awareness and over the last few years no increase in broadcasts on environment can be observed. Nevertheless, there has been at least one progressive approach in the use of radio in environmental is in 1998, All India Radio, the Indian National Radio Network, addressed environmental issues such as water, air and noise pollution, deforestation, solid waste disposal, organic farming and other topics in a 52- episode entertainment-education radio serial 'Yeh Kahan Aa Gaye Hum' ('Where have we arrived?'), a story of rural background in which a factory is constructed near a small village.

The **entertairanent-education communication strategy** purposely designs anc implements a media message to both entertain and educate.' Yeh Kahan Aa Gaye Hum was produced under the leadership of Mrs. Usha Bhasin with the assistance of the Central Pollution Control Board of India. This serial was broadcast weekly with repeated versions from June to December via 31 radio stations covering seven Indian states in the densely populated Hindi-speaking areas of northern India. Due to the wide pre-prograrr publicity via radio, television, press and NGOs working in the broadcast area it was able to attract a listenership of around 100,000 people. While the serial itself addressed environmental issues in an entertaining manner, trying to contact the listeners in their everyday life context, the epilogues usually delivered by a credible media celebrity advertised the educational message. The approach was an interactive one: A competitive spirit was fostered among listeners by awarding prices for the quality of provided feedback, outstanding community work by listeners in the realm of environmental conservation was also recognized. Impact studies accompanying the

broadcasting process showed that the radio serial provoked not only past-broadcast discussion, but also the founding ol clubs in which members listened to the serial collectively and started campaigns to save the environment.

'Yeh Kahan Aa Gaye Hum' is an excellent example that the use of entertainment education communication strategies in the field of environment can be equally successful as in social ones in which it has been practiced before. Programs through the medium of radio can reach the less educated and rural parts of the population and therefore is its role is extremely promising in the years to come.

1.4.4 Limitations of Radio Broadcasting

The different limitations associated with radio broadcasting are:

- It is not a flexible medium, and there is no face-to-face interaction. It is a oneway communication process.
- It cannot be effectively used for all subjects, especially science subjects.
- Production of radio programmes requires expertise.
- It is only an auditory presentation.
- Radio cannot offer personal contact, unlike the classroom teacher.
- Radio lessons cannot account for the presence of listeners (as with books) or whether they are listening or not.
- Radio cannot take into account individual differences in the class. The broadcasts cannot do much more than assuming that every pupil at a certain level is able to : comprehend everything. Furthermore, immediate feedback is another thing which is missing in the radio broadcast, where there is face-to-face discussion.

To overcome these drawbacks, preparation, supporting materials and follow-up exercises are recommended when possible (McIsaac and Gunawardena, 1996).

CHECK YOUR PROGRESS

6. When was the first radio programme broadcasted in India?
7. Define 'radio-vision'.
8. How is a radio-text environment created?

1.5   ROLE OF TELEVISION IN EDUCATION

Television is an important mass media to disseminate education through formal and information methods. Television also helps to make the masses conscious of the environment, rights, duties and privilege. It is a source of teaching etiquettes, language skills, hobbies, social relations and religious believes. The medium is used for formal, non-formal and informal education. To support formal education, television usually functions as a supportive and reinforcement tool. Television can be attached with school curriculum.

Role of television is neither fixed nor easily tangible and measurable. The role is directly related to the question of how the planners are serious and determined to use television. The role could either be enormous or, on the contrary very little depending on the specific tasks and available resources. Generally television can help to achieve the following objectives:

- Social quality in education
- Enhance quality in education
- Reduce dependency on verbal teaching and teachers
- Provide flexibility of time and space in learning.
- Stimulate learning
- Provide mass education opportunities

Television in distance education fulfills the functions mentioned below:

- Supporting and enhancing teaching
- Instructing
- Explaining, clarifying
- Summarizing
- Reinforcement
- Motivation and encouragement
- Using as supplementary for the other materials
- Imposing study speed (determining rate of study)
- Presenting a reference to large masses-
- Changing behaviour
- Presenting unreachable facts and events

Depending on how one looks at the status of educational television in the world today, one sees either a glass half full or a glass half empty. Great advances have been made worldwide in forging inventive applications. Many different programme genres have been used to address diverse audiences for a variety of formal and non-formal learning purposes, with scientifically measured results. The record of accomplishments is impressive, yet TV is drastically underutilized as a teaching tool in countries that have the highest prevalence of urgent and otherwise unmet education needs. The large gap that exists between the state of the art and the state of practice in the use of television for development has many causes, including a maj or lapse of international attention to national capacity building and application. It, however, serves manifold functions of entertainment, transmission of information and education.

Among the nations that receive the greatest amounts of international assistance in health, education, child rights, ecology and the environment, many now contain 20 to 40 million or more individuals who regularly see TV. This means that in some of the most economically limited countries of the world, tens of millions of households of very meager means have invested in the purchase of a TV set which for them is immensely expensive. Although these sets are purchased mainly for entertainment, the result is to make one of the world's most powerful educational tools available on a massively wide scale to many people in the world who have limited access to education; through other means. A critical mass of TV viable countries now exists for educational purposes, to justify undertaking unprecedented levels of international coordination in such areas as experience exchange, training, resource development, and national and regional capacity building.

Model uses of TV for national development have emerged in widely separated times and places, but never has a determined human effort been made in a single locale to realize anything approaching the full scope and impact of television in its capacity to.; teach, illuminate, and empower. Totally absent in developing countries at the close of the 20th century are exemplars of carefully planned, comprehensive national policies] geared to making the best-informed and most rational

uses of television to address the) highest priority education needs, based on a realistic sense of what these nations / actually are going to spend.

The literature on educational uses of TV focuses, variously, on applications of ; particular TV program genres; research and evaluation practices; evaluation results; \ design of effective educational and motivational program approaches; specialized \ producer and researcher training; and patterns of international co-production. The Japan Prize Contest, now a decades-old tradition, serves as a screening center for identifying and honoring the best educational programs from all over the world, and as a venue for professional exchange. The NHK generously makes its library of prize-winning programs available for study at selected centers located around the world.

Analyzing Current Indian Policies and Practices

On 15 September 1959, television first came to India in the form of the National Television Network of India (named Doordarshan), with its first station in Delhi. The use of technology for education in India has come a long way from its hesitant start in the 1950s. Momentum triggered by the SITE and other experiments of the 1970s have enabled the system to develop to a stage where India may be the only country in the world to have its own satellite dedicated to the cause of education and where, in a unique combination of small and large media, of traditional and cutting edge information and communication technologies, the country is poised to become a knowledge super power and a learning community.

One of India's major advantages has been the ability of the national government to play a pivotal role in framing policy, and providing vital financial support to address issues. Indian educators are also concerned about the aUenation between the educational system and the demands of the workplace. Educational administrators are also concerned with making the system responsive and relevant to the needs of the society, keeping in mind the three basic needs of access, equity, and resources mentioned earlier.

The use of educational broadcasting as it exists in India today happened, driven by the desire to experiment with technology for development and educational purposes and promoted by small groups of committed individuals and institutions. Emerging out of the broad policy statement of 1952 cited earlier, specific implementation designs, planning, system design, funding, institutional structures, norms and practices came later and have evolved over time when solutions had to be found for problems. The Indian experience has been with both closed and open user groups and on dedicated and free to air transmission channels of Doordarshan, with a variety of interaction mechanisms from satellite remote terminals to normal telephone lines, fax, and to a lesser extent, e-mail. It has ranged in content from broad general purpose and developmental broadcasting in support of agriculture and basic and non-formal education to instructional programme in support of course materials. It has included both simple transmission and interactive teleconferencing.

There are key problems in the Indian experience. Reformers and proponents of the use of any Information and communication technology (ICT) in education have generally been government officials, far removed from the realities of day-to-day classroom teaching and with little knowledge of the way in which ICTs can be made to work effectively. It has been wholesale vendors who have seen 'total' solutions to school problems in the technology of the day. Simply stated, it has been educational administrators who do not understand technology or teaching, or technologists who have no clue to educational pedagogy and practice.

Current Indian experience, whether it is with EDUS AT, or the National Programme for Technology Enabled learning (NPTEL), the National Mission on Education through Information and

Communication Technology or the Sakshat portal, are all well intentioned as attempts to increase access and standardize the quality of content. Yet they show an indifference to ground realities and a distinct lack of understanding of both technologies and educational pedagogy.

Due to the high level of illiteracy in India, electronic media are in a key position. Furthermore, inquiries have shown that both radio and **television** are perceived as authoritative and friendly media by vast percentages of the population. Television has become one of the most powerful and effective means of propaganda and persuasion. Most Indian homes have cable and satellite connections. Television has become a new status symbol even in remote villages. In rural areas people have access to television e.g. in small restaurants and long route busses. Probably, the rapid growth rate of television sets (3 million annually) will even increase the importance of television in the future. A further advantage of television as an educational media is that it is helpful in teaching practical work— a televised presentation can be as clear as a face-to-face demonstration.

With an average amount of 138 minutes spent on watching television per day, television dominates newspaper and radio not only in the frequency of usage, but also in the amount of time spent watching it.

Considering these promising prerequisites for the use of television in environmental education it is good news that — compared to newspapers and radio — television does a good job in covering environmental issues. Discovery Channel, National Geographic Channel and Animal Planet Channel are broadcasting exclusively on endangered species, wild and sea life. The national channels are regulated by law to offer environmental programs. Doordashan the most important channel of dissemination that reaches all over the country has three regular programmes on environment: each of the weekly broadcasts of scientifically profound 'Earth Matters' focuses on one special environmental problem. Targeted at educated people 'Earth Matters' offers information on the sources, explains the consequences of the problem considered and gives suggestions for solution by changing individual behaviour. Weekly 'Terraquiz'j, India's first environmental quiz show on television, was a competition of the top ranking schools from Green Olympiad. 'Nature Plus' was broadcast daily, most oftef however at midnight. The broadcasting of a forth weekly programme of 30 minute| named 'Earth' in form of a magazine that subsidizes successful initiatives of individual^ is planned by the Ministry of Environment & Forest in cooperation with Doordashan. In addition to that BBC's 'Earth Report' offers exclusive information on environment and with the daily broadcast of 'The new adventures of Captain Planet' on Cartoon Network a programme on environmental issues especially designed for children.

It is true for television that even if there is no consistent programming on environment, ecological issues are tackled in the news as well as in children's, health, science, rural, agricultural and educational programmes.

In contrast to radio and newspaper, politicians have recognized the potential of televisions in creating environmental awareness so that the Ministry of Environment and Forests grants special money for the production of films on environment. Although advertisements on television are highly cost intensive the Ministry of Environment & Forests has proposed to Discovery Channel to produce 50 seconds of informational advertisements on nature and pollution that should be broadcast four times per day and changed monthly.

1.5.1 Educational Characteristics of Television

Some of major characteristics associated with television in education, as penned by R.A. Sharma (2006) are as follows:

- *Higher quality of instruction:* Television programmes are generally well planned or organized and better presented than usual classroom instructions.
- *Flexibility:* Rapid and continuing change can be incorporated well and courses can be updated as per changes in the curriculum and needs of the society. This is not possible with other forms of media like video cassettes.
- *Cost-effectiveness:* If utilized on a large scale, television would prove to be a cost-effective medium.
- *Wide scope:* In education, television can be utilized for a large number of objectives like education of teachers, students, community orientation, etc.
- *Combination of audio and visual components:* Television has the advantage of audio as well as video. This enhances its appeal as compared to radio and print media.
- *Mass education:* Owing to the presence of both audio and visual components, the mass appeal of television is enormous. Thus, this medium can be effectively utilized for mass education on areas of national importance, responsible citizenship and similar other issues.

CHECK YOUR PROGRESS

9. What are the three main functions of television? 10. When was television introduced in India?

1.6 COMMUNICATION SATELLITES

Communication technologies are of current or potential interest to educational technologists and planners. Satellites were first outlined for use in communication, in 1945 by Arthur C. Clarke. Two decades later, a stationary satellite was used in a geosynchronous orbit for communication purposes. The applications currently contemplated for communication satellites in education are indeed diverse, reflecting the differences in educational systems in nations or regions where uses of communication satellites have been proposed. In developing countries like India, emphasis is on taking advantage of wide-area coverage and broadcast capabilities of the satellite to provide a quantum jump in communication abilities, and to expand and improve the basic education system quickly. Generally, educational services of a satellite would be developed in conjunction with local distribution facilities such as cable-television systems; instructional television fixed services systems, regional terrestrial networks and broadcast facilities. Satellites are beneficial for providing educational services to large but sparsely populated areas. The role of satellites in the delivery of educational services can be seen in Table 5.1.

Table 5.1 *Primary Role of Satellite in Delivery of Educational Communications*

Service	Primary role of satellites
Instructional television	Direct delivery to schools and learning centres, to broadcast stations, ITFS and cable head-ends for further distribution.
Computer-assisted instruction	Delivery of CAI to small, remote institutions, particularly those which are at distances of 70-80 miles or more, from major metropolitan areas.

Computing resources multi-access interactive computing	Delivery of interactive computing to remote institutions for purposes of problem-solving and implementation of EIS.
Remote batch processing	Delivery of raw computing power to small and remote institutions for instructional computing and administrative data processing.
Computer interconnection	Interconnection of the computer facilities of institutions of higher education and regional computer networks for resources sharing.
Information resources sharing interlibrary communication	Interconnection of major libraries for bibliographic search and interlibrary loans, etc.
Automated remote information retrieval	Interconnection of institutional and/or CATV head-ends with major information storage centres.
Teleconferencing	Interconnection of educational institutions for information exchange, without physical movement of participants and for gaining access to specialists.

Source: (Singh and Sudarshan, 2006).

In India, as far as usage of satellites in education is concerned, SITE deserves a specia applaud. Hence, it is being discussed in detail in the next section.

1.6.1 Satellite Instructional Television Experiment

India's interest in the practical uses of space communications technology dates back tc early 1960s, when Dr Homi Bhabha and Dr Vikram Sarabhai exhibited great foresigh on active space research programme in the country. In 1963, a decision was made to set up on Experimental Satellite Communications Earth Station (ESCES) at Ahmedabad Around the same time, India's first earth station was set up, a pilot Agricultural TV project (called 'Krishi Darshan') was initiated by Dr Vikram Sarabhai. This project which was inaugurated on 26 January 1967, aimed primarily at demonstrating the effectiveness of TV as a medium for propagating new agricultural practices.

Later in 1975, the Department of Atomic Energy of the Government of India entered into an agreement with National Aeronautics and Space Administration (NASA) of the USA to jointly conduct a Satellite Instructional Television Experiment (SITE). The aim was to provide informal education to the rural population of India through an intimate medium of communication. Accordingly, the SITE programme was launched on 1 August 1975. This joint venture of NASA, Indian Space Research Organization (ISRO) and All-India Radio (AIR), had the following objectives:

(i) Exploring the potential of satellite for nationwide communication, through the medium of TV.

(ii) Broadcasting instruction programmes in the field of agriculture, family planning, education, etc.

SITE made use of the first satellite capable of transmitting television programmes directly to community receivers. SITE is basically a hybrid system combining both direct reception from satellite and reception through terrestrial transmitters linked to the satellite. Its rediffusion facilities cover a range of earth stations and a wide range of TV transmitters. It was a pioneering project of immense significance, particularly to the developing world. A spacecraft for the experiment was provided under a bi-lateral agreement by the United States and the ground segment. The organization management and programming were entirely India's responsibility. The experiment continued for a

year since 1 August 1975 to 31 July 1976, covering more than 2,400 villages in six Indian states and territories. The television programmes were produced by AIR, which were broadcasted by NASA's ATS-6 satellite, stationed in the space above India. The project was supported by various international agencies such as the UNDP, UNESCO, UNICEFand ITU.

This experiment was successful as it played a major role in helping to develop India's own satellite programme, INSAT. The project proved that India had the mettle to use advanced technology for fulfilhng its socioeconomic requirements. Experiments similar to SITE were then carried out in various countries, which determined the importance of satellite TV in providing education. Further, on the technical side, the experiment prompted important research and development activities and stimulated the local electronics industry. It gave opportunity for experimenting in programming to village audiences for innovative and low-cost production.

Objectives

As per the Memorandum of Understanding, the objectives of the project were divided into two parts: (i) general and (ii) specific.

General objectives of the project were to:

- Gain experience in development, testing and management of a satellite-based instructional television system, particularly in rural areas, and to determine its optimal parameters
- Demonstrate the potential value of satellite technology in rapid development of effective mass communications in developing countries
- Demonstrate the potential value of satellite broadcast TV for practical instruction of village inhabitants
- Stimulate national development in India, with important managerial, economic, technological and social implications

The primary general objectives of the project, from an Indian perspective, were to educate people about issuer related to family planning, agricultural practices and national integration. The secondary objectives were to impart general school and adult education, train teachers, improve other occupational skills, and improve general health and hygiene through the medium of satellite broadcasts. Besides these social objectives, India also wanted to gain experience in all technical aspects of the system, including broadcast and reception facilities and TV programme material.

For USA, the primary objective was to test the design and functioning of an efficient, medium-power, wide-band, space-borne FM transmitter that operated on 800-9001MHz. USA also wanted to gain experience of utilization of this space application.

International collaboration

A joint ISRO-NASA working group was established even before the Memorandum of Understanding (M.U) was signed. This group studied the possibility of using a communications satellite for TV broadcast in India. After the MoU was signed, many review meetings were held between NASA and ISRO scientists. Indian scientists visited NASA to study front-end converters and earth station operations. On India's request, the INTELSAT organization agreed to provide free satellite time for pre-SITE testing.

The United Nations Development Programme (UNDP) provided $500,000 in the form of assistance for setting up the Experimental Satellite Communications Earth Station (ESCES) at Ahmedabad. The International Telecommunications Union (ITU) was nominated as the executing

agency for this project. The UNDP provided another $1.5 million, for setting up a TV studio at Ahmedabad and a TV transmitter at Pij in Kheda district. It also provided assistance in setting up a TV training Institute to train many programme production staff members, who would join All India Radio to work on SITE. UNESCO was the executing agency for this project. UNICEF contributed to SITE by sponsoring 21-film modules produced by Shyam Benegal a noted Indian film-maker.

Technical details

The production of television programmes was decentraUzed, with three base production centres located at Delhi, Cuttack and Hyderabad, and an ISRO studio located in Mumbai. Each of the centres had a production studio, three IVC tape recorders, two 16-mm projectors, a slide projector in Telecine and an audio equipment. Each centre also had 2 to 3 full fledged synchronized sound camera units, an editing table (Delhi had two) and a film processing plant. There was also a sound dubbing studio equipped with a pilot tone recording plant and an audio mixing console.

Television programmes prepared by the Indian Government at these four studios were transmitted at 6 GHz to ATS 6 from one of two ground stations located at Delhi and Ahmedabad. These signals were then re-transmitted at 860 MHz by the satellite. They were directly received by 2,000 villages with the help of community television receivers having 3 parabolic antennas. Regular television stations also received the signals and broadcasted them to another 3000 villages. Each television signal had two audio channels to carry audio in two major languages of each cluster. This set-up was called the Direct Reception System (DRS). Apart from direct broadcasts, earth station at Ahmedabad was micro-wave linked with the TV transmitter built in the village of Pij. The Delhi studio was linked to terrestrial TV transmitters of ATR. A receive-only station was built in Amritsar and linked with the local TV transmitter.

The DRS undertook terrestrial broadcasting for large cities and direct broadcasting to SITE television sets for remote villages. However, it did not provide for small towns where the density of TV sets was higher than that in villages. The concept of a low-power limited rebroadcast (LRB) TV transmitter system was evolved to overcome such situations. Two suitable locations, Sambalpur in Orissa (75 villages) and Muzaffarpur in Bihar (110 villages), were tentatively identified for implementing LRB transmitter systems. This experiment was expected to provide useful data on the trade-off between DRS and LRB. However, due to financial constraints, these two LRBs had to be shelved and another LRB was set up at Satish Dhawan Space Centre (SHAR), Sriharikota.

Village selection

As the broadcasting time was limited, it was decided that direct reception receivers would only be installed in 2400 villages, in six regions spread across the country. Technical and social criteria were used to select suitable areas to conduct this experiment. These areas were Rajasthan, Bihar, Orissa, Madhya Pradesh, Andhra Pradesh and Karnataka. As one of the aims of the experiment was to study the potential of TV as a medium of development, villages were chosen specifically for their backwardness. SITE was launched in 20 districts spread across six states. Each of the states thus selected was called a cluster. In each cluster, 3-4 districts, each containing around 1000 villages were identified. Finally, around 400 villages were chosen from each cluster. Close to 80 per cent villages selected for SITE did not have electricity in the buildings where the SITE TV sets would be installed. A special project called 'Operation Electricity' was launched to urgently electrify villages before the start of SITE. Around 150 villages had television sets running on solar cells and batteries.

Programming

All India Radio (ATR) was primarily responsible for generating programmes that were made in consultation with the government. Special committees on education, agriculture, health and family planning identified their own programme priorities and conveyed it to AIR. Two types of programmes were prepared for broadcasting: (i) Educational television (ETV), and (ii) instructional television (ITV).

(i) ETV programmes were meant for school children and focused on interesting and creative educational programmes to spread awareness of the changing society and motivation to respond to these changes. The aim was to broadcast programmes for children during school hours that: (a) teach them community living skills; (b) improve their basic concepts and skills in the areas of mathematics, language and technocracy; (c) instill habits of hygienic and healthy living; (d) promote aesthetic sensitivity; and (e) make them aware of the process of modernization of life and society around them and changes in resultant attitudes. The programmes while attempting to create a positive attitude to formal education, try to widen the children's horizon and familiarize them with facts. The scope of the programme therefore, consists of three main factors: (a) attitudes, (b) information, (c) skills and habits. These programmes were broadcasted for 1.5 hours during school timings and were focused at making education more appealing, creative, purposive and stimulating; and also to create awareness in the changing society. During holidays, this time was used to broadcast *Teacher Training Programmes,* designed to train almost 1,00,000 primary school teachers.

(ii) ITV programmes were meant for adult audiences, mainly those who were illiterate. They were broadcasted for 2.5 hours during evenings. The programmes covered health, hygiene, family planning, nutrition, improved practices in agriculture, and events of national importance.

Thus, programmes were broadcasted for four hours daily in two transmissions. The targeted audience was categorized into four linguistic groups:

(a) Hindi, (b) Oriya, (c) Telugu, and (d) Kannada. Programmes were produced according to the language spoken in the cluster. Due to linguistic and cultural differences, it was agreed that all core programmes would be cluster-specific and in the primary language of the region. A brief commentary giving a gist of the programme was available on the secondary audio channel to keep up the interest of the audience in other language regions. All clusters received 30 minutes of common programmes, including news, which would be broadcasted only in Hindi.

Evaluation

The social research and evaluation of SITE was done by ISRO's special SITE Research and Evaluation Cell (REC). Impact on primary school children was studied under a joint project involving ISRO and the National Council of Educational Research and Training (NCERT). SITE transmissions had a very significant impact on the Indian villages. For the entire year, thousands of villagers gathered around TV sets and watched the shows. Studies were conducted on the social impact of the experiment and on viewership trends. It was found that general interest and viewership were highest in the first few months of the programme (200 to 600 people per TV set) and then declined gradually (60 to 80 people per TV set). This decline was due to several factors, including faults developing in the television equipment, failure in electricity supply and hardware defects. The villagers' pre-occupation with domestic or agricultural work added to these factors. Impact on the rural population was highest in the fields of agriculture and family planning. Nearly 52 per cent of the viewers reported themselves amenable to applying the new knowledge gained by them. Towards the end of the SITE programme, a substantial number of

respondents opined that the government took greater interest in promoting the welfare of poorer sections by disbursing loans and giving other facilities more liberally than before. After introduction of the SITE programme, some benefits of watching television were recognized. Even occasional viewers broadened his outlook.

SITE established considerable success of educational television programmes and more importantly, the acceptance of TV as an educational force in Indian rural primary schools. It also revealed the greater potential of TV for communicating directly to children, and as such recommended for stimulating their interest and curiosity to learn from ETV programmes.

The focus was on the use of terrestrial transmission for television signals before the launch of SITE. It was with the advent of SITE that India could make use of advanced technology to fulfil its socioeconomic needs. This led to an amplified spotlight on satellite broadcasting in India. ISRO began preparations for a nationwide satellite system. ISRO was launched in 1982 by the Indian National Satellite System, after conducting several technical experiments. The Indian space programme remained committed to the goal of using satellites for educational purposes. EDUSAT was launched by India in September 2004. It was the first sateUite in the world built exclusively to serve the educational sector. EDUSAT is used to meet the demand for an interactive satellite-based distance education system for India.

1.6.2 Indian National Satellite (INSAT)

INS AT was the result of previous experiments like SITE, STEP and APPLE. It was a multipurpose satellite system for telecommunications, broadcasting, meteorology, and search and rescue services. INSAT, the largest domestic communication system in the Asia-Pacific Region, was commissioned in 1983. It was a joint venture of the Indian Department of Space (DOS), Department of Telecommunications, India Meteorological Department, All India Radio and Doordarshan. The history of INSAT space segment is as follows:

- Insat-ID, last of the Insat-1 series was launched in 1990

  » Three ISRO-built satellites and Insat-2A were launched in July 1992

- Insat-2B was launched in July 1993
- Insat-2C was launched on 7 December 1995
- Insat-2DT was acquired from Arabsat
- Insat-2E was launched on 3 April 1999
- Insat-3B was launched on 22 March 2000
- Insat-3C was launched on 24 January 2002
- Insat-3A was launched on 10 April 2003
- Insat-3E launched on 28 September 2003
- In 2005, INSAT 4 series began, with the launch of INSAT 4A in December 2005, INSAT 4B in March 2007, INSAT-4CR on 2 September 2007
- Lately, in May 2011, GSAT-8 was inducted in the INSAT system

GSAT-8 is India's advanced communication satellite. INSAT. Some of its services are mentioned as follows:

- The INSAT system provides mobile satellite services, in addition to VSAT services in the telecommunications sector. Today, more than 25,000 Very Small Aperture Terminals

(VSATs) are in operation.

- INSAT has been very advantageous in television broadcasting and redistribution. Owing to the technology of INSAT, more than 900 million people in India have access to TV, through about 1,400 terrestrial rebroadcast transmitters.
    - INSAT has enabled, aided and empowered social development through exclusive channels used for training and developmental education.
    - INSAT provides radio networking.
    - INSAT has succeeded in providing a telemedicine network. This network has been designed to take super-speciality medical services to remote and rural areas. The network now covers 152 hospitals—120 remote rural hospitals and 32 super-specialty hospitals in major cities.
    - Another fillip was added to educational services with the launch of EDUS AT. It is India's first thematic satellite dedicated exclusively for educational services at different levels.
    - Meteorological services are also provided by INSAT through Very High Resolution Radiometer and CCD cameras on a few of its spacecrafts. Moreover, cyclone monitoring through meteorological imaging and issue of warnings about impending cyclones through disaster warning receivers have been operationalized. As many as 350 receivers have been installed along the east and west coasts of India for this purpose.
    - INSAT has been substantially used for educational purposes like nationwide classroom programmes conducted by University Grants Commission (UGC), educational television programme broadcasted in local languages for the benefit of rural population and programmes broadcast by Indira Gandhi National Open University (IGNOU). It is also being used in educating industrial workers, training block and village level extension and agricultural workers and farmers, etc.

5.6.3 GRAMSAT Programme

The GRAMSAT Programme (GP) was planned as an initiative to provide communication networks at the state level. These networks connect different state capitals with districts and blocks. The networks provide computer connectivity, data broadcasting and TV broadcasting facilities and have applications like e-Governance, National Resource Information System (NRIS), Development Information, Teleconferencing, Disaster Management, Tele-medicine and Distance Education. The purpose of GRAMSAT was to broadcast education at all levels from elementary through university and for training agricultural, industrial and local government workers. GRAMSAT networks operate in the States of Orissa, Andaman and Nicobar Islands, Rajasthan and West Bengal. Plans are being made to provide integrated services through a single hub to state networks. This single hub would be like a grid for diverse developmental services. It would integrate Satcom networks having existing communication infrastructure for seamless information through hybrid systems. GRAMSAT was planned to provide continuing education for special groups to ensure that their skills are upgraded regularly. As part of a nationwide GRAMSAT project, Swaran Jayanti Vidya Vikas Antarkish Upagraha Yojana (Vidyavahini) has been inaugurated in Orissa using INSAT 3B.

CHECK YOUR PROGRESS

11. When were satellites first outlined for use in India?
12. What is SITE?
13. How are meteorological services provided by INSAT?

ACTIVITY

Research on Internet and make a list of TV broadcasting government initiatives on education.

1.7 METHODS OF SPREADING AWARENESS ON ENVIRONMENT

Let us now go through some of methods through which mass media spreads awareness about environmental education.

(a) **Dialogue:** One of the methods of spreading awareness about the environment is through dialogue that takes place between two or more people. People while travelling or walking in groups in the parks or elsewhere tend to discuss about the environment. Dialogue is one of the means through which information about the environment spreads from person to person.

(b) **Debate:** Nowadays, environmental education has become such a grave concern that debates are now organized in schools\ colleges which is also one of the means of spreading information about the environment.

(c) **Discussion:** In the present times, various television news channels hold discussion on several issues concerning the environment. Even the Regional Working Associations of various societies\ apartments invite social activists and hold discussions on the topic of environmental education.

(d) **Drama and quiz:** This is another popular medium of spreading awareness about environmental education. For instance, in 2012, the Bengal state government had started the' save Ganga campaign.' As a part of this campaign, the state government organized an elocution contest, quiz, drama, dance, drama and performance by a Bengali music band, all based on the ' save Ganga theme'.

(e) **Seminars, workshops, symposium, meetings and speeches:** This is another method of spreading awareness about the environment. For instance, the Indian Environmental Society (IES) is a non-profit development organization which was established in India in 1972. This society on a regular basis organizes seminars, workshops, symposia. For example, IES organized a seminar on 'Weather and Wetlands' in September, 2013.

(f) **Field survey and trips:** This is one of the methods through which children can gain hands-on experience about the efforts being taken to protect and conserve the environment.

(g) **Quiz, projects, models, charts, books and exhibitions:** One of the most popular means of engaging students in environmental education is by organizing quiz, making projects, models, charts and reading books. Nowadays, schools organize exhibition where projects and models, prepared by students are displayed and the students of other school are invited to view them and accordingly, prizes are awarded to the students to motivate them.

(h) **Eco-clubs:** Eco-clubs play a significant role in creating environmental awareness among the future generations. Roughly, 2000 eco-clubs have been established in government and private schools of NCT of Delhi. The activities performed by these eco-clubs include:

(i) Encouraging the students to keep their surroundings neat and clean and especially green by planting saplings,

(i) Promoting the principle\value of conserving water by reducing the use and wastage of water,

(iii) Motivating the students towards the concept of waste management which includes throwing garbage only in dustbins.

A well known example is that of eco-clubs that have been established in selected schools in three districts of Tamil Nadu with the aim of spreading environmental education.

(i) Songs and street plays: These days various societies which are organized for the purpose of spreading environmental education spread the message about their activities through songs and street plays. For example, Local green NGO Green Vigil Foundation organized a street play in Nagpur in 2013 with the aim of spreading awareness about environmental issues among the general public.

1.8 SUMMARY

In this unit, you have learnt that:

- Mass media has the potentiality to ensure that education reaches people in all geographies.
- In the present scenario, teachers who are responsible for educating children since their childhood should realize their accountability and make extensive use of mass media. They can work on and improve their teaching skills using technology efficiently.
- In absence of access to national and community media, different public education programmes would not have been used to their maximum potential. It is possible to consider programmes that rely entirely on face-to-face education, but even these will not succeed in absence of appropriate supplementary means of advertising, events and news coverage.
- Radio and television are the popular mediums of mass media. Broadcasting is a new trend and technique in the field of education. Last few decades have been witness to rapid developments in communication technologies.
- Radio broadcasting still remains the cheapest mode of mass communication in India benefiting rural and deprived communities with low literacy rate and little excess to education.
  - Some educational advantages of using broadcasting include improvement in quality and relevance, low cost and increase accessibility. The challenges presented by such form of education include lack of dual interaction, lack of clarification, interruptions in transmissions, fixed pace for all and lack of space for reflection on content being taught.
- Nowadays, environmental education has become such a grave concern that debates[1] are now organized in schools\ colleges which is also one of the means of spreading information about the environment.
- One of the most popular means of engaging students in environmental education is by organizing quiz, making projects, models, charts and reading books.

1.9   KEY TERMS

- **Print media:** Print media comprises newspapers, magazines, brochures, newsletters, books, and even leaflets and pamphlets.
- **Gyan Vani:** Gyan Vani is the educational FM radio channel of India. It is a unique decentralized concept of extending mass media for education and empowerment, suited

for the educational needs of the local community.

- **Satellite Instructional Television Experiment (SITE):** This project made use of television for imparting information and knowledge to the rural population in six states of India in 1975.
- **Edutainment:** This implies imparting education through the medium of various popular formats such as quiz shows or soap operas.
- **Teletext:** It is a form of communication system wherein text and graphics are transmitted as digitized signals through air broadcasting or cable channel for display on television sets.

1.10 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Mass media is a collective concept that refers to all media technologies, including the Internet, television, newspapers, film and radio, which are used for mass communications.

2. The different types of mass media are: print media, electronic media and New-age media.

3. The term 'broadcasting' covers transmission of programmes by several types of distribution systems.

4. Educational broadcasting exhibits the following dominant characteristics:

    (i) Its programmes are arranged in series to assist cumulative learning.

    (ii) They are explicitly planned in consultation with external educational

    advisers,

    (iii) They are commonly accompanied by other kinds of learning materials

    such as textbooks and study guides,

    (iv) There is some attempt made to evaluate the use of broadcasts by teachers.

5. Educational broadcasting gives learners the option to move away from syllabus-oriented approaches by emphasizing on direct teaching and reduction of load in the classroom.

6. The Radio Club of Bombay broadcasted the first radio programme in June 1923.

7. The technique of radio-vision allows the subject to be presented through two channels— audio and visual. Explanation is given through recorded narration and visuals are presented in the form of still filmstrips, charts, slides, models, etc.

8. A 'radio-text' environment can be created well by using radio along with textual data transfer via computer networks, simultaneously.

9. The three main functions of television are: (i) entertainment, (ii) transmission of information, and (hi) education.

10. On 15 September 1959, television first came to India in the form of the National Television Network of India (named Doordarshan), with its first station in Delhi.

11. Satellites were first outlined for use in communication, in 1945, by Arthur C. Clarke.

12. SITE is basically a hybrid system combining both the direct reception from satellite, and the reception through terrestrial transmitters linked to the satellite.

13. Meteorological services are provided by INS AT through Very High Resolution Radiometer and CCD cameras on a few of its spacecrafts.

14. The activities performed by these eco-clubs include:

(i) Encouraging the students to keep their surroundings neat and clean and

especially green by planting saplings. (ii) Promoting the principleWalue of conserving water by reducing the use

and wastage of water, (hi) Motivating the students towards the concept of waste management which

includes throwing garbage only in dustbins.

15. Songs and street plays play a vital role in spreading awareness about environment. For example, Local green NGO Green Vigil Foundation organized a street play in Nagpur in February, 2013 with the aim of spreading awareness about environmental issues among the general public.

1.11 QUESTIONS AND EXERCISES

Short-Answer Questions

1. How does mass media help in bringing about a change in people's way of thinking?
2. List the functions of mass media.
3. What are the different types of mass media used in present times?
4. List some characteristics of broadcasting.
5. What are the five dominant characteristics of educational broadcasting?
6. What are the limitations associated with radio broadcasting?

Long-Answer Questions

1. Discuss the educational characteristics and limitations of a radio.
2. Enumerate the educational advantages of television, and describe the role of television in distance education.
3. Critically evaluate the role of mass media in the common man's life.
4. Discuss the impact of Satellite Instructional Television Experiment on broadcasting in India.
5. Discuss the role of communication satellites in India's education system.
6. How does mass media influence society?
7. How can community radio be used for informal education?
8. Discuss the application of communication satellites in higher education.
9. Explain the methods which assist in spreading information about environmental education.

1.12 FURTHER READING

Bell, D.; *The Coming of Past Industrial Society,* Arnold Heinman Publication, New Delhi, 1974.

Bhatia, S.C (ed).; *Papers in Environmental Education,* IUACE, New Delhi, 1984.

Carson,R.; *The Silent Spring,* Fewcett Publication, Greenwich, 1962.

Chakraborty, S.C. (ed); *Value Orientation and Environmental Education,* Vivekananda Nidhi, Calcutta, 1982.

Grossland, R.W., & Moor, S.F.D.; *Environmental Studies Project. An Evaluation Report,* Macmillan, London, 1974.

Sharma, R.A.; *Environmental Education,* Surya Publication, Meerut, 1998.

UNIT 2 EVALUATION IN ENVIRONMENTAL EDUCATION

Structure

2.0 INTRODUCTION

Evaluation is a wider concept than testing and measurement and is supposed to judge the worth of all the educational outcomes brought about as a result of teaching-learning process. Evaluation is a wider term than examination. It was introduced in the 1930s as a reaction against subject-centered and skill-centered examination. For environmental education many instructional material and projects are considered but they do not consist of any evaluation component.

In this unit, you will study about the concepts, types of evaluation and tools of evaluation in environmental education.

2.1 UNIT OBJECTIVES

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

• Analyse the concept of evaluation in environmental education

• Discuss the different types of evaluation

• Explain the evaluation process and its characteristics

• Describe the different co-curricular activities used for evaluation

2.2 CONCEPT OF EVALUATION IN ENVIRONMENTAL EDUCATION

Holistic development of the child is the aim of modern education. Growth and developmey can be effectively judged and appraised by a continuous process of evaluation. The ten|i evaluation process ascertains the workability of learning experiences and change o| behaviour of the student. Evaluation is performed on the basis of both qualitative an| quantitative process.

The term evaluation in the context of Environmental Education has been definef in the following manner:

- Evaluation is a process that critically examines a programme. It involves! collecting and analysing information about a programme's activities characteristics, and outcomes. Its purpose is to make judgments about | programme, to improve its effectiveness, and/or to inform programming decisions (Patton, 1987).
- Evaluation is judging the worth or value of environmental educatior| programme—its products, ends, or outcomes (its effectiveness) and *iti* processes, means, or ways of doing its job with limited resources (its efficiency*
- Evaluation differs from research, which is not so much concerned with makin| judgments as it is with searching, seeking out, and gathering new informatior| to further knowledge.

The lack of success of evaluation process in environmental education may be due, to reasons such as:

- Objectives of programme are stated in an unambiguous language
- Results of the programme are not evaluated in terms of obj ectives
- Instrument used for measurement lacks authenticity and reliability
- Process of evaluation may turn futile if the programme is unstable, unpredictable, and inconsistent
- Discrepancies between evaluators and other external agencies can also lead to failure of evaluation process

How Evaluation Helps?

It is important to periodically assess and adapt activities to ensure their effectiveness.

- Evaluation can help in identifying areas for improvement and ultimately help in realizing goals more efficiently.
- Evaluation helps in determining the effectiveness of results and if the results are not effective, evaluation helps in reaching out to the shortcomings.
- Evaluation enables in demonstrating the success or progress of a designed programme.
- Evaluation helps to identify the effectiveness of teaching processes.
- It helps to find out the weaknesses, abilities, interests, attitudes of the students.
- Evaluation helps in diagnosis and remedy for social, emotional and educational problems with their environment.

One of the best ways to view the benefits from evaluation is to see them as four interrelated components of environmental education programme (see Figure 6.1). Evaluation Can Lead to a Better Environment The ultimate goal of environmental education is a healthful and healing environment. Learning by doing is a major way of teaching environmental education.

Students can become involved in projects in which they act directly to improve their environment, such as, tree planting. Students can also become involved in projects in which they act indirectly to improve their environment, such as, communicating a concern about an environmental problem to an official who can then act directly on it. Evaluating the environmental effects of these activities can help you judge not only the growth in your students but the worth of your instructional programme.

2.3   TYPES OF EVALUATION IN ENVIRONMENTAL EDUCATION

P. W. Airasion and G F. Madaus have categorized evaluation procedures in the following manner:

- **Placement Evaluation:** Determine pupil performance in the beginning of instruction
- **Formative Evaluation:** Monitor learning progress during instruction
- **Diagnostic Evaluation:** Diagnose learning difficulties during instruction
- **Summative Evaluation:** Evaluate achievement at the end of instruction

Within the categories of formative and summative, there are different types of evaluatiorl

Types of Evaluation	Purpose
Formative	
1. Needs Assessment	DetermiiKS who needs the programme, how great the need is, and what can be done to best meet the need. An EE needs assessment programme helps in determining the shortfalls of the programmes and provide a deep insight about what can
2. Process or Implementation Evaluation	This helps in examining how the process is carried out and whether the process is at par with the objectives. It can be a continuous assessment or a one-time assessment. Its results are used to improve the programme. A process evaluation of an EE programme may focus on the number and type of participants
Summative	
1. Outcome Evaluation	It helps in keeping a track of the progress of the programme in achieving its outcomes. These outcomes may be short-term and medium-term. EE outcome evaluations may examine improvements in flie knowledge, skills, attitudes, intentions, or behaviours of the participants
2. Impact Evaluation	This concentrates on determining the impact of the programme. These impacts are the net effects, typically on the entire school, community, organization, society, or environment. EE impact evaluations may focus on the educational environmental quality

2.4   WHY EVALUATION IS REQUIRED?

Evaluation is required for the following reasons:

- Evaluation complements planning. A well designed viable evaluation plan shells out better results than an evaluation carried out hastily.

Lack of time and resources affects the performance of the evaluation process. The evaluation process requires a sound expertise, and a good knowledge about evaluation

- The importance of evaluating environmental education teaching will not only benefit students or school but also benefits whole of the community.
- Evaluation of Environmental Education teaching can help in developing a more efficient teacher and a diligent educator who wants to improve and do something about EE.
- Evaluation demonstrates accountability.
- It can improve the Instructional Programme.
- Evaluation can result in the improvement of the effectiveness and efficiency of teaching methods and learning activities.
- Evaluation can result in the improvement of the effectiveness and efficiency of the learning environment. This includes classroom, the environment outside of the classroom—the physical, emotional, and social climate of the school setting and the community.
- Evaluation can lead to greater growth in learning of the students. Growth in learning as an acquisition of knowledge, the clarification of values and development of moral reasoning, and the improvement of independent critical thinking and action skills.
- Evaluation can help in diagnosing the learning needs of students so that the teachers can be more efficient and effective in correcting deficiencies and fostering growth.
- Evaluation, itself, is an effective teaching tool.
- Evaluating the environmental effects of activities of students can help in judging not only the growth in the students but also the worth of instructional programme.
- Evaluation can help in developing teaching materials and teaching strategies.
- Evaluation helps in monitoring the learner's outcomes.
- Evaluation also helps in enhancing the competencies of educators and professionals.
- It also helps in planning researches, projects and programmes for developing environmental awareness, values, and attitudes.

Characteristics of Evaluation

Although there are no 'right' or 'wrong' evaluation criteria, there are better and worse ones, or at least more useful and less useful ones. The characteristics of evaluation criteria are as follows:

- Accurate and unambiguous
- Comprehensive but concise
- Direct and ends-oriented
- Measurable and Consistently Applied
- Can be crafted to address the different needs and objectives of EE
- Understandable
- Practical
- Sensitive
- Evaluation is inclusive
- Is honest
- Is replicable and its methods are as rigorous as circumstances allow

Did You KNOW

Majority of the work on environmental education within the last quarter century has been guided by the Belgrade Charter (1975) and Tbilisi Declaration (UNESCO, 1978)

2.5 EVALUATION PROCESS

Evaluation procedures serves as a tool not to measure the extent of achievement to the educational objectives but also to develop, review and modify suitably the educational objectives and the learning experiences in an ongoing process. The evaluation procedure in this scheme of interrelated network then may take the initial intermediary and terminal position in the course of activities of a given educational programme. At the initial stage it may be to identify the learner's ability at the course entry level so that learning experiences to be given to the course entrance may be designed in an appropriate (qualitative and quantitative) manner.

At the intermediary position it may help the teacher to check the effectiveness of the course, the achievement of the learner and his pace of learning thereby it may help both the teacher and the learner to monitor the progress of learning towards the set objectives. At the terminal level, it may help to ascertain the achievement of set goals and also to grade learners on their attainment

In the above figure, the rim of the wheel is the educational process involving continuous cycling of interrelated events: assessment of student needs, consideration of goals and objectives, development of the instructional activities and learning environment in student learning. The spokes are, in effect, the links between the hub and rim and support the rim at its four key points. If each point is not kept in good adjustment and balance with the others, movement of the educational process could be somewhat wobbly and out of line.

The following steps form the framework for the evaluation process:

- Deciding the objectives and need
- Planning the evaluation process
- Conducting and implementation of the evaluation process
- Making use of the results for further planning and remedial actions

1.6 CHARACTERISTICS OF A GOOD EVALUATION PROCESS

The following characteristics are required to build and support an evaluation system.

- **Evaluation process is well planned:** While setting goals or the objectives of the programme, teachers are required to identify various ways to measure these goals and objectives, analyse the information collected and make use of it.
- **Evaluation process is continuous and updated:** To make sure evaluation is on track,

teachers update their documents on a regular basis, adding new strategies, changing unsuccessful strategies, revising relationships in the model.

- **Develop an evaluation culture: By** motivating, encouraging and rewarding participation in evaluation helps in building opportunities, communicating a convincing and unified purpose for evaluation, and celebrating evaluation successes.

1.7   ROLE OF TEACHER AND STUDENTS IN EVALUATION PROCESS

Role of Teacher

- The teacher and students should be intimately involved in the evaluation of the environmental education programme. Teachers are closely associated with the evaluation programme because they spend the maximum time with it and help in influencing the students on it
- The teacher is directly responsible for programme's efficient and effective operation.
- Teachers are responsible to gather information and make decisions based on that information.
- The decisions of the teachers will ensure the efficiency and effectiveness of programme.

Role of Students

Not only it is important for the teacher to be an evaluator, but also students should be evaluators. As recipients of the programme, they have a rightful role, and their shared opinions, feelings and insights about the programme, what they learned and the evaluation, itself, can be of special value. The need for the role of the students in evaluation process lies in the ability of independent and critical thinking of the students that makes the evaluation process even more effective. For example, if students are provided with a conducive atmosphere to share their opinions and freely come out with random ideas about environmental issues and solutions without getting threatened, they will feel involved and will be more inclined towards environmental issues and will be willing to find out the solutions. When the students will perceive that their judgments will not work against them, they will be encouraged to think freely and critically about environmental problems and issues.

It is then incumbent to incorporate measures in evaluation programme that give! consideration to the following suggestions:

- Make purposes of the evaluation programme and use of the results clear to students' and non-threatening
- Give students the opportunity to participate in the planning of the evaluation programme
- Consider the rights of students with regard to the access and release of information)
- Ensure anonymity in release of the information

CHECK YOUR PROGRESS

3. What is the purpose of evaluation in environmental education?
4. What is the role of a teacher in the evaluation process?

2.8 ROLE OF DEPARTMENTS AND OTHER AGENCIES IN EVALUATION PROCESS

1. National Forest Commission and India's Afforestation Programme

In 2003, National Forest Commission was set up in India to review and assess India's policy and law, its effect on India's forests, its impact of local forest communities, and to make recommendations to achieve sustainable forest and ecological security in India. The report made over 300 recommendations which included the following:

- India must pursue rural development and animal husbandry policies to address the needs of the local communities, like the need to find affordable cattle fodder and grazing grounds. To avoid destruction of local forest cover, fodder must reach these communities.
- The Forest Rights Bill, which became law in 2007, is likely to be harmful to forest conservation and ecological security.
- The government should work closely with mining companies. Revenue generated from leasing of the mines must be pooled into a dedicated fund to conserve and improve the quality of forests in the region where the mines are located.
- Each Indian state should have the power to declare ecologically sensitive areas.
- The mandate of State Forest Corporations and government owned monopolies must be changed.
- Government should reform regulations and laws that ban felling of trees and transit of wood within India. Sustainable agro-forestry and farm forestry must be encouraged through financial and regulatory reforms, particularly on privately owned lands.

India's national forest policy expects to invest US$ 26.7 billion by 2020, to pursue nationwide afforestation coupled with forest conservation, with the goal of increasing India's forest cover from 20 per cent to 33 per cent.

2. The Centre for Environment Education (CEE)

The Centre for Environment Education (CEE) in India was established in August 1984 as a Centre of Excellence supported by the Ministry of Environment and Forests. The organization works towards developing programmes and materials to increase awareness about the environment and sustainable development. The head office is located in Ahmedabad. The Centre has 41 offices across India.

CEE works for a wide range of sectors, target groups and geographical areas. CEE sees a major opportunity in the UN Decade of Education for Sustainable Development (2005-14) to further contribute towards sustainable development.

CEE's programmes focus on:

- Training and Capacity Building
- Internships and Programmes
- Consultancy Services
- Knowledge Centre for ESD
- Journal onEducation for Sustainable Development

2.9 OBSTACLES TO EVALUATION

- ***Evaluation is not a myth:*** There is no myth about evaluation. It is simply gathering and using information to judge the value and effectiveness of whatever is done
- *Time:* The greatest obstacle to evaluation is that it requires time for preparation and teaching. To overcome this constraint is to build evaluation into programme from the beginning. It is also possible to spread out evaluation activities by concentrating at different times on different components of programme such as classroom setting and various teaching methods
- *Expense:* The major expense in most evaluation is in the hiring of a consultant. It is based on the premise that a worthwhile evaluation can be conducted by teachers. Major expenses are carried out in the implementation of the plan.
- *Subjectivity: "There cm* be a doubt on the subjectivity of the programme when it is planned, guided and evaluated by a teacher.
- *Complexity:* Sometimes the complexity of the evaluation plan hampers the success of the evaluation process.

2.10 CO-CURRICULAR ACTIVITIES IN

ENVIRONMENTAL EDUCATION AS EVALUATION TOOL

Evaluation should be made not just on scholastic aspects but also on co-scholastic aspects which depend to a large extent on the learning ambience and learning culture of an institution.

The main goal of co-curricular activities in environmental education are:

- To improve the quality of environment.
- To create awareness among the people on environmental problems and conservation.

- To create an atmosphere for participating in decision making capability developing an evaluation programmes of environmental education starting from a very young age, children should be taught about the environment that surrounds them.

The six key characteristics of good environment education material are fairness and accuracy, depth, emphasis on skills, building action orientation, instructional soundness and ability. The course content of environmental education can be classified stage wise. These stages are as follows.

1. Primary School Stage And Upper Primary School Stage

Here the emphasis should be mostly (75%) on building up awareness followed by real-life situation (20%) and conservation (5%). Thus, attempt should be only to sensitize the child about environment. The content to be used should be from the surrounding area, from home, school and outdoor. Teaching can include a number of co-curricular activities for evaluation such as:

- Visit reports and interviews
- Storytelling
- Drawing and painting
- Song and poem competition
- Environmental games
- Collection of things like leaves and flowers
- Speech and debate competition
- Essay competition
- Decoration of bulletin boards
- Camps and planning & evaluation of activities
- Excursion reports
- Clubs and display boards

All the above activities can be organized by students in the guidance of teachers and they can be awarded marks and grades according to their performances. These marks and grades can be shown in their final cumulative records.

2. Secondary and Senior Secondary Level

The activities that can be evaluated at the secondary and senior secondary level are as follows:

- Gardening
- Projects on environmental issue
- Assignments, exhibition, cultural activities
- Quiz on environmental

3. College Level

Activities that can be organized at the college level are:

- Community services
- Seminar

- Survey, projects, research, and group discussion
- Conferences
- Environmental excursions
- Stage play etc

The students can be evaluated by their performances, responsibility, provided them to make them aware problem solving and skill full professional.

5. What are the goals of co-currieular activities?
6. Name the five types of activities at college level.

ACTIVITY 1

- Make a project report of any proj ect undertaken by your institution.
- Prepare an assignment on conservation of resources.

2.11 SUMMARY

In this unit, you have learnt that:

- The aim of modern education is all-round development of the child and his growth and development can be effectively judged and appraised by a continuous process of evaluation.
- Evaluation procedures serves as a tool not to measure the extent of achievement to the educational objectives but also to develop, review and modify suitably the educational objectives and the learning experiences in an ongoing process.
- Educational evaluation serves a number of purposes that ultimately contribute to the improvement of the instructional methods, textbooks, curriculum and even advancement of our educational goals.
- Continuous and Comprehensive evaluation is a system of assessment that evaluates all spheres of student's development.
- The techniques of evaluation are means of collecting evidence about the student's development in desirable directions. Our technique of evaluation should necessarily be valid, reliable, usable and defined by objectives.
- Different types of evaluation are: (a) Placement Evaluation, (b) Formative Evaluation, (c) Summative Evaluation and (d) Diagnostic Evaluation.
- Evaluation is judging the worth or value of environmental education programme -its products, ends, or outcomes (its effectiveness) and its processes, means, or ways of doing its job with limited resources (its efficiency is an integral part of any teaching task.
- Evaluation can help in identifying areas for improvement and ultimately help in realizing goals more efficiently.

- Evaluation helps in determining the effectiveness of results and if the results are not effective, evaluation helps in reaching out to the shortcomings.
- Evaluation helps in determining the effectiveness of results and if the results are not effective, evaluation helps in reaching out to the shortcomings Evaluation enables in demonstrating the success or progress of a designed programme.
- Evaluation is well planned and continuously updated.
- The teacher and students should be intimately involved in the evaluation of the environmental education programme. Teachers are closely associated with the evaluation programme because they spend the maximum time with it and help in influencing the students on it.
- Evaluation should be made not just on scholastic aspects but also on co-scholastic aspects which depend to a large extent on the learning ambience and learning culture of an institution.

2.12 KEY TERMS

- **Placement Evaluation:** Determine pupil performance in the beginning of instruction
- **Formative Evaluation:** Monitor learning progress during instruction
- **Diagnostic Evaluation:** Diagnose learning difficulties during instruction

2.13 ANSWERS TO 'CHECK YOUR PROGRESS'

1. The different types of evaluation are:

   - Placement Evaluation
   - Formative Evaluation
   - Diagnostic Evaluation
   - Summative Evaluation

2. Some of the characteristics of a good evaluation are when the following are adhered:

   - Accurate and unambiguous
   - Comprehensive but concise
   - Direct and ends-oriented
   - Measurable and Consistently Applied
   - Can be crafted to address the different needs and objectives of EE

3. Evaluation procedures serves as a tool not to measure the extent of achievement to the educational objectives but also to develop, review and modify suitably the educational objectives and the learning experiences in an ongoing process.

4. The role of a teacher in evaluation is as follows:

   - The teacher and students should be intimately involved in the evaluation of the environmental education programme. Teachers are closely associated with the evaluation programme because they spend the maximum time with it and help in influencing the students on it.
   - The teacher is directly responsible for programme's efficient and effective operation.
   - Teachers are responsible to gather information and make decisions based on that information.
   - The decisions of the teachers will ensure the efficiency and effectiveness of programme.

5. The main goal of co-curricular activities in environmental education are:

- To improve the quality of environment.
- To create awareness among the people on environmental problems and conservation.
- To create an atmosphere for participating in decision-making capability, developing evaluation programmes of environmental education, starting from a very young age, children should be taught about the environment that surrounds them.

6. The five types of activities at the college could be:

- Community services
- Seminar
- Survey ,projects .research, and group discussion
- Conferences
- Environmental excursions
- Stage play

2.14 QUESTIONS AND EXERCISES

Short-Answer Questions

1. Briefly describe how evaluation is applied to the concept of environmental education.
2. List the various types of evaluations.
3. Write short notes on (a) evaluation process (b) characteristics of good evaluation process.
4. Why is evaluation needed in environmental education?

Long-Answer Questions

1. Explain the concept of evaluation in environmental education.
2. Describe the role of teachers and students in environmental evaluation process.
3. Explain the different co-curricular activities used as a tool of evaluation.
4. Explain the evaluation process.

2.14 FURTHER READING

Bell, D.; *The Coming of Past Industrial Society,* Arnold Heinman Publication, N. Delhi, 1974.   .

Bhatia, S.C (ed).; *Papers in Environmental Education,* IUACE, N. Delhi, 1984. Carson,R.; *The Silent Spring, Fewcett* Publication, Greenwich, 1962.

Chakraborty, S.C. (ed); *Value orientation and Environmental Education,Vivek&nands* Nidhi, Calcutta, 1982.

Grassland, R.W., & Moor, S.F.D.; *Environmental Studies Project. An Evaluation Report,* Macmillan, London, 1974.

Sharma, R.A.; *Environmental Education,* Surya Publication, Meerut, 1998.

UNIT 3 ENVIRONMENT AND QUALITY OF LIFE

Structure

3.0 INTRODUCTION

In our country, per capita income has not risen in proportion to the national income. Broadly speaking the total income of a country is the sum total of the income of all families belonging to that country. A family would be able to increase its income if every grown up member of the family works hard and that in every family, the number of dependent young members is kept to a reasonable minimum. Rapid population growth has been largely responsible for very slow or meager improvement in the living conditions of an average individual. The living conditions of the people are broadly

indicated by the food they eat, the clothes they wear, the shelter they live in, and the medical and educational facilities that they are able to enjoy. Only a small family is in better position to provide medical and educational facilities to its members. It is only the healthy and educated members of family who can earn more and are successful *m* life. Large families not only create problems for themselves but also tend to be more demanding on the community and the state, at least up to such times as their members grow up and are able to earn on their own. People who are convinced of the advantages of small family norm have the courage of conviction and also can take to planning a family as a way of life. The final solution to the population problems lies in accepting and practicing a small family norm by each and every family.

Sustainable development is the method of using resources strategically, so as to retain them for the future. The term was used by the Brundtland Commission which coined what has become the most popular definition of sustainable development as development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs.' In this unit, you will also study about the ecology, ecological balance and about the issues affecting ecological equilibrium.

The unit also deals with problems such as population growth, natural resources and their depletion, industrial and urban population and global warming. Along with a detailed discussion of the topics mentioned, the unit will also discuss the ways to overcome these problems. Sustainable development is the development that meets the needs of the present without jeopardizing the needs of the future generations. Jn other words, every generation should leave air, water and soil resources pure and unpolluted. Although it is a difficult proposition, it can be achieved through proper environmental management.

Human civilization through their excellence in scientific and technological fields has reached a level where they can produce more of their own kinds by cloning, exploit lands of other planets and receive information from any part of the world. However, at the same time, human civilization is facing the greatest challenge for survival due to the catastrophe created through environmental degradation. To meet the basic requirements of ever increasing population, industrialization is a must, but it results in pollution, environmental degradation and causes ecological imbalances. At the same time, industrial development cannot be sacrificed as it creates job opportunities, raises the standard of living and solves unemployment problems.

In view of this, a balance has to be struck so that development and environmental protection can occur simultaneously. To achieve this goal, sustainable development is the only answer.

3.1   UNIT OBJECTIVES

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

- Define the meaning of quality of life
- Identify relationship between population and quality of life
- Interpret the concept of small family norms
- List the different methods of family planning

- State the concept of biodiversity
- Explain the various types of biodiversity
- Assess the value and importance of biodiversity
- State the remedial measures for preserving the biodiversity
- Discuss the concept of sustainable development
- Diagnose the urban problems related to energy
- Evaluate various initiatives for solutions to problems related to environment
- State various legal initiatives taken by government in the form of various legislations

3.2 POPULATION GROWTH

The population of the world has grown at an alarming rate since 1650. The unprecedented increase in population has caused and is still causing rise in individual consumption of food, water, and exploitation of natural resources like land, water, fossil fuels, minerals, vegetation, etc. The combined effects of population growth, consumption, overuse, wastage and misuse of resources has and is still putting an unprecedented strain on the capacity of the Earth to sustain life. The impact of growth of human population on environment in particular is discussed below.

3.2.1 Social Impact of Population Growth

Explosive growth in human population causes a number of serious problems like food-scarcity, overcrowding, poverty, increasing consumption of resources, stress on common social facilities, encroachment on monuments, stress on civic services, etc.

1. Food Scarcity

The population growth leading to population explosion causes severe economic disparities and leads to competition for resources, price rise, hunger, malnutrition, and mass starvation.

Due to population growth, the gap between the rich and the poor has also increased. The rich people are exploiting more resources than the poor people. Malnutrition is one of the most common effects of these problems. The poorest people in developing countries do not get adequate calories to develop their health properly. In Ethiopia, almost half of all children under age of 5 suffer from malnutrition. Most poor children and adults suffer from severe vitamin and mineral deficiencies. Failure of senses, mental disorders and damage to vital organs, are some of the problems caused due to malnutrition. As per estimates, from 5 to 20 million people die of starvation across the world, every year.

2. Overcrowding

There is a limited habitable place on the Earth. Overpopulation has caused severe stress on land which has further stressed forests and agricultural areas. People are migrating towards cities in search of jobs and cities are becoming overcrowded. Houses are being constructed on semi-urban and cultivable lands around big cities as there is shortage of space in the cities. Encroachment is happening on government lands like railway platforms, areas around monuments, and parks, etc. Increasing crowd in cities is aggravating the problem of pollution and insanitation leading to the spread of epidemics. Green lands in urban areas and even sea beeches have been reclaimed foi housing and industrial purposes.

3. Poverty

Conditions of having insufficient resources or income are called as poverty. Poverty i< the lack of the basic human needs like food, clothing, housing, drinking water, and health services. Poor people are constantly struggling for shelter and clothing. They often suffer from malnutrition, and diseases.

In developed countries, poverty has caused drug dependence, crime, and mental illness. Overpopulation, unequal distribution of resources, inability to meet the cost oi living, inadequate education and employment, degradation of environment, demographic trends and welfare incentives are primary causes of poverty.

4. Increasing Consumption

It is a simple truth that more people consume more food, wear more clothes, drink more water, need more houses to live, need more medicines for cure, make more noise, create more pollution, generate more wastes, etc.

Some countries of the world have nearly stabilized their population but their lifestyle has become consumption based, for example, United States of America. Though, it is not overpopulated, it consumes about 40 per cent of resources of the world alone and produces not less than 21 per cent of the world's carbon dioxide which is a greenhouse gas.

It has been observed by ecologists that the powerful people and developed nations consume more resources than weak and poor people and developing or under developing countries. Thus, increase in the rate of consumption at one end is causing an increase in hunger and crime at the other end. Thus, the population growth and the changing pattern of consumption are responsible for the severe stress on environment.

5. Encroachment on Monuments

A monument is a building, column or statue of historical importance built-in the past. People who migrate from rural areas and work in cities often face difficulties and most of them are homeless. They take shelter on pavements, abandoned buildings and on spaces left around historical monuments. Gradually, they build temporary houses on these places and keep their families there. Eventually a colony is formed. This condition is the by-product of the explosion of population.

6. Stress on Common Social Facilities

Facilities are required both at home front and on social front. More people mean more use of the available facilities. Due to limitation of facilities, there may be a great rush and competition for the facilities that are available causing severe stress on them. Community halls, bus stops, railway junctions, parks, play grounds, hospitals and even roads are some common social facilities that are facing heavy stress due to population explosion. There is heavy traffic on roads round the clock. All these social facilities are often heavily polluted due to careless practices by people.

7. Stress on Common Civic Services

Services provided by municipalities or municipal corporations to civilians are called civic services. These services include cleanliness, water supply, waste disposal,

maintenance of drainage systems, community healthcare, care of animals, basic education, etc.

Over population has caused severe stress on civic services creating overload of work on bodies providing civic services. Due to this the people responsible are unable to perform their duties properly. The need and deprivation has made people lose their civic sense.

7.2.2 Ecological Impacts of Population Growth

The scientific study of inter-relationships among organisms and between organisms— living and non-living—is called as Ecology. Therefore, ecology relates to environment and ecological impacts of population on environment. The ecological impacts of population growth include impacts of population growth on physical and biological components of the natural environment.

1. Impact of population growth on physical environment

Physical environment means non-living environment or the land, air, water, soil and minerals. The utilization, overuse and misuse of physical resources have increased due to the growth of human population. More population means more mouths to feed which requires more agricultural production. More agricultural production requires two things - (i) more cultivable land, and (ii) advanced agriculture. Cultivable land has been made available by clearing forests and by reclaiming wet lands, ponds and green belts. Advanced agriculture requires utilization of more water, more fertilizers and more pesticides. Fertilizers and pesticides make the soil infertile. Clearing of forests has its own serious impacts and thereby causing imbalance in the environment.

More population means more space for house construction and availability of more consumer goods. Population growth requires more means of transport, more consumption of fossil fuels and more pollution of air, land and water. Thus growth of population leads to pollution of air, land and water. Different types of pollutions are seriously affecting the biological environment.

2. Impact of population growth on biological environment

The population explosion has already caused and is still causing serious impact on the global environment. As for biological environment, human population has stressed most of the biological systems, comprising flora and fauna and biological diversity.

Since most of the components of the physical environment are under serious threat due to population explosion, all the biological components are bound to suffer. Hence, most of the natural processes have been seriously altered which has caused serious imbalances in the ecosystems. These imbalances are explained briefly below:

- For expanding cultivable land, forests have been cleared on large scales. Illegal timber trade by timber mafias and local pressure for firewood have further depleted the forest Resources. These destructive activities of human beings have had an adverse affect on the wild animals and have led to extinction of some wildlife in the process. Forests have also been cleared for setting up of industries and for urbanisation which has affected the habitats of a variety of birds and animals. There are other reasons of forest destruction also. Some of

those reasons are forest fires and *jhoom* cultivation. *Jhoom* cultivation is the practice of growing crops after burning forest vegetation. It is also known as the *slash and burn cultivation.* Intensive agriculture and mining have also caused large scale destruction of habitats.

- Frequent water crises in many parts of the world caused failure of agricultur< leading to hunger and starvation. Vast varieties of plants and animals have beei killed due to water crises. Water crises often lead to migration of people anc animals to other places which in turn cause overcrowding.

- Poaching and killing of wild animals and illegal trade of body parts to earr money have also caused extinction of several species of animals.

- Generation of waste due to increasing consumer culture and population explosior is causing spread of serious epidemics and deaths in many parts of the world.

Habitat destruction and overexploitation of resources induced by population growth has caused serious depletion of biodiversity in many parts of the world and its depletion causes serious losses of a number of factors that are vital for proper functioning of the ecosystems.

Impact of Population Growth on India

India is the best country to study the consequences of over population. Geometric growth in population has pushed our country into population explosion leading to number of serious consequences. Some of them are:

- Decreased availability of food and clothing

- Decreased per capita food availability despite phenomenal increase in their production

- Decreased per capita GMP and reduced standard of living due to ever increasing population

- Increased pressure on resources like land, water, natural forests, animals etc. leading to many far reaching effects like:
  o Fragmentation of land below the economic level.

  o Acute shortage of drinking and irrigation water.

  o Denudation of forest (Deforestation) to increase the area under agriculture.

  o Pollution of water, land, food materials etc.

- Urbanization beyond a healthy developmental limit as more rural people shift to towns/cities in search of better work and earning. Urbanization has led to many problems such as

  o Increased housing problems in cities / towns.

  o Very high vehicular movement in cities / towns leading to accidents, pollution,

    etc.
      o Serious problem connected to vast urban waste generation and its disposal,
      o Serious drinking water shortages.
      o Unending demands for civic amenities like roads, transport, markets, etc.
- Unemployment problems of serious dimension both in urban and rural areas leading to reduced per capita earning, and poverty

- Hunger deaths - because of reduced per capita food availability and poor distribution of food
- Acute shortage of medical facilities including qualified doctors, medicines, dispensaries, modern health care facilities etc - due to high population
- Shortage of education facilities including schools, colleges, qualified teachers
- Serious shortage of power and problems connected with its distribution
- Increased inflation
- Increased borrowings from international organizations
- Reduced care of young ones leading to increased child health problems as well as vulnerability of children to many diseases
- Reduced health care to mothers
- Difficulties encountered in implementation of all national and state developmental programmes
- Increased government expenditure
- Increased density of population

In India, over population has engulfed almost all our achievements in industrial growth, agricultural production, supporting services like medical care, housing, transport, education, and banking. It has put serious pressures on every sector of our economy and every section of society. Almost all our national problems can be traced back to have their roots in overgrowing population.

3.2.3 Relationship between Population and Quality of Life

Slower the population growth, the smaller the population and consequently better the quality of life. An over-crowded nation cannot provide adequate food, shelter, education, employment, health, hygiene and resources. These affect the economical status of the nation. There are some reasons by which quality of life is not maintained well.

1. **Poverty and illiteracy:** Poverty accompanied by malnutrition, unemployment, low status of woman education, limited sources of social and health services contribute to high level of fertility, morbidity, mortality as well as low level of productivity. It leads to high rate of population growth. High rate of population growth decreases the ability to use resources properly and consequently quality of life deteriorates.

2. **Physical, social, health environment:** Excessive population growth puts extra pressure on physical environment, e.g., air, water, resources, fuel, transport. It also puts pressure on social environment in which large families in limited place and poor bonding fight for money and property that negatively affects on quahty of life. The contamination of air, water and food by excessive population again damages the healthy environment and quality of life.

3. **Young generation:** A large proportion of young generation in a population needs more resources for health education, employment and facilities to survive. In the absence of supply of these things, youth is diverting towards exploitation, social abuse, crimes, corruption and ignorance of responsibility and values. To save our youth from these evils we have to control our population.

4. **Old age people:** The steady increase of old age groups or ageing of population poses serious economic and social challenges to all the societies. The quality of life depends on the factors which affect the old age population. A few of them are:

(i)   systems of health care
(ii)   systems of economic and social security

(iii)   support system for their caring in family

(iv)   self reliance and participation in decision-making

(v)   good opportunities and care for challenged or disabled old persons

(vi)   education and health policies

(vii)   economical security

These factors make a good structure of population and better quality of life.

CHECK YOUR PROGRESS

1. What are the social impacts of population growth?

2. State the primary causes of poverty.

3. Fill in the blanks:

   (i) Due to population growth, the gap between the rich and the poor has also _____.

   (ii) Jhoom cultivation is also known as_____ .

   (iii) The scientific study of inter-relationships among organisms and between organisms- hving and non-living-is called as_____ .

3.3   BIODIVERSITY AND ITS CONSERVATION

The earth holds a vast variety of living organisms, which includes different kinds of plants, animals, insects, and microorganisms. It has an immense variety of habitats and ecosystems. The total diversity and variability of hving things and of the system of which they are a part is generally defined as biological diversity, i.e. the total variability of life on Earth. Biodiversity includes diversity within species, between species and of ecosystems.

Perception of biodiversity varies widely among biologists, sociologists, lawyers, naturalists, conservationists, ethno biologists and so on. Thus, biodiversity issues have been a unifying force among people of various professions and pursuits.

Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and water. Through the conservation of biodiversity, the survival of many species and habitats which are threatened due to human activities can be ensured. Other reasons for conserving biodiversity include securing valuable natural resources for future generations and protecting the functions of the eco-system.

3.3.1 Levels of Biodiversity

Biodiversity can be studied at many levels.

1. Genetic biodiversity

It is the basic source of biodiversity. Genes found in organisms can form enormous number of combinations, each of which gives rise to some variability. Genes are the basic units of hereditary information, transmitted from one generation to other. When the genes within the same species show different versions, due to new combinations, it is called genetic variability. For example, all rice varieties belong to the species Oryza sativa, but there are thousands of wild and cultivated varieties of rice which show variations at the genetic level and differ in their colour, size, shape, aroma and nutrient content of the grain. This is genetic diversity of rice. Genetic biodiversity means the variation of genes within a species. In a species, each variety has its own genes or genetic make-up. Diversity of genes within a species increases its ability to adapt to disease, pollution and other changes in environment. When a variety of a species is destroyed, genetic diversity gets diminished.

2. Species biodiversity

This is the variability found within the population of a species or between different species of a community. It represents broadly the species richness and their abundance in a community. Till now, only about 1.5 million living and 300000 fossil species have been actually described and given scientific names. It is quite likely that a large fraction of these species may have become extinct even before they were discovered and enlisted. Species biodiversity means a variety of species within a region. Such diversity can be measured on the basis of species in a region. More the species biodiversity means more the biological wealth.

3. Ecosystem biodiversity

Ecosystem biodiversity is the diversity that shows variations in ecological niches, nutrient cycling, tropic structure, food webs, etc. There is variation in physical parameters like moisture, temperature, altitude and precipitation. Thus, there is tremendous variation within the ecosystems along these gradients.

Variations in trees and wildlife found in forests are due to these physical factors. Ecosystem diversity is of great importance and should be kept intact. This diversity has developed over millions of years of evolution. Destruction of this diversity will result in ecological imbalance. It is impossible to replace the diversity of one ecosystem with that of another. Coniferous trees of boreal forests cannot take up the function of the trees of tropical deciduous forest lands and vice versa as this is the result of the prevailing environmental condition of that particular area with well regulated ecological balance.

3.3.2 Principles of Biodiversity

Biodiversity in terms of its commercial utility, ecological value, social and aesthetic value has enormous importance. We are benefited by other organisms in many different ways. Sometimes, we come to know and appreciate the value of an organism only after it is lost from this earth. All organisms have their importance and role to play in keeping the ecological. The multiple principles of biodiversity are classified as follows:

1. Consumptive use value

These include direct use values where the biodiversity product can be harvested and consumed directly, e.g., fuel, food, drugs and fibre.

Food: A large number of wild plants and shrubs are consumed by human beings as food. Many edible plants species have been taken up for farming. Agricultural scientists develop new hardy strains of different plant species that are available in the wild. A

large number of wild animals are also our sources of food.

Drugs and medicines: About 75 per cent of the world's population depends on plants or plant extracts for medicines. For example, penicillin drug used as an antibiotic is derived from a fungus called penicillin and quinine, the cure for malaria is obtained from the bark of cinchona tree. Recently, vinblastin and vincristine, two anti-cancer drugs, have been obtained from periwinkle (catharanthus) plant, which possesses anticancer alkaloids.

Fuel: Our forests have been a big suppher of fuel wood. Fossil fuels like coal, petroleum and natural gas are products of fossilized biodiversity. Firewood collected by people is not normally marketed, but are directly used by tribals and local villagers; hence, falls under constructive value.

2. Productive use values

These are the commercially usable values that can be marketed and sold. These products can range from lumber or wild gene resources used by scientists for introducing desirable traits in crops and domesticated animals or animal products like tusks of elephants, musk from musk deer, silk from silkworm, wool from sheep, and lac from lac insects. Many industries are dependent on the productive use of values of biodiversity like paper and pulp industry, plywood industry, railway sleeper industry, silk industry, and textile industry.

3. Social value

These are the values associated with the social life, customs, religion and psycho spiritual aspects of the people. Many plants like *tulsi, peepal* and lotus are considered holy and sacred in our country. The leaves, fruits or flowers of some particular plants are used in worship or the sometimes the plant itself is worshipped, like the plant of *tulsi.* The tribal people have close links with the wildlife in the forest. Their social life, songs, dances and customs are closely woven around the wildlife. Animals like cow, snake, peacock and owl also have a significant place in our psycho-spiritual arena and therefore are of social importance. Thus, biodiversity has distinct social value, attached with different societies.

4. Ethical value

Ethical value is also sometimes known as existence value and is based on the concept of' live and let live'. If we must protect all biodiversity as biodiversity is valuable and important for human race to survive.

Ethical value means that we may or may not use a species, but are happy with the fact that they exist in the nature. One feels sorry when any particular species like 'passenger pigeon' or 'dodo' become extinct. This means, there is an ethical value or existence value attached to each species.

5. Aesthetic value

Great aesthetic value is attached to biodiversity. None of us would like to visit vast stretches of barren lands with no signs of visible life. Most people like to spend their time in the lapse of nature and in wilderness. They enjoy the aesthetic value of biodiversity. This type of tourism has come to be known as ecotourism. The concept 'willingness to pay' on such ecotourism gives us a monetary estimate for aesthetic value of biodiversity.

6. Option value

These values include the potential of biodiversity that are presently unknown and need to be explored. It is the knowledge that there are biological resources that may prove to be effective some day in future. Option value also includes the values, in terms of the option to visit areas where a variety of flora and fauna, or specifically some endemic, rare or endangered species exist.

7. Ecosystem service value

This refers to the services that can be rendered to preserve the ecosystems like maintenance of soil fertility, prevention of soil erosion, prevention of floods, fixation of nitrogen, cycling of water, cycling of nutrients, pollutant absorption and reduction of the threat of global warming, etc. Different categories of biodiversity value indicate that there is enormous potential in ecosystem, species and genetic diversity and a decline in biodiversity will lead to huge economic, ecological and socio- cultural losses.

Case Exhibit: Rampant Development May Spell Doom for Western Ghats

The partitioning of about one-third of natural landscapes and throwing open of two-thirds of so-called cultural landscapes to development will eventually lead to fragmentation and desertification of the Western Ghats, said ecologist Madhav Gadgil. Gadgil sounded a warning that the approach of Krishnaswamy Kasturirangan's high-level working group (HLWG) to reject a graded approach with a major role for grass-roots-level inputs for safeguarding the ecologically sensitive Western Ghats, as suggested by the Western Ghats ecology expert (WGEEP) panel would be perilous for the future of the world heritage site. 'This (partitioning and opening to development) amounts to attempts to maintain oases of diversity in a= desert of ecological devastation. Ecology teaches us that such fragmentation would lead, sooner, rather than later, to the desert overwhelming the oases,' said Gadgil.

Gadgil's WGEEP had submitted a report on the protection of the Western Ghats in August 30, 2011, which the central government kept under wraps till it was put in the public domain by the high court of Bombay at Goa on May 24, 2012, in connection with a public interest petition. The central government formed the Kasturirangan panel to advise it on the Western Ghats ecology expert recommendations. The high-level working group report was released on April 17. The 1600km-ionj* Western Ghats has two distinct landscapes, natural ones with protected areas and reserve forests and cultural landscapes in the foothills. 'There is very little else and the high-level working group suggested strengthening of government machinery to protect the natural landscapes,' Gadgil told TOI. But the ecologist, who wrote to Kasturirangan, said the safeguarding by guards with guns may not$_f$. work, as the high-level working group recommended portioning of the'natural landscape, and it will lead to degradation. Gadgil said opening up cultural landscapes to development has spawned scams like the 35,000 crore illegal mining in Goa. 'It is vital to think of the maintenance of habitat continuity, and of an ecologically and socially-friendly matrix to ensure

long-term conservation of biodiversity rich areas, and this is what we had proposed,' Gadgil stated in his letter. Gadgil pointed out that freshwater biodiversity is far more threatened than forest biodiversity. 'This lies largely in cultural landscapes in foothills,' he said. The Western Ghats ecology expert panel chief accused the government of proposing to set up more polluting industries in Ratnagiri and suppressing its own zonal atlas for citing of industries.

A polluting industry in Ratnagiri ravaged fisheries, rendering 20,000 people obless, while only 11,000 benefitted from it. Gadgil alleged that the government adopted a passive approach to the pollution issue, but invoked police powers to suppress the peaceful protests against pollution on as many as 180 out of 600 days in 2007-09.

'But the high-level working group report shockingly dismisses democratic devolution of decision-making powers, remarking that local communities can have no role in economic decisions,' he added.

Source: http://articles.timesofindia.indiatimes.com/2013-05-18/goa/ 39353711_1_ western-ghats-hlwe-madhav-eadril

3.3.3 Biogeographical Classification of India

India has different types of climate and topography in different parts of the country and these variations have induced enormous variability in flora and fauna. India has a rich heritage of biological diversity and occupies the tenth position among the plant rich nations of the world.

It is very important to study the distribution, evolution, dispersal and environmental relationship of plants and animals in time and space. There are ten different bio-geographic habitats in India.

1. Trans-Himalayan-Upper regions
2. Himalayan -North-West Himalayas, West, Central and East Himalayas
3. Desert-Kutch, Thar and Ladakh
4. Semi-Arid-Central India, Gujarat-Rajwara
5. Western Ghats - Malabar Coast, Western Ghat Mountains
6. Deccan Peninsula - Deccan Plateau South, Central, Eastern, Chhota Nagpur
7. Gangetic Plain - Upper Gangetic Plain, Lower Gangetic Plain
8. North-East India - Brahmaputra Valley, North Eastern Hills
9. Islands -Andaman Islands, Nicobar Islands, Laskhadweep, etc. 10. Coasts -

West Coast and East Coast

Case Exhibit: Indian Tiger Faces Extinction for Lack of DNA Variety

As researchers have previously warned, Tigers in India may be a little too close for comfort — when it comes to their DNA, anyway. A new study from Cardiff University has researchers concerned that Indian tigers face extinction because of a lack of 'genetic diversity.' Partnering with India's National Center for Biological Sciences, researchers compared current DNA samples from tigers on the Indian subcontinent to genetic data obtained during the time of the British Raj, a period of British rule in India from 1858 to 1947. They found that 93 percent of the tiger DNA variants from that historical period are no longer present in the current tiger population. 'This is due to loss of habitat and habitat fragmentation, meaning lower population sizes, and the prevention of tigers from dispersing as they once would have, which means their gene pool is no longer mixing across

the subcontinent,' Mike Bruford, a professor at the Cardiff School of Biosciences, explained to the BBC.

The lack of genetic diversity in Indian tigers presents an obvious 'red flag' for conservationists, Bruford and his team note in the study. Genetic variation can be crucial for species survival and adaptation to environmental change, and its judicious management is now required in the Convention on Biological

Diversity's 2020 targets. Although recent studies demonstrate that Indian tigers retain the highest proportion of the specie's genetic variation, this study demonstrates that some components of that genetic variation have been lost, and what remains is now subdivided. Though conservation efforts "— from protected reserves to endeavors to mitigate human-tiger conflict — are currently in place, researchers state that 'it is critical to maintain within-population variation, as well as increasing population connectivity' on a large scale. While the study's findings are startling, researchers warned in 2011 that poor genetic diversity may be a threat to the tiger population. That year, a Wildlife Institute of India study revealed a loss of many alleles — an alternate form of a gene, which can cause varying characteristics across a species — among tigers in the Ranthambore Tiger Reserve. At the time, investigator S.R Goyal attributed the loss to 'an isolated population without any genetic exchange,' according to the *Times News Network.*

The tiger is classified as endangered on the International Union for Conservation of Nature's Red List of Threatened Species. According to the World Wildlife Fund, the tiger population is estimated to be as low as 3,200, with as few as 1,400 tigers in India.

Source: http://www.huffingtonpost.com/2013/05/15/indian-tigers-geneticdiv_n_ 3280050.html?utm_hp_ref=green

3.3.4 Global Biodiversity

The United Nations Conference on Environment and Development at Rio in 1992, put biological diversity on the international agenda by signing the Convention on Biological Diversity (CBD). This convention addresses many issues ranging from forests, agriculture to Intellectual Property Rights (IPRs). India is a signatory to CBD and ratified it in 1993. The Government of India has finalized the National Policy and Action Strategy for Biodiversity. A legislation was finalized and the Indian Parliament passed the Biodiversity Bill in .2002; The objective of the convention was 'the conservation of biological diversity, the sustainable use of its components and equitable sharing of benefits arising out of the utilization of genetic resources.' It also covered the ecological, economic and social aspects of biodiversity.

The success of the convention can be evaluated in two main ways:

The first one is by the analysis of the changes in components of biodiversity (i.e., species and ecosystems) and by measuring the effectiveness of the measures taken to implement the convention. According to the Worldwide Fund for Nature, scientists have identified about 1.4 million species. Of these, around 1.03 million are animals and 2,48,000 are higher plants. But, human knowledge of the world's biodiversity is still not complete. Higher plants have also been fairly well studied, but it is possible that 15 per cent more may still be discovered. Numerous insects, invertebrates, lower plants and micro-organisms exist, but have yet to be identified and described. One recent estimate put this figure as high as 30 million.

Human impact on nature has reached such high proportions that the world is today witnessing an extraordinary rate in loss of species. Many thousands of species will disappear even before they are found and described by biologists. In 1988, the International Union for Conservation of Nature (IUCN) listed 4,589 threatened animals. Scientists at the Kew Gardens in Britain listed around 20,000 plant species as threatened. According to an estimate by the IUCN's Threatened Plants Unit, by the year 2050 up to 60,000 plant species will become extinct or threatened. These estimates show that the current rate of extinction is at least 25,000 times greater than the extinction that took place during evolutionary times. The rate of extinction of mammals alone has risen from one species every five years in the seventeenth century to one every two years in the twentieth century.

Biological Diversity at National Level

Every country is characterized by its own biodiversity which mainly depends on the climate. India has a rich biological diversity of flora and fauna. Overall six per cent of the global species are found in India. The total number of living species identified in India country is 1,50,000. Out of the total 25 biodiversity hot spots of the world, India possesses two— one in the northeast region and one in the Western Ghats. Indian is also one of the 12 mega-biodiversity countries in the world.

India as a Mega-Diversity Nation

India is one of the twelve mega-diversity countries in the world. The Ministry of Environment and Forests, Govt, of India (2000), records 47,000 species of plants and 81,000 species of animals which is about 7 per cent and 6.5 per cent respectively of global flora and fauna. These major groups of species include endemism, centre of origin, marine diversity, etc. A large proportion of the Indian biodiversity is still Unexplored. Due to its diverse climatic conditions, there is a complete spectrum of biodiversity in our country.

3.3.5 Threats to Biodiversity

Extinction or elimination of a species is a natural process of evolution. The rate of loss of species in the geologic past has been a slow process but the process of extinction has become particularly fast in the recent years of civilization. In the recent times, the human impact has been so severe that thousands of species and varieties are becoming extinct annually.

The following are the major causes and issues related to threats to biodiversity:

Loss of Habitat

Destruction and loss of natural habitat is the single largest cause of losing biodiversity. Billions of hectares of forests and grasslands have been converted into agricultural land, pastures, settlement areas or for development projects. These forests and grasslands were the homes of thousands of species, which perished due to loss of their natural habitat. There has been severe damage to the wetlands which were thought to be useless ecosystems. They are getting destroyed due to draining, filling and pollution causing huge loss of biodiversity.

The habitat is divided into small and scattered patches, so that the complete loss of habitat can be put at bay. This phenomenon is known as habitat fragmentation. There are many wildlife species such as bears and large cats that require large territories to live but are threatened as they breed only in the interiors of the forests. Marine diversity is also under serious threat as there is due to large-scale destruction of the breeding and feeding grounds offish and other species.

Poaching

Illegal trade of wildlife products by killing prohibited endangered animals is another threat to the wildlife. The rich countries in Europe and North America and some affluent countries in Asia like Japan, Taiwan and Hong Kong are the major importers of wildlife products or wildlife itself. The trading of such wildlife products is highly profitable for the poachers who smuggle them to other countries mediated through mafia.

3.3.6 Man-Wildlife Conflicts

As we know that it is very important to preserve and protect wildlife but sometimes we come across situations when wildlife causes immense damage and danger to man. Under such conditions it becomes difficult for the forest department to pacify and gain local support for wildlife conservation from the people or villages that are affected by the wildlife.

Instances of man-animal conflicts come to limelight from several states in our country time and again. In Sambalpur, Odisha, 195 humans were killed in the recent past by elephants. In retaliation, the villagers killed ninety-five elephants in the border region of Kote-Chamarajanagar belt in Mysore. The conflict in this region Has arisen because of massive damage done by the elephants to the cotton and sugarcane crops. The elephants are electrocuted by the villagers or blown off with explosives when they intrude into the fields. In fact, more killings are done by locals than by poachers. In early 2004, a man-eating tiger was reported to have killed sixteen Nepalese people and a four year old child inside the Royal Chitwan National Park, 240 km South-west of Kathmandu. Similar incidents were reported near Sanjay Gandhi National Park, Borivali, Mumbai where similar incidents of human killings, especially of small children was reported.

Causes of Man-Animal Conflicts

- Dwindling habitats of tigers, elephants, rhinos and bears due to shrinking forests cover are compelled to move outside the forests. Human encroachment into the forest areas has rendered all forest living animals to trespass the borders of human civilizations. This is because the conflicts between man and the wildlife have increased since it is an issue of survival of both.

- Weak and injured animals have a tendency to attack man. At times, a tigress might attack the human if she feels that her cubs are in danger. It is very difficult to trace a man-eating tiger and in the process many innocent tigers get killed.

- Earlier, the forest department used to cultivate crops like paddy, and sugarcane within the sanctuaries as they are a favourite of elephants. Due to lack of such practices the animals tend to move out of the forest in search of food. It may be noted that, one adult elephant needs 2 quintals of green fodder and 150 kg of clean water daily and if it is not available, the animal will leave its habitat in search of it.

- Very often, the villagers put electric wiring around their ripe crop fields. The elephants get injured, suffer pain and may then turn violent.

- Disappearance and disruption of wildlife corridor due to development has given the animals a chance to attack humans.

- The cash compensation paid by the government in lieu of the damage caused to the crops by the wild animals is not enough. The affected farmer, therefore, gets revengeful and kills the wild animals.

Remedial Measures to Curb the Conflict

- Tiger Conservation Project (TCP) has made provisions of vehicles, tranquillizer guns, binoculars and radio sets, etc., to deal with any imminent danger tactfully.
- There should be adequate crop compensation and cattle compensation schemes along with substantial cash compensation for loss of human life.
- Solar-powered fencing should be provided along with electric current proof trenches to prevent animals from straying into the agricultural fields.
- Cropping pattern should be changed near the forest borders and adequate amount of food and water should be made available to the animals.
- Wildlife corridors should be provided for mass migration of big animals during unfavourable periods.
- Rituals such as wild animal hunting like 'Akhand Shikar', practiced in Similipal Sanctuary, Odisha should be banned.

3.3.7 Endangered and Endemic Species of India

India is home to a number of species that are facing various degrees of extinction. The IUCN Red List of Threatened Animals is internationally recognized as the list that categorizes the status of globally threatened animal species. Based on the numbers and the level of threat, the species have been classified into the following groups:

- **Critically endangered**

  Animals in this category face the highest risk. Critically endangered means that a species' numbers have decreased, or will decrease, by 80 per cent within three generations. There are 18 critically endangered animal species in India, including the Ganges shark, Himalayan wolf, Indian vulture and pygmy hog.

- **Endangered**

  A species is said to be endangered when its population is at risk of becoming extinct because it is either few in numbers, or threatened by changing environmental or predation parameters. There are 54 endangered species in India, including Asiatic lion, chiru (Tibetan antelope), Ganges dolphin, Indian rhinoceros, Indian elephant, Royal Bengal tiger, Nilgiri tahr, Olive Ridley turtle, red turtle, snow leopard, etc.

- **Vulnerable**

  A vulnerable species is one which has been categorized as likely to become endangered unless the circumstances threatening its survival and reproduction improve.

- **Threatened**

  Threatened species are any species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future. In addition to the animals, nearly 450 plant species have been identified in the categories of endangered.

India is also rich in endemic species. Endemic species are those that are found in specific locations and nowhere else in the world. The biodiversity hotspots in India are rich in endemic species. The Western Ghats are the richest in endemic species, with about 62 per cent of the known amphibian species and nearly 50 per cent of the lizards of India being endemic to this region.

There are 42 species of endemic birds in India, out of which 35 are found in the Western Ghats. About 30 per cent of the world's recorded flora is endemic to India. Most of these endemic species are found in the Himalayas and adjoining regions and in the Western Ghats. Endemic mammals of India include lion-tailed macaque, Nilgiri langur, brown palm civet and Nilgiri tahr.

3.3.8 Conservation of Biodiversity

Due to the tremendous importance of biodiversity it is considered an asset of a region or a nation. Due to its multiple advantages of commercial value, consumption value, medicinal value, social, cultural, religious and optional values, biodiversity needs to be conserved. The need for its protection and conservation has become more important due to overexploitation and the subsequent depletion. There are two types of methods of conservation of biodiversity:

- Ex-situ
- In situ

Ex-situ conservation means off-site protection of biodiversity. It is the process of protecting an endangered species of plant or animal by removing it from an unsafe or threatened habitat and placingituhder human care. While Ex-situ conservation comprises some of the oldest and best-known techniques known to and created by man, it also involves newer techniques like laboratory method.

Ex-situ conservation

Creation of zoos, botanicalgardens, culture collection centres are the most conventional and traditional methods of ex-situ conservation, all of which house and protect specimens for breeding anU reproduction of wild life animals and plants. Endangered plants may also be preservqdin part in such botanical garden through seed banks and germ plasma banks. Endftilgered animals are preserved using similar techniques through preservation in gene bank. In the gene banks, which consist of cryogenic facilities, live sperms, eggs rir embryos can be stored. Some countries have established frozen zoos to store such samples from more than 366 species, which consist of mammals, reptiles and birds.

Drawbacks of ex-situ conservation : Ex-situ conservation although is helpful to man's effort to sustajfi^iiidprotect biodiversity, is rarely enough to save a species from extinction. It can be used as a last resort or as a supplement to in-situ conservation. It cannot re-creale a habitat. Furthermore, ex-situ conservation techniques are often costly natural.

In-situ conservation

In-situ conservation means toconserve the biodiversity within the habitat and on site. It deals with the protection of an extinct species of plant or animal in its natural habitat, either by protecting or priventing the habitat itself from getting exhausted. The benefit of in-situ consen'ation is that it maintains the natural surroundings of the population of the animals or plant in 'Us natural distinctive property. In situ conservation should be preferred to ex-situ,conservatiqn, the latter opted only in case where in situ conservation is either too difficult impossible. Wildlife conservation is mostly based on in situ conservation teougbprdtection and recreation of the wildlife habitat.

Case Exhibit: Dindigul's Forests Fall to Mafia's Axe

The Sirumalai reserve forest, a rare wildlife habitat and home to rare species of medicinal plants, is being denuded of its trees for large scale cultivation. Sirumalai also caters to the irrigation needs of scores of villages in the Dindigul union. It feeds a network of check dams

that service villages dotting the foothills that stretch between. Vellode and Vadipatti. The farmers here have been engaged for decades in horticulture and floriculture. Sirumalai, a hill station criss-crossed by private estates, has traditionally relied on streams and other natural resources for its water supply. The sinking of bore wells was banned. Now, the State Government has sanctioned more than 20 bore wells to meet the drinking water needs of the local people. The panchayat administration has already started sinking bore wells at 20 points in Pazahiyur, Sirumalai Pudhur, Thenmalai and other populated areas. This would set a wrong precedent and tacitly permit private estates to sink bore wells illegally for their irrigation needs, local people fear.

It would have an adverse impact on the environment. Bore wells would drain the forest streams and storage in ponds. Surface water would vanish. They would disrupt and divert the natural flow of ground water, creating dry fractures in the earth. The hill station may become vulnerable to massive landslides and, in the long run, to earth quakes, cautions R. Rajasekaran, former Assistant Conservator of Forests (Retired).

The hill would lose its core strength. Vast prairies would turn dry, creating food shortage for animals. With no food and water available within the core zone, wildlife would migrate to villages and invade farmlands. Ultimately, the biodiversity would be disturbed, he adds.

The population of the Indian Gaur is high here at present. With no predator around, its population has increased manifold. Already, the Gaur has started climbing down to Natham Road, 20 km away, in search of forage and water during summer. Besides, the forest has large numbers of wild dog, bear and deer, says A. Kumara Menon, former Ranger of Sirumalai Hills.

Forest officials say there is no proper record of the tree wealth in Sirumalai. While environmentalists fear they are fighting a losing battle to preserve the reserve forest.

The Tamil Nadu Green Movement has filed a petition in the Madurai Bench of the Madras High Court seeking a direction to protect the Sirumalai forests. In a landmark judgment, the Bench had directed the Forest Department to identify and demarcate the forest land and forest reserve in Sirumalai and remove all encroachments within the reserve forest. With timber smugglers having laid mud roads inside the reserve forest to transport felled trees, the court also directed forest officials to close off all illegal roads and introduce an eight hour shift at a forest check post. But forest officials did not take the court directions very seriously, said S. Jayachandran, Joint Secretary, Tamil Nadu Green Movement.

Timber smuggling continues unabated. Smugglers use the permits issued for cutting trees in private patta land to fell trees in the reserve forest, says a senior forest official. Now the groundwater level has dropped and rainfall is deficient, he observes. Sirumalai is famous for its hill banana, jack fruit and lemon varieties. Sadly, the areas under cultivation are fast shrinking. In 2010, the State Government led by the DMK party had identified various sites in the state to establish five genetic heritage gardens. Sirumalai was identified for setting up the Mullai genetic garden. 500 acres of land was set aside by the government, under the control of the Horticulture Department. However, as the government changed, the proposal was suspended. It was planned to set up the Kurinji, Marudham, Neidhal and Palai genetic gardens in Chakkotai in Thanjavur, Thirukkadaiyur in Nagapattinam and Pattinamkathan village in Ramanathapuram districts. Says N. Arun Shankar, Secretary of the Palni Hill Conservation Council, 'We should realize how important the Sirumalai and Kodaikanal hills are for Dindigul for clean air that keeps the towns cool and ensure quality of life.'

Source: http://www.thehindu.com/news/national/tamil-nadu/dindiguls-forestsfall-to-mafias-axe/article4717543.ece

4. _____are the basic unit of hereditary information, transmitted from

one generation to other.

5. Species biodiversity is the variability found within the population of a species or between different species of a community. (True/False)
6. What do you mean by genetic variability?
7. Give a brief note on the biological diversity of India.
8. How did the Convention of Biological Diversity, 1992 define biodiversity?
9. What are the three levels of biodiversity?

10. What is the ethical value of biodiversity?
11. What are the two hot spots of biodiversity in India?

3.4 MODERN LIFESTYLE AND ITS IMPACT ON ENVIRONMENT

The present condition of our society is changing rapidly with new innovations in technologies and modern means of communication. Every individual is in cut throat competition and material achievement has transformed human beings to mechanical robots.

The most serious problems faced by our nation and society are as follows:

- Rapid degradation of our cultural heritage.
- Lucrative salaries cannot provide satisfaction rather it creates frustration and unhappiness.
- High status and position in society is desired by every individual and causes lack of mental peace.
- His of society like embezzlement of public fund, molestation, distortion, robbery and corruption has been labelled on population growth.
- Erosion of social, moral, cultural and political values.
- Race of competition for money, position, standards, desires.
- People are acquainted with their rights but not for their duties.
- The self-centeredness, unlimited greed, bribery, corruption, violence, distortion, frustration are the evils of modern society.
- Modernization in sense of dressing, behaving, communication, customs and tradition, living habits, diets, education and jobs, celebration of festivals and occasions have pushed the traditional values into the background and many new ideas are contending to fill the gap.
- Industrialization and advance technologies in agriculture. The change in the modern system brings new perceptions, ideologies, attitudes and behaviour that affects lifestyle.
- Adaptation of western culture and late night parties, drinking and drug abuse, legality of homosexuality are trying to disintegrate the moral values.
- Excessive growth of population directly affects the living standards of people. Basic amenities and requirement of energy resource, housing facilities, and means of transport are demanded hugely, it becomes difficult to satisfy such demands of overly populated cities which thus, leads

to crime and conflicts in urban and semi-urban areas.

- In absence of adequate means of survival in the villages and small towns, people are migrating to metropolitan and cosmopolitan cities to earn their livelihood. This creates ambiguous population growth in these cities. Since cities lack enough infrastructure to accommodate such migrants, this results in slum, beggary and crimes.

- Long working hours causes fatigue, mental pressure, anxiety, frustration and, anger among individual which affects their family. This also adversely affects
. the development and growth of their kids.

- Job opportunities and liberalism develop a concept of nuclear family in young generation. This creates a gap not only between places but also between people.

- From the point of view of culture, globalization produces two conflicting occurrences.
    - o **Standardization** of consumption behaviour, clothes and cultural products have a tendency to produce rising resemblances in the living conditions of societies.

    - o **Diversification** strives to preserve the multiple facets of society by promoting access to the diverse features of world heritage.

Globalization engenders exclusion, growth of economic and social differences, aggravation of clashes between groups of different identities, the dislocation of the societies and the dissipation of commitments to universal solidarity.

- Everyone cannot get peace as there are many obstacles in satisfying desires.

    - o In modern lifestyle the perception of man is not correct. One is not in a position to perceive things rightly and may have certain undesirable notions about self and may refuse to see reasons behind what one is doing.

    - o Selfishness and materialistic nature induces a person to act according to himself in his own interest.

    - o Circumstances are always fluctuating and these are beyond one's control. Sometimes up and down in life makes a man of different personality.

- Political Conflicts in a nation also adversely affects the lifestyle of its nationals.
- Lack of value based educational programmes. Values like truth, honesty, righteous conduct are disappearing from the families and from the school set up.

3.4.1 Modern Lifestyle: Effect on Environment

'The modern day lifestyle is detrimental to other life forms in the ecosystem. There is a great need to effect a change in the stance towards environment and life style as well,' said Dr Ayub Khan.

Most of the environmental problems of the present day are essentially man-made. The role of man is therefore, important because it is his attitude and values which shapes the environment. Environment comprises of: Physical, social, emotional and educational environment environment.

1. **Physical environment:** Global warming, green house effect, deforestation, imbalanced nature, floods, drought, heavy rains and unhygienic colonization are the main effects on environment by the modern lifestyle.
2. **Social, emotional and psychological environment:** The old-traditional way of life has vanished forever. Today only villages and some small towns remind us of this kind of life, and

as time passes, more people will choose to abandon traditional way of life and move to the 'big city'.

Modern way of life has nothing in common with the traditional one. Human habits, values, norms have changed. The most important of these social changes can be observed in human relationships, family economy, education, government, health, and religion.

In traditional societies, to begin with, there was a strong fellow-feeling; everybody was considered a friend and was expected to act this way, in case of personal or family crisis..

In addition to the change in human behaviour towards people outside his family, there is change in family life as well. The extended family used to provide all means of socialization and economic production.

3. **Educational environment:** Education has also affected the environment. Pre- industrial societies addressed education only to the elite and the rich. In modern societies, however, basic education is, open for everyone, and the number of persons achieving higher education is rising all the time. Heavy expenses and high status of international branded schools and colleges for higher education has just become a game of money and showing off stature which is disintegrating values and discipline.

3.4.2 Values and Ethics of Life

Value denotes the degree of importance of something with the aim of determining what action is best to do or live or at least attempt to describe the value of different actions. It may be described as treating actions themselves as abstract objects, putting value to them. It deals with right conduct and good life, in the sense that a highly, or at least relatively highly, valuable action may be regarded as ethically 'good' and an action of low, or at least relatively low, value may be regarded as 'bad'.

What makes an action valuable may in turn depend on the ethic values of the objects it increases, decreases or alters. An object with 'ethic value' may be termed an 'ethic or philosophic good'

Definitions

1. **Kane (1962):** 'Values are the ideals, beliefs or norms which a society or the large majority of the society's members hold'

2. **T.W. Hippie (1969):** 'Values are conscious or unconscious motivators and justifiers of the actions and judgment'

3. **Prof. C. Seshadri (1992):** 'Values refers to objects that human beings consider desirable and worthy of pursued in their thoughts, feelings and actions. These objects may be material or abstract qualities and state of mind and heart likf truthfulness, happiness, peace, justice. In any case they function as ideals ands standards and govern human actions'

4. **Urban:** 'Value is that which satisfies human desire' **Nature oValues**

- Values are standards or guidelines for an individual's life, nation and its polices
- Values are influenced by an individual's experiences, desires and specific situations.
- Values stir our life's journey.
- Values are not static.
- Values are modes of organizing conduct.

- Values possess both cognitive and affective dimensions.
- Values can be structured and restructured through process of reflective thinking. It animates an individual.
- Values energize individuals to actions.
- Values are felt sometimes partly and sometimes wholly and are influenced by emotions.
- Values are acquired subconsciously in many ways.

Types of Values

1. Personal Value

A personal value is absolute or relative. Personal values provide an internal referent for what is good, beneficial, important, useful, beautiful, desirable, constructive, etc. Values generate behavior and help solve common human problems for survival by comparative rankings of value, the results of which provide answers to questions of why people do what they do and in what order they choose to do them.

According to Morris Massey, values are formed during three significant periods:

- Imprint period from birth to 7 years.
- Modelling period from 8-13 years.
- Socialization period from 13-21 years.

2. Cultural value

Individual cultures develop values which their members broadly share. Values relate to the norms of a culture, but they are more global and abstract than norms. Norms provide rules for behaviour in specific situations, while values identify what should be judged as good or evil. While norms are standards, patterns, rules and guides of expected behavior, values are abstract concepts of what is important and worthwhile. Flying the national flag on a holiday is a norm, but it reflects the value of patriotism. Wearing dark clothing and appearing solemn are normative behaviors at a funeral. In certain cultures norms reflect the values of respect and support of friends and family. Different cultures reflect different values.

3. Intrinsic value

Intrinsic value is an ethical and philosophic property. It is the ethical or philosophic value that an object hasinitselfforforitsownsake, asan intrinsic property. An objec with intrinsic value may be regarded as an end orend-in-itself. Intrinsicism is the belief that value is a non-relational characteristic of an object. This means that an object can be valuable or not, good or bad, without reference to who it is good or bad for, and without reference to the reason it is good or bad.

4. Extrinsic value

Extrinsicism is the tendency to place major emphasis on external matters rather than on more profound realities. In terms of morals and ethics, it tends to stress the external observance of laws and precepts, with lesser concern for the ultimate principles underlying moral conduct.

5. Social value

Social values are good for the society and form the basis of the relationship of an individual with other people in society.

6. Ethical values

These values relate to our personal behaviour with our fellow beings. These may be regarded as a study under ethics, which, in turn, may be grouped as philosophy, ol the more broad (and vague) philosophic value.

Ethical value denotes something's degree importance, with the aim of determining what action or life is best to do, or at least attempt to describe the value of different actions. It may be described as treating actions themselves as abstract objects, putting value to them.

It deals with right conduct and good life, in the sense that a highly, or at least relatively highly, valuable action or may be regarded as good, and an action of low, oi at least relatively low, value may be regarded as bad.

7. Economical value

Economic value may be regarded as a result of philosophical value. The limit where a person considers to purchase something may be regarded as the point where the personal philosophic value of possessing something exceeds the persona philosophic value of what is given up in exchange for it, e.g. money. In this light, everything can be said to have a 'personal economic value' in contrast to its 'societal economic value.'

8. Aesthetic value

These are those which provide pleasure and happiness to individuals.

7.4.3 Ethics for Life

Ethics is the branch of study dealing with what is the proper course of action for man. It is the study of right and wrong in human endeavours. At a more fundamental level, it is the method by which we categorize our values and pursue them.

Ethics is a requirement for human life. It is our means of deciding a course of action. Without it, our actions would be random and aimless. There would be no way to work towards a goal because there would be no way to pick between a limitless numbers of goals. Even with an ethical standard, we may be unable to pursue our goals with the possibility of success. To the degree which a rational ethical standard is taken, we are able to correctly organize our goals and actions to accomplish our most important values. Any flaw in our ethics will reduce our ability to be successful in our endeavors.

A proper foundation of ethics requires a standard of value to which all goals and actions can be compared to. This standard is our own lives, and the happiness which makes them livable. This is our ultimate standard of value, the goal in which an ethical man must always aim. It is arrived at by an examination of man's nature, and recognizing his peculiar needs. A system of ethics must further consist of not only emergency situations, but the day-to-day choices we make constantly. It must include our relations to others, and recognize their importance not only to our physical survival, but to our well-being and happiness. It must recognize that our lives are an end in themselves, and that sacrifice is not only not necessary, but destructive.

3.4.4 Sustainable Development

Sustainable development is such a concept that signifies that the rate of consumption or the use of natural resources should be approximate to the rate at which these resources can be

substituted or replaced. It also requires that a nation or a society should be able to satisfy its requirements—social, economic and others, without undermining the interest of our future generations. Developed countries use too many natural resources and such practice cannot continue for long. Mother Nature has been making available its resources and services and it is also serving as a receptacle for absorbing wastes for too long a time. We have to realize now that nature today is very fragile. Nature is finite. And experts have warned that it has reached a critical threshold beyond which it would lead to ecological decline that would further lead to nothing but 'disaster'. These experts are strong advocates of 'limits to growth' philosophy.

This concept of sustainable development can be further extended to the principle of justice and equity (equal distribution) between the developed and underdeveloped countries of North and South. Therefore, national as well as international leaders and institutions have a major responsibility for sound developmental, economic and environmental issues. They should keep in view the principle of equity and those principles that determine the intergenerational inequities.

Another aspect of sustainable development is related to system analysis, that is to say, how economic, social and environmental systems interact at various scales of operation, to lead sustainable development that will strike optimal balance among the three subsystems. It must ultimately lead to reduced poverty in developing countries by minimizing resources depletion, environmental damage and social instability.

Thus, sustainable development should lead to:

- Protecting the environment
- Avoiding depletion of non-renewable resources
- Seek reliance on alternative sources
- Equal access to resources
- Intergenerational distribution of resources
- Systems thinking

Sustainable Global Governance

In the 1970s, it was realized that there were 'limits to growth'. If growth continued unbridled at the existing rates, it was asserted that it would exhaust the limited stock of natural resources of the earth. Although technological innovations have contributed in pushing outwards the 'limits to growth', it is now being argued that the limits must be evaluated in terms of the 'carrying capacity' of the environment. There is a consensus over the fact that growth without commensurate efforts at environmental protection will pose a global threat.

The international community has responded to this perceived threat and environmental protection and sustainable development concerns are now on a high priority of the international agenda. The last century has seen a proliferation of international legal instruments—declarations and agreements—aimed at environmental protection. Whereas declarations are more general in nature, containing a general commitment to environmental protection without being legally binding, agreements contain binding obligations for the member states and deal with specific issues relating to particular environmental problems.

On various occasions, the highest representatives of states and governments have got together in international conferences on environmental protection and development. An international structure has been put in place, which is devoted to further the objective of environmental protection. There is also talk of setting up a centralized world body—a World

Environment Organization (WEO)—to address the problems of environment. However, despite the intensified efforts at the international level, there are numerous challenges that must be met in order to allow these initiatives to be successful in their endeavour.

Various environmental problems have been identified, some related to the conservation of natural resources and ecosystems, such as forests, wildlife, biodiversity, wetlands, migratory species, etc. Issues put a question mark on how much the earth can give. Other issues relate to ensuring that we stay within the limits of the 'carrying capacity' of the environment. Issues, mostly relating to ozone depletion, global warming, hazardous wastes, persistent organic pollutants (POPs), hazardous chemicals, genetically modified organisms (GMOs), atmospheric pollution, marine pollution, etc., relate to the basic question of how much the earth can take.

Because of the diversity of environmental problems, the legal regime at the international level is necessarily fragmented, with over 200 Multilateral Environmental Agreements (MEAs) each dealing with different environmental problems.

The basic principles of environment management are increasingly being incorporated into political constitutions since the Stockholm Conference on Human Environment held in 1972. Therefore, the Stockholm Conference has taken issues such as proper use of natural reserves, environmental development as well as ecological pollution into consideration and they found expression in constitutional form. These are often articulated in terms of obligations which are stated clearly to its citizens. Moreover, a duty is often imposed on citizens to safeguard the national environment. Most of the developing countries exhibit this constitutional trend.

Equitable Use of Resources for Sustainable Lifestyle

There is a big division in the world in the use of resources, viz., north and south, more developed countries (MDCs) and less developed countries (LDCs), 'haves' and 'have nots'. It is observed that MDCs have only 22 per cent of world's population, but they use 88 per cent of natural resources, 73 per cent of energy and command 85 per cent of income; in turn, they contribute a big proportion to its pollution. On the other hand, LDCs have very low or moderate industrial growth and have 78 per cent of the world's population. They use only 12 per cent of natural resources, 27 per cent of energy and have only 15 per cent of global income. The rich have gone richer and the poor have become poorer. There is a huge gap between them. This is not sustainable growth.

The solution to this problem is to distribute wealth and resources in a more evenhanded way. An unbiased method of distribution has to have global consent. There are two major causes of non sustainability. These are as follows:

- Overpopulation in poor countries
- Overconsumption of resources by rich countries

The rich countries will have to lower their consumption levels and the minimum needs of the poor must be satisfied by providing them resources. The need of the hour is fairer sharing of resources between the rich and poor, which will bring about sustainable development for all.

Within the concept of sustainable development, industrial ecology plays a significant role in order to create a balance between industrial development and preservation of natural resources. It refers to the adoption of such industrial processes, technology, equipment and raw material where the products can be recycled after their life cycle is complete or can be put to alternative use or a byproduct can be made out of it. This not only reduces the pressure on raw

materials and compensates them for producing afresh; it also reduces the costing impact. Advanced technology also reduces wastage and is more energy efficient.

Case **Exhibit: Tackling Challenges for Sustainable Development**

The United Nations Conference on Sustainable Development will be held on June 20-22, 2012, which is commonly known as Rio+20, treating 'green economy within the context of sustainable development and poverty eradication' and 'institutional framework for sustainable development' as its two themes. Under the two themes, Rio+20 will assess the progress and implementation gaps in meeting already agreed commitments, address new and emerging challenges, and secure renewed political commitment to sustainable development.

It is known that uneven development, severe regional environmental pollution, desertification, climate change, population growth, poverty, increased demand for natural resources and energy supply are among the challenges China, India and many other developing countries are facing for sustainable development.

China is committed to pursuing sustainable development as a national strategy. As a matter of fact, sustainable development is embodied in China's traditional values. Over 2,000 years ago, the great Chinese philosophers Mencius observed that 'refraining from over fishing will ensure fishing last forever' and 'cutting wood according to the season ensure the health of forest' are the means to achieve harmony between man and nature.

China has achieved remarkable results in promoting sustainable development process and accumulated some experience. China has instituted the most stringent systems for managing farmland and water resources, and fed one fifth of the global population with less than 10 per cent of the world's farmland and only 28 per cent of the world's per capita water resources. In the past decade, China has implemented the policy of development-oriented aid to the rural poor and lifted around 70 million people out of poverty, making it the first country to meet the Millennium Development Goal. China has carried out afforestation for two decades, with coverage now reaching 620,000 square kilometers. It is also committed to the implementation of energy conservation, and increased the efforts in pollution control. Since 2005, while maintaining a robust economic growth, China has cut energy consumption per unit of GDP by 21 per cent, and emissions of major pollutants such as SO_2 and COD by 16 per cent and 14 per cent respectively. China also attaches great importance to people's livelihood and strives to promote the well-being of the people.

China cannot develop itself in isolation from the rest of the world, and global sustainability cannot be maintained without China. China has taken the initiative to promote bilateral and multilateral cooperation. It has carried out cooperation with many countries in the fields of resources, environment, disaster prevention and mitigation, and a large number of demonstration projects on sustainable development with the United Nations agencies and other international organizations.

Meanwhile, China is also providing any possible assistance to other developing countries and least developed countries in accordance with the principles of equality, mutual benefit, and emphasis on practical results, utilization of diversified forms, and the pursuit of common development. As of the end of 2010, China had offered zero tariff treatment to more than 60 per cent of the products from 38 least developed countries, provided other developing countries with 287 billion yuan (USD 46 billion) of financial assistance, and written off 30

billion yuan (USD 4.76 billion) debt of 50 heavily indebted poor countries and least developed countries.

China is in the process of rapid industrialization and urbanization and its development has many constrains. First, China is poor in natural endowment, low in per capita share of resources, and it has a fragile eco-system and disparity in regional development. Second, it is facing the dual pressures to accelerate development while restructuring the economy. China is a country that is still moving ahead on the path of development and has a huge large population, a weak economic base and feeble productivity. Measured by the newly-adjusted national poverty line, China still has 128 million poor people in rural areas. Each year, over 10 million people enter the labour market. The conflict between resources supply and demand is more prominent, the emissions of major pollutants continue to exceed the capacity of the environment. China thus faces a formidable task of growing the economy while protecting the environment. Third, economic and social structural problems are prominent in China. The industrial structure is not sound; the domestic and external demand as well as investment and consumption are not balanced; economic growth is too dependent on investment and exports; and domestic consumer demand is obviously insufficient.

China and India, as two emerging economies consisting of one-third of the population in the world, both want to eradicate poverty and achieve modernization. The Indian saying 'We produce to live, not to consume' and the ancient Chinese philosophy of 'unity between heaven and man' and 'the law of following the nature' are all examples of oriental wisdom. We look forward to the cooperation between China and India in Rio+20 to guarantee a sustainable development for both countries and other developing countries. We hope that the Rio+20 shall send a positive, clear and powerful message to reinvigorate international cooperation and inject new vitality into sustainable development.

Source: Adapted from http://www.indianexpress.com/news/tackling-challenges-for-sustainable-development/964069/0 Accessed on 20 June, 2012

3.4.5 Balance between Trade and Environmental Policy

We now discuss different aspects of globalization such as free trade and terms of trade in the context of environment. We will also discuss standards of the environment.

The recent trends in globalization of production and steep reduction in all barriers to allow free flow of trade and investment are opposed by many environmental groups all over the world. They perceive globalization as harmful to the environment for various reasons:

- Free trade is seen as a means of more output and income, which means more resource depletion and degradation of the natural environment.
- Free trade, investment and globalization of production will lead to increase in transport activity and encourage the relocation of environmentally degrading industries to countries with lower environmental standards or more fragile natural environments, and thus, contribute to further environmental damage.
- Free foreign investment reduces the incentive to develop environmentally friendlier technologies.
- The outcome of free trade may be industrial and agricultural reorganization to capture the economies of scale made possible by larger markets. This may comprise larger manufacturing plants: factories that are aesthetically unpleasing and farms that remove hedgerows and use intensive agricultural techniques.
- Free international trade overlooks the environment, which is similar to domestic free markets

that ignore environmental losses. In other words, trade liberalization can be expected to increase market failure (Pearce and Warford, 1993, pp. 299-300).

Terms of Trade and Environment

The World Commission on Environment and Development (Brundtland Commission 1987) viewed that world commodity trade frequently encourages resource depletion in the developing world:

> The proportion of increased volumes of commodity exports has led to cases of unsustainable overuse of the natural resource base. While individual cases may not fit this generalization, it has been argued that such processes have been at work in ranching for beef, fishing in both coastal and deep-sea waters, forestry, arid the growing of some cash crops. Moreover, the prices of commodity exports do not fully reflect the environmental costs to the resource base.

Further the Brundtland Commission also draws attention to the possible consequences of increases in trade to primary product exporting developing countries. The 'Brundtland hypothesis' about the link between the terms of trade and the environment is as follows (Pearce and Warford 1993, pp. 285-286):

> If the terms of trade decline, exporting countries must export more and more just to maintain foreign exchange earnings constant. In the specific case of crop exports, then, emphasis is placed on expanding acreage in order to increase exports. If the affected crops are environmentally hazardous - groundnuts or maize - soils in land that is not marginal may be directly damaged. Harm to marginal soils would be even more. Even if the crops are environmentally benign, efforts might be made to expand cultivation onto marginal lands by clearing shrub and forest land and adding to potential erosion through deforestation. The vagaries of trade and the fluctuating exchange rates are often shown to cause extensive environmental damage. Devalued currencies of many commodity exporting developing countries are shown as a major reason for increasing depletion of forests which are cleared for exports. The liberal trade in ivory during 1980s appears to have depleted almost one-third of the elephant population in Africa. Massive depletion of forests is attributed to the pressure of free trade in hardwood.

Thus, the present phase of globalization, with an emphasis on free trade, would make the world's tropical forests unsustainable, unless there are firm commitments. The growing dependence on exports seems to result often in inappropriate and environmentally damaging shift in cropping pattern. For instance, growing demands for cassava have made small farmers in Thailand to extend cassava cultivation into previously forested land. It is shown that cassava production for export is a noteworthy basis of deforestation, soil erosion and soil nutrient reduction in Thailand.

There are instances of extensive environmental destruction unleashed by the corporate culture. The denudation of forests and with that the destruction of the culture of commons is widely known. The extensive and ruthless ecological damage done to the Ogoni region in Nigeria by the multinational oil companies and the uprooting of the livelihood of its people are well documented. Perhaps, one of the notorious examples of globalization facilitating polluting and hazardous industries in the developing countries is the case of Union Carbide Pesticide factory in Bhopal, India. The Methyl Iso Cyanide (MIC) gas leak from this factory rendered several thousand people blind. This was one of the worst industrial tragedies of the last century.

3.4.6 Fundamentals of Environment and Sustainable Development

To evaluate the critical aspects of environment and development, some basic concepts need to be explained.

Population and its Implication

There are two aspects that affect environment: a) Population growth and b) economic development. The interaction between population growth, resource depletion/ environmental damage has been debated. High population growth causes stress on the environment, and there are thinkers, who feel that the blame has to be on economic development, industrial growth and unsustainable economic development are the matters of cause of concern especially in development.

It can be expressed by the following equation:

$$I \quad = \quad P \times A \times T$$

where   I   =   Impact of environment

           P =   Population

           A =   Affluence (consumption)

           T =   Technology coefficient

More people means more pressure on resources, more consumption of energy, more production of wastes including greenhouse gases - all have adverse effects on the environment. India's population has crossed the hundred crores mark. The question is whether we have devised adequate developmental programmes that can match the increase in population. If not, population factor itself would be a sufficient contribution toward degradation of environment and resource depletion.

Sustainable development is about integrational equity. But, if the future equity is of great concern, it is not legitimate to ignore the equity occurring in the present populations in different parts of the globe. Sustainability should reflect equity, environmental concerns.and social responsibilities vis-a-vis population regardless of time or location.

Limits to Growth

We will need to change attitudes, consumption patterns, manufacturing and marketing practices and get into a technological world that it is less intensive in its use of materials

and energy, to be able to manage the environmental crisis. Improvement of efficiency alone is not going to be enough. Growth has been treated as an infinite variable. This is not a correct assumption. 'Earth's carrying capacity' is not seriously thought about. And such a world has to desperately try to keep pace with the environmental problems because of such incorrect assumptions.

For example, climate change (global warming), can be combated only if the world transits to a non-carbon energy economy, only after that, the limitations of the environmental concerns posed by a carbon energy economy would reduce. The world needs an international mechanism that not only provides incentives to all nations to live within their entitled norms (amounts), but also helps to promote a rapid transition to a non-carbon energy economy.

There is considerable scope for dematerialization and de-energization without a decrease in the living standards. This will be possible only if it is promoted through changes in the fiscal system, which supports appropriate technological improvements. This can happen if the principle of sufficiency is ignored. We will need to set a level of sufficiency, i.e., this much and not beyond it.

Sufficiency will be possible only if one day the world is prepared to reach an international agreement on limits to growth and to say, that we have fixed our level of greed and no more. Global agreement is still a distant possibility.

For sustainable use of global common systems, a separate set of policies will have to be adopted. It has to be a system that provides for the establishment of equitable entitlements or property rights to provide economic incentives to those who use this environment space in a sustainable manner and disincentives to those who use it in an unsustainable manner.

The world faces an enormous challenge in the coming years.

Economy

Rate of Gross National Product (GNP) is one of the most important indicators of economic performance of any nation. Increase in GNP indicates the economic health of the country. Such an increase however, is based on high rate of consumption of natural resources, of which depletion of environmental resources is significant. Economic growth comes in conflict with issues of environmental concerns.

India had adopted the Economic Reforms Models via liberalization and globalization. There are significant advantages from this transition; however, the ecological disadvantages are required to be taken into account. Long-term ecological costs are to be taken into account. In our effort to increase the GNP, we may not like to liquidate ecological assets.

High economic growth results in high rate of extraction, transformation and utilization of non-renewable resources. It is important to also achieve good rate of regeneration of natural resources.

Economic growth cannot take place without sustaining ecological costs. Economic growth has to be environmentally sustainable. Developing countries have yet to undertake more developmental programmes and attain reasonable standards of living. Therefore, GNP must increase in these countries. Elements of resource generation and positive approach to environment have to be incorporated in developmental programmes.

Poverty

In order to properly manage environment and resources, due consideration should be given to the fact that poor people directly depend upon natural resources for their livelihood. Sustainable development must address the issue of eradication of poverty which is linked with employment for women and youth and other income generation programmes.

Human Settlement Issues

The environmental implications of urban development and rural development (slums) must be recognized. It will be necessary to give priority to the needs of urban as well as rural poor. The human settlement programme should concentrate on the following aspects:

- Providing shelter to all
- Investment in infrastructure- water, sewage and solid waste
- Promotion of sustainable energy and transport system
- Promotion of sustainable land use management

Land Resources

Land not only includes a physical entity in terms of topography, but it also includes natural resources, soil, minerals and biota. These components provide varieties of services which are essential for life support system. Land is an infinite resource. Integrated approach is necessary for the management of land.

Forests

There should be a rational approach adopted for management of forests and forest lands. Sustainable forest development, production of forest products and forest services require institutional approach at the government level.

3.4.7 Urban Problems Related to Energy

Cities are the major hubs of economic growth, trade, education, innovations and employment. Until recently, a majority of human population lived in the rural areas and their economic activities centered around agriculture, cattle rearing, fishing, hunting or cottage industry. It was some two hundred years ago with the dawn of industrial era that the cities showed rapid development. Now, almost half of the world's population resides in urban areas and there is an increasing movement of the rural folk to cities in search of employment. The urban growth is so fast that it is becoming difficult to accommodate all the industrial, commercial and residential facilities within a limited municipal boundary. As a result, there is spreading of the cities into the sub-urban or rural areas too. This phenomenon is known as urban sprawl.

In developing countries too, urban growth is very fast and in most of the cases it is uncontrollable and unplanned growth. In contrast to the rural set-up, the urban setup is densely populated, consumes a lot of energy and materials and generates a lot of waste.

The energy requirement of an urban population is much higher than that of the rural ones. This is because urban people have a higher standard of life and their lifestyle demands more energy inputs in every sphere of life. The energy demanding activities include the following:

- Residential and commercial lighting
- Transportation means including automobiles and public transport for moving from residence to workplace
- Modern lifestyle using a large number of electrical gadgets in everyday life
- Industrial plants using a big proportion of energy
- A large amount of waste generation which has to be disposed off properly using energy based techniques
- Control and prevention of air and water pollution which need energy dependent technologies

Due to high population density and high energy demanding activities, the urban problems related to energy are much more magnified as compared to rural population.

3.4.8 Water Conservation

Water being one of the most precious and indispensable resources, it needs to be conserved. The following strategies can be adopted for conservation of water.

1. **Decreasing run-off losses:** Huge water-loss occurs due to run-off on most of the soils, which can be reduced by allowing water to infiltrate into the soil. This can be achieved by using contour cultivation, terrace farming, water spreading, chemical treatment or improved water-storage system.

   • *Contour cultivation:* Small furrows and ridges across the slopes, trap rainwater and allow more time for infiltration. Terraces constructed in deep soils have large water-storage capacity. On gentle slopes trapped run off is spread over a large area for better infiltration.
   • *Conservation-bench terracing:* It involves construction of a series of benches for catching the runoff water.
   • *Water spreading:* It is done by channeling or lagoon-levelling. In channeling, the water flow is controlled by a series of diversions with vertical intervals. In lagoon-levelling, small depressions are dug in the area so that there is temporary storage water.
   • *Chemical wetting agents (Surfactants):* These seem to increase the water intake rates when added to normal irrigated soil.
   • *Surface crop residues:* Tillage, mulch, animal residues, etc., help in reducing run-offs by allowing more time for water to penetrate into the land.
   • *Chemical conditioners:* Conditioners like gypsum ($CaSO_4.2H_2O$) when applied to sodic soils improve soil permeability and reduce run off. Another useful conditioner is HPAN (hydrolyzed poyacrylonitrile).
   • *Water-storage structures:* Structures like farm ponds, dug-outs, etc., built by individual farmers can be useful measures for conserving water through reduction of run-offs.

2. **Reducing evaporation losses:** This is more relevant in humid regions. Horizontal barriers of asphalt placed below the soil surface increase water availability and increase crop yield by 35-40 per cent. This is more effective on sandy soil but less effective on loamy sand soils.

   A co-polymer of starch and acrylonitrile called 'super slumper' has been reported to absorb water up to 1400 times its weight. The chemical has been found to be useful for sandy soils.

3. **Storing water in soil:** Storage of water takes place in the soil root zone in humid regions when the soil is wetted to field capacity. By leaving the soil fallow for one season, water can be made available for the crop grown in the next season.

4. **Reducing irrigation losses:** (a) Use of lined or covered canals to reduce seepage (b) irrigation in early morning or late evening to reduce evaporation losses (c) sprinkling irrigation and drip irrigation to conserve water by 30-50 per cent (d) growing hybrid crop varieties with less water requirements and tolerance to saline water help conserve water.

5. **Reuse** of **water:** (a) Treated wastewater can be used for ferti-irrigation, (b) using grey water from washings, bath-tubs, etc., for watering gardens, washing cars or paths help in saving fresh water.

6. **Preventing wastage** of **water:** This can be done in households, commercial buildings and public places, (a) Closing taps when not in use, (b) repairing any leakage from pipes, (c) using small capacity flush in toilets.

7. **Increasing block pricing:** The consumer has to pay a proportionately higher bill with higher use of water. This helps in the economic use of water by the consumers.

Rainwater Harvesting

Rainwater harvesting is a technique of increasing the recharge of groundwater by capturing and storing rainwater. This is done by constructing special water-harvesting structures like dug wells, percolation pits, lagoons and check dams. Rainwater, wherever it falls, is captured and pollution of this water is prevented. Rainwater harvesting is not only proving useful for poor and scanty rainfall regions, but also for the rich ones.

The annual average rainfall in India is 1200 mm; however, in most places it is concentrated over the rainy season, from June to September. It is an astonishing fact that Cherapunji, the place receiving the second highest annual rainfall of 11000 mm still suffers from water scarcity. The water flows away as run-off and there is little vegetation to check the run-off and allow infiltration. Till now, there is hardly any rainwater harvesting being done in this region, thereby losing all the water that comes through rainfall.

Rainwater harvesting has the following objectives:

- To reduce run-off loss
- To avoid flooding of roads
- To meet the increasing demands of water
- To raise the water table by recharging ground water
- To reduce ground water contamination
- To supplement ground water supplies during lean seasons

Rainwater can be mainly harvested by anyone of the following methods:

- By storing in tanks or reservoirs above or below ground
- By constructing pits, dug wells, lagoons, trench or check-dams on small rivulets
- By recharging the ground water

Before adopting a rainwater harvesting system, the soil characteristics, topography, rainfall pattern and climatic conditions should be understood.

Traditional rainwater harvesting

In India, it is an old practice in high rainfall areas to collect rainwater from rooftops into storage tanks. In foot-hills, water flowing from springs is collected by embankment type water storage. In Himalayan foot-hills, people use hollow bamboos as pipelines to transport the water of natural springs. Rajasthan is known for its *'tankas'* (underground tanks) and *'Khadins'* (Embankments) for harvesting rainwater. In our ancient times, we had adequate *taalaabs, baawaris, johars, hauz,* etc., in every city, village and capital cities which were used to collect rainwater and ensure adequate water supply in dry periods.

Modern techniques of rainwater harvesting

In arid and semi-arid regions, artificial ground water recharging is done by constructing shallow percolation tanks. Check-dams made of any suitable native material (brush, rocks, plants, loose rocks, wire nets, stones, slabs, sacks, etc.) are constructed for harvesting run-off from large

catchment areas. Rajendra Singh of Rajasthan popularly known as 'waterman' has been doing a commendable job for harvesting rainwater by building check-dams in Rajasthan and he was honoured with the prestigious Magsaysay Award for his work.

Groundwater flow can be intercepted by building groundwater dams or storing water underground. As compared to surface dams, groundwater dams have several advantages like minimum evaporation loss, reduced chances of contamination, etc.

In rooftop, rainwater harvesting which is a low cost and effective technique for urban houses and buildings, the rainwater from the top of the roofs is diverted to some surface tank or pit through a delivery system which can be later used for several purposes. Also, it can be used to recharge underground aquifers by diverting the stored water to some abandoned well or by using a hand pump.

All these techniques of rainwater harvesting are low cost methods with little maintenance expenses. Rainwater harvesting helps in recharging the aquifers, improves groundwater quality by dilution, improves soil moisture and reduces soil erosion by minimizing run-off water.

Watershed Management

The land area drained by a river is known as the river basin. Watershed is defined as the land area from which water drains under gravity to a common drainage channel. Thus, watershed is a delineated area with a well-defined topographic boundary and one water outlet. The watershed can range from a few square kilometers to few thousand square kilometers in size. In the watershed, the hydrological conditions are such that water becomes concentrated within a particular location like a river or a reservoir, by which the watershed is drained.

The watershed comprises complex interactions of soil, landform, vegetation, land use activities and water. People and animals are an integral part of a watershed. They have mutual impacts on each other.

A watershed is directly involved in sustained food production, water supply for irrigation, power generation and transportation as well as for influencing sedimentation and erosion, vegetation growth, floods and droughts.

Thus, management of watersheds treating them as basic functional units is extremely important and the first Integrated Watershed Management was adopted in 1949 by the Damodar Valley Corporation.

Watershed degradation: Watersheds are very often found to be degraded due to uncontrolled, unplanned and unscientific land-use activities. Organizing, deforestation, mining, construction activities, industrialization, shifting cultivation, natural and artificial fires, soil erosion and ignorance of local people have been responsible for degradation of various watersheds.

Objectives of watershed management: Rational utilization of land and water sources for optimum production causing minimum damage to the natural resources is known as watershed management. The objectives of watershed management are as follows:

1. To rehabilitate the watershed through proper land use adopting conservation strategies for minimizing soil erosion and moisture retention so as to ensure good productivity of the land for the farmers
2. To manage the watershed for beneficial developmental activities like domestic water supply,

irrigation, and hydropower generation

3. To minimize the risks of floods, droughts and landslides
4. To develop rural areas in the region with clear plans for improving the economy of the regions

Watershed management practices: In the Fifth Five Year Plan, watershed management approach was included with a number of programmes for it and a national policy was developed. In watershed management, the aspects of development are considered with regard to availability of the resources.

The practices of conservation and development of land and water are taken up with respect to their suitability for people's benefit as well as sustainability. Various measures which are taken up for management include the following:

1. **Water harvesting:** Proper storage of water is done with provision for use in dry seasons in low rainfall areas. It also helps in moderation of floods.

2. **Afforestation and agro-forestry:** In watershed development, afforestation and crop plantation play a very important role. They help in preventing soil erosion and retention of moisture. In high rainfall areas, woody trees are grown in between crops to substantially reduce the run-offs and loss of fertile soil. In Dehradun, trees like eucalyptus, leucaena and grasses like chrysopogon are grown along with maize or wheat to achieve the objectives. Woody trees grown successfully in such agro-forestry programmes include *sheesham,* teak and *keekar* which have been used in watershed areas of river Yamuna.

3. **Mechanical measures for reducing soil erosion and run-off losses:** Several mechanical measures like terracing, bunding, bench terracing, no-till farming, contour cropping, strip cropping, etc., are used to minimize run-offs and soil erosion, particularly on the slopes of watersheds. Bunding has proved to be a very useful method in reducing run-off, peak discharge and soil loss in Dehradun and Siwaliks.

4. **Scientific mining and quarrying:** Due to improper mining, the hills lose stability and get disturbed resulting in landslides, rapid erosion, etc. Contour trenching at an interval of one meter on overburdened dump, planting some soil binding plants, land draining of water courses in the mined area are recommended for minimizing the destructive effects of mining in watershed areas.

5. **Public participation:** People's involvement including the farmers and tribals is the key to the success of any watershed management programme, particularly in the soil and water conservation. People's cooperation as well as participation has to be ensured for the same. The communities are to be motivated for protecting freshly planted areas and maintaining water harvesting structures implemented by the government or some external agency (NGO) independently or by involving the local people. Educating the people about the campaign and its benefits or sometimes, paying certain incentives to them can help in effective people's participation.

Successful watershed management has been done at Sukhomajri Panchkula, Haryana through active participation of the local people.

Watershed management in the Himalayan region is of vital importance since most of the watersheds of our country lie there. Several anthropogenic activities accelerate its slope instability which needs to be prevented and efforts should be made to project the watershed by preventing overgrazing, terracing and contour farming to check run-offs and erosion. On steeper slopes with sliding faces, straw mulching tied with thin wires and ropes helps in establishing the vegetation and stabilizing the slopes.

3.4.9 Resettlement and Rehabilitation Issues

Economic development raises the quality and standard of living of the people of a country. Developmental projects are planned to bring benefits to the society. However, in the process of development, very often, there is an overexploitation of natural resources and degradation of the environment. Besides this, quite often, the native people of the project site are directly affected. These native people are generally the poorest of the poor, the underprivileged tribal people. Various types of projects result in the displacement of the native people who undergo tremendous economic and psychological distress, as the socio-economic and ecological base of the local community is disturbed.

- **Displacement problems due to dams:** The big river valley projects have one of the most serious socio-economic impacts due to large-scale displacement of local people from their ancestral home and loss of their traditional profession or occupation. India is one of the countries in the world leading in big dam construction and in the last fifty years more than 20 million people are estimated to have directly or indirectly affected by these dams. Hirakud Dam, Bhakra Nangal Dam, Tehri Dam are the examples where many people and their villages in the vicinity benefitted. It also resulted in the Chipko Movement lead by Sunderlal Bahuguna.

- **Displacement due to mining:** Mining is another developmental activity, which causes displacement of the native people. Several thousands of hectares of land area is covered in mining operation and the native people are displaced. Sometimes, displacement of local people is due to accidents occurring in mined areas like subsidence of land that often leads to shifting people, e.g., various mines are predominant in Jharkhand, these mines had displaced many people.

- **Displacement due to creation of national park:** When some forests are covered under a national park, it is a welcome step for conservation of the natural resources. However, it also has a social aspect associated with it which is often neglected. A major portion of the forest is declared as core-area, where the entry of local dwellers or tribals is prohibited. When these villagers are deprived of their ancestral right or access to forests, they usually retaliate by some destructive activities. There is a need to look into their problems and provide them with some employment.

Rehabilitation Issues

The United Nations Universal Declaration on Human Rights has affirmed that the right to housing is the basic human right. In India, most of the displacements have resulted due to land acquisition by the government for various reasons. This is the reason that the government has brought into force the Land Acquisition Act, 1894. This Act makes it mandatory to serve notice to the people to vacate their lands if the need arises, according to government planning. Provision of cash compensation in lieu of the land vacated exists in the Act. The major issues related to displacement and rehabilitation are as follows:

- Tribals are usually the most affected amongst the displaced who are already poor. Displacement further increases their poverty due to loss of land, home, jobs, food insecurity, loss of access to common property assets, increased morbidity and mortality and social isolation.

- Break up of families is an important social issue arising due to displacement in which the women are the worst affected and they are not even given cash/land compensation.

- The tribals are not familiar with the market policies and trends. Even if they get cash compensation, they get alienated in the modern economic set-up.

- The land acquisition laws ignore the communal ownership of property, which is an inbuilt system amongst the tribals. Thus, the tribals lose their communitarian basis of economic and cultural

existence. They feel like fish out of water.

- Kinship systems, marriages, social and cultural functions, their folk-songs, dances and activities vanish with their displacement. Even when they are resettled, it is individual-based resettlement, which totally ignores communal settlement.
- Loss of identity and loss of the intimate link between the people and the environment is one of the biggest losses. The age-long indigenous knowledge, which has been inherited and experienced by them about the flora and fauna, gets lost.

Rehabilitation Policy

There is a need for a comprehensive national rehabilitation policy. Different states are following different practices in this regard.

There is a need to raise public awareness on these issues to bring the resettlement and rehabilitation plans on a humane footing and to honour the human rights of the oustees.

3.4.10 Environmental Ethics

Environmental ethics refers to the issues, principles and guidelines relating to human interactions with their environment. It is lightly said, 'The environmental crisis is an outward manifestation of the crisis of mind and spirit.' It all depends on how we think and act. If we think 'Man is all powerful and the supreme creature on this earth and man is the master of nature and can harness it at his will', it reflects our human-centric thinking. On the other hand, if we think 'Nature has provided us with all the resources for leading a beautiful life and she nourishes us like a mother, we should respect her and nurture her', this is an earth-centric thinking.

The first view urges us to march ahead gloriously to conquer the nature and establish our supremacy over nature through technological innovations, economic growth and development without much botheration about the damage done to the planet earth. The second view urges us to live on this earth as a part of it, like any other creation of Nature and live sustainably. So, we can see that our acts will follow what we think. If we want to check the environmental crisis, we will have to transform our thinking and attitude. That in turn, would transform our deeds, leading to a better environment and better future.

These two world-views are discussed here in relation to environmental protection.

Anthropocentric worldview

This view guides most industrial societies. It puts human beings at the centre giving them the highest status. Man is considered to be the most capable for managing the planet earth. The guiding principles of this view are as follows:

- Man is the planet's most important species and is in charge of the rest of the nature
- Earth has an unlimited supply of resources and it all belongs to us
- Economic growth is very good and more the growth, the better it is, because it raises our quality of life and the potential for economic growth is unlimited
- A healthy environment depends upon a healthy economy
- The success of mankind depends upon how good managers we are for deriving benefits for us from the nature

Eco-centric worldview

This is based on earth-wisdom. The basic beliefs are as follows:

- Nature exists not for human beings alone, but for all the species
- Earth's resources are limited and they do not belong only to human beings
- Economic growth is good till it encourages earth-sustaining development and discourages earth-degrading development
- Healthy economy depends upon a healthy environment
- Success of mankind depends upon how best we can cooperate with the rest of the nature while trying to use the resources of nature for our benefit

Environmental ethics can provide us the guidelines for putting our beliefs into action and help us in deciding what to do when faced with crucial situations. Some important ethical guidelines known as earth ethics or environmental ethics are as follows:

- Love and honour the earth since it nurtures life
- Keep each day sacred on earth and celebrate the turning of its seasons
- Be grateful to the plants and animals which provides food.
- Limit the number of off springs because too many people will overburden the earth
- Do not waste resources on destructive weapons
- Do not run after gains at the cost of nature rather should strive to restore its damaged majesty
- Not to conceal from others the effects that have been caused by one's actions on earth
- Not to steal from future generations, their right to live in a clean and safe planet by impoverishing or polluting it
- Consume the material goods in moderate amounts so that all may share the earth's precious treasure of resources
- Our *Vedas* also have glorified each and every component of nature as gods or goddesses so that people have a feeling of reverence for them. Our religious and cultural rituals make us perform such actions that would help in the conservation of nature and natural resources. Even the various festivals envisaged by Hinduism also prescribe the participation of humans in the celebrations through nature. (Nisarga Pooja is what we perform during celebrations of our festivals, e.g., Satyanarayana Pooja, Vatapournitma, Baishakhi, Ganesh Festival, Dusshera)

  The concept of ahimsa in Buddhism and Jainism ensure the protection and conservation of all forms of life, thereby keeping the ecological balance of the earth intact. Our teachings on 'having fewer wants' ensure to put 'limits to growth', and thus, guide us to have an ecocentric lifestyle

3.4.11 Climate Change

Climate is the average weather of an area. It is the general weather conditions, seasonal variations and extremes of weather in a region. Such conditions which average over a long period, for at least thirty years is called climate.

The Intergovernmental Panel On Climate Change (IPCC) in 1990 and 1992 published the best available evidence about past climate changes, the greenhouse effect and recent changes in global temperature. It is observed that earth's temperature has changed considerably during the geological times. It has experienced several glacial and interglacial periods. However, during the past 10,000 years of the current interglacial period, the mean average temperature has fluctuated by 0.51°C over the 100 to 200 year period. We have relatively stable climate for thousands of years due to which we have practiced agriculture and increased population. Even small changes in climatic conditions may disturb agriculture that would lead to migration of animals including humans.

Anthropogenic activities are upsetting the delicate balance that has been established between various components of the environment. Greenhouse gases have increased in the atmosphere resulting,in increase in the average global temperature.

This may upset the hydrological cycle, resulting in floods and droughts in different regions of the world, causing sea level to rise, changes in agricultural productivity, famines and death of humans as well as livestock.

Global Warming

Troposphere, the lower most layer of the atmosphere, traps heat by natural processes due to the presence of certain gases.

The average global temperature is 15°C. In the absence of greenhouse gases, this temperature would have been 18°C. Therefore, greenhouse effect contributes to a temperature rise to the tune of 33°C.

Heat trapped by greenhouse gases in the atmosphere keeps the planet warm enough to allow us and other species to exist. The two chief greenhouse gases are water vapour which is controlled by the hydrological cycle and carbon dioxide which is controlled mostly by the global carbon cycle. While the levels of water vapour in the troposphere have relatively remained constant, the levels of carbon dioxide have increased.

Other gases whose levels have increased due to human activities are methane and nitrous oxide. Deforestation has further resulted in elevated levels of carbon dioxide due to non-removal of carbon dioxide by plants through photosynthesis.

Warming or cooling by more than 2°C over the past few decades may prove to be disastrous for various ecosystems on the earth, including humans as it would alter the conditions faster than some species could adapt or migrate. Some areas will become inhabitable because of droughts or floods following rise in the average sea level.

Measures to check global warming

To slow down enhanced global warming the following steps will be important:

- Cut down the current rate of use of CFCs and fossil fuel
- Use energy more efficiently
- Shift to renewable energy resources
- Increase in nuclear power plants for electricity production
- Shift from coal to natural gas
- Trap and use methane as a fuel

- Adopt sustainable agriculture
- Stabilize population growth
- Efficiently remove carbon dioxide from smoke stacks
- Plant more trees
- Remove atmospheric carbon dioxide by utilizing photosynthetic algae

Greenhouse Gases

The phenomenon that worries the environmental scientists is that due to anthropogenic activities, there is an increase in the concentration of the greenhouse gases in the air that absorbs infra-red light containing heat and results in the re-radiation of much of the outgoing thermal infra-red energy, thereby increasing the average surface temperature beyond 15°C. The phenomenon is referred to as the enhanced greenhouse effect to distinguish its effect from the one that has been operating naturally for millennia.

The greenhouse gases include carbon dioxide, chlorofluorocarbons, methane and nitrous oxide. These are the greenhouse gases present in the troposphere which result in an increase in the temperature of air and earth.

Impacts of enhanced greenhouse effect

The enhanced greenhouse effect will not only cause global warming, but will also affect various other climatic and natural processes.

- Global temperature increase: It is estimated that the earth's mean temperature will rise between 1.5 to 5.5 °C by 2050, if inputs of greenhouse gases continues to rise at the present rate. Even at the lower value, earth would be warmer than it has been for the past 10,000 years.
- Rise in sea level: With the increase in global temperature, sea water will expand. Heating will melt the polar ice sheets and glaciers resulting in further rise in sea level. Current models indicate that an increase in the average atmospheric temperature of 3°C would raise the average global sea level by 0.2-1.5 meters over the next 50-100 years.

  One meter rise in sea level will inundate low-lying areas of cities like Shanghai, Cairo, Bangkok, Sydney, Hamburg and Venice, as well as agricultural lowlands and deltas in Egypt, Bangladesh, India and China. This will affect rice productivity. This will also disturb many commercially important spawning grounds, and would probably increase the frequency of storm damage to lagoons, estuaries and coral reefs.

  In India, the Lakshadweep Islands with a maximum height of four meters above the sea level is vulnerable. Some of the cities like Mumbai may be saved by heavy investment on embankments to prevent inundation.

  Life of millions of people who have build homes in the deltas of Ganges, the Nile, the Mekong, thp Yangtze and the Mississippi rivers will be affected, by the sea level rise.

- Effects on human, health: The global warming will lead to changes in the rainfall pattern in many areas, thereby affecting the distribution of vector-borne diseases like malaria, filariasis and elephantiasis.

  Areas which are presently free from diseases like malaria may become the breeding ground for the" vectors of such diseases. The areas likely to be affected in this manner are Ethiopia,

Kenya and Indonesia. Warmer temperature and more water stagnation will favour breeding of mosquitoes, snails and some insects, which are the vectors of such diseases.

Higher temperature ariMumidity will increase/aggravate respiratory and skin diseases.

- Effects on agricwtugefclhere are different views regarding the effect of global warming on agriculture,-It may show positive or negative effects on various types of crops in dilliNvni legions of the world. Tropical and subtropical regions will be more affected since the average temperature in these regions is already on the higher side. Even a rise of 2°C may be quite harmful to crops. Soil moisture will decrease and evapo-transpiration will increase, which may drastically affect wheat and maize production.

Increase in temperature and humidity will increase pest growth like the growth of vectors for various diseases. Pests will adapt to such changes better than the crops.

To cope up with the changing situation, drought resistant, heat resistant and pest resistant varieties of crops have to be developed.

Acid Rain

Oxides of sulphur and nitrogen that rise from industrial operations and fossil fuel combustion are the major sources of acid forming gases. Acid forming gases are oxidized over several days by which time they travel several thousand kilometers. In the atmosphere, these gases are ultimately converted into sulphuric and nitric acids. Hydrogen chloride emission forms hydrochloric acid. The end product of these acids is acidic rain.

Acid rain is only one component of acidic deposition. Acidic decomposition is the total wet acidic deposition (acid rain) and dry deposition.

Rainwater is turned acidic when its pH falls below 5.6. In fact, clean or natural rainwater has a pH of 5.6 at 20°C because of formation of carbonic acid due to the dissolution of CO_2 in water.

In the absence of rain, dry deposition of acid may occur. Acid forming gases like oxides of sulphur and nitrogen and acid aerosols get deposited on the surface of water bodies, vegetation, soil and other materials. On moist surfaces or in liquids, these acid forming gases can dissolve and form acids similar to that formed in acid rain.

Effects of acid rain

Acid rain causes a number of harmful effects below pH 5.1. The effects are visible even at pH less than 5.5.

- It causes deterioration of buildings, especially made of marble, e.g., monuments like Taj Mahal. Crystals of calcium and magnesium sulphate are formed as a result of corrosion caused by acid rain.
- It damages stone statues. Acidic rains have dissolved parts of invaluable stone statues in Greece and Italy.
- It damages metals and costings
- Aquatic life especially fish are badly affected by lake acidification
- Aquatic animals suffer from toxicity of metals such as aluminium, mercury, manganese, zinc and lead which leak from the surrounding rocks due to acid rain

- It results in reproductive failure, and killing offish
- It damages foliage and weakens trees
- It makes trees more susceptible to stresses like cold temperature, drought, etc. Many insects and fungi are more tolerant to acidic conditions, and hence, they can attack the susceptible trees and cause diseases

Control of acid rain

- Emission of SO and NO from industries and power plants should be reduced by using pollution control equipment
- Liming of lakes and soils should be done to correct the adverse effects of acid rain
- Coating of protective layer of inert polymer should be given in the interior of water pipes

3.4.12 Wasteland Reclamation

Economically unproductive lands suffering from environmental deterioration are known as wastelands. The wastelands include salt-affected lands, sandy areas, gullied areas, undulating uplands, barren hill-ridges, etc. Snow covered areas, glacial areas and areas rendered barren after *Jhum* cultivation are also included in wastelands. More than half of our country's geographical area (about 175 million ha) is estimated to be wasteland, thus indicating the seriousness of the problem for a country Uke ours which has to support one-sixth of the world's population.

Maximum wasteland areas in our country lie in Rajasthan (36 million ha) followed by Madhya Pradesh and Andhra Pradesh. In Haryana, the wastelands cover about 8.4 per cent of the total land area and most of it comprises saline, sodic or sandy land areas.

Wastelands are formed by natural processes, which include undulating uplands, snow-covered lands, coastal saline areas and sandy areas or by anthropogenic (man-made) activities leading.to eroded, saline or waterlogged lands.

Wasteland reclamation practices

Wasteland reclamation and development in our country falls under the purview of Wasteland Development Board, which works to fulfill the following objectives:

- To improve the physical structure and quality of marginal soils
- To improve the availability of good quality water for irrigating these lands
- To prevent soil erosion, flooding and landslides
- To conserve the biological resources of land for sustainable use

3.4.13 Strategies for Ensuring Environment-Friendly Business Operations

Instituting environment-friendly practices does not mean sacrificing your competitive edge. Business owners are realizing that they can make a bigger impact by changing their business policies than by changing their personal behaviour, and this has lead to a change in corporate culture over the last few years that has resulted in a notable environmental impact.

In the past, efforts to institute eco-friendly business practices were admirable, but these efforts appear negligible compared to the changes that are being made today. Minimizing the consumption of paper products and electricity are still effective ways for companies to save money and help the

environment at the same time, but many companies are stepping outside these standardized boundaries to effect big changes.

Many companies are choosing to enact organization-wide policies that take enormous effort and patience, and the results of these efforts are just filtering in. Leaving the choice in the hands of consumers often results in poor choices, but when companies choose to be careful about what they produce and how they produce it, the impact can be tremendous.

In the Great Lakes area of the United States and Canada, wind energy is becoming an increasingly viable source of power for companies of all sizes. Wind powered electricity costs only slightly more than standard electricity for the consumer, and many conscientious business owners are willing to pay the premium. For the producers of electricity, using wind power makes sense as a way to help reduce reliance on fossil fuels. Reducing dependence on one commodity allows the producers to further diversify and create a more sustainable financial future for their company. Thus, both the producers and consumers of wind powered electricity benefit from the creation of this clean, environment-friendly energy source.

Simple changes in business practices and purchasing can make an enormous impact on the environment, and the cost of the choices is usually minimal or nonexistent. Whether or not you believe that carbon emissions are the culprit behind our increasingly unstable global climate, there are simple changes that can be made that would make a big impact on the health of our planet.

For new businesses that are still finding their feet in a highly competitive market, the size of their profit margin may be more of a concern than the size of their carbon footprint.

The advent of the Internet era has enabled businesses to cut costs whilst also building an environment-friendly philosophy across the organization, however, traditional energy-saving methods should not be ignored either. Some of the easiest methods are as follows:

- **Keep travel to a minimum:** One of the biggest expenses many companies have is transporting people for meetings. A lot of valuable time is wasted 'in transit' at airports and stations and 'time', which means wastage of money. However, with Internet technology, travel can be kept to a minimum. Using VoIP software, instant messaging, and e-mail and telephone conferencing services, it is much cheaper than flying a team of executives cross-country for a one-hour meeting.

- **Use web-based technology:** Companies that have clients or other offices across the world should use web-based technology to keep costs down. Documents can be stored remotely in a secure central hub in cyberspace, with passwords enabling only authorized people to gain access. Using such a technology reduces the need to post or courier or fax any documents.

  Remote storage saves on office space, furniture and staff time. With encryption it is just as safe as physical storage.

- **Run a paperless office:** Similarly, digital storage is a cost-effective and environmentally-friendly way of managing important documents. Anything from portable USB hard-drives to large, networked storage facilities can cater for companies of all sizes, which cuts out needless paper waste.

- **When printing is unavoidable:** In case printing is unavoidable, ensure a printer is compatible with refillable ink cartridges and has a duplex printing function. Many print shops will give significant discounts on fresh cartridges in exchange for your used cartridges. And by printing on both sides of a piece of paper, you can halve the amount of paper you need to use.

- **Online marketing:** Marketing is central to the success of any business. While hard copies of marketing material will always have a place, it is important to optimize online operations. A company's website is often the first port of call for customers—so it must be informative, well presented and easy to navigate. It is required to target new customers on forums, make business listings, and most importantly, have electronic versions of information brochures—many customers prefer mailing information. Having a strong online marketing strategy will boost sales, cut costs and also save a lot of money on printing.
- **Turn off equipment:** Many companies leave their computers on stand-by overnight and at weekends, which is a massive waste of energy. Instill a company-wide policy that insists that everyone must turn their computers off if not in use. The same applies to coffee machines, heaters, etc.
- **Energy-saving light bulbs:** Energy saving light bulbs are very effective, they conserve energy and thus help the environment. They use up to 80 per cent less electricity than a standard bulb, but produce the same amount of light.

Through a combination of Internet technology and a genuine desire to make a difference, all businesses—new or otherwise—can adopt environment-friendly principles and reduce needless financial waste at the same time.

Green Funding

Green funding is a mutual fund or other investment vehicle that will only invest in those companies that are deemed socially conscious in their business dealings or directly promote environmental responsibility. A green fund can come in the form of a focused investment vehicle for companies engaged in environmentally supportive businesses, such as alternative energy, green transport, water and waste management, and sustainable living.

A green fund's strategy can be based on avoiding negative company criteria (businesses such as guns, alcohol, gambling, pornography, animal testing, etc.), choosing positive company criteria (environmental programs, energy conservation, fair trade, etc.), or a combination of both strategies.

Based on performance, it is not yet clear whether green funds and socially responsible investing can consistently create better returns for investors. However, they do represent a proactive step towards environmental consciousness, which many investors appreciate.

Socially conscious investing is on the rise, which is due largely to increased worldwide exposure to the issue, as well as increased federal funding for alternative energy and other programs.

3.4.14 Environmental Legislations

India is the first country in the world to have made provisions for the protection and conservation of environment in its constitution. On 5 June 1972, environment was first discussed as an item of international agenda in the UN Conference on Human Environment in Stockholm and thereafter, 5 June is celebrated all over the world as the World Environment Day. Soon after the conference, our country took substantive legislative steps for environmental protection. The Wildlife (Protection) Act was passed in 1972, followed by the Water (Prevention and Control of Pollution) Act, 1974, the Forest (Conservation) Act, 1980, Air (Prevention and Control of Pollution) Act, 1981 and subsequently the Environment (Protection) Act, 1986.

Constitutional Provisions

The provisions for environmental protection in the constitution were made through the forty-second amendment as follows:

Article 48 A of the constitution provides: 'The state shall endeavour to protect and improve the environment and to safeguard forests and wildlife of the country.'

Article 51A (g) provides: 'It shall be the duty of the every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures.'

Thus, our constitution includes environmental protection and conservation as one of our fundamental duties.

Some of the important Acts passed by the Government of India are discussed as follows:

1. Wildlife (Protection) Act, 1972

The major activities and provisions in the Act can be summed up as follows:

- Defines the wildlife related terminology
- Provides for the appointment of wildlife advisory board, wildlife warden, their powers, duties, etc.
- Under the Act, comprehensive listing of endangered wildlife species was done for the first time and prohibition of hunting of the endangered species was mentioned
- Protection to some endangered plants
- Provides for setting up of national parks, wildlife sanctuaries, etc.
- Provides for the constitution of central zoo authority
- There is provision for trade and commerce in some wildlife species with license for sale, possession and transfer
- Imposes a ban on the trade or commerce in scheduled animals
- Provides for legal powers to officers and punishment to offenders
- Provides for captive breeding programme for endangered species

Several conservation projects for individual endangered species like Lion (1972), Tiger (1973), Crocodile (1974) and Brown antlered Deer (1981) were stated under this Act. The Act is adopted by all states in India except J & K, which has its own Act.

Some of the major drawbacks of the Act include mild penalty to offenders, illegal wildlife trade in J & K, personal ownership certificate for animal articles like tiger and leopard skins, no coverage of foreign endangered wildlife, pitiable condition of wildlife in mobile zoos and little emphasis on protection of plant genetic resources.

2. Forest (Conservation) Act, 1980

This Act deals with the conservation of forests and related aspects. Except for J & K, the Act is adopted all over India. The Act covers under it, all types of forests including reserved forests, protected forests or any forested land irrespective of its ownership.

The outstanding aspects of the Act are as follows:

- The state government has been empowered under this Act to use the forests only for forestry purposes. If at all it wants to use it in any other way, it has to take prior approval of

the Central Government, after which it can pass orders for declaring some part of reserve forest for non-forest purposes (e.g. mining) or for clearing some naturally growing trees and replacing them by economically important trees (reforestation)

- It makes provision for conservation of all types of forests and for this purpose there is an advisory committee which recommends funding for it, to the Central Government
- Any illegal non-forest activity within a forest area can be immediately stopped under this Act

Non-forest activities include clearing of forest land for cultivation of any type of plants/crops or any other purpose (except re-afforestation). However, some construction work in the forest for wildlife or forest management is exempted from non-forest activities (e.g. fencing, making water-holes, trench, pipelines, check-posts, wireless communication, Etc.) Penalties include a fine of up to ' 500 per offence and imprisonment of up to six months.

3. Amendment in the Forest Act, 1992

- In 1992, some amendment was made in the Act which made provisions for allowing some non-forest activities in forests, without cutting trees or limited cutting with prior approval of the Central Government, These activities are the setting of transmission lines, seismic surveys, exploration, drilling and hydroelectric projects. The last activity involves large-scale destruction of forests, for which prior approval of the Centre is necessary.

- Wildlife sanctuaries, national parks, etc., are totally prohibited for any exploration or survey under this Act without prior approval of the Central Government, even if no tree-felling is involved.

- Cultivation of tea, coffee, spices, rubber and plants which are cash-crops, are included under non-forestry activity and not allowed in reserve forests.

- Even cultivation of fruit-bearing trees, oil-yielding plants or plants of medicinal value in forest area need to be first approved by the Central Government. This is because newly introduced species in the forest area may cause an imbalance in the ecology of the forest. If the species to be planted is a native species, then no prior clearance is required.

- Tusser cultivation (a type of silk-yielding insect) in forest areas by tribals as a means of their livelihood is treated as a forestry activity as long as it does not involve some specific host tree like *Asan* or *Arjun.* This is done in order to discourage monoculture practices in the forests which, are otherwise rich in biodiversity.

- Plantation of mulberry for rearing silkworm is considered a non-forest activity. The reason is the same as described earlier.

- Mining is a non-forestry activity and prior approval of the Central Government is mandatory. The Supreme Court in a case T.N. Godavarman Thirumulkpad vs. Union of India (1997) directed all on-going mining activities to be ceased immediately in any forest area of India, if it has not obtained prior approval of the Central Government.

- Removal of stones, *bajri,* boulder, etc., from riverbeds located within the forest area fall under non-forest activity.

- Any proposal sent to the Central Government for non-forest activity must have a cost-benefit analysis and Environmental Impact Statement (EIS) of the proposed activity with reference to its ecological and socio-economic impacts.

Thus, the Forests (Conservation) Act has made ample provisions for conservation and protection of forests and preventing deforestation.

4. Water (Prevention and Control of Pollution) Act, 1974

It provides for the maintenance and restoration of the wholesomeness of water by the prevention and control of its pollution. Pollution is referred to as the contamination of water, or a change of the physical, chemical or biological properties of water, or such discharge that can probably result in a trouble or cause the water to be detrimental or injurious to public health and safety or dangerous for any other use or for marine plants and other life forms or animal life.

The way in which water pollution has been defined, has thus covered all likely agents in water that can probably cause any harm or have a potential to harm any kind of life form in any way.

The main highlights and provisions of the Act can be summarized as follows:

- It provides for maintenance and restoration of the quality of all types of surface and groundwater
- It provides for the establishment of Central and State Boards for pollution control
- It confers them with powers and functions to control pollution. The Central and State Pollution Control Boards are widely represented and are given comprehensive powers to advise, coordinate and provide technical assistance for prevention and control of pollution of water
- The Act provides for funds, budgets, accounts and audit of the Central and State Pollution Control Boards
- The Act also provides for a variety of penalties for the defaulters and procedure for the same

The most important regulatory associations are the Pollution Control Boards that have been assigned different types of duties and powers.

5. Central Pollution Control Board (CPCB)

The board is supposed to:

- Advise the Central Government in matters related to the prevention and control of water pollution
- Coordinate the activities of State Pollution Control Boards and provides them technical assistance and guidance
- Organize training programmes to prevent and contain pollution
- Set up wide-ranging programmes on pollution-related issues, through mass media.
- Collate, compose and publish scientific and informative statistics related to pollution
- Prepare manuals for treatment and dumping of sewage and trade waste matter
- Dictate norms for water quality parameters
- Design countrywide programmes for prevention, control or abatement oj pollution
- Set up and identify laboratories for examination of water, sewage or trade wastt matter samples

The State Pollution Control Boards also have similar functions to be executed at the state level and are governed by the directions of CPCB.

- The board gives recommendations to the state government, in terms of the location of any industry that is likely to contaminate a stream or a well.
- It lays down standards for effluents and is empowered to take samples from any stream,

well or trade effluent or sewage passing through an industry.

- The State Board is empowered to take legal samples of trade effluent in accordance with the procedure laid down in the Act. The sample taken in the presence of the occupier or his agent is divided into two parts, sealed, signed by both the parties and sent for analysis to some recognized lab. If the samples do not conform to the prescribed water quality standards (crossing maximum permissible limits), then 'consent' is refused to the unit.

- Every industry has to obtain consent from the Board (granted for a fixed duration^ by applying on a prescribed proforma providing all technical details, along with a prescribed fee, following which analysis of the effluent is carried out.

- The Board suggests efficient methods of utilization, treatment and disposal oi trade effluents.

The Act has made detailed provisions regarding the power of the Boards to obtain information, take trade samples, restrict new outlets, restrict expansion, enter and inspect the units and sanction or refuse consent to the industry after effluent analysis.

While development is necessary, it is all the more important to prevent pollution which can jeopardize the lives of people. Installation and proper functioning of effluenl treatment plants in all polluting industries is a must for checking the pollution of watei and land. Despite certain weaknesses in the Act, the Water Act has ample provisions for preventing and controlling water pollution through legal measures.

Penalties include a fine of up to '5000 a day for first offence and/or imprisonment from one to six years. On repeated offence, the penalty goes up to ' 10000 a day and/ or imprisonment from one to six years.

6. The Air (Prevention and Control of Pollution) Act, 1981

The salient features of the act are as follows:

- It provides for prevention control and abatement of air pollution.

- Air pollution refers to the existence of any solid, liquid or gaseous substance (inclusive of noise) in the atmosphere in a proportion that is likely to be harmful to human beings or any other living creatures or plants, or property or environment.

- Noise pollution has been inserted as pollution in the Act in 1987.

- Pollution control boards at the central or state level have the regulatory authority to implement the Air Act. Just parallel to the functions related to the Water (Prevention and control of pollution) Act, the boards perform similar functions related to the improvement of air quality.

  The boards have to check whether or not the industry strictly follows the norms or standards laid down by the board under Section 17 regarding the discharge of emission of any air pollutant. Based upon analysis report, consent is granted or refused to the industry.

- Just like the Water Act, the Air Act has provisions for defining the constitution, power and function of pollution control boards, funds, accounts, audit, penalties and procedures.

- Section 20 of the Act has provision for insuring emission standards for automobiles. Based upon it, the state government is empowered to issue instructions to the authorities in charge of registration of motor vehicles (under Motor Vehicle Act, 1939) that is bound to comply with such instructions.

- As per section 19, in consultation with the state pollution control board, the state government may declare an area within the state as 'Air Pollution Control Area' and can prohibit the use of any fuel other than the approved fuel in the area causing air pollution. No person shall without prior consent of the State Board operate or establish any industrial unit in the 'Air Pollution Control Area'.

The Water and Air Acts have also made special provisions for appeals. Under Section 28 of the Water Act and Section 31 of the Air Act, a provision for appeals has been made. An appellate authority consisting of a single person or three persons appointed by the head of the state, the Governor is constituted to hear such appeals as filed by some aggrieved parties due to some order made by the state board within thirty days of passing the orders.

The appellate authority, after giving the appellant and the state board, an opportunity of being heard, disposes off the appeal as expeditiously as possible.

Penalties include a fine of up to ? 5000 a day and/or imprisonment for up to one and a half to six years for first offence and fine of ^ 10000 a day and imprisonment of one and a half to six years.

7. The Environment (Protection) Act, 1986

The Act came into force on 19 November, 1986. The Act is applicable throughout India. A few of the terms related to environment have been described as follows in the Act:

- Environment comprises water, air and land and the interrelationship that exist among and between them and human beings, all other living organisms and property.
- Environmental pollution is referred to the existence of any solid, liquid or gaseous matter in such quantity that can be, or has a tendency to be harmful to the environment.
- Hazardous substance can be defined as any material or preparation which can be detrimental to human beings or other life forms, or property, or the environment, through its physico-chemical properties or usage.

This Act has empowered the Central Government in such a way that it has the authority to take appropriate action for the protection and improvement of the environment, while the state government has the power to manage the actions. The most important function of Central Government under this act includes setting up of:

- The standards of quality of air, water or soil for a variety of regions and objectives.
- The most permissible levels of intensity of different types of environmental pollutants for different areas.
- The procedures and safeguards for the handling of hazardous substances.
- The prohibition and restrictions on the handling of hazardous substances in different areas.
- The prohibition and restriction on the location of the industries and to carry on processes and operations in different areas.
- The procedures and safeguards for the prevention of accidents which may cause environmental pollution and providing for remedial measures for such accidents.

The power of entry and inspection, power to take samples, etc., under this Act lies with the Central Government or any officer empowered by it.

For the purpose of protecting and improving the quality of the environment and preventing and abating pollution, standards have been specified under Schedule I-IV of Environment (Protection)

Rules, 1986, for emission of gaseous pollutants and discharge of effluents/waste water from industries.

These standard vary from industry to industry and also vary with the medium into which the effluent is discharged or the area of emission.

3.4.15 Enforcement of Environmental Legislation: Major Issues

We have seen that there are a number of important environmental laws in the form of Acts for safeguarding our environmental quality. But in spite of these acts, we find that we are not able to achieve the target of bringing 33 per cent of our land cover under forests. Still we are losing our wildlife. The rivers have been turned into open sewers in many places and the air in our big cities is badly polluted. The status of our environment shows that there are drawbacks in environmental legislations and problems in their effective implementation.

Public Environmental Awareness

Public awareness about environment is at the stage of infancy. Of late, some awareness has taken place related to environmental degradation, pollution, etc., but incomplete knowledge and ignorance about many aspects has often led to misconceptions.

Development has paved the path for rise in the levels or standards of living, but it has simultaneously led to serious environmental disasters. Issues related to environment have been often branded as antidevelopment. The wisdom lies in maintaining a balance between our needs and supplies so that the delicate ecological balance is not disrupted.

Some of the main reasons responsible for widespread environmental ignorance can be detailed as follows:

1. Our courses in science, technology, economics, etc., have so far failed to integrate the knowledge in environmental aspects as an essential component of the curriculum.
2. Our planners, decision-makers, politicians and administrators have not been trained so. as to consider the environmental aspects associated with their plans.
3. In a zeal to go ahead with some ambitious development projects, quite often, there is a purposeful concealment of information about environmental aspects.
4. There is greater consideration of economic gains and issues related to eliminating poverty by providing employment that overshadows the basic environmental issues.

Methods to Propagate Environmental Awareness

There is immense need for environmental awareness. It is to be fashioned with the help of formal and informal education to all sections of the society. It is important that everyone is aware of it because 'environment belongs to everyone' and 'every single person matters' where the environment is to be conserved or protected.

People can be made aware of the environmental issues through different steps and techniques to be used in different parts of the society, as follows:

1. **Education can be used in the case of students**

Environment education should begin for students in their childhood. These studies are now being incorporated at all stages in schools and colleges as per the orders of the Supreme Court.

2. **Masses can be environmentally educated through mass-media**

   The role of media in educating masses via articles, rallies, campaigns, street plays and TV serials is critical. This will simultaneously attract people of every age group.

3. **Among the planners, decision-makers and leaders**

   It is very important that these groups of people are essentially oriented and trained through specifically planned workshops and training programmes.

Role of Non-government Organizations (NGOs)

The Chipko Movement for conservation of trees by Dasholi Gram Swarajya Mandal in Gopeshwar or the Narmada Bachao Andolan organized by Kalpvariksh, are a few of the prominent movements, where NGOs have been significantly active in the society for the conservation of environment.

The Bombay Natural History Society (BNHS), the World Wide Fund for Nature-India (WWF-India), Kerala Sastra Sahitya Parishad, Center for Science and Environment (CSE) and many others are playing a significant role in creating environmental awareness through research as well as extension work. The recent report by CSE on more than permissible limits of pesticides in the cola drinks sensitized the people all over the country.

Before we all take up the task of environmental protection and conservation, we have to be environmentally educated and aware. It can therefore said, 'If you want to act green, first think green.'

Integration of Trade and Environmental Policy

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 industrialization and urbanization, 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, untreated sewerage, industrial effluents, lack of proper solid waste and hazardous waste disposal are threatening our health and environment as never before.

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 urbanization, poor sanitation infrastructure, -unregulated industrialization, deforestation, etc. For example, the construction of large dams, hydropower schemes, diversion canals and vast irrigation systems have caused ecological disturbances in the river ecosystems of these countries. These systems are poisoned by industrial effluents and agricultural runoffs. 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.

Integrated Rural Development Programme

The World Bank defines Rural Development as 'improving the living standards of the masses of the low income population residing in rural areas making the process of rural development sustainable'. Mahatma Gandhi had declared that political emancipation had no meaning unless it lifted the people from poverty and ignorance. He enunciated a 13-point programme of rural development involving basic education, village industries, Khadi and other minimum requirements of the rural areas to improve the quality of life there.

After independence, the national government adopted these ideas to launch a planned rural development programme. The Integrated Rural Development Programme was initiated in 1977 to generate employment among the rural population as single largest anti-poverty programme for direct assistance by the government to the rural people. Its aims included:

- Development of production potential of each area and utilization and upgrading of available human skills
- Development of cottage, poultry, fishery, forestry and cottage industries to raise the living standards of the poor villagers

In addition, several other programmes were initiated in different Five Year Plans to promote rural development. They include industrialization of the backward areas, intensive development of agriculture, extension of irrigation, development of roads and road transport, provision for universal education, improvements in conditions of living and water supply, planning for tribal development, etc. Several developmental programmes were also initiated for drought prone and flood prone areas.

The following developmental initiatives by the government deserve special mention:

1. Area specific programmes

Integrated Area Development Programme (IADP), Whole Villages Development Programme (WVDP), CommandArea Development Programme (CAD), Drought Prone Area Programme (DPAP) and Desert Development Programme **(DDP).**

2. Target group specific programmes

Small Farmers Development Agency (SFDA), Marginal Farmers and Landless Agency (MFLA), Antyodaya, and Integrated Tribal Development Project (ITDP).

3. Employment programmes

Crash Scheme for Rural Employment (CSRE), Food For Works Programme (FFWP), Pilot Intensive Rural Employment Programme.

4. Development of agro-industries

In the First Five Year Plan, the agriculture development and village industries were taken up as the twin development issues. It was visualized that increased agricultural produce will raise farmers'

incomes and opportunities for processing raw materials through village cottage industries. The planning commission covered, among others, these village industries for development: khadi, coir, oil, fisheries, sericulture, forests, dairying, leather, hand-made paper and horticulture. The subsequent plans also stressed the role of the agriculture-based village industries. The objectives were:

- To create immediate and long-term employment on a large scale at a relatively small capital cost
- To meet a substantial part of increased demand for goods by the large-scale industries and its integration with the small-scale industries
- To facilitate mobilization of resources of capital and skill
- These policies are now better appreciated because the products of village and craft industries have gradually found markets even among the urban elite.

5. Employment programmes

Pilot Intensive Rural Employment Programme (PIREP), National Rural Employment Programme (NREP), Rural Landless Employment Guarantee Programme (RLEGP), Jawahar Rojgar Yojana (JRY) and Training for Rural Youth for Self Employment (TRYSEM).

6. Social welfare programmes

National Adult Education Programme (NAEP), Minimum Needs Programme (MNP), Applied Nutritional Programme (ANP) and Integrated Child Development Project (ICDP).

CHECK YOUR PROGRESS

12. What are the two aspects that effect environment?
13. What are the strategies that can be adopted to conserve water?
14. What is acid rain?
15. What are the measures to be taken to slow down global warming?
16. What are the various stages and methods that can be used for raising environmental awareness among the different sections of the society?
17. A _____ compares the estimated costs of a project with the benefits that will be achieved.

ACTIVITY

Enlist some successful family planning schemes initiated by the Indian Government.

DID YOU KNOW

The UN climate conference in Doha, agreed to a treaty which restricts the emission of greenhouse gas of some developed countries and reinforced its earlier decision to adopt a new global climate pact by 2015.

3.5 SUMMARY

In this unit, you have learnt that:

- The rapid and excessive increase in population affects the quality of life.
- The increase in the size of family decreases the quality of food, health, education, employment and environment.
- Poverty, illiteracy, physical, social, health environments, and young generation are the factors on which quality of life is dependent.
- Apattern which sets limit for any community's fertility behaviour is called norms.
- Family size affects physical growth, mortality, economy, cultural and social development of family.
- A small family has many advantages for the health and development of children as well as for the development of community and nation.
- There are various ways and devices for controlling the birth and regulate the number and spacing of human births.
- Physical, chemical and mechanical methods are used in family planning programmes.
- Biodiversity refers to the assortment and variability among all groups of living organisms and the ecosystem complexes in which they occur. The enormous variability in the flora and fauna in India is due to the different climatic conditions and topography of the country.
- India ranks tenth among the plant rich countries and eleventh in terms of the number of endemic species of higher vertebrates. Also, India is one of the twelve mega-diversity countries in the world. The loss of natural habitat and poaching are the major threats to biodiversity. There are two approaches to conservation of biodiversity, in-situ conservation and ex-situ conservation.
- Genetic biodiversity is the basic source of biodiversity. Genes found in organisms can form enormous number of combinations, each of which gives rise to some variability. Genes are the basic units of hereditary information, transmitted from one generation to other. When the genes within the same species show different versions, due to new combinations, it is called genetic variability.
- Species biodiversity is the variability found within the population of a species or between different species of a community. It represents broadly the species richness and their abundance in a community.
- Ecosystem biodiversity is the diversity of ecological complexity showing variations in ecological niches, tropic structure, food webs, nutrient cycling, etc. Ecosystems also show variations with respect to physical parameters like moisture, temperature, altitude and precipitation. Thus, there occurs tremendous diversity within the ecosystems, along these gradients.
- Biodiversity in terms of its commercial utility, ecological service, social and aesthetic value has enormous importance. We are benefited by other organisms in innumerable ways. Sometimes, we come to know and appreciate the value of an organism only after it is lost from this earth. Very small, insignificant, useless looking organism may play a crucial role in the ecological balance of the ecosystem or may be a potential source of some invaluable drug for dreaded diseases like cancer or AIDS.
- Every country is characterized by its own biodiversity depending mainly on its climate. India has a rich biological diversity of flora and fauna. Overall, 6 per cent of the global species are found in India. It is estimated that India ranks tenth among the plant rich countries of

the world, eleventh in terms of the number of endemic species of higher vertebrates and sixth among the centres of diversity and origin of agricultural crops.

- India is one of the twelve mega-diversity countries in the world. The Ministry of Environment and Forests, Government of India (2000) records 47,000 species of plants and 81,000 species of animals which is about 7 per cent and 6.5 per cent respectively of global flora and fauna. These major groups of species include endemism, centre of origin, marine diversity, etc.

- Areas which exhibit high species richness as well as high species endemism are termed as hot spots of biodiversity. Species which are restricted only to particular areas are known as endemic. India shows a good number of endemic species. About 62 per cent of amphibians and 50 per cent of lizards are endemic to India. Western Ghats are the site of maximum endemism.

- The United Nations Conference on Environment and Development at Rio in 1992 put biological diversity on the international agenda by signing the Convention on Biological Diversity (CBD). This convention addresses many issues ranging from forests, agriculture to Intellectual Property Rights (IPRs).

- Extinction or elimination of a species is a natural process of evolution. In the geologic period, earth has experienced mass extinctions. During evolution, species have died and have been replaced by others. However, the rate of loss of species in the geologic past has been a slow process, keeping in view the vast span of time going back to 444 million years. The process of extinction has become particularly fast in the recent years of civilization.

- Sustainable development is a concept that signifies that the rate of consumption or the use of natural resources should be approximate to the rate at which these resources can be substituted or replaced. It requires what a nation or society should be able to satisfy its requirements-social, economic and others-without undermining the interest of our future generations.

- The fundamentals of environment and sustainable development are population and its implications. There are two aspects that effect environment: population growth and economic development. Human settlement areas, land resources and forest developments are some issues which need sustainable development.

- There are urban problems related to energy, as the energy requirement of an urban population is much higher than that of the rural ones. Similarly, water being one of the most precious and indispensable resources, it needs to be conserved. Rainwater harvesting is a technique of increasing the recharge of ground water by capturing and storing rainwater.

- Watershed is directly involved in sustained food production, water supply for irrigation, power generation, and transportation as well as for influencing sedimentation and erosion, floods and droughts. Thus, management of watersheds by treating them as basic functional unit is extremely important.

- Change in climate may upset the hydrological cycle resulting in floods and droughts in different regions of the world, sea level rise, changes in agricultural productivity, famines and death of humans.

- Troposphere, the lower most layer of the atmosphere traps heat by natural process due to the presence of certain gases. This effect is greenhouse effect and it is similar to warming effect.

- There is great necessity for environmental awareness; it is to be inculcated by providing formal and informal education to every section of the society.

3.6 KEY TERMS

- **Biodiversity:** .Refers to the variety and variability among all groups of living organisms **and** the ecosystem complexes in which they occur.
- **EcosygJpffiMQdiversity:** The diversity of ecological complexity showing variatiQiJ&jfl e^plogical niches, tropic structure, food webs, nutrient cycling, etc.
- **Genetic biodiversity:** The basic source of biodiversity born of the genes found in organisms that can form enormous number of combinations, each of which gives rise to some variability.
- **Species biodiversity:** The variability found within the population of a species or between different species of a community; represents broadly the species, richness and their abundance in a community.
- **In-situ conservation:** Means to conserve the biodiversity within the habitat and on site.
- **Ex-situ conservation:** Means off-site protection of biodiversity, i.e., the process of protecting an endangered species of plant or animal by removing it from an unsafe or threatened habitat and placing it under human care.
- **Hot spots:** The areas which exhibit high species richness as well as high species Endemism.
- **Anthropocentric world view:** This view guides most industrial societies and puts human beings at the centre giving them the highest status.
- **Climate:** The average weather of an area; the general weather conditions, seasonal variations and extremes of weather in a region.
- **Environmental ethics:** indicates the issues, principles and guidelines related to the interactivity of humans with their environment.
- **Global warming:** The process wherein troposphere, the lower most layer of the atmosphere, traps heat by natural processes due to the presence of certain gases leading to the warming effect observed in the horticultural greenhouse made of glass.
- **Rainwater harvesting:** A technique of increasing the recharge of groundwater by capturing and storing rainwater done by constructing special water-harvesting structures like dug wells, percolation pits, lagoons and check dams.
- **Watershed:** The land area from which water drains under gravity to a common drainage channel, i.e., a delineated area with a well-defined topographic boundary and one water outlet.
- **Sustainable development:** A concept that signifies that the rate of consumption or the use of natural resources should be approximate to the rate at which these resources can be substituted or replaced.
- **Cost-benefit analysis:** Compares the estimated costs of a project with the benefits that will be achieved.
- **Green funding:** A mutual fund or other investment vehicle that will only invest in those companies that are deemed socially conscious in their business dealings or directly promote environmental responsibility.
- **Watershed:** The land area from which water drains under gravity to a common drainage channel.

ANSWERS TO 'CHECK YOUR PROGRESS'
1. Explosive growth in human population causes a number of serious problems like food-scarcity, overcrowding, poverty, increasing consumption, stress on common social facilities, encroachment on monuments, and stress on civic services.

2. Overpopulation, unequal distribution of resources, inability to meet the cost of living, inadequate education and employment, degradation of environment, demographic trends and welfare incentives are primary causes of poverty.

3. (i) Increased

(ii) Slash and burn cultivation (iii) Ecology

4. Genes

5. True

6. When the genes within the same species show different versions, due to new combinations, it is called genetic variability. For example, all rice varieties belong to the species Oryza sativa, but there are thousands of wild and cultivated varieties of rice which show variations at the genetic level and differ in their colour, size, shape, aroma and nutrient content of the grain.

7. Every country is characterized by its own biodiversity depending mainly on its climate. India has a rich biological diversity of flora and fauna. Overall, 6 per cent of the global species are found in India. It is estimated that India ranks tenth among the plant rich countries of the world, eleventh in terms of the number of endemic species of higher vertebrates and sixth among the centres of diversity and origin of agricultural crops.

8. In the Convention of Biological Diversity, 1992, biodiversity has been defined as the variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part of.

9. Biodiversity means the variety and variability of all living organisms. Biodiversity constitutes the biological wealth. Biodiversity is at three levels genetic diversity, species diversity and ecosystem diversity.

10. It is also sometimes known as existence value. It involves ethical issues like 'all life must be preserved'. It is based on the concept of 'live and let live'. If we want our human race to survive, then we must protect all biodiversity, because biodiversity is valuable.

11. There are twenty-five such hot spots of biodiversity on a global level, out of which two are present in India, namely the Eastern Himalayas and the Western Ghats.

12. There are two aspects that affect environment:

    (a) Population growth
    (b) economic development.

The interaction between population growth, resource depletion/environmental damage has been debated. High population growth causes stress on the environment, and there are thinkers, who feel that the blame has to be on economic development, industrial growth and unsustainable economic development are the matters of cause of concern especially in development.

13. The following strategies can be adopted for conservation of water:

• Decreasing run-off losses: Huge water-loss occurs due to run-off on most of the soils, which can be reduced by allowing most of the water to infiltrate into the soil. This can be achieved by using contour cultivation, terrace farming, water spreading, chemical treatment or improved water-storage system.

- Contour cultivation: Small furrows and ridges across the slopes, trap rainwater and allow more time for infiltration. Terraces constructed in deep soils have large water-storage capacity. On gentle slopes trapped run off is spread over a large area for better infiltration.
- Conservation-bench terracing: It involves construction of a series of benches for catching the run-off water.
- Water spreading is done by channeling or lagoon-leveling. In channeling, the water flow is controlled by a series of diversions with vertical intervals. In lagoon-levelling, small depressions are dug in the area so that there is temporary storage water.
- Chemical wetting agents (Surfactants): These seem to increase the water intake rates when added to normal irrigated soil.
- Surface crop residues, tillage, mulch, animal residues, etc., help in reducing run-offs by allowing more time for water to penetrate into the land.
- Chemical conditioners like gypsum (CaS04.2H20) when applied to sodic soils improve soil permeability and reduce run off. Another useful conditioner is HPAN (hydrolyzed poyacrylonitrile).
- Water-storage structures like farm ponds, dug-outs, etc., built by individual farmers can be useful measures for conserving water through reduction of run-offs.

14. Oxides of sulphur and nitrogen that emanate from industrial processes and burning of fossil fuel are the main sources of acid forming gases. Acid forming gases undergo oxidation for more than several days. During this period, they travel several thousand kilometers. In the atmosphere, these gases are finally transformed into sulphuric and nitric acids. Hydrogen chloride emission forms hydrochloric acid. The end product of these acids is acidic rain.

15. To slow down enhanced global warming the following steps will be important:

- Cut down the current rate of use of CFCs and fossil fuel
- Use energy more efficiently
- Shift to renewable energy resources
- Increase in nuclear power plants for electricity production
- Shift from coal to natural gas
- Trap and use methane as a fuel
- Adopt sustainable agriculture
- Stabilize population growth
- Efficiently remove carbon dioxide from smoke stacks
- Plant more trees
- Remove atmospheric carbon dioxide by utilizing photosynthetic algae

16. Various sections of the society can be made environmentally aware through a variety of stages and methods. These are as follows:

(i) By educating students: This kind of education should be provided to students right from their early years. Environmental studies are now being made part of the syllabus in every level of school and college education,* as per the directives of the Supreme Court.

(ii) Mass-media can make the masses environmentally aware: Media has a key role to play in the education of masses, with the help of articles, rallies, campaigns, street plays, TV serials, etc. This will appeal all age groups at the same time, (iii) Among the planners, decision-makers and leaders: It is very important to give these classes of people necessary orientation and training through specially organized workshops and training programmes.

17. Cost-benefit analysis.

3.8 QUESTIONS AND EXERCISES

Short-Answer Questions

1. Define the following:

   (i) Quality of life

   (ii) Mortality

   (iii) Norm

   (iv) Psychological views of quality of life

2. ' Small family affects the man, family and country.' Highlight the statement by showing the effects of small family norms.
3. Define the concept of quality of life. How it is related to population and its growth.
4. Define biodiversity.
5. Explain genetic, species and ecosystem diversity.
6. What are the major threats to biodiversity?
7. What are hot spots of biodiversity? Which are the hot spots found in India?
8. Discuss their salient features.
9. What do you understand by sustainable development? What are the major measures to attain sustainability?

10. Why is urban requirement of energy more than that of the rural requirement?
11. State the measures to conserve water.
12. What is rainwater harvesting? What are the purposes served by it?
13. What is a watershed? Critically discuss the objectives and practices of watershed management.

Long-Answer Questions

1. Explain the affect of family size on the basic human needs.
2. Discuss the various aspects of the 'quality of life'.
3. Describe the basic elements of the relation between population and quality of life.
4. Elaborate the advantages of the concept of small family norms.
5. What do you mean by consumptive use value, productive use value, social value, ethical value and option value of biodiversity?
6. What are the main causes of man-wildlife conflicts? Discuss the remedial steps that can curb the conflicts.

7. What is meant by in-situ and ex-situ conservation of biodiversity?

8. What do you understand by 'environmental refugees' or 'oustees'? What are the major causes for displacement of native tribal people? Discuss with examples.

9. What are the major issues and problems related to rehabilitation of the displaced tribals? Discuss with examples.

10. What are greenhouse gases and greenhouse effect? How do they contribute to the global warming?

11. Discuss the maj or implications of enhanced global warming.

12. Write an essay on acid rain.

13. Discuss the various measures for wasteland reclamation.

14. Discuss the salient features of various environmental legislations.

15. Write notes on various authorities established by various laws for prevention and control of environmental pollution.

3.9 FURTHER READING

Bell, D.; *The Coming of Past Industrial Society,* Arnold Heinman Publication, New Delhi, 1974.

Bhatia, S.C (ed).; *Papers in Environmental Education,* IUACE, New Delhi, 1984.

Carson,R.; *The Silent Spring,* Fewcett Publication, Greenwich, 1962.

Chakraborty, S.C. (ed); *Value Orientation and Environmental Education,* Vivekananda Nidhi, Calcutta, 1982.

Grassland, R.W, &Moor, S.F.D.; *Environmental Studies Project. An Evaluation Report,* Macmillan, London, 1974.

Sharma, R.A.; *Environmental Education,* Surya Publication, Meerut, 1998.

UNIT 4   RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL EDUCATION

Structure

4.0 INTRODUCTION

Several areas of research have emerged in the field of environmental education. Various governmental and non-governmental organizations have contributed in several ways to the development, training and research in environmental education.

In this unit, you will learn about UNESCO-UNEP Environmental Education Programmes, the role of UGQuniversities, NCERT, SIE and NGOs in research and development and the emerging areas of research in environmental education.

4.1 UNIT OBJECTIVES

After going through this unit, you will be able to;

- Explain the environmental educational programmes launched by UNESCO-UNEP

- Describe the role played by UGC, NCERT and NGO's for environmental education

- Analyse the emerging areas of research in environmental education

- Explain the concept of research and its methods

- List the environmental projects and programmes carried out by different agencies

4.2 UNESCO-UNEP ENVIRONMENTAL EDUCATION PROGRAMMES

The UNESCO-UNEP International Congress on Environmental Education and Training, held in Moscow, USSR, 17-21 August 1987, and attended by more than 300 specialists from 100 countries, prepared a document outlining the international strategy for research and development in the field of environmental education. In 1975, in accordance with the recommendations of the United Nations Conference on the Human Environment (Stockholm, 1972), UNESCO and the United Nations Environmental Programme (UNEP) launched the International Environmental Education Programme (IEEP). In

1977 the Intergovernmental Conference on Environmental Education (Tbilisi, USSR), recognized that there was a strong need in all countries for international cooperation in this field, which required UNESCO and UNEP to carry on their attempts to advance the development of environmental education within the international community.

Environmental education (EE) is incorporated as one of the main objectives of UNESCO's Medium-Term Plan for 1977-1982, which was approved by the UNESCO General Conference at its 19th session (Nairobi, 1976). The Tbilisi Conference believed that EE should be made an important part of the entire educational process and aimed at every class of the population: (i) the general public and non-specialists (ii) scientists and technicians and several others.

The results of the action taken under the UNESCO-UNEP International Environmental Education Programme (IEEP) may be appreciated in three areas.

- Firstly, the efforts of UNESCO-UNEP environmental education programme have created extensive awareness of the need for environmental education.

- Secondly, it assisted in the formulation of concepts and the working out of methodological approaches in this field, which was the main task during the period 1978-1980.

- Thirdly, it facilitated in the incorporation of an environmental dimension in the educational processes of the member countries.

Some of the programmes launched by UNESCO are Man and Biosphere Programme (MAB), the International Hydrological Programme (IHP), the International Geological Correlation Programme (IGCP) and the programmes relating to the marine sciences. IEEP's contribution has taken particular shape concerning the studies and the organization of seminars, research and experimental projects, as a result of which UNESCO has clearly stated that environmental education should become an integral part of education taking into account both the social and the natural aspects of the human environment.

Let us now go through the various programmes:

- **International Geological Correlation Programme (IGCP):** This programme has been implemented by UNESCO in collaboration with the International Union of Geological Sciences. Its objective is to encourage coordinated research on geological problems of global importance by setting up spatio-temporal connections and making the history of the planet well known along with the origin and formation of mineral and energy resources.

- **International Hydrological Programme (IHP):** The objective of the International Hydrological Programme (IHP) is to make a comprehensive assessment of the freshwater resources of the different regions of the world. It also intends to develop a scientific and technological foundation for the rational management of those resources from both the quantitative and qualitative perspectives.

- **International Oceanographic Commission (IOC):** The programmes of IOC and UNESCO's supplementary programme on the marine sciences are intended to improve the understanding of the ocean which would enable its resources to be used without damage to the ecosystem. In the field of marine sciences, the COMAR project comprises the implementation of research and training activities with the aim of combined management of coastal systems.

UNEP through its various international and regional programmes has successfully provided training to more than 10,000 professionals and specialists from the developing countries. Another such programme is the Programme on Desertification Control, which endeavours to coordinate the activities undertaken at the regional and national level to fight desertification.

Apart from the various environmental educational programmes launched by UNESCO-UNEP, one needs to pay attention to the fact that several training courses have also been offered by UNEP in the field of environment management services. In this context, environment training courses are provided concerning soil, water, energy, wildlife, industry and environment and desertification control among others.

Hence, one can summarize that the various scientific programmes developed by UNESCO-UNEP, have undoubtedly made a significant contribution both at the national and international level for the development of environmental awareness, education and training for sustainable development.

The United Nations Conference on Environment (Stockholm, June 1972)

The UN Conference was a major event for those concerned with the quality of the environment of the world. This conference resulted in the creation of the United Nations Environment Programme (UNEP). It also focused attention on an international environmental education programme (IEEP).

The UNEP is conceived as a catalyzing agency for the United Nations family to help focus on international issues, monitor trends and facilitate coordinated international action to safeguard the environment.

In the 1980s Member States negotiated to reach an agreement on several aspects of environmental concern. The leading scientists met at the World Climate Conference in 1990 to find ways to redress the harmful effects of environmental degradation and climatic change. It was followed by the United Nations Conference on Environment and Development held at Rio de Janeiro in 1992, which became known as the Earth Summit. The summit adopted a declaration which defines the rights and responsibilities of States and provides guidelines for the management of forests worldwide. Among other things, it was declared that the states have a right to exploit their own resources but not to cause damage to the environment of other states. In a conference in Berlin in 1995, it was realized that industrialized countries did not carry out the general commitments to limit emissions of toxic gases. It was decided that the northern industrialized countries should reduce the emissions of poisonous gases by about 50 per cent.

Selected Programmes Included in Earth Summit Agenda 21 at the United Nations Conference on Environment and Development (UNCED) Conference Held at Rio de Janeiro (1992):

- Promoting and protecting human health conditions
- Integrating environment and development in decision making
- Protecting the atmosphere
- Combating deforestation
- Managing fragile eco-systems: combating desertification and drought
- Promoting sustainable mountain development
- Promoting sustainable agriculture and rural development
- Conserving biological diversity
- Ensuring environmentally sound management of biotechnology
- Protection of the oceans, all kinds of seas, including enclosed and semi enclosed seas and coastal areas, and the protection, rational use and development of their living resources
- Protecting the quality and supply of fresh water resources: application of integrated approaches to

the development, management and use of water resources

- Promoting environmentally sound management of toxic chemicals, including prevention of illegal international traffic in toxic and dangerous products

1. Name some of the programmes launched by UNESCO in the field of spreading environmental education.
2. Name the conference which led to the formation of UNEP.

4.3 ROLE OF UGC/UNIVERSITIES, NCERT AND NGOs FOR ENVIRONMENTAL EDUCATION

ROLE of UGC

Several government and non-government bodies are playing an integral role in promoting environmental education.

- The Ministry of Environment and Forests interacts actively with the University Grants Commission (UGC), National Council of Educational Research and Training (NCERT) and the Mnistry of Human Resource Development (MHRD) for introducing and expanding environmental concepts, themes, issues etc. in the curricula of schools and colleges. The two Centres of Excellence, on Environmental Education of the Ministry are also involved in the activities of the UGC, NCERT and MHRD related to formal environmental education.

- The University Grants Commission (UGC) made it mandatory for all undergraduate colleges and universities in the country to introduce a six-month compulsory course in environmental studies beginning from the academic session 2004-05.
- Supreme Court Directive on the Compulsory Teaching of Environment

On a public litigation petition in 1991, the Supreme Court of India asked the National Council of Educational Research and Training (NCERT) and other concerned authorities to take steps to enforce compulsory education on environment in a graded way from the academic session 1992-93. Since the order was not implemented even after eleven years, advocate M.C. Mehta filed an application to ensure implementation of the earlier order. The Supreme Court passed the order on 22 April 2004 for compliance.

The Supreme Court issued a notice on 13 July 2004 to the concerned authorities to inform them whether they had implemented orders for inclusion of environment as a subject in the institutions under their court.

Role of NCERT

It may be recalled that on 22 April 2004 the court had endorsed a model syllabus prepared by the NCERT for introducing environmental studies as a compulsory subject from class one to class twelve.

The NCERT is the model agency to monitor the implementation of the model syllabus in schools. The syllabus has been prepared after consultation with several experts and institutions, State governments, the Central Pollution Control Board and non-government organizations.

Pattern of Environmental Education

- Environmental education should be integrated into the whole system of formal education at all levels
- Environmental education should be interdisciplinary in nature
- Environmental education should adopt a holistic perspective which will examine the ecological, social, cultural and other aspects of particular problems
- Environmental education should be centred on practical problems related to real life
- Environmental education should aim at building up a sense of value

The National Policy on Education 1986 emphasizes environment as one of the ten core areas of education and it has been a part of the school curriculum for several years. On the public interest litigation by Mr. M.C. Mehta, the Supreme Court has drawn the attention of the masses towards EE and it has also helped to structure the implementation of EE in formal education. There is now an agreed upon approach, syllabus and materials for EE that have been published by the NCERT. (See box 3 'Supreme Court Order on EE' for details)

The key document encapsulating the approach for implementation of EE in the school curriculum is the Affidavit which was submitted to the Supreme Court in 2007 and which was accepted by the Supreme Court in Dec 2010. The main declarations were as follows:

- Infusion ofEE concepts in all subjects
- Compulsory evaluation of EE content with at least 10% of the total marks devoted to EE content
- No written exam in XII standard

- Major emphasis on project-based learning

Following the acceptance of the Affidavit, the NCERT pubHshed in 2011 the *'Handbook on Environmental Education'*which provides source material for the core course at the XI and XII standard levels/Project books have been developed for Standards VI to X. Each student is expected to carry out at least two projects every year, and the whole class can carry out at least 20 different projects.

Following the NCF 2005, at NCERT when the textbooks were being developed, a workshop was held to orient textbook writers to the approach to EE and the syllabus. After detailed discussions, a report was prepared on how the infusion can take place.

NCERT has not only adopted the approach itself but has also made it mandatory for the state boards that they should provide orientation to textbook writers about EE and then, after the textbooks are developed, prepare the report on infusion.

Each state has been requested to:

- Identify nodal officers at the state and district level such as in DIETs
- Nodal officers were in turn made responsible to select experts and experienced professionals from universities and NGOs who can further provide training and expertise in the new approach to EE.

The structured approach initially was aiming at development of awareness about environmental issues as desired by the directive of the Supreme Courts. But looking at the true spirit of the PIL 860/1991 and the directives of Hon'ble Supreme Court of India - the main objective of EE as per NCF-2005 is to bring about attitudinal changes amongst children. With the implementation of this infusion approach in the EE curriculum, attitudinal changes have been witnessed and environmental awareness has increased.

The 'Eco-Club Programmes', that are the MoEF sponsoredNGC programmes in which the students are involved in projects related to the current environmental issues. NGC programmes are further analysed by Centres of Excellence of MoEF, the Pollution Control Board etc. MHRD through the formal educational system also encourages the actions of MoEF. The tasks of MoEF and MHRD are bridged by awarding NGC programmes to those schools which encourage their students to take up relevant environmental proj ects.

Box 1: New Approach to Implementation of EE as per NCF-2005

The NCERT has recommended the following implementation approach in the context of EE (which are described in the Affidavit to the Supreme Court, and accepted).

- Classes I and II: EE concerns are transacted through activities.
- Classes III to V: EE is being imparted through a subject namely EVS (Environmental Studies)
- Classes VI to X: Follows infusion approach for EE. 10 percent of assessment of grand total is based on EE besides project and field work in separate time carved out from existing timetable.
- Classes XI and XII: Besides infusion in electives. A separate compulsory course 50 marks based on core syllabus and projects work is for all. Marks to be reflected/ added to the total marks. Time to be carved out of existing time table (such as time allocated to general studies) table.

Box 2: Issues to Consider for Strengthening *EE*

The whole exercise of the PIL, the NCERT Affidavit and the Supreme Court Ruling has probably served to enhance the scale of discussions on environment education in the country. A syllabus, project books, textbooks, training courses etc have been prepared by NCERT and Education Depts. and others in various states over the last few years. However, with the final Ruling, some issues such as the following must be considered, and discussions should continue on how to integrate sustainability thinking into education:

- In Std VI to X, Project Assessment of EE projects would be 10 per cent of the marks allocated for practical / projects in Science and Geography. This means that if 20 marks are allotted, then each student would have to undertake two EE projects that would be assessed for just 2 marks.
- In several states, unlike in CBSE schools, there is no subject like General Studies at XI and XII level which is common to all streams. A separate compulsory subject may be needed at this level to transact the core component.
- In XI and XII, the method of seminars may not be practical in large class sizes.
- The capacity of teachers to organize projects based learning needs strengthening.
- Around the world (and in India), there are advances in thinking about Education for Sustainable Development, and ideas such as the whole school approach which can build upon the impetus provided by the Supreme Court Ruling.

Box 3: The Supreme Court and Environment Education Sequence of Events

Writ Petition, 1991

In 1991, Shri M C Mehta filed an application in the public interest (Writ Petition (Civil) No. 860 of 1991), asking the Supreme Court to:

- Issue direction to cinema halls that they show slides with information on the environment
- Issue direction for the spread of information relating to the environment on All India Radio and
- Issue direction that the study of the environment becomes a compulsory subject in schools and colleges

Directive to NCERT to Prepare EE Syllabus, 2003

On 18th December 2003, the Hon'ble Supreme Court further ordered, *"We also direct the NCERT ....to prepare a module (model) syllabus",* and directed that

> *"We accept on principle that through the medium of education awareness of the environment and its problems related to pollution should be taught as a compulsory subject. The University Grants Commission will take appropriate steps immediately to give effect to what we have said, i.e. requiring the Universities to prescribe a course on environment. So far as education upto the college level is concerned, we would require every State Government and every Education Board connected with education upto the matriculation stage or even intermediate college to immediately take steps to enforce compulsory education on environment in a graded way."*

NCERT developed a graded syllabus for Environment Education for 1 to 12 standards, which was accepted by the Supreme Court *(the syllabus has subsequently been revised for Standards XI and XII) to incorporate contemporary environmental issues.*

Appointment of NCERT as Nodal Agency for EE, 2004

On 13th July 2004 the Supreme Court directed that *'the syllabus prepared by the NCERT for Class I to XII shall be adopted by every state in their respective schools'. It further directed that 'NCERT be appointed as a nodal agency to supervise the implementation of this Court's order'.* [Compliance to Supreme Court order is mandatory and desirable, and applies to all states and Union Territories (in fact, it is one of the few things that apply to education uniformly all over India).

EE and the National Curriculum Framework, 2005

In 2004, MHRD set up a nationwide process towards the development of the National Curriculum Framework 2005. This included the setting-up of a national steering committee and 21 national focus groups. One of these was a Focus Group on Habitat and Learning. In substance and spirit, this group was to look into the area of EE. The group delineated the objective as, 'The main focus of EE should be to expose students to the real-life world, natural and social, in which they live; to enable them to analyze, evaluate, and draw inferences about problems and concerns related to the environment; to add, where possible, to our understanding of environmental issues; and to promote positive environmental actions in order to facilitate the move towards sustainable development.'

The Group recommended a systematic infusion of components of EE into the curricula of all disciplines while ensuring that adequate time is earmarked for pertinent activities.

The NCERT prepared its new syllabi and textbooks in accordance with the NCF 2005.

NCERT Affidavit, 2007

The NCERT submitted an Affidavit in October 2007 to the Supreme Court describing the spirit of the NCF 2005 and clarifying that to have compliance with the earlier order of the Supreme Court, a separate subject for EE is not a necessity. It can be done through infusion, in science, social studies, mathematics, language and other subjects, and/or through a separate subject. It does however have to be part of the compulsory curriculum.

This Affidavit is a key document outlining the sequence of relevant events subsequent to the PIL up to the proposal for how EE may be transacted from Standards I and XII. It was drafted after detailed discussions between the petitioner (Shri MC Mehta), the respondent (NCERT), and the experts appointed by the petitioner and NCERT.

Acceptance of Affidavit, Dec 2010

The Affidavit was accepted by the Supreme Court on 03 December 2010 and the writ petition WPC 860/1991 has been disposed off. Now, all school education boards are expected to follow the approach to EE described in the Affidavit. NCERT is coordinating the effort to enhance implementation EE in the spirit of the NCF 2005 as it is the basis of the affidavit.

Environmental Education in the School Curriculum

- At the primary stage, Environmental Studies (Social Studies, Nature Study and Health Education) is one of the prescribed areas of curriculum. It gets about 20 per cent time.

- At the middle level, environmental studies or environmental education is not prescribed as a subject. Science as an integrated course is heavily based on the use of day-to-day observation in the environment by the students and includes topics like the balance of nature, population, etc.

- At the secondary level, the subject of science includes many topics concerning environmental education.

Centre for Environment Education (CEE) was established in 1984 as a Centre of Excellence supported by the Ministry of Environment and Forests, Government of India. CEE is a national institute which has been established with the objective of promoting environmental awareness all over the country. CEE has been working in the various states of India in collaboration with the Department of Education, State Council of Education Research and Training (SCERT), State Institute of Education (SJE) and Directorate of Environment (DoE).

Let us take the example of CEE's working in Uttar Pradesh. Some of the important projects going on in the state are:

- Implementing Children Forest Programme in 100 schools of Lucknow with the support from UP Forest Department.
- Developed the Hindi version of UNESCO's Environment Education Kit on Desertification, which includes teachers' guide, case study series, cartoon book and poster.
- Implementing Ministry of Environment and Forests (MoEF) supported 'Ganges river dolphin - Conservation Education Programme' along [Granges and Brahmaputra rivers and its tributaries.

Role of NGOs

1. Centrally Sponsored Scheme of Environmental Education

A Centrally Sponsored Scheme of Environmental Orientation to School Education has been started with effect from 1989-90, under which 100 per cent financial assistance is provided to States/Union Territories and voluntary organizations working in the field of environment education. Various programmes aimed at creating environmental consciousness among the students and the community would be organized on project basis in selected areas comprising homogenous ecological conditions. The project activities include review of curriculum, preparation of revised textbooks, curricular and extra- curricular materials, preparation of general informative books/brochures/ posters/audio-visual materials, adoption of monuments by schools for study and upkeep, study of ecological problems in the neighborhood, participation in conservation projects, etc. Setting up of school nurseries will be taken as one of the preferred activities with the help of State Departments of Environment and Forests and National Wastelands Development Board. The scheme also provides for involvement of voluntary organizations in innovative projects relating to environment education.

The scheme has received a very good response from the voluntary organizations. Some of the proposals sanctioned are:

- Uttarakhand Seva Nidhi, Almora, for environmental orientation to elementary education in Kumaon and Garhwal regions of Uttar Pradesh.
- Sanchal Foundation, New Delhi, for a project on social imperatives of development which seeks to establish a linkage between the natural disasters and environmental degradation.

- Centre of Environment Education (CEE), Ahmedabad, to act as a nodal agency for involving NGOs (non-government organizations) working in the area of environment education to take up locale-specific activities in a cluster of schools around which programmes would be designed and implemented with the national and State-level perspectives. The full intent of environmental education will not be achieved because the environmental concerns are locale specific and, therefore, do not admit global solution. These efforts, therefore, need to be supplemented by more intensive locale specific efforts.

The NGO's establish a worldwide network in collaboration with several governmental and non-governmental organizations in designing international environmental policies:

- Creating awareness among the general people on the existing environmental issues and problems
- Facilitating the participation of various kinds of stakeholders in the discussion on environmental issues
- Protecting the natural resources and delegating the equitable use of resources
- Generating data on natural resources
- Assessing and monitoring environmental quality
- Disseminating information through newsletters, brochures, articles, audio visuals and other sources of mass media
- Organizing seminars, lectures and group discussion for the promotion of environmental awareness

India has a number of NGO's working in the field of research and development, conservation and protection of the environment such as Assam Science Society, Centre for Environmental Education, Bombay Natural History Society, etc.

Greenpeace International is a non-governmental organization for the protection and conservation of environment. Greenpeace International uses direct action, lobbying and research to achieve its goals. Greenpeace International has 2.8 million supporters worldwide. It has national as well as regional offices in forty-one countries.

The mission of this independent, global non-governmental organization is to change attitudes and behaviour, to protect and conserve the environment and to promote peace by:

- Catalyzing an energy revolution to address the most important threat faced by earth, i.e., climate change.
- Defending the oceans of the earth by challenging wasteful and destructive fishing, and creating a global network of marine reserves.
- Protecting the world's remaining ancient forests on which many animals, plants and people are dependent.
- Working for disarmament and peace by reducing dependence on finite resources and calling for the elimination of all nuclear weapons.
- Creating a toxic free future with safer alternatives to hazardous chemicals in products and their manufacturing.
- Campaigning for sustainable agriculture by encouraging socially and ecologically responsible farming practices.

The organization currently actively addresses many environmental issues by running campaigns, with their primary focus on efforts to stop global warming and to preserve the biodiversity of the world's oceans and ancient forests. In addition to the more conventional methods of environmental organizations, such as lobbying with the politicians and attending international conferences, Greenpeace International has a stated methodology of engaging in non-violent direct action. Greenpeace International uses direct action to attract attention to particular environmental causes, whether by placing themselves between the whaler's harpoon and their prey, or by invading nuclear facilities dressed as barrels of radioactive waste. Some of Greenpeace International's most notable successes include the ending of atmospheric testing of nuclear weapons, a (purportedly) permanent moratorium on international commercial whaling, and the declaration of the Antarctica as a global park by the Antarctic Treaty, forbidding possession by individual nations or commercial interests. To back up this latter point, World Park Base was established in the Antarctica, and ran for five years, from 1987 to 1992.

2. Friends of the Earth

'Friends of the Earth' is the world's largest grassroots environmental network. It unites seventy-one different national member groups and some 5,000 local activist groups on every continent.

With approximately 1.5 million members and supporters around the world, Friends of the Earth campaigns on the most important and urgent environmental and social issues of the present times. It challenges the current model of economic and corporate globalization, while promoting solutions that will help in creating environmentally sustainable and socially just societies. Friends of the Earth follow a decentralized and democratic structure that allows all member groups to participate in the decisionmaking process.

Mission

Friends of the Earth aims to:

- Protect the earth against further deterioration and repairing damage inflicted upon the environment by human activities and negligence
- Preserve the ecological, cultural and ethnic diversity of the earth
- Increase public participation and democratic decision-making, both of which are important for protecting the environment and sound management of the natural resources
- Achieve social, economic and political justice and equal access to resources and opportunities for men and women at the local, national, regional and international levels
- Promote environmentally sustainable development at the local, national, regional and global levels

Activities of Friends of the Earth

Friends of the Earth works on various environmental and social issues. Through its programme on Climate Justice and Energy, it is fighting for justice for the communities affected by climate change and promoting energy sovereignty, the right of the communities in choosing their own sources of sustainable energy. It also advocates a strong agreement within the framework of the UN negotiations, a just agreement on climate finance and an end to deforestation, one of the biggest causes of climate change.

The organization's Food Sovereignty Programme aims to stop the production of genetically modified organisms and corporate control over food. It fights for the right of the people to determine their own food systems.

The Forest and Biodiversity Programme of the Friends of the Earth campaigns against illegal logging and deforestation. It works with various communities and the local people to uphold their rights to manage their forests. It also exposes and opposes the negative impacts of monoculture plantations of crops, such as sugarcane, palm oil and soy for producing agro fuels.

Their Economic Justice - Resisting Neo-liberalism programme challenges the current economic model. It exposes and resists corporate power and the new Global Europe strategy and identifies and promotes initiatives that generate sustainable livelihood.

(a) Climate justice and energy

The world today faces two related challenges that threaten the lives and livelihood of billions of people: climate change and global energy crisis. The main reason of these challenges is our unsustainable level of consumption, which requires huge quantities of energy for production and transportation.

Solutions to these challenges lie in the right of different communities to choose their sources of sustainable energy and to develop a healthy consumption level. There is also a need for reducing greenhouse gas emissions and for all people to equally share resources within ecological limits. Friends of the Earth works for climate justice and energy access through proactive, community-based campaigns and projects.

(b) Food sovereignty

Traditional food production systems like small-scale farming which aims to produce foodgrain for the local people, is now getting replaced by large-scale agriculture by transnational agribusiness. The climate crisis puts an additional threat on food production.

It is essential to build global food systems based on diverse, localized agricultural solutions. People should be allowed to determine and control their own food systems. This form of agriculture

also helps communities to become more resilient to climate change. Friends of the Earth support small-scale peasant farmers in resisting the corporate powers. The organization helps in building bridges between those who produce and those who consume food.

(c) Forests and biodiversity

The forests of the world are in trouble. Privatization, increased exports and liberalization of international trade have led to a massive increase in large-scale plantations, which produce and export timber and pulp. This has also led to the increase in demand for exotic timber and crops, such as soy and palm.

All these pressures have led to the disappearance of half of the world's forests. These forests need to be protected as they provide livelihood to many local communities and indigenous people. Forests store carbon and regulate our climate and thus are crucial in our fight against climate change. They are also home to various species of animals and birds on earth. Friends of the Earth member groups work in association with the local communities to preserve forests and uphold their rights to manage forest resources and secure sustainable livelihood. It campaigns against industrial large-scale plantations, monoculture production and commercialization of forests and biodiversity.

(d) Economic justice - Resisting neo-liberalism

Trade and investment, development funding and corporate lobbying are the drivers of the present economic model. This model is based on the belief that economic growth and liberalization will make the world a better place. While this has benefited large corporations, it excludes and even harms the most impoverished people while doing little to protect the environment.

Friends of the Earth challenge the influential big corporations and questions the neoliberal policies of trade that do not take into account the general people's problems. The organization campaigns to change the course of the economy in a dynamic, creative and constructive way. It shares the inspiration and the positive experiences with old and new, just and sustainable development thinking and practices.

CHECK YOUR PROGRESS

3. When was the Centre for Environment Education (CEE) established in India?
4. Name some of the NGO's working in the field of research and development in India.

4.4 CONCEPT OF RESEARCH

Research comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. It is used to establish or confirm facts, reaffirm the results of previous work, solve new or existing problems, support theorems, or develop new theories. A research project may also be an expansion on past work in the field. To test the validity of instruments, procedures, or experiments, research may replicate elements of prior projects, or the project as a whole. The primary purposes of basic research (as opposed to applied research) are documentation, discovery, interpretation, or the research and development (R&D)c methods and systems for the advancement of human knowledge. Approaches to research depend on epistemologies, which vary considerably both within and between humanities and science and its

branches. There are several forms of research: scientific, humanities, artistic, economic, social, business, marketing, practitioner research, etc.

A broad definition of research is given by Martyn Shuttle worth - "In the broadest sense of the word, the definition of research includes any gathering of data, information and facts for the advancement of knowledge.

Another definition of research is given by Creswell who states, — 'Research is a process of steps used to collect and analyse information to increase our understanding of a topic or issue'. It consists of three steps: Pose a question, collect data to answer the question, and present an answer to the question.

4.4.1 Steps in Conducting Research

Research is often conducted using the hourglass model structure of research. The hourglass model starts with a broad spectrum for research, focusing in on the required information through the method of the project (like the neck of the hourglass), then expands the research in the form of discussion and results. The major steps in conducting research are as follows:

- Identification of research problem
- Literature review
- Specifying the purpose of research
- Determine specific research questions
- Specification of a conceptual framework -usually a set of hypotheses
- Choice of a methodology (for data collection)
- Data collection
- Analysing and interpreting the data
- Reporting and evaluating research
- Communicating the research findings and, possibly, recommendations

Rudolph Rummel [says, 'no researcher should accept any one or two tests as definitive. It is only when a range of tests are consistent over many kinds of data, researchers, and methods can one have confidence in the results.'

4.4.2 Research Methods

The goal of the research process is to produce new knowledge or deepen understanding of a topic or issue. This process takes three main forms:

- Exploratory research, which helps to identify and define a problem or question.
- Constructive research, which tests theories and proposes solutions to a problem or question.
- Empirical research, which tests the feasibility of a solution using empirical evidence.

There are two major types of research design: qualitative research and quantitative research. Researchers choose qualitative or quantitative methods according to the nature of the research topic they want to investigate and the research questions they aim to answer:

1. Qualitative Research

In qualitative research, the researcher is the instrument or the tool for designing, collecting, and analysing research. Qualitative research, in contrast to quantitative research, generally does not

translate aspects of the world into numbers to be analyzed mathematically. Instead, it analyzes the world through the lenses the researcher brings to bear on the data.

Qualitative research aims to get a better understanding through experience, truthful reporting, and quotations of actual conversations. It is restricted only to test hypothesis and single set of subject, who is qualitatively researched. Observation and interview are the common methods used for qualitative research.

2. Quantitative Research

The Quantitative research is concerned with testing of hypotheses by experimental, co-relation and survey (or descriptive method). The data collection methods are purely on random sampling and structured data collection instruments. The data is statistically analysed to compare and make relationship between the variables.

In qualitative or quantitative research primary, data is collected by interviews or questionnaires. Secondary data already exists, such as census data, which can be reused for the research. It is a good ethical research practice to use secondary data wherever possible.

3. Mixed-method Research

It is a research that includes qualitative and quantitative elements, using both primary and secondary data.

4. Pure Scientific Research

Pure scientific research often referred to as 'pure science', is about explaining the world around us and trying to understand how the universe operates.

5. Applied Scientific Research

Applied scientific research comprises testing of theories generated by pure science, and applying them to real situations. The researches on environmental study solve a specific question or issue and find out the definite comprehensive answer.

8.4.3 Significance of Research in Environmental Education

The significance and importance of research in environmental education are as follows:

- Maximize the scope of EE with state-of-the-art thinking, developments, innovations and perspectives in the areas of Environment and Sustainable Development
- Focus on capacity-building activities in programs and projects
- Develop programmes that are adaptable to different geographic, cultural, social and economic contexts
- Partnering with a view to utilizing the complementary strengths of other organizations, so as to avoid duplication of effort, and to network effectively towards the synergistic convergence of ideas and goals
- Develop programmes and materials to build on the existing strategic opportunities and facilities for EE
- Encouraging and supporting other agencies in the field of EE and ESD to develop similar materials and programmes based on their specific needs and situations
- Build synergies between the Government, NGOs and CEE for comprehensive impact

- Identify the key entry points for different thrust areas, and key targets for initiating and consolidating gains, to achieve a multiplier effect
- Facilitate information networks at local, national and regional levels, through a number of tools such as dialogues, directories, and newsletters
  - Conduct workshops/ seminars to facilitate dialogue between various stakeholders, including the government and the society, on the environmental implications of growth and development

4.5 EMERGING AREAS OF RESEARCH IN ENVIRONMENTAL EDUCATION

Environmental Education has emerged as a new dimension in the history of education. A study of the development of environmental education reveals that its explosive growth is due to its strong relationship with the basic human needs and emotions.

School and teacher training colleges play an important role in environmental education and the effectiveness of such education depends upon the method of teaching, objectives to be achieved and the content of the curriculum. Therefore, the following objectives are to be kept in mind while designing the curriculum for environmental education.

Some of the objectives of environmental education are:

- To introduce students to the natural and social world
- To help evaluate and resolve problems related to the environment
- To develop an understanding of environmental issues
- To initiate positive environmental actions towards sustainable development

A revamping of the education system is required to produce environmentally conscious citizens through research and teaching at various levels to make environmental education a lifelong process with awareness and attitude. Such a challenge has to be taken by the educational institutions, government and semi-government bodies at all levels.

The world has now witnessed the development of information and communication technologies in which education plays a vital role to create awareness and build the capacity of communities to visualize and participate in the process of sustainable development of the environment.

Areas of Research and development in environmental education are:

1. Environmental Services

Environmental services usually deal with protecting or enhancing nature in one way or the other. These services of our nature have added to the economy of our nation. Even after adding value to the Gross Domestic Product (GDP) of our country, this area is wholly neglected and unwisely used. Therefore, it is the demand of time to raise awareness among people to save our nature and more and more research must be conducted in this sphere to impart its lost value. Also, researches must lay emphasis on the effectiveness of these services and promote them.

2. Global Competitiveness

With the emergence of supersonic communication technologies, the world seems to have become small. Though globalization has benefitted the world but it has diminished the natural resources. The natural resources are being used in a non-judicious manner without showing any

concern for the future generations. In such a situation, it is strongly recommended to conduct researches

- To balance the use of natural resources and industrial development
- To optimize the use of natural resources
- To attain sustainable development

3. Forestry and Extension of Forests

Despite being immensely benefited from the forest resources, their importance is largely undermined in our society. Forests are being cut to build houses and urban infrastructure. Trees are not only getting reduced in numbers but also there is a decline in the quality of plants and trees. There is an urgent need to conduct researches:

(i) To maintain quality and quantity of plantation in forests

(ii) To check illegal cutting of trees

(iii) To analyse, revive and review the fruitful outcomes of the policies, Acts such as National Forest Policy, 1998, Indian Forest Act, 1927, Forest Conservation Act, 1980, enacted to protect the forests

    (a) The link between the researches conducts in the laboratories and the local bodies like farmers is very weak. The outcomes or findings of the experiments fail to reach the local level, i.e., the local farmers and producers. Therefore, researchers are required to develop a strategy by which farmers can get benefitted with new methods and techniques.

    (b) The universities conducting UG and PG courses in forestry are run by the Indian Council of Agricultural Research (ICAR) and financed by the Indian Council of Forestry Research and Education (ICFRE). It is the responsibility of ICFRE to monitor, upgrade and improve the quality of the curriculum. However, there is a lack of coordination between these two councils. Hence, studies must be made to develop a link in between two councils to evaluate and monitor the forest courses continuously.

    (c) Researches must be done on the concerns which are based on the local needs. This means one has

- To study the needs of the farmers, quality of soil, seeds and plants and condition of rains
- To study the prclblem faced by farmers
- To study the ways to improve the quality and quantity of yields
- To think over extension of forests by replacing laboratories to Krishi Vigyaan Kendra that can decide their programmes by collecting the feedbacks from farmers

    (d) Studies are required on the emerging areas like biological record keeping, environmental impact indicators, biodiversity valuation principles, trade and intellectual property rights, biopiracy, gene pool management, protected areas effectiveness, environmental economics, carbon sequestration, bio economic modeling and valuation of ecosystem services.

4. Wildlife

India is a land of various species of animals, birds and water animals. Many of them have extinguished due to climatic changes, illegal poaching, smuggling and absence of natural habitat.

Extensive attention is required to conduct researches:

- To orient the philosophy of wildlife management in the local community.
- In order to involve the local communities as a part of participatory models in protecting the wildlife and understanding the responsibilities of human beings towards them
- To encourage eco-tourism
- To review and extend the role of government and semi-governmental bodies, local communities, NGO's to save the endangered species from getting extinguished
- To measure the efficiency and effectiveness of Wildlife Protection Act, 1972 and repealing it to insert stricter regulations against poaching and smuggling

5. Balance between Environment and Development

There exists a correlation between environment and development. In this century, it is required that development must be sustainable. By sustainable development we mean that development takes place in such a manner, that the natural resources are utilized in a judicious manner, so that the future generations are also able to satisfy their needs through the use of these resources.

The Ministry of Environment and Forests, is the central decision making agency responsible for taking decisions related to India's environmental and forestry policies and programmes. The Ministry of Environment and Forests have designed a national environmental information system for collecting, storing, retrieving and disseminating information in the field of environment and its associated areas.

Therefore, a comprehensive information system is required for institutions, organizations which are engaged with various subject areas of the environment. Researches must be conducted on studying the effectiveness of information system and finding out ways to make it more informative.

6. Conservation and Protection of Animals and Plants

The Wildlife Protection Act, 1972 is an Indian legislation enacted for the protection of plants and animal species. Research is required:

- To specify the plant and animal species and decide which species are to be kept for consideration (included) and which are to be excluded
- To collect hard data about the population and population dynamics of these species
- To develop standardized norms for inclusion and exclusion of plants and animal species
- To find out the reasons for those species which are excluded
- To study about the balance in the population of the species by the propagation methods

7. Biodiversity

Biodiversity is an ignored field and no attempts have been made to document biodiversity at the local, regional and national level. The areas on which researches must be carried out-

- Effect of construction like-roads, railways, dams, mining, industries and societies in the area of

high population of species on biodiversity

- Planning a programme to study phytodiversity like angiosperms, gymnosperms, bryophytes and fungi

8. Integration **and** Harmonization of Different Courses

Various courses at the graduation and post graduation level are run by different universities and institutes on environmental areas and are responsible for imparting knowledge regarding environmental issues. There exists a shortfall in this system because the knowledge so imparted does not add value to the students nor is it utilized in resolving any environmental issues. In such a situation, the young minds are getting underutilized and are unable to develop themselves and the nation's economy.

Central and state governments must act proactively and provide students with appropriate job opportunities so that they can unwind their versatile thoughts for the development of environment.

Researches must be done to

- Develop coordination between academic, professional and training courses
- To redesign the whole system of academic, professional and training courses
- A system must be developed in such a way that it attracts foreign students
- To universalize the various courses related to the environment
- To develop the need based specified courses and training programmes

9. **Ecosystem**

Ecosystem is the interrelationship between the biotic and non-biotic components of the environment. Various ecosystems exist under one ecosystem. It mainly consists of human beings, flora and fauna. Ecosystem is highly affected by the changes in the environment. Therefore, it is required to keep a vigilant eye on the ecosystem. Many animal species are getting extinct due to urbanization, habitat loss and pollution.

- More ^studies are required to find out the ways to protect the endangered species
- To record the data about the endangered species and extinguished species

10. **Land Degradation**

Degradation of land and reduction of fertile land are one of the most common results of unbalanced nature. This is caused due to excessive use of pesticides and chemicals, practices of yielding more than the capacity of generation, use of unscientific methods and use of fertile land for urbanization. It is required to focus on the causes of degradation so astO'kHep the environment safe. Researches must be conducted on the following areas:

- To adopt scientific, sustainable land use practices for optimum utilization of land and soil for quality production
- To innovate techniques to convert barren unproductive land into fertile lands
- To protect the desert ecosystem and develop techniques to maximize the utilization of the desent resources.

11. Mountain Ecosystem

Mountain ecosystem, one of the most fragile ecosystems consists of flora and fauna found in the mountain areas. Due to deforestation, unplanned urbanization, pollution of fresh water sources, inadequate sanitation, overcrowding in hilly areas, landslides due to heavy rains and excessive focus on developing tourism mountain ecosystem is losing its identity. Research is required to be conducted:

- To visualize ways to protect the mountain ecosystem
- To measure and identify the role of local community and resources in maintaining production
- To analyse the best practices that could be carried out to resolve the environmental issues with the help of local community
- To train and impart vocational skills so that the local communities can grab appropriate opportunities for better living

12. Pollution Abatement

Pollution is mainly caused due to the introduction of contaminants into the natural environment that causes instability, disorder and harm to the ecosystem. To reduce the level of pollution, researches need to be carried out in the following areas:

- To design alternative energy resources and replacement of natural fossil fuels by the use of bio-gas, bio- diesel, solar energy and wind energy plants
- To study the use of such resources in which transmission of heat and carbon is minimum
- To invent low cost techniques and models for sewage treatment and solid waste disposal

13. Environmental Education and Research

Environmental education is a discipline which is infused with science and social elements. Science exposes the students to their real life situations and enables them to; analyse and evaluate the problems related to the natural and social environment. No doubt, environmental education is fulfilling its goals by providing theoretical knowledge to students but natural and social exposure is lacking. Thus, educational studies must be carried out:

- To promote practical training such as activity based projects and field assignment
- To study the effectiveness of the above said methods as compared with thej traditional methods
- To evaluate the result of pollution and climate changes on fresh water resource;
- To study the impact of climate change on glaciers, flow of rivers, sea tides anijj rainfall
- To study the different river valley projects, hydro thermal projects and cana and dam building projects
- To refine and modify the environmental education curriculum and analyse thi curriculum of various schools and universities
- To design co-curricular activities to promote field knowledge to students

14. Training and Capacity Building

Training and capacity building means the training of those people engaged in the environmental services and generating capacities within them physically and mentally to get well equipped to

encounter hazards and disaster situations. Researches need to be carried out in this area to promote the following:

- To study the various means to circulate knowledge and spread awareness regarding the emerging issues of environment
- To provide opportunities to people engaged in environmental services to express their views and suggestions to improvise
- To revive the training of trainers and higher study courses

15. Information Management

This is an era of internet revolution. Internet has emerged as an incredible source of sharing information. Internet provides access to speedy communication covering the entire country but still there are some arid areas which are deprived of the Internet facility. Many departments of governmental and semi-governmental bodies are still using manual recording procedures for forest inventory, growth and yield statistics, diversity of species, migration of species and quantity of pollutants and their effect. It is more time consuming and involves huge labor cost. Therefore,

- Surveys must be done to identify the places which are not equipped with these facilities
- Distribution of computers and posting of trained officers to remote areas
- Provision of Geographic Information System for storage, analysis and retrieval of spatial, temporal and tabular data for natural resources
- To prepare a unified database that can be utilized both for policy formulation and planning purposes

16. Population Explosion

Population explosion is a consequence of the rapidly increasing population of our country. Today, the population of India has crossed 1.241 billion according to 2011 census. Population has exploded due to various reasons which are illiteracy, polygamy, decline in death rate and others. There is a huge scope of studies regarding:

- Awareness and implementation of family planning techniques
- B alanced birth rate and mortality rate and maintenance of their proper record
- Role of education in providing awareness by infusing concerns regarding population control in the curriculum

17. Development of Eco Friendly Products

Developing eco-friendly products and spreading their use is a vital step in the process of protecting the environment. Eco friendly products can be manufactured for cosmetics, food packaging, agricultural products and medicines, etc. Research can be conducted:

- To seek the areas and potential eco friendly products, eco friendly environment can be created
- To analyse the methods and ways to manufacture pollution free and environment friendly products
- To study the effectiveness of the use of organic medicines in place of allopathic medicines
- To study the development of small scale industries, the promotion of artisans and craftsman in remote and tribal areas to efficiently produce articles made from recycled material

18. Hazardous Management

Tremendous benefits have been derived from the use of pesticides in the areas of forestry, public health, domestic sphere and agriculture. Apart from its multiple uses, pesticides have adversely affected human beings, animals, cultivation of crops and the environment as a whole. The detrimental impact of pesticides on human beings has been studied at the international level. However, there is an urgent need to study the effects of these pesticides on human diseases such as cancer, kidney failure, and prolonged sterility in India.

- A study is also required to be conducted for the protection of farmers and workers who are exposed to the excessive use of DDT, Lindane and Dieldrin compounds that cause leukemia, brain tumour and gall bladder diseases.

- It is also required to conduct a survey to collect statistical data regarding the workers and farmers who are exposed to such harmful diseases.

- Study can be done on the pollution cycle of mercury and lead and its compounds which are affecting the aquatic and earthly life. Also, steps must be taken to find out the innovative methods of control to prevent mercury and lead toxicity in the environment.

- A perfectly monitored system must be developed to check the contamination of natural resources such as air, water and soil. Contamination could take place through germs, radiation, chemicals, insecticides, etc.

19. Waste Disposal Management

India is today facing the problem of disposing waste. There has to be a well planned mechanism for the proper disposal of waste.

- To study various disposal management techniques of foreign countries and draft a suitable disposable mechanism that is conducive to the Indian environment
- To study the methods of recycling the waste material

20. Resource Management

Due to increase in population and excessive use of resources, resource management is highly imbalanced. There is a need to achieve sustainable development and optimally utilize the meagre resources. The objectives of the National Environmental Policy 2006, are conservation of significant environment resources, efficient use of environment resources and enhancement of resources for environmental services, integration of environmental concerns in economic and social development. Research needs to be conducted for:

- The studies are required to analyse the status of achievement of these objectives
- To study the planning of conservation techniques
- To study the ways to promote the renewable energy resources
- To study the progress of objectives of the National Forest Policy, 1988

21. Quality Control

Quality of the environment is recognized by the quality of species vegetation, water, air, soil and other resources. The quality of these natural resources can be maintained only when they are prevented from any kind of contamination. Major part of the research must be focused on:

- To study the protection of grassland and wetland ecosystems
- To study the adaption of more integrative approaches to maintain quality
- To study the use of scientific efforts to deal with large scale changes which are affecting the land based system
- To identify the species which have an ecological value and assist in maintaining the productivity and sustainability of the forest communities
- To study the effect of chronic and acute disturbances that cause malfunctioning of habitats
- To study the methods that help in reinstating the species to their respective habitats after such disturbances
- To analyse the economical value of ecosystem services
- To study the protection of environment from the danger caused by the living modified organisms (LMO's)
- To develop safe processes and procedures for the production of LMO's

22. Policies and Legislative Framework

This area of research lays emphasis on the policies and the laws that govern the protection of the environment. There are many laws implemented for the proper governance of environment but there exists an ambiguity regarding its objectives.

Laws that govern environmental issues are: National Forest Policy 1988, the Indian Forest Act 1927, The Forest (Conservation) Act 1980, Wildlife Protection Act 1972, Biodiversity Act 2002, National Environment Policy 2006, Environmental Protection Act 1986, Water Prevention and Control of Pollution Act 1974, Water Cess Act 1977 and Air Prevention and Control of Pollution Act 1981.

- To study the possible amendments in the Acts, so formed, with the advent of new technologies
- To measure the effectiveness of these Acts in order to protect our environment
- To make these laws people friendly so that the people can be aware about the provisions of these Acts

23. Curriculum Reformation

The curriculum for environmental education has been well designed by NCERT and the National Curriculum Framework. It is mainly based on interdisciplinary and multidisciplinary approaches. Still there is some scope for practical training which adds to classroom teaching. Research must be conducted:

- To promote the development of co-curricular activities and practical field work specially in rural areas to make the rural communities aware about health and hygiene
- To study the introduction of the role of media and role of technology in the curriculum
- To conduct surveys on the availability of textbooks and the material on multimedia which are based according to the curriculum

- To focus on the evaluation of the curriculum which should be refined and modified according to the present situation of the country

24. Finance, Budget and Expenditures

When we talk about the development of environment and ways of protecting it, the major issue that arises is the availability of adequate finance, preplanned budget and spending them at the proper place where it is required. Therefore, a detailed study is required to analyse, review and implement the governmental budget policies and to forecast the future allocation of monetary resources in the field of development and protection of the environment.

- To encourage students, researchers and officers by giving them scholarships, stipends and other amenities by the colleges, universities and governmental agencies for their extensive work in the field of development and protection of the environment
- To encourage students and researchers for training at the international level sponsored by governmental agencies
- To avail funds to develop highly equipped centres with well trained personnel for providing training in rural areas, in the areas of disaster management, agriculture, population control, vaccination and pollution control
- To avail adequate funds for the development of alternative energy resources like solar energy units, installation of wind mills to generate wind energy, hydel energy proj ects, construction of dams, and irrigation facilities

25. International Research

There are institutions present in different sectors which are working in areas like interaction between geosphere and biosphere, microbiology of soil, eco-friendly technologies, floods, cyclones, landslides and coastal resource management and fresh water resources. The information about all these areas must be exchanged among nations to bring about sustainable development.

CHECK YOUR PROGRESS

5. List some of the emerging areas of research in environmental education.
6. What kind of research work needs to be conducted in the field of quality of the environment?

DID YOU KNOW

- A recycled tin can would save enough energy to power a television for 3 hours.
- The use of plastic growing about 4 per cent each year. Plastic can take up to 5 vears to break down.

4.6 STRATEGIES IN ENVIORNMENTAL EDUCATION

Strategies for Curriculum and its Transaction in Environmental Education

The objectives of environmental education can be fulfilled by formal and non-formal system of education.

The strategies of EE have been summarized as:

- Teaching can be made effective and interesting by real experiences
- Helps in developing ability of observation and imagination
- Objectives of teaching can be realized
- Develops feeling of cooperation and team work

The co-curricular activities of education are the most appropriate means for providing opportunities for the action. There are two main programmes recommended by educational commission and policy:

- Socially Useful Productive Work (SUPW)
- National Social Scheme (NSS) The activities

are:

- To clean environment through NSS camps
- To grow plaints & develop gardens for protection
- To clean the public places
- To construct roads, dig pits for the wastes
- To develop sense sanitation among tne people by organizing cultural programmes

- To develop the consciousness about population education by organizing camps of population education or family planning
- To encourage the students to prepare charts related to environmental pollution and its protection
- To motivate the students for using stories and essays on the environmental education

Roles of MoEF, MHRD and other Ministries

The responsibility of the formal educational system for environmental education is on the Ministry of Human Resource Development, and the parallel responsibility of EE through non-formal efforts are associated with the Ministry of Environment.

EE in the Curriculum

The national system of education, as defined in the National Policy on Education, 1986, visualizes a national curricular framework which contains a common elements related with natural and social environment.

The National Policy on Education, 1986 (NPE) states that the 'protection of the environment' is a value which along with certain other values must form an integral part of the curriculum at all stages of education. The policy states: 'There is a paramount need to create a consciousness of the environment. It must permeate all ages and all sections of society, beginning with the child. Environmental consciousness should

inform teaching in schools and colleges. This aspect will be integrated in the entire educational process.'

There has been special emphasis on the need of the following:

- To give importance to environmental education, and this has been kept in view while designing curriculum
- To framing the syllabi and developing textbooks

The National Council of Educational Training and Research (NCERT), the apex body in the area of developing curriculum for the formal education system, developed a four pronged approach. The four elements of the strategy are:

1. Strengthening Infusion of EE
2. Teacher Training for effective EE
3. Introduction of Environment as a separate subject
4. Use of non-formal methods of EE through the involvement of NGOs

The success of the above strategy will depend upon the close synergy and partnership between the MHRD and the MoEF, their key institutions, State Governments, NGOs as well as educational institutions throughout the country. In addition, the four components are closely linked with each other and cannot be considered in isolation from the other.

CEE is closely involved in this process, part and supported by the World Bank. The priority is first step which is analysing the curricula across India to check the degree and quality of infusion of EE. The Bharati Vidyapeeth Institute of Environmenl Education and Research (BVTEER) is the helping hand of CEE is this process.

Environmental Orientation to School Education (EOSE)

The Ministry of Human Resource Development (MHRD) supports a centrally sponsored scheme under its financial assistance is provided to government and voluntary organizations and other institutions working in the field of environmental education to develop local specific programmes and materials. Under this scheme, CEE is one of the designated nodal agencies.

Centers of Excellence

One of the strategies of the Department was to establish 'Centres of Excellence' for research, training and education whose responsibility is to strengthen the country's infrastructure and develop an ability to solve the related issues. The Centre for Environment Education was set up in 1984 at Ahmedabad under this programme. A second centre, the C.R Ramaswamy Environmental Education Centre at Chennai was set up in 1988 under the same scheme. The main activities of both the Centres are the development of environmental resource materials, organization of training programmes and creation of environmental awareness among teachers, students and the general community.

Environmental Information System (ENVIS)

The Ministry of Environment and Forests has set up ENVIS for different aspects of environment. The objectives of this system are:

- To provide national environmental information service to the users of originators, processors and disseminators

- To build up storage, retrieval and dissemination capabilities

- To promote support and assist education and personnel training programmes designed to enhance environmental information processing and utilizing capabilities

- To promote exchange of information amongst developing countries. CEE has been designated as the National ENVIS Centre for Environmental Education

Eco-clubs in Schools

- Under the ministry of environment and forests a non formal pro-active system is formed to impart environmental education to school children through environmental activities planned by eco-clubs.

- An Eco-club may be set up in a middle/high school and should consist of a minimum of 20 members and a maximum of 50 members, particularly interested in the conservation and protection of the environment, and willing to dedicate time and effort on a regular basis towards this end. The members may be drawn from students belonging to classes from VI to X. Each Eco-club will be in charge of an active teacher in the school concerned. The Ministry provides some finance support per annum per Eco-Club.

The Agents of Change, Selecting Target Groups

CEE has strategically selected the primary school teachers as capacity builder agents to achieve maximum outcomes. Another target was 10-14 year olds to introduce activity based learning by doing approaches for environmental education as children are open, and capable of accepting new ideas and are free from pressure of competition.

Training and Capacity Building

Another thrust area of CEE is training and capacity building of individuals and institutions in environmental education. A range of short and long-term training programmes are offered. Some of the programmes are: Training programme in Environmental Education (TEE), Internship Programme in Environmental Journalism, Training in Librarianship and Documentation (TLD), Training for Indian Forest Officers, Environmental Education Bank, Certificate Course in Environmental Education (CCEE) to fulfill the requirement of trained professionals in EE in South and South East Asia.

Regional and International Approach

Various international activities are carried out by the Centre. The activities are on-going training programmes, workshops in collaboration with other NGOs, Institutes, Workshops/Seminars/Specific Focus Meetings, Training Programmes, Subject Expertise, Collaborative Projects and Partnerships and Networking.

SASEANEE is the Asian Regional Network of IUCN's Commission on Education and Communication. SASEANEE is a network of agencies and individuals in or interested in networking, initiating, or supporting environmental education programmes in the Region. The Secretariat is located at CEE. The South Asia Cooperative Environment Programme (SACEP) has through the Ministry of Environment and Forests, designated CEE as its Subject Matter Focal Point of Environmental Education and Training and National Focal Point.

Strategies for Awareness and Evaluation of Environmental Issues

1. National Environmental Awareness Programme (NEAC)

The Ministry of Environment and Forests (MOEF), Government of India started National Environment Awareness Campaign (NEAC) in 1986 with the aim of creating environmental awareness at all levels of society. Under NEAC, the Ministry provides financial assistance to selected non-governmental organizations, education and training institutes, community organizations, etc. to create massive awareness among citizens of India.

2. Museums of Natural History

The Ministry of Environment and Forests adopted another strategy by setting natural History of Museums

- To promote non-formal education
- To create environmental awareness among people

3. Promoting Mass Media

The Ministry provides financial assistance for the production of films, video-spots and other audio visuals on important environmental issues for creation of mass awareness. These are normally telecasted by our National Television (Ejpordarshan) Channels. There are slots in our National TV Channel especially for environment.

4. The CEE Strategy

CEE is a national centre in the field of environmental education (EE). Its main objective is to promote environmental awareness, an understanding of natural processes and interrelationship between human beings and environment. It provides efforts to servicing the EE needs of special groups such as teachers and educators, journalists and communicators, business and industry, government departments and NGOs, planners and policy makers, in-service professionals and community-based organized guided by certain basic strategies for maximization of their effectiveness and impact.

5. Chain Management

CEE has its strategies to manage a chain between government and voluntary sector; using the mass media, seminars, workshops, etc. The 20,000 odd daily newspapers and periodicals in the country constitute a powerful medium for reach a significant section of the urban and rural population.

CEE publishes its articles in newspapers, non-governmental organizations and individual subscribers in English and Hindi and translated in many other languages. The multiplier effect is considerable. Exhibitions form another effective medium for environmental communication.

CEE develops environment-related themes which are telecast on television and video facilities.

6. Partnerships with NGO's

CEE has, therefore, developed a strategy of working with government and nongovernment institutions (local schools, local NGOs, State Departments of Education) across the country by developing school-cluster programmes supported by MoEF.

7. Quality Management

CEE strongly emphasis the quality of the materials, talent and validity of action carried under environmental education process. It appreciates imaginations, creativity in the actions and material.

8. Field demonstrations

CEE has through its field programmes aimed at creating awareness among the communities about the ecological significance of the forest areas around which they live. For e.g. CEE has launched the first Eco-development programme around the Ranthambhore National Park in Rajasthan. Afield office was set up in 1987 at Sawai Madhopur near Ranthambhore for implementation of various educational and developmental programmes in selected villages around the park. The focus of the programme has been on environmental improvement by people themselves through environmentally sound technologies. Among the areas for which communication/ education programmes were developed to this end was animal husbandry. Another project - Hingolgadh Ecodevelopment Project was initiated in six villages around the Hingolgadh nature Education Park in Rajkot district of Gujarat. Today the project continues activities in 15 such villages and has extended its activities to 25 other villages not directly dependent on the sanctuary.

9. Experiencing Nature

Sundarvan, a nature education park, is part of CEE. It has designed some programmes to:

- Expose urban children and adults to the beauty and harmony of nature.
- Develop love and pity for flora and fauna.
- Educate children using small animals, nature camps and training camps.
- Organize special camps for special groups such as deaf and dumb children and under privileged children

Two permanent camp sites have been set up for nature education in the context of forest and marine environments respectively at Bakore and Beyt Dwarka in Gujarat. These are managed by Sundarvan. In total about 13000 participants have been exposed to nature programmes through these camps.

10. Sustainable Development

After the Rio Conference in the light of Agenda 21, comprehensive information system has been developed for key decision making areas such as industrial technology, conservation of protected areas and urban development. CEE launched in 1996 a special initiative that targets policy makers in every field.

Media for Sustainable Development (MSD) projects and programmes identify and articulate issues of current policy relevance in the environment-development.

A major book series funded by the Ford Foundation, the Swiss Development Cooperation and CEE on policy issues relating to sustainable development is being brought out by CEE. The books aim to:

- Educate and inform decision makers and policy planners about a concern or issue related to ecologically sensitive and equit

- Present alternative and innovative models of action for a variety of ecological situations
- Present audio-visual series dealing with sustainable development

MSD also runs a monthly press feeder service CEE-NFS (CEE's News and Feature Service) which supplies well researched, ready to use articles, news items and features on a non-exclusive basis to over 600 newspapers and magazines across the country. CEE-NFS seeks to make optimal use of existing media networks for the improvement of environmental awareness. CEE-NFS also carries articles based on issues identified by the books under the Environment and Development series.

11. IT/ Websites

Information Technology (IT) advances in the last few years has thrown up an entirely new medium, which is fast and economical. CEE decided to look at this as a potential medium of the future for EE.

CEE has already launched seven sites targeted at various groups. The sites and the groups they are targeted at are

4.7   RESEARCHES AND PROJECTS IN DIFFERENT FIELD OF ENVIRONMENT EDUCATION

A number of workshops have been conducted in collaboration with international agencies, institutions, and NGOS. Resource materials brought out by CEE have been adapted and developed for use in neighbouring countries. CEE has entered into various collaborative projects with international partners. These include partnerships with the following: national wildlife federation, USA, State University of New York, US National Park Service, World Resources Institute, USA, Field Studies Council, UK, International Television Trust for the Environment (TV/E), UK and UNESCO-UNEP.

1. CPCB, India has recently taken up a project on air quality with assistance of EEC.
2. Human exposure assessment location (HEAL) is part of the health related monitoring programme by WHO in cooperation with UNEP worked on the following:

   - Air monitoring
   - Water quality
   - Monitoring
   - Food columniation monitoring

3. ICSU international council of scientific unions a non-government organization encourages exchange of scientific information, international scientific co-operation & studies
4. International union for conservation of nature and natural resources (IUCN) scientifically based conservation methods
5. Projects earth- carried by Mr. Robert in collaboration with UNEP to empire, educate, on crucial issues facing the earth's environment
6. MAB launched by UNESCO (1971) carried 14 projects

Recent Projects

Project-1   Ecological effects of increasing human activities on tropical and subtropical forest ecosystems

Project-2   Ecological effects of different land uses and management practices on temperate and Mediterranean forest landscapes

Project-3   Impact of human activities and land use practices on grazing lands

Project-4   Impact of human activities on the dynamics of arid and semi-arid zone ecosystems with particular attention to effects of irrigation

Project-5   Impact of human activities on mountain ecosystem.

Project-6   Conservation of natural areas and the gene material they contain.

Project-7   Ecological assessment of pest management and fertilizer use on terrestrial and aquatic ecosystem.

Project-8   Ecological aspects of urban systems with particular emphasis on energy utilization.

Project-9   Research on environmental pollution and its effects of the biosphere.

Project-10   Perception of environmental quality.

Project-11   Ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones.

Project-12   Ecology and rational use of Island ecosystem.

Project-13   Effects of major engineering works on man and his environment.

Project-14   Interaction between environment transformation and the adaptive demographic and genetic structure of human population.

CHECK YOUR PROGRESS

7. What are the different strategies of environmental education?
8. State the reasons for developing nature related programme by CEE.

ACTIVITY 1

Visit a nearby school or college and find out what the institution is doing to educate the students about environment and its problems.

4.8 SUMMARY

In this unit, you have learnt that:

- In 1975, in accordance with the recommendations of the United Nations Conference on the Human Environment (Stockholm, 1972) UNESCO and the United Nations Environmental Programme (UNEP) launched the International Environmental Education Programme (IEEP).

- Some of the programmes launched by UNESCO are Man and Biosphere Programme (MAB), the International Hydrological Programme (IHP), the International Geological Correlation Programme (IGCP) and the programmes relating to the marine sciences.

- UNEP through its various international and regional programmes has successfully provided training to more than 10,000 professionals and specialists from the developing countries. Here, mention should also be made about Oceans and Coastal Areas Programme Activity Centre (OCA/PAC), which expects to train some 500 experts yearly in 1988-1989.

- The Ministry of Environment and Forests interacts actively with the University Grants Commission (UGC), National Council of Educational Research and Training (NCERT) and the Ministry of Human Resource Development (MHRD) for introducing and expanding environmental concepts, themes, issues etc. in the curricula of schools and colleges.

- The University Grants Commission (UGC) made it mandatory for all undergraduate colleges and universities in the country to introduce a six-month compulsory course in environmental studies beginning from the academic session 2004-05.

- A Centrally Sponsored Scheme of Environmental Orientation to School Education has been started with effect from 1989-90, under which 100 per cent financial assistance is provided to States/Union Territories and voluntary organizations working in the field of environment education.

- Greenpeace International is a non-governmental organization for the protection and conservation of environment. Greenpeace International uses direct action, lobbying and research to achieve its goals.

- Friends of the Earth are the world's largest grassroots environmental network. It unites seventy-one different national member groups and some 5,000 local activist groups on every continent.

- A revamping of the education system is required to produce environmentally conscious citizens through research and teaching at the various levels to make environmental education a lifelong process with awareness and attitude.

- A broad definition of research is given by Martyn Shuttle worth - "In the broadest sense of the word, the definition of research includes any gathering of data, information and facts for the advancement of knowledge.

- CEE has strategically selected the primary school teachers as capacity builders agent to achieve maximum outcomes. Another targets were 10-14years to introduce activity based learning by doing approaches for environmental education as children's are open , capable for accepting new ideas and free from pressure of competition.

4.9 KEY TERMS

- **Centre for Environment Education (CEE):** CEE is a national institute established in 1984 with the objective of promoting environmental awareness all over the country

- **Eco-friendly products:** Are those products which are not harmful to the atmosphere or surroundings.
- **Ecosystem:** Is the interrelationship between the biotic and non biotic components of the environment.
- **Geosphere:** It is the collective name for the lithosphere, the hydrosphere, the cryosphere, and the atmosphere.

4.10 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Some of the programmes launched by UNESCO are Man and Biosphere Programme (MAB), the International Hydrological Programme (IHP), the International Geological Correlation Programme (IGCP) and the programmes relating to the marine sciences.
2. The United Nations Conference on Environment Stockholm, June 1972 led to the formation of UNEP.
3. The Centre for Environment Education (CEE) was established in India in 1984.
4. Some of the NGO's working in the field of research and development, conservation and protection of the environment in India are Assam Science Society, Centre for Environmental Education and Bombay Natural History Society.
5. Some of the emerging areas of research in environmental education are:
   - Environmental Services
   - Global Competitiveness
   - Forestry
   - Wildlife
   - Balance between environment and development
   - Conservation and protection of animals and plants
   - Biodiversity
   - Integration and harmonization of different courses
   - Ecosystem
6. Quality of the environment is recognized by the quality of species vegetation, water, air, soil and other resources. The quality of these natural resources can be maintained only when they are prevented from any kind of contamination. Major part of the research must be focused on:

   - To study the protection of grassland and wetland ecosystems.
   - To study the adaption of more integrative approaches to maintain quality.
   - To study the use of scientific efforts to deal with large scale changes which are affecting the land based system.
   - To identify the species which have an ecological value and assist in maintaining the productivity and sustainability of the forest communities.
7. The strategies of EE have been summarized as:

- Teaching can be made effective and interesting by real experiences
- Helps in developing ability of observation and imagination
- Objectives of teaching can be realized
- Develops feeling of cooperation and team work

8. CEE has developed nature based programmes for the following reasons:

- Expose urban children and adults to the beauty and harmony of nature
- Develop love and pity for flora and fauna
- Educate children about nature by using small animals, nature camps and training camps
- Organize special camps for special groups such as deaf and dumb children and under privileged children

4.11 QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is the importance of the United Nations Conference on Environment held at Stockholm in 1972?
2. Write short note on the role of

   (i)UGC/Universities

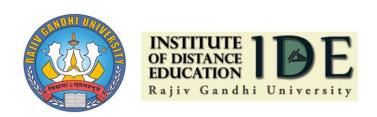   (ii) NGO's in the field of environment education. 3. What is

Research?

Long-Answer Questions

1. Explain the working of 'Friends of the Earth' environmental network.
2. Elaborate on the various areas of research and development in environmental education.
3. Explain the different research methods.
4. Describe the different programmes carried out by CEE.

4.12 FURTHER READING

Bell, D.; *The Coming of Past Industrial Society,* Arnold Heinman Publication, New Delhi, 1974.

Bhatia, S.C. (ed).; *Papers in Environmental Education,* IUACE, New Delhi, 1984.

Carson, R.; *The Silent Spring,* Fewcett Publication, Greenwich, 1962.

Chakraborty, S.C. (ed); *Value Orientation and Environmental Education,* VivekanandaNidhi, Calcutta, 1982.

Grossland, R.W., & Moor, S.F.D.; *Environmental Studies Project: An Evaluation Report,* Macmillan, London, 1974.

Sharma, R.A.; *Environmental Education,* Surya Publication, Meerut, 1998.

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