SYLLABUS
Class: - I Year
Subject: - Environment Studies

Unit	Contents
UNIT – I	**Environment and Natural Resources:** • Multidisciplinary nature, Scope and Importance of Environment • Components of Environment. Atmosphere, Hydrosphere, Lithosphere, and Biosphere. • Brief account of Natural Resources and associated problems: Land Resource, Water Resource, Energy Resource. • Concept of Sustainability and Sustainable Development
UNIT – II	**Biome, Ecosystem and Biodiversity:** • Major Biomes: Tropical, Temperate, Forest, Grassland, Desert, Tundra, Wetland, Estuarine and Marine • Ecosystem: Structure function and types their Preservation & Restoration. • Biodiversity and its conservation practices. Keywords: Biome, Ecosystem, Biodiversity
UNIT – III	**Environmental Pollution, Management and Social Issues:** • Pollution: Types, Control measures, Management and associated problems. • Environmental Law and Legislation: Protection and conservation Acts. • International Agreement &Programme.
	• Environmental Movements, communication and public awareness programme. • National and International organizations related to environment monitoring. • Role of information technology in environment and human health.

UNIT -I

INTRODUCTION

The word environment is derived from the French word 'environner' which means to 'encircle or surround'. · Thus our environment can be defined as "the Social, Cultural and Physical conditions that surround, affect and influence the survival, growth and development of people, animals and plants"

This broad definition includes the natural world and the technological environment as well as the cultural and social contexts that shape human lives. It includes all factors (living and nonliving) that affect an individual organism or population at any point in the life cycle; set of circumstances surrounding a particular occurrence and all the things that surrounds us.

SEGMENTS OF ENVIRONMENT

Environment consists of four segments.

1. Atmosphere- Blanket of gases surrounding the earth.
2. Hydrosphere- Various water bodies present on the earth.
3. Lithosphere- Contains various types of soils and rocks on the earth.
4. Biosphere- Composed of all living organisms and their interactions with the environment.

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- The Environment studies is a multi-disciplinary science because it comprises various branches of studies like chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc.

- It is the science of physical phenomena in the environment. It studies about the sources, reactions, transport, effect and fate of physical and biological species in the air, water, soil and the effect of from human activity upon these.
- As the environment is complex and actually made up of many different environments like natural, constructed and cultural environments, environmental studies is inter disciplinary in nature including the study of biology, geology, politics, policy studies, law, religion engineering, chemistry and economics to understand the humanity's effects on the natural world.
- This subject educates the students to appreciate the complexity of environmental issues and citizens and experts in many fields.
- By studying environmental science, students may develop a breadth of the interdisciplinary and methodological knowledge in the environmental fields that enables them to facilitate the definition and solution of environmental problems.

SCOPE OF ENVIRONMENTAL STUDIES

Environmental studies as a subject has a wide scope. It includes a large number of areas and aspects, which may be summarized as follows:

· **Natural resources**- their conservation and management

· **Ecology and Biodiversity**

· **Environmental pollution and control**

· **Human population** and environment

· **Social issues** in relation to development and environment

These are the basic aspects of environmental studies which have a direct relevance to every section of society. Several career options have emerged in these fields that are broadly categorized as:

(i) Research and development in environment:

Skilled environmental scientists have an important role to play in examining various environmental problems in a scientific manner and carry out R&D activities for developing cleaner technologies and promoting sustainable development.

(ii) Green advocacy:

With increasing emphasis on implementing various Acts and Laws related to environment, need for environmental lawyers has emerged, who should be able to plead the cases related to water, air, forest, wildlife, pollution and control etc.

(iii) Green marketing:

While ensuring the quality of products with ISO mark, now there is an increasing emphasis on marketing goods that are environment friendly. Such products have ecomark or ISO 14000 certification. Environmental auditors and environmental managers would be in great demand in the coming years.

(iv) Green media:

Environmental awareness can be spread amongst masses through mass media like television, radio, newspaper, magazine, hoardings, advertisements etc., for which environmentally educated persons are required.

(v) Environmental consultancy:

Many non-government organizations, industries and government bodies are engaging environmental consultants for systematically studying and tackling environment related problems.

IMPORTANCE OF ENVIRONMENTAL STUDIES

- The importance of environmental studies is that, the current trend of environmental degradation can be reversed if people of educated communities are organized, empowered and experts are involved in sustainable development.
- Environmental factors greatly influence every organism and their activities.

- At present a great number of environmental issues, have grown in size and complexity day by day, threatening the survival of mankind on earth. These issues are studied besides giving effective suggestions in the environment studies.
- · The environment studies enlighten us, about the importance of protection and conservation of our natural resources, indiscriminate release of pollution into the environment etc.

Environment studies have become significant for the following reasons:

1.Environment Issues being of International Importance:

It has been well recognized that environment issues like global warming, ozone depletion, acid rain, marine pollution and loss of biodiversity are not merely national issues but are global issues and hence must be tackled with international efforts and cooperation.

2. Problems Cropped in The Wake of Development:

Development, in its wake gave birth to Urbanization, Industrial Growth, Transportation Systems, Agriculture and Housing etc. However, it has become phased out in the developed world. The North, to cleanse their own environment has, fact fully, managed to move 'dirty' factories to South. When the West developed, it did so perhaps in ignorance of the environmental impact of its activities. Evidently such a path is neither practicable nor desirable, even if developing world follows that.

3. Explosively Increase in Pollution:

World census reflects that one in every seven persons in this plant lives in India. Evidently with 16 per cent of the world's population and only 2.4 per cent of its land area, there is a heavy pressure on the natural resources including land. Agricultural experts have recognized soils health problems like deficiency of micronutrients and organic matter, soil salinity and damage of soil structure.

4. Need for An Alternative Solution:

It is essential, specially for developing countries to find alternative paths to an alternative goal. We need a goal as under:

(1) A goal, which ultimately is the true goal of development an environmentally sound and sustainable development.

(2) A goal common to all citizens of our earth.

(3) A goal distant from the developing world in the manner it is from the over consuming wasteful societies of the "developed" world.

5. Need To Save Humanity From Extinction:

It is incumbent upon us to save the humanity from extinction. Consequences to our activities cause destructing the environment and depleting the biosphere, in the name of development.

6. Need For Wise Planning of Development:

Our survival and sustenance depend. Resources withdraw, processing and use of the product have all to be synchronized with the ecological cycles in any plan of development. Our actions should be planned ecologically for the sustenance of the environment and development.

NEED FOR PUBLIC AWARENESS

1. **Growing Population:** A population of over thousands of millions is growing at 2.11 per cent every year. Over 17 million people are added each year. It puts considerable pressure on its natural resources and reduces the gains of development. Hence, the greatest challenge before us is to limit the population growth. Although population control does automatically lead to development, yet the development leads to a decrease in population growth rates.
2. **Poverty:** India has often been described a rich land with poor people. The poverty and environmental degradation are mixed with one another. The vast

majority of our people are directly dependent on the nature resources of the country for their basic needs of food, fuel shelter and fodder. About 40% of our people are still below the poverty line.

3. **Environment degradation** has adversely affected the poor who depend upon the resources of their immediate surroundings. Thus, the challenge of poverty and the challenge of environment degradation are two facets of the same challenge.
4. **Agricultural Growth:** The people must be made familiar with the methods to sustain and increase agricultural growth without damaging the environment. High yielding varieties have caused soil salinity and damage to physical structure of soil.
5. **Need to Increase Ground water:** It is essential of rationalizing the use of groundwater. Factors like community wastes, industrial effluents, chemical fertilizers and pesticides have polluted our surface water and affected quality of the groundwater. It is essential to restore the water quality of our rivers and other water bodies. Suitable strategies for conservation of water, provision of safe drinking water and keeping water bodies clean should be developed.
6. **Development and Forests:** Forests serve catchments for the rivers. With increasing demand of water, plan to harness the mighty river through large irrigation projects were made. Certainly, these would submerge forests; displace local people, damage flora and fauna. As such, the dams on the river Narmada, Bhagirathi and elsewhere have become areas of political and scientific debate. Forests in India have been shrinking for several centuries owing to pressures of agriculture and other uses. Vast areas that were once green, stand today as waste lands. These areas are to be brought back under vegetative cover. The tribal communities inhabiting forests, respects the trees, birds and animals give them sustenance. We must recognize the role of these people in restoring and conserving forests. The modern knowledge and skills of the forest department should be integrated with the traditional knowledge

and experience of the local communities. The strategies for the joint management of forests should be evolved in a well planned way.

7. **Degradation of Land:** At present out of the total 329 mha of land, only 266 mha possess any potential for production. Of this, 143 mha is agricultural land nearly and 85 suffers from varying degrees of soil degradation. Of the remaining 123 mha, 40 are completely unproductive. The remaining 83 mha is classified as forest land, of which over half is denuded to various degrees. Nearly 406 million head of livestock have to be supported on 13 mha, or less than 4 per cent of the land classified as pasture land, most of which is overgrazed. Thus, out of 226 mha, about 175 mha or 66 per cent is degraded to varying degrees. Water and wind erosion causes further degradation of almost 150 mha This degradation is to be avoided.
8. **Evil Consequences of Urbanization:** Nearly 27% of Indians live in urban areas. Urbanization and industrialization has given birth to a great number of environmental problems. Over 30 percent of urban Indians live in slums. Out of India's 3,245 towns and cities, only 21 have partial or full sewerage and treatment facilities. Hence, coping with rapid urbanization is a major challenge.
9. **Air and water Pollution:** Majority of our industrial plants are using outdated and pollution causing technologies and makeshift facilities devoid of any provision of treating their wastes. A great number of cities and industrial areas have been identified as the worst in terms of air and water pollution. Acts are enforced in the country, but their implement is not so easy. The reason is their implementation needs great resources, technical expertise, political and social will. Again the people are to be made aware of these rules. Their support is indispensable to implement these rules.

INSTITUTIONS IN ENVIRONMENT

Managing natural resources require efficient institutions at all levels i.e. local, national, regional and global. Among the large number of institutions that deal with environmental protection and conservation, a few well-known organization include government organizations like the BSI and ZSI, and NGOs like the BNHS, WWF-1, *etc*.

-
- **· The Bombay Natural History Society (BNHS), Mumbai**
- **· World Wide fund for nature- India (WWF-1), New Delhi**
- **· Centre or science and environment (CSE), New Delhi**
- **· C.P.R Environmental Education Centre, Madras**
- **· Centre for Environment Education (CEE)**
- **· Bharati Vidyapeeth University, Institute of Environment Education & Research, Pune**
- **· The Salim Ali Center for Ornithology and Natural History (SACON) · Wild life Institute of India (WII), Dehradhun**
- **· Zoological survey of India (ZSI)**
- **· The madras Crocodile Bank Trust (MCBT)**
- **· Botanical Survey of India (BSI)**

NATURAL RESOURCES

- · Natural resources can be defined as 'variety of goods and services provided by nature which are necessary for our day-to-day lives'.· Eg: Plants, animals and microbes (living or biotic part), Air, water, soil, minerals, climate and solar energy (non- living or abiotic part).
- · They are essential for the fulfillment of physiological, social, economical and cultural needs at the individual and community levels.

TYPES OF NATURAL RESOURCES

They are of two types of resources namely Renewable and Non-Renewable Resources.

1. **Renewable resources:** The resources that can be replenished through rapid natural cycles are known as renewable resource. These resources are able to increase their abundance through reproduction and utilization of simple substances. Ex: Plants, (crops and forests) and animals. Some examples of renewable resources though they do not have life cycle but can be recycled. Ex: Wood and wood-products, pulp products, natural rubber, fibers (e.g. Cotton, jute, animal wool, silk and synthetic fibers) and leather. · In addition to these resources, water and soil are also classified as renewable resources. Solar energy although having a finite life, as a special case, is considered as a renewable resource in as much as solar stocks is inexhaustible on the human scale.
2. **Non renewable resources:** The resources that cannot be replenished through natural processes are known as non-renewable resources. These are available in limited amounts, which cannot be increased. These resources include fossil fuels (petrol, coal etc.), metals (iron, copper, gold, silver, lead, zinc etc.), minerals and salts (carbonates, phosphates, nitrates etc.).Once a non-renewable resource is consumed, it is gone forever.

Non-renewable resources can further be divided into two categories,

A) Recyclable and

B) Non-recyclable

A) Recyclable: These are non-renewable resources, which can be collected after they are used and can be recycled. These are mainly the non-energy mineral resources, which occur in the earth's crust (Ex: Ores of aluminum, copper, mercury etc.) and deposits of fertilizer nutrients (e.g.

Phosphate sock and potassium and minerals used in their natural state (asbestos, clay, mica etc.)

B) Non-recyclable: These are non-renewable resources, which cannot be recycled in any way.

Ex: Fossil fuels and uranium, which provide 90 per cent of our energy requirements

NATURAL RESOURCES AND ASSOCIATED PROBLEMS: ·

The main problem associated with natural resources is unequal consumption. · A major part of natural resources are consumed in the 'developed' world. The 'developing nations' also over use many resources because of their greater human population. However, the consumption of resources per capita (per individual) of the developed countries is up to 50 times greater than in most developing countries.

- Advanced countries produce over 75% of global industrial waste and greenhouse gases.
- Energy from fossil fuels consumed in relatively much greater quantities in developed countries. Their per capita consumption of food too is much greater as well as their waste.

FOREST RESOURCES

A forest can be defined as a biotic community predominant of trees, shrubs or any other woody vegetation usually in a closed canopy. It is derived from latin word *'foris'* means *'outside'*. India's Forest Cover is 6,76,000 sq.km (20.55% of geographic area). Scientists estimate that India should ideally have 33% of its land under forests. Today we only have about 12% thus we need not only to protect our existing forests but also to increase our forest cover.

FUNCTIONS OF FOREST

1. It performs very important function both to human and to nature.

2. They are habitats to millions of plants, animals and wild life.

3. They recycle rain water.

4. They remove pollutant from air.

5. They control water quality.

6. They moderate temperature and weather.

7. They influence soil condition and prevent soil erosion.

USES OF FOREST

1. Commercial uses
2. Ecological uses

Commercial uses:

i. Wood – used as a fuel

ii. Supply wood for various industries – Raw materials as pulp, paper, furniture timber etc.

iii. Minor forest products – gum, dyes, resins

iv. Many plants – Medicines

v. Supply variety of animal products – honey. Ivory, horns etc.

vi. Many forest lands are used for - Mining, grazing, for dams and recreation.

Ecological uses: Forest provides number of environmental services.

i. **Production of oxygen:** Photosynthesis produces large amount of oxygen which is essential for life.

ii. **Reducing global warming:** Carbon dioxide is one of the main green house gas. It is absorbed by plants for photosynthesis. Therefore the problem of global warming caused by CO_2 is reduced.

iii. **Soil conservation:** Roots of trees bind the soil tightly and prevent soil erosion. They also act as wind breaks.

iv. **Regulation of hydrological cycle:** Watershed in forest act like giant sponges and slowly release the water for recharge of spring.

v. **Pollution moderators:** Forest can absorb many toxic gases and noises and help in preventing air and noise pollution.

vi. **Wild life habitat:** Forest is the home of millions of wild animals and plants.

REASON FOR DEFICIENCY OF FOREST:

In India the minimum area of forest required to maintain good ecological balance is about 33% of total area. But at present it is only about 12%. So over exploitation of forest material occurs.

OVER EXPLOITATION OF FOREST: Due to over population, there is an increased demand for medicine, shelter, wood and fuel. Hence exploitation of forest materials is going on increasing.

Cause of over exploitation:

1. Increasing agricultural production.
2. Increasing agricultural activities.
3. Increase in demand of wood resources.

DEFORESTATION: It is process of removal of forest resources due to natural or manmade activities (i.e.) destruction of forests.

Causes of deforestation:

1. Developmental projects: Developmental projects causes deforestation through two ways.

- · Through submergence of forest area.
- · Destruction of forest area. Ex: big dams, hydro electric projects, road construction etc.

2. Mining operations: It reduces forest areas. Ex: Mica, coal, Manganese and lime stone.

3. Raw materials for industries: Wood is an important raw material for various purposes. Ex: Making boxes, furniture and paper etc.

4. Fuel requirement: Wood is the important fuel for rural and tribal population.

5. Shifting cultivation: Replacement of natural forest ecosystem for mono specific tree plantation. Ex: Teak

6. Forest fires: Forest fire destructs thousands of acres of forest.

7. Over grazing: Over grazing by cattle reduces the cultivation land

Consequences of deforestation (or) impacts of deforestation:

- Economic loss
- Loss of biodiversity
- Destructs the habitats of various species
- Reduction in stream flow
- Increases the rate of global warming

- Disruption of weather patterns and global climate
- Degradation of soil and acceleration of the rate of soil erosion.
- Induces and accelerates mass movement / land slides.
- Increases flood frequency, magnitude / severity.
- Breaks the water cycle
- Breaks the nutrient cycle

PREVENTIVE MEASURES (OR) AVOID OF DEFORESTATION (OR) METHODS OF CONSERVATION OF FORESTS

1. New plants of more or less of the same variety should be planted to replace the trees cut down for timber
2. Use of wood for fuel should be discouraged.
3. Forest pests can be controlled by spraying pesticides by using aero planes
4. Forest fire must be controlled by modern techniques.
5. Over grazing by cattle must be controlled.
6. Steps should be taken by the government to discourage the migration of people into the islands from mainland.
7. Education and awareness programmes must be conducted.
8. Strict implementation of law of Forest conservation Act.

MAJOR ACTIVITIES IN FORESTS

TIMBER EXTRACTION

Wood used for engineering purposes like building houses, making furniture is called timber. The products derived from timber have been important to many civilizations, and thus it has acquired value within these civilizations. Timber extraction results in deforestation and in the fragmentation of the last remaining forests. It harms valuable species of trees, birds and wild animals. In spite of this, it is sometimes necessary to extract timber, so as to meet the needs of a developing country. During the extraction of timber, cutting, felling and handling should be done selectively, carefully and in a planned manner, in order to save the remaining forests and biodiversity.

Effects of Timber Extraction

The major effects of timber extraction on forest and tribal people include:

1. Poor logging results in a degraded forest.
2. Floods may be intensified by cutting of trees or upstream watersheds.
3. Loss of biodiversity.
4. Climatic changes such as less rains.
5. New logging roads permit shifting cultivators to gain access to logged areas and cut the remaining trees.
6. It results in forest fragmentation which promotes loss of biodiversity because some species of plants and animals require large continuous areas of similar habitat to survive.
7. Exploitation of tribal people by the contractors.
8. Soil erosion especially on slopes occurs extensively.
9. Sedimentation of irrigation systems, floods may be intensified by cutting of trees on upstream.

DAMS

Today there are more than 45,000 large dams around the world, which play an important role in communities and economies that harness these water resources for their economic development. Current estimates suggest some 30-40% of irrigated land worldwide relies on dams. Hydropower, another important the use of stored water, currently supplies 19% of the world's total electric power supply and is used in over 150 countries. The world's two most populous countries – China and India –have built around 57% of the world's large dams.

Dams problems

Dams are the massive artificial structures built across the rivers to store water for much beneficial purpose.

Dams are considered a "Temples of modern India". Dams destruct vast area of forest area. India has more than 1600 large dams.

Effects of dams on forest:

1. Thousands of hectares of forest will be cleared.
2. Killing of wild animals and destruction of aquatic life.
3. Spreading of water borne diseases.
4. Water logging increases the salinity of the soil.

Ex: Narmadha Sagar project it has submerged 3.5 lakhs hectares of forest.

Effects of dam on tribal people

1. Construction of big dams lead to the displacement of tribal people.
2. Displacement and cultural change affects the tribal people both mentally and physically.
3. They do not accommodate the modern food habits and life style.

4. Tribal people are ill treated by the modern society.
5. Many of the displaced people were not recognised and resettled or compensated.
6. Body condition of tribal people will not suit with new areas and hence they will be affected by many diseases.

MINING

The process of extracting mineral resources and fossil fuels like coal from the earth is called as mining.

Types of mining

1. Surface mining: Mining of minerals from shallow deposits
2. Underground mining: Mining of minerals from deep deposits

Steps involved in mining

1. Exploration
2. Development
3. Exploitation
4. Ore processing
5. Extraction and purification of minerals

The extent of damage by underground mining is more than that of surface mining, which needs enormous amount of land area for its operation and management.

Effects of mining

1. Pollute soil, water and air.
2. Destruction of natural habitat.

3. Continuous removal of minerals leads to the formation of trench where water is logged which contaminates the ground water.
4. Vibrations cause earth quakes.
5. Produces noise pollution
6. Reduces shape and size of the forest.
7. Increased risk of landslides.
8. Spoils the aesthetic beauty.

WATER RESOURCES

Water claims to be an important resource. An important use of water in our country is for irrigation. Besides, water is also required in large amounts for industrial and domestic consumption.

USES

· Is essential for all forms of life.

· Many uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually, all of these human uses, require fresh water. · No plant or animal species can survive without water. If water in our body drops by 1% we feel thirst, if it drops by 10% we face death.

HYDROLOGICAL CYCLE:

- Water from various water bodies
- Evaporated by solar energy
- Enters in to the atmosphere as clouds
- Falls again on earth as rain or snow

- Ultimately returns to the ocean.

Effects of over utilization of water

1. Decrease of ground water:

i. Increased usage decreases the ground water.

ii. Insufficient rain fall

iii. Building construction activities sealing the permeability of the soil.

2. Ground subsidence: If ground water withdrawal is greater than it's recharge rate, then the sediments in the aquifers get compacted. As a result shrinkage of land surface takes place.

Problems: a. Structural damages to the buildings

b. Fracture in pipes.

c. Reversing the flow of canals.

3. Lowering of water table: Over utilization of ground water in arid and semi arid regions for agriculture disturbs the state of equilibrium of the hydrological cycle. **Problem:** a. Lowering of water table

b. Decrease the number of aquifers

c. Change the speed and direction of water.

4. Intrusion of salt water: In coastal area over exploitation of ground water leads to the intrusion of salt water from sea. Therefore that water cannot be used for drinking and agriculture.

5. Over utilization of water causes earth quakes, landslides and famines.

6. Drying up of wells: Due to over utilization, ground water level decreases much faster than can be regenerated. It leads to drying up of dug well and bore wells.

7. Pollution of water: Near the agricultural land ground water decreases therefore water containing nitrogen enters into the ground and pollute the ground water. **Problem:** Water which contains excess nitrate content is not suitable for drinking.

REASONS FOR DECLINE OF GROUND WATER

Population continues to rise at an unprecedented and unsustainable rate; many more areas are expected to experience this imbalance in the near future.

1. Population explosion: World population is > 6 billion and will continue to increase significantly during the next few decades - Enormous demands on the world's limited freshwater supply. The total annual freshwater withdrawals today are estimated at 3800 cubic kilometers, twice as much as just 50 years ago (World Commission on Dams, 2000).

2. Overutilization of Surface and Groundwater: Occurs at various levels. Use of more water than really needed by human beings. Many agriculturists use more water than necessary to grow crops. Industries in order to maximize short-term economic gains, does not bother its liquid waste and releases it into streams, rivers and the sea.

3. Deforestation: Once hill slopes are removed of forest cover, the rainwater rushes down the rivers and is lost. Forest cover permits water to be held in the area permitting it to seep into the ground. This charges the underground stores of water in natural aquifers. This can be used in drought years if the stores have been filled during a good monsoon. This soil and water management and afforestation are long-term measures that reduce the impact of droughts. The destruction of forests influences the regulation of natural water cycle. The removal of dense and uniform cover over the hilly zones leads to occurrence of floods in drainage basins. Nations situated in tropical climates including India experience disastrous floods caused by the indiscriminate deforestation of the slopes above the valleys.

4. Hydropower generation: Large amount of water is used for generating power which otherwise used for human needs.

5. Dams - for Agriculture and Power Generation

6. Rain fall: The erratic and inadequate rainfall results in reduction in storage in subsurface reservoirs. The building construction activities are sealing the permeable zone, reducing the area for percolation of rainwater into subsurface and increase in surface runoff.

7. India's increasing demand for water for intensive irrigated agriculture, for generating electricity, and for consumption in urban and industrial centers, has been met by creating large dams. Dams support 30 to 40% of this area.

FLOOD

It is an over flow of water. It happens when the magnitude of flow of water exceeds the carrying capacity of the channel within its bank.

CAUSES OF FLOOD

1. Heavy rainfall, melting of snow and sudden release of water from dams. (Flash floods)

2. Reduction in the carrying capacity of the channel.

3. Deforestation, mining and over grazing increase the runoff from rains and the level of flood raises.

EFFECT OF FLOOD

1. Water spreads in the surrounding area and submerges them.

2. Cultivated land gets affected.

3. Extinction of civilization.

FLOOD MANAGEMENT

1. Floods can be controlled by dams.

2. Channel management control flood.

3. Flood hazards reduced by forecasting or flood warning.

4. Flood may also be reduced by reduction of run off by increasing infiltration through appropriate afforestation in the catchment area.

DROUGHT

Drought is nothing but scarcity of water, which occurs due to

1. Inadequate rain fall
2. Late arrival of rain fall
3. Excessive withdrawal of ground water.

Lack of water for the needs of agriculture, livestock, industry or human population may be termed as a drought. Drought causes serious damages to plants, animals and human life

CAUSES OF DROUGHT

1. When annual rain fall is below normal and less than evaporation, drought is created.

2. High population.

3. Intensive cropping pattern

Ex: Maharashtra - There has been no recovery from drought for the last 30 years due to over exploitation of water by sugarcane crop.

EFFECTS OF DROUGHT

1. Drought causes hunger, malnutrition and scarcity of drinking water an also changes the quality of water.

2. Drought causes widespread crop failure leading to acute shortage of food and adversely affects human and live stock population.

3. Worst situation of drought causes desertification.

4. Raw materials of agro based industries are critically affected during drought time, hence industrial and commercial growth decreases.

5. Drought increases the degradation of natural resources.

6. Drought causes large migration of people and urbanization.

DROUGHT MANAGEMENT

1. Indigenous knowledge is essential.

2. Rain water harvesting system.

3. Construction of reservoirs to improve ground water level.

4. Modern irrigation technology (drip irrigation) very useful to conserve water. 5. Afforestration activities also improve the potential of water in the drought area. 6. Crop mixing and dry forming are the suitable methods which minimize the risk of crop failures in dry area.

DAMS

Dams made significant contributions to human development and the benefits derived from them have been considerable. Large dams are designed to control floods and to help the drought prone areas, with supply of water. But large dams have proved to

cause severe environmental damage. Hence an attempt has been made to construct small dams. Multiple small dams have less impact on the environment.

Benefits: Dams ensure a year round supply of water for domestic use and provide extra water for agriculture, industries and hydropower generation.

Problems: They alter river flows, change nature's flood control mechanisms such as wetlands and flood plains, and destroy the lives of local people and the habitats of wild plant and animal species, particularly is the case with mega dams.

Some of the problems are mentioned below.

SUSTAINABLE WATER MANAGEMENT

- · Dam construction and submersion leads to significant loss of farmland and forest and land submergence
- · Siltation of reservoirs, water logging and salination in surrounding lands reduces agricultural productivity
- · Serious impacts on ecosystems - significant and irreversible loss of species and ecosystems, deforestation and loss of biodiversity, affects aquaculture · Socio economic problems for example, displacement, rehabilitation and resettlement of tribal people.
- · Fragmentation and physical transformation of rivers
- · Displacement of people - People living in the catchment area, lose property and livelihood
- · Impacts on lives, livelihoods, cultures and spiritual existence of indigenous and tribal people
- · Dislodging animal populations
- · Disruption of fish movement and navigational activities
- · Emission of green house gases due to rotting of vegetation
- · Natural disasters – reservoirs induced seismicity, flash floods etc and biological hazards due to large-scale impounding of water – increase exposure to vectorbrone diseases, such as malaria, schistosomiasis, filariasis.

- · Building several small reservoirs instead of few mega projects
- · Developing small catchment dams and protecting wetlands
- · Soil management, micro-catchment development and afforestation permits recharging of underground aquifer, thus reducing the need for large dams
- · Treating and recycling municipal waste water for agricultural use.
- · Preventing leakages form dams and canals and loss in municipal pipes · Effective rainwater harvesting in urban environments
- · Water conservation measures in agriculture, such as using drip irrigation, control of growing water intensive cash crops ; control of water logging.
- · Pricing water at its real value makes people use it more responsibility and efficiently and reduces wastage
- · In deforested areas where land has been degraded, appropriate soil management practices, making bunds along the hill-slopes and making nalla plugs can help retain moisture and make it possible to revegetate degraded areas
- · Use waste water for activities that does not need fresh water – Recycling · Adopt mini water harvesting models for domestic usage.
- · Protect existing tanks
- · Develop systematic water management and adopt strict water auditing · "Save water Campaigns" for public awareness on water scarcity
- · Through rainwater harvesting, community based participatory initiatives and holistic watershed management.
- · Responsible water usage can only be achieved by empowering local communities and creating local accountability.
- · The government should develop policies that protect water resources, promote sustainable watershed management and invest in technologies that will

increase efficiency in irrigation, industrial usage and improve water harvesting techniques.

WATER CONFLICTS

1. Conflict through use: Unequal distribution of water led to interstate and international disputes.

National conflicts:

a. Sharing of cauvery water between Karnataka and TamilNadu.

b. Sharing of Krishna water between Karnataka and Andrapradesh

c. Siruvani – TamilNadu and Kerala

International conflicts:

Indus – India and Pakistan & Colorado river – Mexico and USA

MINERAL RESOURCES

Naturally occurring inorganic crystalline solids with uniform chemical composition are called as minerals.

USES AND EXPLOITATION OF MINERALS

1. Development of industrial plants and machinery. - Fe, Al & Cu
2. Construction work – Fe, Al &Ni
3. Generation of energy - coal, lignite, uranium
4. Designing defense equipments like weapons and ornaments
5. Agricultural purposes – fertilizers and fungicides – Zn & Mn
6. Jewellery –Au, Ag & Pt

7. Making alloys for various purposes

8. Communication purposes – telephone, wires, cables and electronic devices 9. Medicinal purposes, particularly in ayurvedic system

ENVIRONMENTAL DAMAGES CAUSED BY MINING ACTIVITIES

1. Devegetation:

· Topsoil and vegetation get removed

· Deforestation leads to several ecological losses

· Land scape gets badly affected

2. Ground water contamination: Mining pollutes ground water; sulphur is converted into sulphuric acid which enters into the soil.

3. Surface water pollution: Radioactive wastes and other acidic impurities affect the surface water, which kills many aquatic animals.

4. Air pollution: Smelting and roasting are done to purify the metal which emits air pollutants and damage the nearby vegetation. It causes many health problems. **5. Subsidence of land:** Mainly underground mining results in cracks in houses, tilting of buildings and bending of rail tracks.

EFFECTS OF OVER EXPLOITATION OF MINERALS

1. Rapid depletion of mineral deposits

2. Wastage

3. Environmental pollution

4. Needs heavy energy requirements.

MANAGEMENT OF MINERAL RESOURCES

1. The efficient use and protection of mineral resources.
2. Modernization of mining industries
3. Search for new deposit
4. Reuse and recycling of the metals.
5. Environmental impacts can be minimized by adopting eco friendly mining technology.

FOOD RESOURCES

Food is an essential requirement for survival of life. Main components are carbohydrates, fats, proteins, minerals and vitamins.

TYPES OF FOOD SUPPLY

1. Crop plants: Grains mostly **c**onstitute about 76% of the world's food. Ex: Rice, Wheat and Maize

2. Range lands: Produces 17% of world's food from trees and grazing animals. Ex: Fruits, milk and meat

3. Ocean: Fisheries – 7% of world's food

WORLD FOOD PROBLEM

1. In the earth's surface, 79% is water out of total area. 21% land (forest, desert, mountain and barren land) . Less % cultivated land, at the same time population explosion is high therefore world food problem arises.
2. Environmental degradation like soil erosion, water logging, water pollution, salinity affects agricultural land.
3. Urbanization affects agricultural land. Hence production of rice, wheat, corn and other vegetable is difficult.

TYPES OF NUTRITION

1. Nutritious nutrition: To maintain good health and disease resistance, we need large amount of carbohydrate, proteins, fats and smaller amount of micronutrients such as vitamins and minerals such as Fe, Ca and iodine. Food and agricultural organization (FAO) of United Nations estimated that on an average, the minimum calorie intake on a global state is 2500 calories/day.

2. Under nutrition: People who cannot buy enough food to meet their basic energy needs suffer from under nutrition. They receive less than 90% of this minimum dietary calorie.

Effect of under nutrition: Suffer from mental retardation and infectious diseases.

3. Mal nutrition: Besides minimum calorie intake we also need proteins, minerals, vitamins, iron and iodine. Deficiency leads to malnutrition resulting in several diseases.

Effect of mal nutrition:

	ciency of nutrients	**Effects**
1 Protein	Growth	
2 Iron	Anemia	
3 Iodine	Goiter	
4 Vitamin	Blindness	

India 3[rd] largest producer of crops, nearly 300 million Indians are still under nourished. **World food summit 1996:** The world food summit, 1996 has set the goal to reduce the number of under nourished and mal nourished people to just half by 2015.

OVER GRAZING

It is a process of eating the forest vegetation without giving a chance to regenerate.

EFFECTS OF OVER GRAZING

1. Land degradation

· Over grazing removing the cover of vegetation

· Exposed soil gets compacted

· Soil moisture reduces.

· Desertification - OG leads to poor, dry and compacted soil.

· Land cannot be used for further cultivation.

2. Soil erosion: When the grasses are removed the soil becomes loose and gets eroded by the action of wind and rain fall.

3. Loss of useful species: OG affects the plant population and their regenerating capacity. OG replace the plant of high nutritive value with plant of low nutritive value.

AGRICULTURE

Agriculture is an art, science and industry of managing the growth of plants animals for human use. It includes cultivation of the soil, growing and harvesting crops, breeding and raising livestock, dairying and forestry.

TYPES OF AGRICULTURE

1. Traditional agriculture
2. Modern (or) industrialised agriculture

1. Traditional agriculture

Small plot, simple tools, surface water, organic fertilizer and a mixture of crops constitute traditional agriculture. They produce enough food to feed their family and to sell it for their income.

2. Modern agriculture

Hybrid seeds of single crop variety, high tech equipments, lot of fertilisers, pesticides and water to produce large amount of single crops.

EFFECTS OF MODERN AGRICULTURE

1. Problems in using fertilizers

a. **Excess of fertilizers causes micronutrient imbalance**. (e.g) Punjab and Haryana deficiency of nutrient zinc in the soil affect the productivity of the soil.

b. **Blue baby syndrome** (nitrate pollution): Nitrate present in the fertilizer causes blue baby syndrome, when the amount exceeds the limit leads to death.

c. **Eutrophication:** Nitrogen and phosphorus in the crop fields washed out by runoff water in the water bodies, which increases the nourishment of the lakes called eutrophication. Hence algal species increases rapidly. Life time of the species is less and they decompose easily and pollute the water which affects the aquatic life.

2. Problems in using pesticides

1. Death of non target organism.

2. Producing new pest – super pest

3. Bio magnification – Most of the pesticides are non bio degradable, keep on concentrating in the food chain and it is harmful to human beings.

4. Risk of cancer:

a. It directly acts as carcinogen

b. It indirectly supports immune system.

3. Water logging: Land where water stand for most of the year.

Causes of water logging:

1. Excessive water supply
2. Heavy rain
3. Poor drainage

Remedy:

1. Preventing excessive irrigation
2. Subsurface drainage technology
3. Bio drainage like trees like Eucalyptus

ENERGY RESOURCES

ENERGY DISTRIBUTION IN THE WORLD

- Developed countries like USA and Canada constitute only 5% of the world's population but consume 25% of the world's available energy.
- Energy consumed by a person in a developed country for a single day is equal to energy consumed by a single person in a poor country for one year.
- Developed country GNP increases and energy consumption increases. In the poor country GNP and energy consumption are less.

TYPES OF ENERGY RESOURCES:

1. Renewable energy resource (or)Non conventional energy resources
2. Non renewable energy resources (or) Conventional energy resources

RENEWABLE ENERGY SOURCES: Energy which can be regenerated.

Merits of renewable energy resources

1. Unlimited supply
2. Provides energy security.
3. Fits into sustainable development concept.
4. Reliable and the devices are modular in size.
5. Decentralized energy production.

Types of renewable energy resources

1. **Solar energy:** Nuclear fusion reaction of sun produces enormous amount of energy. Several techniques are available for collecting, storing and using solar energy. a. **Solar cell (or) Photovoltaic cell (or) PV cell:**

· Solar cell consists of p- type semi conductor (Si doped with B) and n-type semi conductor (Si doped with P). P-type forms top layer and n-type forms bottom layer.

· Solar rays fall on the top layer, the electrons from valence band promoted to the conduction band which crosses the p-n junction into n-type semi conductor. Potential difference between the two layers is created which causes flow of electrons.

Uses: It is used in calculators, electronic watches, street light, water pumps etc. b. **Solar battery:** Large number of solar cells connected in series is called solar battery. It is used in remote areas where continuous power supply is a problem.

c. **Solar water heater:** It consists of insulated box painted with black paint with glass lid. Inside the box black painted copper coil is present. Cold water is

allowed to flow, it is heated up and flows out into a storage tank from which water is supplied through pipes.

2. **Wind energy:** Moving air is called wind. The energy recovered from the force of the wind is called wind energy It's speed is high.
    a. **Wind mills:** When a blowing wind strikes the blade of the wind mill, it rotates continuously. And rotational motion of the blade drives number of machines like water pump, flour mills and electric generators.
    b. **Wind farms:** When a large number of mills are installed and joined together in a definite pattern – it forms wind farm. It produces large amount of electricity.

Condition: Minimum speed for wind generator is 15 Km/hr

Advantages:

1. It does not cause air pollution
2. Very cheap

3. Ocean energy:

Tidal energy (or) Tidal power: Ocean tides are due to gravitational force of sun and moon which produce enormous amount of energy. High tides – rise of water in the ocean. Low tides – fall of water in the ocean. Tidal energy can be used by constructing a tidal barrage. During high tides sea water enters into the reservoirs and rotates the turbine, produce electricity. During low tides water from reservoir enters into the sea rotate the turbine produce electricity.

Ocean thermal energy:

Temperature difference between surface water and deeper level water in ocean generates electricity. The energy available due to the difference in temperature of water is called ocean thermal energy.

Condition: Temperature difference should be 200C.

Process: Ammonia is converted into vapours on the surface of warm water, it increases the vapour pressure which rotate the turbine and generates electricity. Deeper level cold water is pumped to cool and condense the vapour in to liquid.

3. **Geo thermal energy:** Temperature of the earth increases at a of 20 –750C per/km when we move down the earth. The energy utilised from the high temperature present inside the earth is called geothermal energy.

Natural geysers: Hot water or steam comes out of the ground through cracks naturally is called natural geysers.

Artificial geysers: Artificially a drill hole up to the hot region and by sending a pipe into it. The hot water or steam is used to rotate the turbine and generate electricity.

4. **Bio mass energy:**

Bio mass: Organic matter produced by plants or animals used as source of energy **Bio gas:** Mixture of methane, carbondioxide and hydrogen sulphide. Methane is the major constituent. It is obtained by anerobic fermentation of animal dung (or) plant wastes in the presence of water.

Bio fuels: Fuels obtained by the fermentation of biomass.

Ex: Ethanol, methanol

Ethanol: Produced from sugar cane. Calorific value is less.

Methanol: Obtained from ethanol Calorific value too less.

Gasohol: Mixture of ethanol and gasoline India trial is going on to use gasohol in cars and buses.

Hydrogen fuel: Hydrogen produced by pyrolysis, photolysis and electrolysis of water. It has high calorific value. Non polluting one because the combustion product is water. **Disadvantages:**

1. Hydrogen is highly inflammable and explosive.

2. Safe handling is required.

3. Difficult to store and transport.

NON RENEWABLE ENERGY SOURCES:

Energy which cannot be regenerated is called as non-renewable.

1. Coal: It is a solid fossil fuel.

Disadvantages:

When coal is burnt large amount of CO2 is released which causes global warming.

S, N produces toxic gases during burning.

2. **Petroleum:** Crude oil is a liquid consists of more than hundreds of hydrocarbons and small amount of impurities. The petroleum can be refined by fractional distillation. In the world level 25% of oil reserves are in Saudi Arabia. At present rate of usage, the world crude oil reserves are expected to get exhausted in just 40 years.

3. **Liquefied petroleum gas (LPG):** Petroleum gases obtained during FD and cracking can be easily converted into liquid under high pressure as LPG. It is colorless and odorless gas, but during cylindering mercaptans are added to detect leakage.

4. Natural gas: These are found above oil in oil wells. It is a mixture of methane and other hydrocarbons. Calorific value is high. There are two types. Dry gas and wet gas.

5. Nuclear energy: Dr.H.Bhabha is a father of nuclear power development in India. 10 nuclear reactors are present in India. It produces 2% of India's electricity. Nuclear energy can be produced by two types of reactions. Nuclear fission and nuclear fusion.

Nuclear fission; It is a nuclear change in which heavier nucleus split into lighter nuclei on bombardment of fast moving neutrons. Large amount of energy is released through chain reaction.

Ex: Uranium with fast moving neutron gives barium and krypton in addition to three neutrons; in the second stage it gives nine neutrons and so on. This process of propagation of the reaction by multiplication is called chain reaction.

Nuclear fussion: It is a nuclear change in which lighter nucleus is combined together at extremely high temperature (1 billion 0C) to form heavier nucleus and a large amount of energy is released.

Ex: Isotopes of hydrogen combine to form helium molecule.

UNIT-III

ENVIRONMENTAL POLLUTION

WHAT IS POLLUTION

- Pollution is the introduction of harmful substances or products into the environment
- We will be examining 3 main parts of pollution
  - Water Pollution
  - Air Pollution
  - Land Pollution

WATER POLLUTION:

CAUSES

- Factors that contribute to water pollution can be categorized into two different groups
  - Point sources
  - Non-point sources
- Point sources are the easiest to identify and control
- Non point sources are ambiguously defined and harder to control

POINT SOURCES

- Some point sources of water pollution include
  - Waste products from factories
  - Waste from sewage system
  - Waste from power plants
  - Waste from underground coalmines
  - Waste from oil wells
- They are called point sources because they are direct sources of water pollution and can be reduced and monitored

NON-POINT SOURCES

- The term non-point source encompasses a large range of sources such as:
  - when rain or snow moves through the ground and picks up pollutants as it moves towards a major body of water
  - the runoff of fertilizers from farm animals and crop land

- air pollutants getting washed or deposited to earth
- storm water drainage from lawns, parking lots, and streets

AIR POLLUTION:

CAUSES

- One of the main causes of air pollution is the release of carbon dioxide into the atmosphere, this happens because of Deforestation and fossil fuel burning
- Sulfur dioxide is another air polluter and is released into the atmosphere by the burning of sulfur containing compounds of fossil fuels. Sulfur oxides are very dangerous to humans at a high concentration. Sulfur in the atmosphere is responsible for acid rain
- Chlorofluorocarbons (CFCs) also contribute to air pollution by reducing the amount of ozone the stratosphere. CFCs come from a variety of places such as:
  - the burning of plastic foam items
  - leaking refrigerator equipment
  - spray cans

NATURAL AIR POLLUTANTS

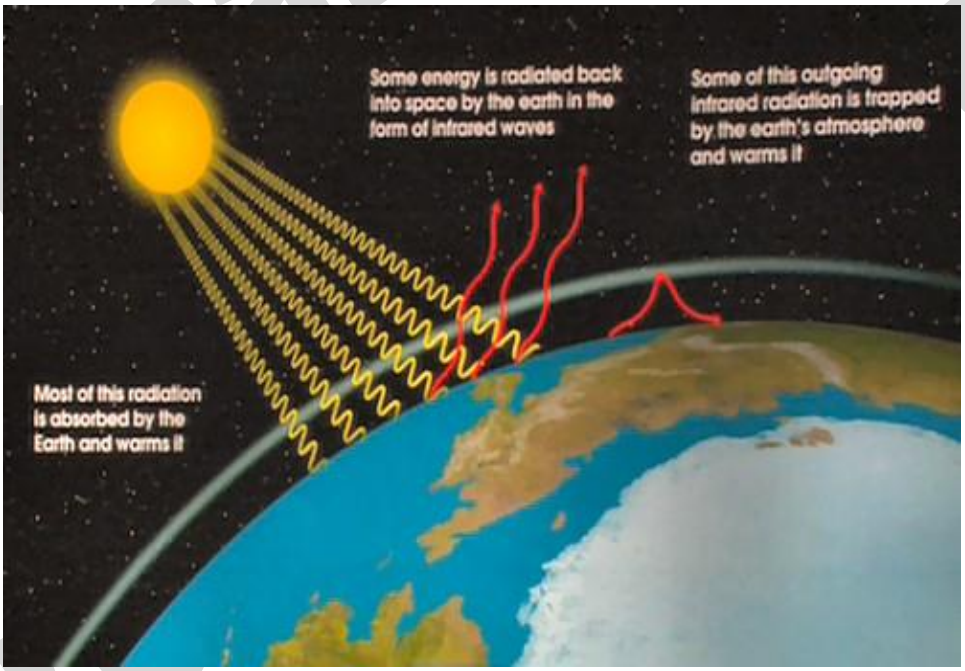
- Natural air pollutants can include:
  - Smoke from wild fires
  - Methane released from live stock
  - Volcanic eruptions

CONSEQUENCES

- CO2 is a good transmitter of sunlight, but it also partially restricts infrared radiation going back from the earth into space, which produces the so-called greenhouse effect that prevents a drastic cooling of the Earth during the night
- Increasing the amount of CO2 in the atmosphere reinforces this effect and is expected to result in a warming of the Earth's surface
- CO2 in atmosphere→GLOBAL WARMING

- Sulfur dioxide, nitrogen oxides, ozone and peroxyacl nitrates (PANs), cause direct damage to leaves of crop plants and trees when they enter leaf pores (stomates)
- Chronic exposure of leaves and needles to air pollutants can also break down the waxy coating that helps prevent excessive water loss and damage from diseases, pests, drought and frost
- "In the midwestern United States crop losses of wheat, corn, soybeans, and peanuts from damage by ozone and acid deposition amount to about $5 billion a year". (Miller 498)
-

GREEN HOUSE EFFECT



ACID RAIN

- When emissions of sulfur dioxide and nitric oxide from stationary sources are transported long distances by winds, they form secondary pollutants such as nitrogen dioxide, nitric acid vapor, and droplets containing solutions of sulfuric acid, sulfate, and nitrate salts
- These chemicals descend to the earth's surface in wet form as rain or snow and in dry form as a gases fog, dew, or solid particles, it is known as acid rain or acid deposition

SMOG

- With the introduction of petroleum to replace coal economies in countries, photochemical smog has become predominant in many cities, which are located in sunny, warm, and dry climates with many motor vehicles
- Worst episodes of photochemical smog tends to occur in summer

LAND POLLUTION:

CAUSES

- Four Main causes of land pollution
  - Construction
  - Agriculture
  - Domestic waste
  - Industrial Waste

CONSTRUCTION

- Buildings take up resources and land, the trees are chopped down and used to make buildings
- Takes away from places for animals and other organisms to live

AGRICULTURE

- As there are more and more people inhabiting the earth, food is in higher demand and so forests are chopped down and turned into farmland
- In addition, herbicides, pesticides, artificial fertilizers, animal manure (poop) are washed into the soil and pollute it

DOMESTIC WASTE

- Tons of domestic waste is dumped every day. Some waste from homes, offices and industries can be recycled or burnt in incinerators

- There is still a lot of garbage, such as refrigerators and washing machines that are dumped in landfills simply because they cannot be reused in anyway, nor recycled

INDUSTRIAL WASTE

- Plastics factories, chemical plants, oil refineries, nuclear waste disposal activity, large animal farms, coal-fired power plants, metals production factories and other heavy industry all contribute to land pollution

CONSEQUENCES

- Land pollution exterminates wild life
- Acid rain kills trees and other plants
- The vegetation that provides food and shelter is destroyed
- Land pollution can seriously disrupt the balance of nature, and, in extreme cases, can cause human fatalities
- Pesticides can damage crops; kill vegetation; and poison birds, animals, and fish. Most pesticides kill or damage life forms other than those intended. For example, pesticides used in an effort to control or destroy undesirable vegetation and insects often destroy birds and small animals. Some life forms develop immunity to pesticides used to destroy them

WAYS TO STOP POLLUTION

- You can help to reduce global air pollution and climate change by:
- Driving a car that gets at least 35 mpg
- Walking, biking, and using public transportation
- Using CFL bulbs over incandescent bulbs
- Buying only energy efficient appliances
- Recycling newspaper, aluminum, and others
- Planting trees!
- Avoid purchasing products that contain CFCs

- Supporting much stricter clean air laws and enforcement of international treaties to reduce ozone depletion and slow global warming

NOISE POLLUTION:

The word noise is derived from the Latin word nausea meaning seasickness. Like its root meaning, noise has a negative effect to human health and well-being. Noise resulting from road traffic, jet planes, jet skis, garbage trucks, construction equipment, manufacturing processes, lawn mowers, leaf blowers, and boom boxes, to name a few, are among the audible litter that are routinely broadcast into the air (Noise, Noise Pollution and Clearinghouse). They interfere with sleep, concentration, communication, and recreation. The potential health effects of noise pollution are numerous, pervasive, persistent, and medically and socially significant. Health problems related to noise include hearing loss, stress, high blood pressure, sleep loss, distraction and lost productivity, and a general reduction in the quality of life and opportunities for tranquility. Noise is among the most pervasive pollutants today, Its more severe and widespread than ever before, and it will continue to increase in magnitude and severity because of population growth, urbanization, and the associated growth in the use of increasingly powerful, varied, and highly mobile sources of noise. However, strategies such as noise mitigation and its three distinct methods: control, path control and receptor shielding (Noise Mitigation) can reduce environmental noise.

CAUSES

We are bombarded with sound even when we live in rural areas. From crop dusters to large farm equipment, we have plenty of sound in the country. In the urban areas, we not only have sound that is produced at unnatural decibel levels, the sound is reflected from hard surfaces that form at every kind of angle. We go to theaters and concerts where the ability to magnify sound has developed in incredible ways. We listen on headphones, where sound is not only concentrated, but the waves pound the eardrums with persistent and unnatural force.

Living next to airports, anywhere in the flight path of departing planes, and near maintenance

facilities where engine run ups can blast sound for miles, is another source of unnatural and massive sound. Freeways, busy streets, moving trains, even the noise levels in hospital intensive care rooms, where a patient should be able to expect some peace and quiet are insane.

Sound pollution has resulted in days where there is virtually no period of time when some sound is not expected to intrude into our homes and lives.

The decibel measurement system is a very complicated matter, so for acoustic measurement, the amount of pressure on the eardrum is the important factor.

A decibel level of 225 is considered to be deafening. The most common source of that much sound is an aircraft taking off.

At a level of 130, pain begins. level 130 is also considered to be deafening. Close proximity to pneumatic concrete drills is the most common experience.

At level 110-120, fireworks displays, close proximity to trains, leaf blowers, music concerts, and thunder are recognizable sounds. 110 is the lowest level that is considered to be deafening. Between 90 and 110, we have far more common items: some sirens, passing trucks, trucks without mufflers, car horns, and lawn mowers. The category is "Very Loud".

Between 70 and 90, noise is "loud", and includes noisy restaurants and offices, vacuum cleaners, flush toilets.

EFFECT

Noise has a big impact on people all day every day. But with people not noticing it, makes it hard for anyone to do anything about it. It is causing many different problems to people mentally, socially, and physically. There are many ways to help or prevent it, but these changes are not immediately visible, so they are left unattended to.

Exposure to very loud sounds that are enjoyable, and not technically noise to the listener, can lead to hearing impairment. A survey of hearing was tested among youngsters between the ages of 6 and 19. They found that 1 out of 8 of them suffered a noise-related hearing problem. Teens attend dances, equip vehicles with systems, and even work in loud fast food restaraunts. Noises are especially bothersome at night when one is trying to sleep, which is vital to good health. Noise from snowmobiles, jet skis, and supersonic jets has also intruded on the environment, affecting animals' abilities to communicate, protect their young, and mate.

MENTAL HEALTH:

Noise pollution is not believed to be a cause of mental illness, but it is assumed to accelerate and intesify the development of latent mental disorders. Some of theses cases would be : anxiety, stress, nervousness, nausea, headache, emotionally instability, argumentatives, sexual impotence, changes in mood, and increase in social conflicts. The news media reguraly report violent behavior arising out of disputes over noise which in many cases these disputes ended in injury or death.

SOCIAL HEALTH:

Noise is a prominent feature of the environment including noise from transport, industry, and neighbors. Exposure to transport noise disturbs sleep I nthe laboratory, but not generally in field studies where adaptation occurs. Noise interferes in complex task performances, modifies social behavior and causes annoyance.

PREVENTION

Follow the below given steps for controlling and preventing noise pollution.

- Control of Noise pollution at Source
- Noise producing industries, railway stations, aerodrome, etc. should be located far away from the residential areas.
- We should play various music systems such as stereos, television, etc. at low volume.
- We should not use loud speakers during night. Even during time they should be used at low volumes.

- Various machines should be well maintained so that they produce less sound.
- It is observed that certain persons blow horns of their vehicles unnecessarily, or remove silencers of the exhaust pipes of vehicles. Such practices produce lot of noise and should be avoided.
- Laws should be framed so that the persons producing unnecessary noise are punished.

Control of Noise Pollution by obstructing the path of Noise

- By constructing soundproof buildings, the menace of sound pollution can be minimized.
- Plants also help in controlling noise pollution because they absorb high frequency sound waves. Thus, planting trees along the roads help in controlling noise pollution.

THERMAL POLLUTION:

Thermal pollution is generally defined as the discharge of heated water into aquatic biomes. But thermal pollution also covers releases of colder than normal water into the aquatic biomes. The general effect is to raise or lower the temperature of the aquatic biome in ways that kill off life that is sensitive to higher temperatures. If the heated water from industrial operations contains chemicals or radiation that is toxic to life in aquatic biomes, then the problem is compounded.

CAUSES

The most common human, or anthropogenic, causes of thermal pollution are coolant release from power production and manufacturing plants, urban runoff from storm drains that carry surface runoff from roads and warmer surfaces, and releases of colder than normal water from reservoirs into rivers and waterways.

In the industrial area, petroleum refineries, pulp/paper mills, chemical plants, steel mills and smelters are the big contributors to thermal heat pollution.

Natural causes include geothermal and volcanic activity, either under the oceans and seas or from above ground lava flow. Lightening strikes can also introduce massive amounts of heat, and the natural progress of warmer currents into colder biomes occur.

EFFECT

The effects of thermal pollution include damage to larvae and eggs of fish in rivers where there is a limited tolerance for temperature change. The other effects are on the biodiversity of aquatic biomes due to killing off of some species that are not resistant to temperature change, which disrupts the balance of the food and light chains for plants, fish, bacteria, and microscopic life forms. Fish and macroinvertibrates are most susceptible to temperature changes, as they have the most limited tolerance for sudden excessive heat and cold.

Heat affects the metabolic rate and enzymatic activity of aquatic animals, leading to more eating, which can upset the balance in food availability.

Dissolved oxygen and other chemical changes to the structure of the water are another effect of heat thermal pollution. The heat tends to decrease the amount of dissolved oxygen in the water.Another effect is that living entities attempt to migrate when their environment is untenable. The increased migration of life forms to areas that had a perfect balance can create a fight for limited resources, once the population increases.

PREVENTION

What can be done about anthropogenic thermal pollution? There are cooling ponds and towers that store and transition the water to more acceptable temperatures before release. There is also recycling of the heated water to direct it to areas where heat is needed.

Following are the means to reduce thermal pollution:

1. Theoretically, when efficiency of any heat engine is equal to 1.0 then it will convert 100% of heat energy to mechanical energy. So there will be no loss of heat to the environment. This is practically impossible. Rather, we should aim at maximizing the efficiency of heat engines (steam, IC, nuclear etc) so that heat loss is minimum.
2. Reduce mechanical friction in any rotating parts.
3. Avoid consuming energy more than necessity. Burn less coal, oil or gas.
4. Promote use of more nuclear energy because it will not generate Carbon di oxide.
5. One of the major cause of Global warming is increasing concentration of Carbon di oxide, leading to more green house effect. On the other hand, green plants have got the capacity to absorb Carbon di oxide. In the photo synthesis plants take water, sunlight and carbon di oxide to prpoduce their food. So, plant as many trees as possible. Massive plantation is the only solution for reducing global

carbon di oxide level. Indirect effect of plantation is, It will reduce soil temperature, cause more rains, some of the carbon di oxide shall be dissolved in rain and shall go to the sea - which will ultimately form carbonate rocks and will help in the flora and fauna of the marine life.

5. If we can follow these, certainly we shall be successful in reducing thermal pollution and will be able to prevent the glaciers from melting and rising of sea levels.

Thermal can be prevented very easily. Most of the people who cause thermal pollution are big facctories which use the water then pour it back in the ocean. To prevent this all they have to do is just cool the water before they put it back in the ocean.

NUCLEAR POLLUTION:

The **environmental impact of** nuclear power results from the nuclear fuel cycle, operation, and the effects of nuclear accidents.

The routine health risks and greenhouse gas emissions from nuclear fission power are small relative to those associated with coal, but there are "catastrophic risks"[1] such as the possibility of over-heated fuel releasing massive quantities of fission products to the environment. The public is sensitive to these risks and there has been considerable public opposition to nuclear power. The 1979 Three Mile Island accident and 1986 Chernobyl disaster, along with high construction costs, ended the rapid growth of global nuclear power capacity.

A major EU funded research study known as ExternE, or Externalities of Energy, undertaken over the period of 1995 to 2005 found that the environmental and health costs of nuclear power, per unit of energy delivered, was €0.0019/kWh. This is lower than that of many renewable sources including the environmental impact caused by biomass use and the manufacture of photovoltaic solar panels, and was over thirty times lower than coals impact of €0.06/kWh, or 6 cents/kWh. However the energy source of the lowest external costs associated with it was found to be wind power at €0.0009/kWh, which is an environmental and health impact just under half the price of Nuclear power.

In March 2011 an earthquake and tsunami caused damage that led to explosions and partial meltdowns at the Fukushima I Nuclear Power Plant in Japan. Concerns about the possibility of a large scale radiation leak resulted in 20 km exclusion zone being set up around the power plant and people within the 20–30 km zone being advised to stay indoors. John Price, a former member of the Safety Policy Unit at the UK's National Nuclear Corporation, has said that it "might be 100 years before melting fuel rods can be safely removed from Japan's Fukushima nuclear plant"

Waste streams

Nuclear power has at least four waste streams that may harm the environment:

1. they create spent nuclear fuel at the reactor site (including plutonium waste)
2. they produce tailings at uranium mines and mills
3. during operation they routinely release small amounts of radioactive isotopes
4. during accidents they can release large quantities of dangerous radioactive materials

The nuclear fuel cycle involves some of the most dangerous elements and isotopes known to humankind, including more than 100 dangerous radionuclides and carcinogens such as strontium-90, iodine 131 and cesium -137, which are the same toxins found in the fall out of nuclear weapons".

Radioactive waste

High-level waste

Around 20–30 tons of high-level waste are produced per year per nuclear reactor.[6] The world's nuclear fleet creates about 10,000 metric tons of high-level spent nuclear fuel each year.[7] Several methods have been suggested for final disposal of high-level waste, including deep burial in stable geological structures, transmutation, and removal to space. So far, none of these methods have been implemented.[8] There is an "international consensus on the advisability of storing nuclear waste in deep underground repositories",[9] but no country in the world has yet opened such a site.[9][10][11][12][13] There are some 65,000 tons of nuclear waste now in temporary storage throughout the U.S., but in 2009, President Obama "halted work on a permanent repository at Yucca Mountain in Nevada, following years of controversy and legal wrangling".

Nuclear reprocessing may reduce the volume of high-level waste, but by itself does not reduce radioactivity or heat generation and therefore does not eliminate the need for a geological waste repository. Reprocessing has been politically controversial because of the potential to contribute to nuclear proliferation, the potential vulnerability to nuclear terrorism, the political challenges of repository siting (a problem that applies equally to direct disposal of spent fuel), and because of its high cost compared to the once-through fuel cycle.The Obama administration has disallowed reprocessing of nuclear waste, citing nuclear proliferation concerns.]

Nine U.S. states have "explicit moratoria on new nuclear power" until a long-term storage solution emerges.

Other waste

Moderate amounts of low-level waste are produced through chemical and volume control system (CVCS). This includes gas, liquid, and solid waste produced through the process of purifying the water through evaporation. Liquid waste is reprocessed continuously, and gas waste is filtered, compressed, stored to allow decay, diluted, and then discharged. The rate at which this is allowed is regulated and studies must prove that such discharge does not violate dose limits to a member of the public (see radioactive effluent emissions).

Solid waste can be disposed of simply by placing it where it will not be disturbed for a few years. There are three low-level waste disposal sites in the United States in South Carolina, Utah, and Washington. Solid waste from the CVCS is combined with solid radwaste that comes from handling materials before it is buried off-site.

Power plant emissions

Radioactive gases and effluents

Most commercial nuclear power plants release gaseous and liquid radiological effluents into the environment as a byproduct of the Chemical Volume Control System, which are monitored in the US by the EPA and the NRC. Civilians living within 50 miles (80 km) of a nuclear power plant typically receive about 0.1 μSv per year. For comparison, the average person living at or above sea level receives at least 260 μSv from cosmic radiation.

The total amount of radioactivity released through this method depends on the power plant, the regulatory requirements, and the plant's performance. Atmospheric dispersion models combined

with pathway models are employed to accurately approximate the dose to a member of the public from the effluents emitted. Effluent monitoring is conducted continuously at the plant.

DISASTER MANAGEMENT

'Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters

Types of disasters

There is no country that is immune from disaster, though vulnerability to disaster varies. There are four main types of disaster.

- **Natural disasters.** These disasters include floods, hurricanes, earthquakes and volcano eruptions that can have immediate impacts on human health, as well as secondary impacts causing further death and suffering from floods causing landslides, earthquakes resulting in fires, tsunamis causing widespread flooding and typhoons sinking ferries
- **Environmental emergencies.** These emergencies include technological or industrial accidents, usually involving hazardous material, and occur where these materials are produced, used or transported. Large forest fires are generally included in this definition because they tend to be caused by humans.
- **Complex emergencies.** These emergencies involve a break-down of authority, looting and attacks on strategic installations. Complex emergencies include conflict situations and war.
- **Pandemic emergencies.** These emergencies involve a sudden onset of a contagious disease that affects health but also disrupts services and businesses, bringing economic and social costs.

Any disaster can interrupt essential services, such as the provision of health care, electricity, water, sewage/garbage removal, transportation and communications. The interruption can seriously affect the health, social and economic networks of local communities and countries. Disasters have a major and long-lasting impact on people long after the immediate effect has been mitigated. Poorly planned relief activities can have a significant negative impact not only on the disaster

victims but also on donors and relief agencies. So it is important that physical therapists join established programmes rather than attempting individual efforts.

Local, regional, national and (where necessary) international organisations are all involved in mounting a humanitarian response to disasters. Each will have a prepared disaster management plan. These plans cover prevention, preparedness, relief and recovery (see below).

Disaster prevention

These are activities designed to provide permanent protection from disasters. Not all disasters, particularly natural disasters, can be prevented, but the risk of loss of life and injury can be mitigated with good evacuation plans, environmental planning and design standards. In January 2005, 168 Governments adopted a 10-year global plan for natural disaster risk reduction called the Hyogo Framework. It offers guiding principles, priorities for action, and practical means for achieving disaster resilience for vulnerable communities.

Disaster preparedness

These activities are designed to minimize loss of life and damage – for example by removing people and property from a threatened location and by facilitating timely and effective rescue, relief and rehabilitation. Preparedness is the main way of reducing the impact of disasters. Community-based preparedness and management should be a high priority in physical therapy practice management.

Disaster relief

This is a coordinated multi-agency response to reduce the impact of a disaster and its long-term results. Relief activities include rescue, relocation, providing food and water, preventing disease and disability, repairing vital services such as telecommunications and transport, providing temporary shelter and emergency health care.

Disaster recovery

Once emergency needs have been met and the initial crisis is over, the people affected and the communities that support them are still vulnerable. Recovery activities include rebuilding infrastructure, health care and rehabilitation. These should blend with development activities, such

as building human resources for health and developing policies and practices to avoid similar situations in future.

Disaster management is linked with sustainable development, particularly in relation to vulnerable people such as those with disabilities, elderly people, children and other marginalised groups.

Myths and Realities of Disaster Assistance summarises some of the common misunderstandings about disaster management.

FLOODS

A **flood** is an overflow of water that submerges land.[1] The European Union (EU) Floods Directive defines a flood as a covering by water of land not normally covered by water.[2] In the sense of "flowing water", the word may also be applied to the inflow of the tide. Flooding may result from the volume of water within a body of water, such as a river or lake, which overflows or breaks levees, with the result that some of the water escapes its usual boundaries,[3] or may be due to accumulation of rainwater on saturated ground in an area flood.

While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, it is not a significant flood unless such escapes of water endanger land areas used by man like a village, city or other inhabited area.

Floods can also occur in rivers, when flow exceeds the capacity of the river channel, particularly at bends or meanders. Floods often cause damage to homes and businesses if they are placed in natural flood plains of rivers. While flood damage can be virtually eliminated by moving away from rivers and other bodies of water, since time out of mind, people have lived and worked by the water to seek sustenance and capitalize on the gains of cheap and easy travel and commerce by being near water. That humans continue to inhabit areas threatened by flood damage is evidence that the perceived value of living near the water exceeds the cost of repeated periodic flooding.

The word "flood" comes from the Old English *flod*, a word common to Germanic languages (compare German *Flut*, Dutch *vloed* from the same root as is seen in *flow, float*; also compare with Latin *fluctus*, *flumen*). Deluge myths are mythical stories of a great flood sent by a deity or deities to destroy civilization as an act of divine retribution, and are featured in the mythology of many cultures.

Principal types and causes

Areal

- Floods often happen over flat or low-lying areas when the ground is saturated and water either cannot run off, or cannot run off quickly enough to stop accumulating. This may be later followed by a river flood as water moves away from the areal floodplain into local rivers and streams.
- Floods can occur if water accumulates across an impermeable surface (e.g. from rainfall) and cannot rapidly dissipate (i.e. gentle orientation or low evaporation).
- A series of storms moving over the same area can cause areal flash flooding.
- A muddy flood is produced by an accumulation of runoff generated on cropland. Sediments are then detached by runoff and carried as suspended matter or bed load. Muddy runoff is more likely detected when it reaches inhabited areas. Muddy floods are therefore a hill slope process, and confusion with mudflows produced by mass movements should be avoided.

Reverie

- **Slow kinds:** Runoff from sustained rainfall or rapid snow melt exceeding the capacity of a river's channel. Causes include heavy rains from monsoons, hurricanes and tropical depressions, foreign winds and warm rain affecting snow pack. Unexpected drainage obstructions such as landslides, ice, or debris can cause slow flooding upstream of the obstruction.
- **Fast kinds:** include river flash floods resulting from convective precipitation (intense thunderstorms) or sudden release from an upstream impoundment created behind a dam, landslide, or glacier.
- Dam-building beavers can flood low-lying urban and rural areas, often causing significant damage.

Estuarine

- Commonly caused by a combination of sea tidal surges caused by storm-force winds and high river stages due to heavy rain.

Coastal

- Caused by severe sea storms, or as a result of another hazard (e.g. tsunami or hurricane). A storm surge, from either a tropical cyclone or an extratropical cyclone, falls within this category.

Catastrophic

- Caused by a significant and unexpected event e.g. dam breakage, or as a result of another hazard (e.g. earthquake or volcanic eruption). See outburst flood.

Human-induced

- Accidental damage by workmen to tunnels or pipes.

Effects

Primary effects

- Physical damage – damage to structures, including bridges, buildings, sewerage systems, roadways, and canals.

Secondary effects

- *Water supplies* – Contamination of water. Clean drinking water will become scarce.
- *Diseases* – Unhygienic conditions. Spread of water-borne diseases.
- *Crops and food supplies* – Shortage of food crops can be caused due to loss of entire harvest.[4] However, lowlands near rivers depend upon river silt deposited by floods in order to add nutrients to the local soil.
- *Trees* – Non-tolerant species can die from suffocation.[5]
- *Transport* – Transport links destroyed, so hard to get emergency aid to those who need it.

Tertiary and long-term effects

- Economic – economic hardship due to temporary decline in tourism, rebuilding costs, food shortage leading to price increase, etc.
- Psychological – flooding can be highly traumatic for individuals, in particular where deaths, serious injuries and loss of property occurs.

EARTHQUAKE

An **earthquake** (also known as a **quake**, **tremor** or **temblor**) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. The **seismicity**, **seismism** or **seismic activity** of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured using observations from seismometers. The moment magnitude is the most common scale on which earthquakes larger than approximately 5 are reported for the entire globe. The more numerous earthquakes smaller than magnitude 5 reported by national seismological observatories are measured mostly on the local magnitude scale, also referred to as the Richter scale. These two scales are numerically similar over their range of validity. Magnitude 3 or lower earthquakes are mostly almost imperceptible and magnitude 7 and over potentially cause serious damage over large areas, depending on their depth. The largest earthquakes in historic times have been of magnitude slightly over 9, although there is no limit to the possible magnitude. The most recent large earthquake of magnitude 9.0 or larger was a 9.0 magnitude earthquake in Japan in 2011 (as of March 2011), and it was the largest Japanese earthquake since records began. Intensity of shaking is measured on the modified Mercalli scale. The shallower an earthquake, the more damage to structures it causes, all else being equal.[1]

At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacement of the ground. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Earthquakes can also trigger landslides, and occasionally volcanic activity.

In its most general sense, the word *earthquake* is used to describe any seismic event — whether natural or caused by humans — that generates seismic waves. Earthquakes are caused mostly by rupture of geological faults, but also by other events such as volcanic activity, landslides, mine blasts, and nuclear tests. An earthquake's point of initial rupture is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

Measuring and locating earthquakes

Earthquakes can be recorded by seismometers up to great distances, because seismic waves travel through the whole Earth's interior. The absolute magnitude of a quake is conventionally reported by numbers on the Moment magnitude scale (formerly Richter scale, magnitude 7 causing serious

damage over large areas), whereas the felt magnitude is reported using the modified Mercalli intensity scale (intensity II–XII).

Every tremor produces different types of seismic waves, which travel through rock with different velocities:

- Longitudinal P-waves (shock- or pressure waves)
- Transverse S-waves (both body waves)
- Surface waves — (Rayleigh and Love waves)

Propagation velocity of the seismic waves ranges from approx. 3 km/s up to 13 km/s, depending on the density and elasticity of the medium. In the Earth's interior the shock- or P waves travel much faster than the S waves (approx. relation 1.7 : 1). The differences in travel time from the epicentre to the observatory are a measure of the distance and can be used to image both sources of quakes and structures within the Earth. Also the depth of the hypocenter can be computed roughly.

In solid rock P-waves travel at about 6 to 7 km per second; the velocity increases within the deep mantle to ~13 km/s. The velocity of S-waves ranges from 2–3 km/s in light sediments and 4–5 km/s in the Earth's crust up to 7 km/s in the deep mantle. As a consequence, the first waves of a distant earthquake arrive at an observatory via the Earth's mantle.

Rule of thumb: On the average, the kilometer distance to the earthquake is the number of seconds between the P and S wave **times 8**.[44] Slight deviations are caused by inhomogeneities of subsurface structure. By such analyses of seismograms the Earth's core was located in 1913 by Beno Gutenberg.

Earthquakes are not only categorized by their magnitude but also by the place where they occur. The world is divided into 754 Flinn-Engdahl regions (F-E regions), which are based on political and geographical boundaries as well as seismic activity. More active zones are divided into smaller F-E regions whereas less active zones belong to larger F-E regions.

Effects of earthquakes

1755 copper engraving depicting Lisbon in ruins and in flames after the 1755 Lisbon earthquake, which killed an estimated 60,000 people. A tsunami overwhelms the ships in the harbor.

The effects of earthquakes include, but are not limited to, the following:

Shaking and ground rupture

Damaged buildings in Port-au-Prince, Haiti, January 2010.

Shaking and ground rupture are the main effects created by earthquakes, principally resulting in more or less severe damage to buildings and other rigid structures. The severity of the local effects depends on the complex combination of the earthquake magnitude, the distance from the epicenter, and the local geological and geomorphological conditions, which may amplify or reduce wave propagation.[45] The ground-shaking is measured by ground acceleration.

Specific local geological, geomorphological, and geostructural features can induce high levels of shaking on the ground surface even from low-intensity earthquakes. This effect is called site or local amplification. It is principally due to the transfer of the seismic motion from hard deep soils to soft superficial soils and to effects of seismic energy focalization owing to typical geometrical setting of the deposits.

Ground rupture is a visible breaking and displacement of the Earth's surface along the trace of the fault, which may be of the order of several metres in the case of major earthquakes. Ground rupture is a major risk for large engineering structures such as dams, bridges and nuclear power stations and requires careful mapping of existing faults to identify any which are likely to break the ground surface within the life of the structure.[46]

Landslides and avalanches

Earthquakes, along with severe storms, volcanic activity, coastal wave attack, and wildfires, can produce slope instability leading to landslides, a major geological hazard. Landslide danger may persist while emergency personnel are attempting rescue.[47]

Fires

Fires of the 1906 San Francisco earthquake

Earthquakes can cause fires by damaging electrical power or gas lines. In the event of water mains rupturing and a loss of pressure, it may also become difficult to stop the spread of a fire once it has started. For example, more deaths in the 1906 San Francisco earthquake were caused by fire than by the earthquake itself.[48]

Soil liquefaction

Main article: Soil liquefaction

Soil liquefaction occurs when, because of the shaking, water-saturated granular material (such as sand) temporarily loses its strength and transforms from a solid to a liquid. Soil liquefaction may cause rigid structures, like buildings and bridges, to tilt or sink into the liquefied deposits. This can be a devastating effect of earthquakes. For example, in the 1964 Alaska earthquake, soil liquefaction caused many buildings to sink into the ground, eventually collapsing upon themselves.[49]

Tsunami

The tsunami of the 2004 Indian Ocean earthquake

A large ferry boat rests inland amidst destroyed houses after a 9.0 earthquake and subsequent tsunami struck Japan in March 2011.

Main article: Tsunami

Tsunamis are long-wavelength, long-period sea waves produced by the sudden or abrupt movement of large volumes of water. In the open ocean the distance between wave crests can surpass 100 kilometers (62 mi), and the wave periods can vary from five minutes to one hour. Such tsunamis travel 600-800 kilometers per hour (373–497 miles per hour), depending on water depth. Large waves produced by an earthquake or a submarine landslide can overrun nearby coastal areas in a matter of minutes. Tsunamis can also travel thousands of kilometers across open ocean and wreak destruction on far shores hours after the earthquake that generated them.[50]

Ordinarily, subduction earthquakes under magnitude 7.5 on the Richter scale do not cause tsunamis, although some instances of this have been recorded. Most destructive tsunamis are caused by earthquakes of magnitude 7.5 or more.[50]

Floods

A flood is an overflow of any amount of water that reaches land.[51] Floods occur usually when the volume of water within a body of water, such as a river or lake, exceeds the total capacity of the formation, and as a result some of the water flows or sits outside of the normal perimeter of the body. However, floods may be secondary effects of earthquakes, if dams are damaged. Earthquakes may cause landslips to dam rivers, which collapse and cause floods.[52]

The terrain below the Sarez Lake in Tajikistan is in danger of catastrophic flood if the landslide dam formed by the earthquake, known as the Usoi Dam, were to fail during a future earthquake. Impact projections suggest the flood could affect roughly 5 million people.[53]

Human impacts

An earthquake may cause injury and loss of life, road and bridge damage, general property damage (which may or may not be covered by earthquake insurance), and collapse or destabilization (potentially leading to future collapse) of buildings. The aftermath may bring disease, lack of basic necessities, and higher insurance premiums.

CYCLONE

In meteorology, a **cyclone** is an area of closed, circular fluid motion rotating in the same direction as the Earth.[1][2] This is usually characterized by inward spiraling winds that rotate counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere of the Earth. Most large-scale cyclonic circulations are centered on areas of low atmospheric pressure.[3][4] The largest low-pressure systems are cold-core polar cyclones and extratropical cyclones which lie on the synoptic scale. According to NHC glossary, warm-core cyclones such as tropical cyclones and subtropical cyclones also lies within synoptic scale.[5] Mesocyclones, tornadoes and dust devils lie within the smaller mesoscale.[6] Upper level cyclones can exist without the presence of a surface low, and can pinch off from the base of the Tropical Upper Tropospheric Trough during the summer months in the Northern Hemisphere. Cyclones have also been seen on extraterrestrial planets, such as Mars and Neptune.[7][8] Cyclogenesis describes the process of cyclone formation and intensification.[9] Extratropical cyclones form as waves in large regions of enhanced mid-latitude temperature contrasts called baroclinic zones. These zones contract to form weather fronts as the cyclonic circulation closes and intensifies. Later in their life cycle, cyclones occlude as cold core systems. A cyclone's track is guided over the course of its 2 to 6 day life cycle by the steering flow of the cancer or subtropical jet stream.

Weather fronts separate two masses of air of different densities and are associated with the most prominent meteorological phenomena. Air masses separated by a front may differ in temperature or humidity. Strong cold fronts typically feature narrow bands of thunderstorms and severe

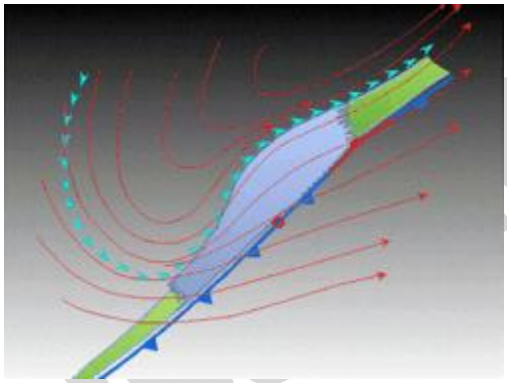
weather, and may on occasion be preceded by squall lines or dry lines. They form west of the circulation center and generally move from west to east. Warm fronts form east of the cyclone center and are usually preceded by stratiform precipitation and fog. They move poleward ahead of the cyclone path. Occluded fronts form late in the cyclone life cycle near the center of the cyclone and often wrap around the storm center.

Structure

There are a number of structural characteristics common to all cyclones.The cyclones have high pressure outside and low pressure inside. A cyclone is a low pressure area.[13] A cyclone's center (often known in a mature tropical cyclone as the eye), is the area of lowest atmospheric pressure in the region.[13] Near the center, the pressure gradient force (from the pressure in the center of the cyclone compared to the pressure outside the cyclone) and the force from the Coriolis effect must be in an approximate balance, or the cyclone would collapse on itself as a result of the difference in pressure.[14]

Because of the Coriolis effect, the wind flow around a large cyclone is counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.[15] Cyclonic circulation is sometimes referred to as contra solem. In the Northern Hemisphere, the fastest winds relative to the surface of the Earth therefore occur on the eastern side of a northward-moving cyclone and on the northern side of a westward-moving one; the opposite occurs in the Southern Hemisphere.[16] (The wind flow around an anticyclone, on the other hand, is clockwise in the northern hemisphere, and counterclockwise in the southern hemisphere.)

Formation



The initial extratropical low pressure area forms at the location of the red dot on the image. It is usually perpendicular (at a right angle to) the leaf-like cloud formation seen on satellite during the early stage of cyclogenesis. The location of the axis of the upper level jet stream is in light blue.

Tropical cyclones form when the energy released by the condensation of moisture in rising air causes a positive feedback loop over warm ocean waters.[17]

Cyclogenesis is the development or strengthening of cyclonic circulation in the atmosphere (a low pressure area).[9] Cyclogenesis is an umbrella term for several different processes, all of which result in the development of some sort of cyclone. It can occur at various scales, from the microscale to the synoptic scale.

Extratropical cyclones form as waves along weather fronts before occluding later in their life cycle as cold core cyclones.

Tropical cyclones form due to latent heat driven by significant thunderstorm activity, and are warm core.

Mesocyclones form as warm core cyclones over land, and can lead to tornado formation.[11] Waterspouts can also form from mesocyclones, but more often develop from environments of high instability and low vertical wind shear.[12] Cyclogenesis is the opposite of cyclolysis, and has an anticyclonic (high pressure system) equivalent which deals with the formation of high pressure areas—Anticyclogenesis.

The surface low has a variety of ways of forming. Topography can force a surface low when dense low-level high pressure system ridges in east of a north-south mountain barrier. Mesoscale convective systems can spawn surface lows which are initially warm core.[The disturbance can grow into a wave-like formation along the front and the low will be positioned at the crest. Around the low, flow will become cyclonic, by

definition. This rotational flow will push polar air equatorward west of the low via its trailing cold front, and warmer air with push poleward low via the warm front. Usually the cold front will move at a quicker pace than the warm front and "catch up" with it due to the slow erosion of higher density airmass located out ahead of the cyclone and the higher density airmass sweeping in behind the cyclone, usually resulting in a narrowing warm sector. At this point an occluded front forms where the warm air mass is pushed upwards into a trough of warm air aloft, which is also known as a trowal.

Tropical cyclogenesis is the technical term describing the development and strengthening of a tropical cyclone in the atmosphere. The mechanisms through which tropical cyclogenesis occurs are distinctly different from those through which mid-latitude cyclogenesis occurs. Tropical cyclogenesis involves the development of a warm-core cyclone, due to significant convection in a favorable atmospheric environment. There are six main requirements for tropical cyclogenesis: sufficiently warm sea surface temperatures, atmospheric instability, high humidity in the lower to middle levels of the troposphere, enough Coriolis force to develop a low pressure center, a preexisting low level focus or disturbance, and low vertical wind shear. An average of 86 tropical cyclones of tropical storm intensity form annually worldwide, with 47 reaching hurricane/typhoon strength, and 20 becoming intense tropical cyclones (at least Category 3 intensity on the Saffir–Simpson Hurricane Scale)

LANDSLIDES

A **landslide** or **landslip** is a geological phenomenon which includes a wide range of ground movement, such as rockfalls, deep failure of slopes and shallow debris flows, which can occur in offshore, coastal and onshore environments. Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope stability. Typically, pre-conditional factors build up specific sub-surface conditions that make the area/slope prone to failure, whereas the actual landslide often requires a trigger before being released.

Causes

The Mameyes Landslide, in the Mameyes neighborhood of barrio Portugués Urbano in Ponce, Puerto Rico, which buried more than 100 homes, was caused by extensive accumulation of rains and, according to some sources, lightning.

Landslides occur when the stability of a slope changes from a stable to an unstable condition. A change in the stability of a slope can be caused by a number of factors, acting together or alone. Natural causes of landslides include:

- groundwater (porewater) pressure acting to destabilize the slope

- Loss or absence of vertical vegetative structure, soil nutrients, and soil structure (e.g. after a wildfire)
- erosion of the toe of a slope by rivers or ocean waves
- weakening of a slope through saturation by snowmelt, glaciers melting, or heavy rains
- earthquakes adding loads to barely stable slope
- earthquake-caused liquefaction destabilizing slopes
- volcanic eruptions

Landslides are aggravated by human activities, Human causes include:

- deforestation, cultivation and construction, which destabilize the already fragile slopes
- vibrations from machinery or traffic
- blasting
- earthwork which alters the shape of a slope, or which imposes new loads on an existing slope
- in shallow soils, the removal of deep-rooted vegetation that binds colluvium to bedrock
- Construction, agricultural or forestry activities (logging) which change the amount of water which infiltrates the soil

UNIT II

SUSTAINABLE DEVELOPMENT

Sustainable development is the process of maintaining human needs while preserving the environment for future generations. An example of this would be the entire green movement. This is utilizing the resources we have efficiently so that they will be available for many years to come.

"**Development** is defined … as: the modification of the biosphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life. For development to be sustainable it must take account of social and ecological factors, as well as economic ones; of the living and non-living resource base; and of the long term as well as short term advantages and disadvantages of alternative actions.

"Sustainability is a strategy for improving the quality of life while preserving the environmental potential for the future, of living off interest rather than consuming natural capital. Sustainable development mandates that the present generation must not narrow the choices of future generations but must strive to expand them by passing on an environment and an accumulation of resources that will allow its children to live at least as well as, and preferably better than, people today.

"The **possibility** that human and other forms of life will **flourish** on the Earth **forever**"

Sustainable development is the "process of meeting the needs of current and future generations without undermining the resilience of life-supporting properties or the integrity & cohesion of social systems".

Extending this definition further, we differentiate among four dimensions of sustainability:

1. Ecological configuration
2. Economic production & consumption
3. Governance & politics
4. Institution & Performance

Sustainability Development is:

a. Preserving natural resources for future generations
b. Preserving the option value of human and man-made capital for future generations
c. Improving quality of life for individuals
d. Ensuring a fair distribution of lifequality"

Sustainable development "is an obligation to conduct ourselves so that we leave to the future the option or the capacity to be as well off as we are"

"Economic growth that provides fairness and opportunity for all the world's people, not just the privileged few, without further destroying the world's finite natural resources and carrying capacity"

"**The main principle of sustainable development**

1. Is to limit the human scale to a level which, if not optimal, is at least within carrying capacity and therefore sustainable.
2. Technological progress for sustainable development should be efficiency-increasing rather than through put-increasing.
3. Renewable resources, in both their source and sink functions, should be exploited on a profit maximizing sustained yield basis and in general not driven to extinction (regardless of the dictates of present value maximization), since they will become ever more important as non-renewable run Out … Specifically this means that:
   - harvesting rates should not exceed regeneration rates; and
   - Waste emissions should not exceed the renewable assimilative capacity of the environment.
4. Non-renewable resources should be exploited, but at a rate equal to the creation of renewable
   Substitutes.

Necessary Conditions for Global Sustainability:

"Ecological stability requires that:

- Consumption by the economy of the products and services of nature be compatible with rates of production by the ecosphere.
- The production of wastes by the economy remains within the assimilative capacity of the ecosphere.
- Economic activity protects the essential life-support functions of the ecosphere and preserves the biodiversity and resilience of Earth's ecological systems.
- Society satisfies basic standards of material equity and social justice.
- Governance mechanisms be in place to enable an informed citizenry to have an effective participatory role in decision-making.
- People share a positive sense of community cohesion (local and global) and a sense of collective responsibility for the future"

CHALLENGES

- The first challenge is the need to provide society with adequate and high quality goods and services - e.g., food, health care, transportation, security, etc.
- The second four challenges relate to four environmentally different concerns:
    1. Ecosystem integrity and the loss of biodiversity;
    2. Resource depletion;
    3. Toxic pollution; and
    4. Climate change.

The burden of these environmental problems is felt unequally within nations, between nations, and between generations, leading to concerns for international and intergenerational equity. These concerns for equity are often expressed under the heading of 'environmental justice.' The final two challenges relate to:

Economic and social concerns associated with employment, wages, and economic inequality.

ENERGY

Energy is a key input for meeting basic needs and for achieving socio-economic development goals that include, inter-alia, fuel for cooking, heating and lighting in households, power for industry, and petroleum products for transportation. The supply of and the demand for virtually every type of energy generates varying degrees of environmental externalities that affect human health, ecological stability, and economic development. These effects can occur at the local, regional, national or transnational level. Cities, with their high population densities, tend to concentrate environmental problems that elsewhere, are otherwise geographically dispersed. A classic example of this is air pollution in cities where both point (e.g. industrial emissions from smokestacks) and nonpoint (e.g., vehicle exhaust) sources are concentrated in a limited, densely populated geographic area. The degree of the problem varies with prevailing winds and thermal stratification patterns, urban geography, levels of industrialization and motorization, and the incidence of indoor as well as outdoor human exposure. It is important to note that the cause of many of these problems may be urban but the impact can be felt both inside and outside the city. In addition, ambient air pollution may affect the health of urban residents and damage the crops n of farmers in rural areas. Urban areas in developing countries typically generate up to fifty per cent, and often more, of the national gross domestic product. This involves the consumption and transformation of energy resources that are not found within the physical limits of the city.

Energy is the capacity to work. We use energy at various levels in different forms. It is used in the kitchen for cooking food to run machines at the factories. The motor vehicles, the train, the turbines and the aeroplanes are driven by the energy. The exploration of Antarctica or the arrival of man on the moon is only by harnessing energy rich fuels.

Energy provides the power to progress. Its uses at present life are manifold. We cannot grow without it. More d man is advancing towards modernity, more he is becoming dependent on energy, from the prehistoric period, when man first came to know about the use of fire, till date, it plays a key role in the economic and social developments of mankind.

A nation is considered rich not by amount of minerals or industrial resource it possesses, but by its technical ability is has acquired and scientific progress it is making, which depends ultimately on

the supply and consumption of energy. The per capital daily consumption of energy of the developed countries is much higher in comparison to the developing countries like India.

Energy Resources –

Along with all other natural like air, water, land, forestry and fisheries, energy also occupies an important place. Our progress and prosperity depend solely upon it. Natural resources, energy and environment are intimate related. Distributed or anyone would definitely cause disturbances in other two.

Energy is required for beneficial use of natural resources and the resources, on the other hand, provide energy. The interaction of these two in the environment in safe and tolerable limit is called 'limit of tolerance.' When this is disturbed, great disaster occur.

Depending on the source and availability, energy resources are mainly of two types:

1. Non – Conventional or renewal energy
2. Conventional or non – renewal energy

Non – Conventional or renewable energy –

It is a type of non – replenish able or non – exhaustable form obtained from the continuous or repetitive currents of energy occurring in the natural environment. As the source of energy in unlimited, it is also called infinite or renewable energy. E.g. Biomass and Biogas, Solar, Wind, Tidal, Minihydel and Geothermal

Conventional Energy –

All the non – renewable types of energy come under this category. In this case, the raw materials that provide energy cannot be replaced. Once it is used, its stock is depleted forever. The common types are coal, Oil natural gas and recently the Nuclear energy.

The main factors contributing to increases in commercial energy consumption in LDCs are increased levels of motor vehicle use and urbanization. This increased fuel consumption is bound to

exacerbate urban-based pollution. One consequence of this growth in demand for commercial fuels is that related environmental impacts will also increase if no mitigating measures are introduced. These effects will be increasingly felt all the way from the neighbourhood to the global level. At all levels (production, transformation, and consumption), urban energy use is a commercial activity, whether it is power generation for use by urban-based industries, refining of petroleum products, or neighbourhood sales of kerosene for household lighting. In cities, even these traditional types of fuel such as wood or charcoal, are bought and sold3. The implication for environmental management is that it is much easier to use economic policy instruments to influence energy consumption where there is a market, i.e., in the city.

Most of the commercial and noncommercial energy produced today is used in and for human settlements, and a substantial percentage of it is used by the household sector. Developing countries are at present faced with the need to increase their energy production to accelerate development and raise the living standards of their populations, while at the same time reducing energy production costs and energy-related pollution. Increasing the efficiency of energy use to reduce its polluting effects and to promote the use of renewable energies must be a priority in any action taken to protect the urban environment.

The structure of Urban Energy Use and its Environmental Implications

An energy balance i.e., share of different types of energy sources by sector, in total energy use,usually prepared for an entire country, presents data on the types of fuels being used by different sectors of the economy. Overall, electricity is the most important energy source; it is used extensively by households, industries, and commercial enterprises. Apart from focusing on the key fuels and sectors, an energy balance points out special features of each sector. For example, while charcoal accounts for only 8% of total gross energy consumption, it supplies 40% of the fuel used by industries in Delhi.

An important consequence of the dynamics of the energy ladder is the shift in fuels used in developing cities (and their related environmental problems) in recent years. The consumption of

energy for lighting, cooking, and appliances by households and the service industry has changed significantly: growth in household incomes and urbanization has been accompanied by a change in the fuel mix to energies that can be used more efficiently. As incomes and urbanization continue, the share of traditional fuels used in cities will diminish while modem fuel consumption will increase.

Environmental impact of urban energy supply

The impact depends upon the types of energy supply. In the case of wood and charcoal, deforestation is the impact at the regional level while health and safety are affected during the conversion process of biomass into charcoal. The supply processes of petroleum products and natural gas cause land degradation and sulphur emissions at the local level and land/sea spills at the regional level. The conversion processes can lead to global warming through CO2 emissions.

The extraction and conversion processes of coal lead to water pollution, respiratory ailments and land degradation at the local level. Electricity generation from hydro affect river ecosystems at the regional level and displacement of populations, etc. at the local level. Nuclear energy generation leads to mine wastes at the local level and fuel cycle radiation at the regional level. Nuclear waste storage poses environmental threats that have local, regional and global connotations.

The impact of power plants located in urban areas, can be serious at the local level as a result of the emission of pollutants leading to deterioration of air quality and health hazards affecting concentrated population.

Despite the seemingly gloomy picture of deforestation, with economic growth, urban consumers usually make the transition from biofuels to commercial fuels, thus reducing fuel-related pressure on peri-urban forest resources. The change-over could be even more environmentally beneficial if power generation, industry and the transport sectors were to use natural gas.

WATER CONSERVATION

"Life Started From Water Nature Flourishes with Water Seasons Caused By Water Development Progresses with Water Energy Formed Of Water Health Depends On Water Religion Imbibes Water History Made Of Water Trade Rides On Water Bio-Diversity Needs Water Water Sustains Life It Brings Prosperity and Happiness "

A step to conserve water is the step to secure the future. The most essential among all the natural resources on earth is water. A drop of water is worth more than a sack of gold for the thirsty man. If each one of us make efforts to save water today , it will save us later. Water conservation is the most effective and environmentally sound method to fight global warming. Water conservation is what that can reduce the scarcity of water. It aims to improve the efficiency of use of water, and reduce losses and waste.

WATER IS A VERY IMPORTANT RESOURCE IN OUR LIFE . WATER IS BECOMING SCARCE DUE TO INCREASE IN POPULATION, INDUSTRIES AND AGRICULTURAL ACTIVITIES AND DUE TO POOR RAINFALL.

- Over the years rising populations, growing industrialization, and expanding agriculture have pushed up the demand for water.
- Efforts have been made to collect water by building dams, reservoirs and digging wells; some countries have also tried to recycle and desalinate sea water.
- Water conservation has become the need of the day.
- The method of recharging ground water by harvesting rainwater is gaining importance in many cities.
- In the forests, water seeps gently into the ground due to vegetation cover. This groundwater in turn feeds wells, lakes, and rivers. Protecting forests means protecting water 'catchments'. In ancient India, people worshipped Nature and one of them was Water.

Goals of Water Conservation

The goals of water conservation efforts include as follows:

Sustainability – To ensure availability for future generations, the withdrawal of fresh water from an ecosystem should not exceed its natural replacement rate.

Energy conservation – Water pumping, delivery, and wastewater treatment facilities consume significant amount of energy. In some regions of the world over 15% of total electricity consumption is devoted to water management.

Habitat conservation – Minimizing human water use helps top reserve fresh water habitats for local wildlife and migrating water flow, as well as reducing the need to build new dams and other water diversion infrastructure.

Water wastage

- People waste water in their homes without even realizing it. We have become so accustomed to have a 24 hour supply of water to meet all of our needs from cooking, to cleaning, to drinking, that we sometimes forget that we do not have an infinite supply of water. Besides using renewable energy in the home to cut back on the use of electricity, we must also learn how to save our water supply. Here are a few tips on how to do so.
- The first thing you should do is check for leaks in taps, pipes, and dishwasher hoses which can cause over 2,000 liters of water per month to be wasted. Repairing any leaks will save you a ton of money and you will also be saving the environment.
- In the same way that you can buy renewable energy, you can also buy water efficient taps that will make the most of your water and will ensure that you are not wasting any while the tap is running.
- To save both water and energy, if you're not already using green energy, then you should wait until your dishwasher is completely full before running it. On average, dishwashers use approximately 40 litres of water per load, but thanks to features that some dishwasher have, you can specify that it is a light load, or rinse only, or air dry. All of these features allow you to save both water and energy.

Water Saving Tips

Tips for Conserving Water Indoors

Verify your home is leak free. Repair dripping taps by replacing washers. Avoid flushing the toilet unnecessarily.

Use water efficient flushes, plumbing fixtures having sensors, low flow faucet aerators which require minimum water.

- Turn off water while brushing teeth.
- For shaving, use mug rather than using running water.
- Close faucets while soaping and rinsing clothes.
- Keep overflow valve in the over head tanks so as not to waste water.
- Use waste water of cloth cleaning to clean the floor.
- Use waste water in flush.
- Don't use running water for releasing ice from tray
- Don't use extra detergent in washing clothes.
- Don't use running water while hand-washing clothes.
- Operate automatic washing machine when it is fully loaded.
- Don't use shower/big bath tubs in bathrooms.
- While going outdoor, turn off the main valve for water.
- Develop habit of monitoring water meters.

Tips for Conserving Water Outdoors

Minimize grass lawns in your yard because less grass means water demand.

Don't over-water your lawns.

A good rain eliminates the need watering for more than a week.

Water the lawns during early morning hours when temperature and wind speeds are the lowest. This reduces losses from evaporation.

Try to use waste of dish washing/cloth cleaning for gardening and cleaning the floor.

Check leaks in hose, pipes etc. Use sprinkler/drip irrigation systems.

Don't allow water to flow into gutter.

Don't wash floors with a hose. Use a broom.

Avoid over fertilizing your lawn. The application of excess fertilizer increases the need of water.

Benefits to Conserve water -

- If you save water it can save your money bills.
- Reduction in interior water use cuts waste water flows, especially overflowing of gutters which contaminates the environment.
- Environment benefits include eco system and habitat protection.
- Water conservation helps in improving the quality of your drinking water
- **Technical methods to conserve water :**

Rainwater Harvesting:

Rainwater harvesting is the gathering and collection of water from the rooftop. The traditional method of rain water harvesting is the most effective and simple way to conserve the water. It means utilization of rain water for the domestic as well as agricultural purposes. There are three technical methods of rain water harvesting such as Catchment, Conveyance and storage.

Historical Water Bodies:

There are many traditional water bodies which have been in disuse for the longer time. These bodies can be reused as the recharging points.

Ponds:

Steps should be taken to avoid dumping of sewage into the village ponds. Efforts need to be made to deepen these ponds with the dragline machines. Garbage and other waste should not be dumped into the ponds.

- Implementation of water economy measures, reuse and recycle of wastes, and creation of surface water bodies like reservoirs Lakes, ponds etc.
- Development of efficient water transport and distribution systems.
- Control on waste discharge in water bodies and also on the land to avoid pollution and efficient treatment of wastewater for recycling of treated effluents.
- Recharge of ground water.

RAIN WATER PRESERVATION

1. Rainwater is absolutely pure. So it is safe to drink preserved rainwater even without boiling. But, if gas is available, it is best to first boil the water and then drink it.
2. During the first 15 minutes of rain, dust and sand particles, gas molecules and also germs are amassed by the rainwater and washed away. Therefore water should be collected after at least 15 minutes.
3. In heavily industrialized and densely populated areas, rainwater should be gathered after 30 minutes.
4. A clean pitcher or a jug can be used to collect rainwater. The pot should be placed in an open space so that water dripping from trees or rooftops does not spoil the pure water.
5. Rainwater can also be used to wash clothes or dishes. In fact, soaps and detergents work better in soft rainwater than in hard water containing metal ions.
6. Short and long-term measures should be taken from now on. Constructing rainwater-harvesting mechanism in all new buildings can be made obligatory by the government. Preserving rainwater on a mass scale can definitely lessen the present water crisis..

CONSERVATION OF NATURAL RESOURCES:

Natural resources occur naturally within environments that exist relatively undisturbed by mankind, in a natural form. A natural resource is often characterized by amounts of biodiversity and geodiversity existent in various ecosystems.

Natural resources are derived from the environment. Some of them are essential for our survival while most are used for satisfying our wants. Natural resources may be further classified in different ways.

Natural resources are materials and components (something that can be used) that can be found within the environment. Every man-made product is composed of natural resources (at its fundamental level). A natural resource may exist as a separate entity such as fresh water, and air, as

well as a living organism such as a fish, or it may exist in an alternate form which must be processed to obtain the resource such as metal ores, oil, and most forms of energy.

There is much debate worldwide over natural resource allocations, this is partly due to increasing scarcity (depletion of resources) but also because the exportation of natural resources is the basis for many economies (particularly for developed nations such as Australia).

Some Natural resources can be found everywhere such as sunlight and air, when it is so the resource is known as an ubiquitous (existing or being everywhere) resource. However most resources are not ubiquitous. They only occur in small sporadic areas; these resources are referred to as localized resources. There are very few resources that are considered inexhaustible (will not run out in foreseeable future) – these are solar radiation, geothermal energy, and air (though access to clean air may not be). The vast majority of resources are however exhaustible, which means they have a finite quantity, and can be depleted if managed improperly. The natural resources are materials, which living organisms can take from nature for sustaining their life or any components of the natural environment that can be utilized by man to promote his welfare is considered as natural resources

Classification

There are various methods of categorizing natural resources, these include source of origin, stage of development, and by their renewability, these classifications are described below. On the basis of origin, resources may be divided into:

- Biotic – Biotic resources are obtained from the biosphere (living and organic material), such as forests, animals, birds, and fish and the materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter.
- Abiotic – Abiotic resources are those that come from non-living, non-organic material. Examples of abiotic resources include land, fresh water, airand heavy metals including ores such as gold, iron, copper, silver, etc.

Considering their stage of development, natural resources may be referred to in the following ways:

1. **Potential Resources** – Potential resources are those that exist in a region and may be used in the future. For example, petroleum may exist in many parts of India, having sedimentary rocks but until the time it is actually drilled out and put into use, it remains a potential resource.
2. **Actual Resources** – Actual resources are those that have been surveyed, their quantity and quality determined and are being used in present times. The development of an actual resource, such as wood processing depends upon the technology available and the cost involved.
3. **Reserve Resources** – The part of an actual resource which can be developed profitably in the future is called a reserve resource.
4. **Stock Resources** – Stock resources are those that have been surveyed but cannot be used by organisms due to lack of technology. For example:hydrogen.

Renewability is a very popular topic and many natural resources can be categorized as either renewable or non-renewable:

- Renewable resources are ones that can be replenished naturally. Some of these resources, like sunlight, air, wind, etc., are continuously available and their quantity is not noticeably affected by human consumption. Though many renewable resources do not have such a rapid recovery rate, these resources are susceptible to depletion by over-use. Resources from a human use perspective are classified as renewable only so long as the rate of replenishment/recovery exceeds that of the rate of consumption.
- Non-renewable resources are resources that form extremely slowly and those that do not naturally form in the environment. Minerals are the most common resource included in this category. By the human perspective, resources are non-renewable when their rate of consumption exceeds the rate of replenishment/recovery; a good example of this are fossil fuels, which are in this category because their rate of formation is extremely slow (potentially millions of years), meaning they are considered non-renewable. Some resources actually naturally deplete in amount without human interference, the most notable of these being radio-active elements such as uranium, which naturally decay into heavy metals. Of these, the metallic minerals can be re-used by recycling them, but coal and petroleum cannot be recycled.

FOOD RESOURCES:

means all commodities and products, simple, mixed, or compound, or complements to such commodities or products, that are capable of being ingested by either human beings or animals, irrespective of other uses to which such commodities or products may be put, at all stages of processing from the ...

Food sources

All food has its origin in plants. Some food is obtained directly from plants; but even animals that are used as food sources are raised by feeding them food derived from plants. Cereal grain is a staple food that provides more food energy worldwide than any other type of crop. Maize, wheat, and rice - in all of their varieties - account for 87% of all grain production worldwide.[2] Most of the grain that is produced worldwide is fed to livestock.

Other foods not from animal or plant sources include various edible fungi, especially mushrooms. Fungi and ambient bacteria are used in the preparation of fermented and pickled foods like leavened bread, alcoholic drinks, cheese, pickles, kombucha, and yogurt. Another example is blue-green algae such as Spirulina. Inorganic substances such as baking soda and cream of tartarare also used to chemically alter an ingredient.

There is a need to introduce production efficiency of crops and livestock because

- rapid increase in population
- No major scope of increasing area of land under cultivation.
- Success in efforts to meet food demand increase in food grain production
- Increase in Food Grain production - Green Revolution
- Increase in milk production – White Revolution

Effects of these 'revolutions' on Environment

Excessive use of natural resources thereby disturbing the ecological balance

Solution: Increase in food production without degrading our environment and disturbing the ecological balance i.e**. sustainable practices**

LAND ENVIRONMENT

Soil is an important resource of the lithosphere. All the nutrient elements essential for the web of life in the biosphere are derived from the soil which is component of land resources. Both primary as well as secondary consumers receive their nutrients from plant life. Soil is not only a resource but it is also an environmental medium. Land is a finite resource and therefore it is under heavy stress due to growing population. It has been observed that soil forms due to weathering of layer of Earth's crust, presence of living organisms and, their products of decay. Thus soil has been defined as uncemented aggregate of mineral grains and decayed organic matter with liquid and gas, occupying void spaces between the soil particles. It is a complex physic-biological system.

The total volume of soil contains about 45% solid mineral particles while, organic matter acquires about 5% of the volume. At optimum moisture levels essential for plant growth, the pore space has been considered to be divided roughly in two halves. 25% of the volume is considered to be occupied by water and 25% by air. The proportion of air and water however are subject to rapid fluctuations. Erosion of soil leads to environmental degradation. This has shown an increasing trend to deforestation and hence need urgent attention. Soil acts as filter for groundwater. Uncontrolled runoffs lead to formation of sediments in water bodies due to erosion of soil.

Elements of Land Management

In order to conserve the fertile soils and, to restrict the erosion of soil, land management efforts reserve most important place in the field of environmental management. Such management strategies consider the following basic objectives.

1. Protection of land surface from the impact of raindrops.
2. Increase in the infiltration of rainwater using hydro geological techniques.
3. Decrease in the volume and velocity of overland flow.
4. Reduction in the erodibility of soils.

These objectives can be achieved by soil conservation measures related to (i) crop management and (ii) mechanical protection (iii) conservation devices and practices.

Measures of crop management include:

1. Proper crop selection, as per the characteristics of the soil that may markedly reduce surface exposure to rainfall and bind soil particles together.
2. Sowing of crops in such a manner that no ground surface remains exposed to rainfall of high intensity for a long period.
3. Practice of intercropping and mixed cropping
4. Stubble mulching
5. Maintenance of soils at a high fertility level through supply of organic matter like manure, application of fertilizers and crop rotation.

Mechanical protection devices include:

1. Contour farming
2. Terracing on mountain slopes
3. Control of gully erosion

The above mentioned protection measures can be affected by the construction of series of check dams of Earthen material, plantation of vines, grasses, bushes and trees, and the development of pastures. Plugging off gully heads with stone-filled iron nets, debarring cultivation on land between two gullies, and plant bushes and trees to protect the remaining and from gully erosion may also be implemented.

Land use

Since the population is increasing, per capita land availability is decreasing. Therefore, more and more land is being exploited which will adversely affect the natural resources on the Earth. The common man-made uses of land are human habitat, agriculture, industry, artificial water bodies and facilities like communication systems, roads sports grounds, mining etc. owing to such uses of land which permanently cover the land surface, such land may get converted into wasteland.

Best example of the non-eco friendly activity for land use is mining. Falling of trees and making quarries, collection of non-fertile overburden dumps, subside areas, etc., are the most important damaging effect of the mining activity. These activities directly damage the previous use of the land area and result in long-term adverse impacts on land. Due to changes in land quality, it losses the water absorption capacity and result in loss of water. This culminates in loss of green cover on land resulting in more evaporation further continues, water from the water tables starts reaching the soil surface. This reduces the available water table. Such a process affects the plant life and also leads to erodibility of the soil. The combines effect of loss of soil moisture and erosion results in causing loss of soil particles and soil nutrients. Flow of this soil to water bodies in the runoff causes siltation and eutrophication of surface water bodies.

The impacts on land use pattern due to various activities such as agriculture, urbanization, development of communication systems, construction of dams and hydropower plants, industry and mining are the major factors to be considered in land resources management.

Soil Erosion

Erosion is the process by which soil particles are removed from the ecosystem, usually by wind or flowing water. Soil erosion leads to a decrease in the soil productivity due to a physical loss of the fertile topsoil, reduction in the rooting depth, and removal of plant nutrients and loss of water. Raindrops are reaching the Earth's surface with certain speed. These drops hit the soil surface and create an impact on the soil. The soil surface gets loosened due to this impact. During heavy rains an impact of raindrops loosens particles from the soil cover and moves them from their position in runoff. These loosened partials from the soil are transported to longer distance, away from its original positions, by turbulent water. These particles get deposited in the riverbeds or in the oceans as silt. Thus the soil eroded and siltation occurs.

Soil erosion is one form of soil degradation along with soil compaction, low organic matter, loss of soil structure, poor internal drainage, salinisation, and soil acidity problems. These other forms of soil degradation, serious in themselves, usually contribute to accelerated soil erosion. Soil erosion is

a naturally occurring process on all land. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss each year in Ontario. Soil erosion may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of topsoil. The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainage networks.

Erosivity is defined as the potential ability of process to cause erosion of soils in a certain set of environment conditions. It depends upon the drop size, velocity, distribution angle and direction, intensity, frequency and duration of rain and runoff (supply rate, flow depth, velocity, frequency, magnitude, duration and sediment content). Soil erosion is one form of soil degradation along with soil compaction, low organic matter, loss of soil structure, poor internal drainage, salinisation, and soil acidity problems. These other forms of soil degradation, serious in themselves, usually contribute to accelerated soil erosion.

Importance of Soil to the Biosphere

Soil plays a vital role in determining the quality and composition of the biosphere which develops over it. Soil is an important section of the biosphere as it performs following functions related to maintenance of environmental balance:

i. Soil provides mechanical support to the plant.
ii. Owing to the porosity and water-holding capacity of soil, it serves as a reservoir of water and supplier water to the plants through roots even when the land surface is dry.
iii. The ion-exchange capacity of the soil ensures availability and supply of macro and macronutrients for the growth of plants, animals and microbes. It also helps in preventing excessive leaching of nutrient ions, while maintaining proper pH.
iv. The clay micelles and humus particles of soil (less than 0.002mm tightly adsorbs a number of nutrient loss and supply them evenly to the plants.
v. The biotic component of soil contains organotropic bacteria, nitrifying bacteria, Nitrogen-fixing bacteria, fungi, protozoans, and other microbes which help in decomposition and mineralization of organic matter and regeneration of nutrients.

Erosion by Water

The rate and magnitude of soil erosion by water is controlled by the following factors:

Rainfall Intensity and Runoff

Both rainfall and runoff factors must be considered in assessing a water erosion problem. The impact of raindrops on the soil surface can break down soil aggregates and disperse the aggregate material. Lighter aggregate materials such as very fine sand, silt, clay and organic matter can be easily removed by the raindrop splash and runoff water; greater raindrop energy or runoff amounts might be required to move the larger sand and gravel particles.

Soil Erodibility

Soil erodibility is an estimate of the ability of soils to resist erosion, based on the physical characteristics of each soil. Generally, soils with faster infiltration rates, higher levels of organic matter and improved soil structure have a greater resistance to erosion. Sand, sandy loam and loam textured soils tend to be less erodible than silt, very fine sand, and certain clay textured soils.Past erosion has an effect on a soils' erodibility for a number of reasons. Many exposed subsurface soils on eroded sites tend to be more erodible than the original soils were, because of their poorer structure and lower organic matter. The lower nutrient levels often associated with subsoils contribute to lower crop yields and generally poorer crop cover, which in turn provides less crop protection for the soil.

Slope Gradient and Length

Naturally, the steeper the slope of a field, the greater the amount of soil loss from erosion by water. Soil erosion by water also increases as the slope length increases due to the greater accumulation of runoff. Consolidation of small fields into larger ones often results in longer slope lengths with increased erosion potential, due to increased velocity of water which permits a greater degree of scouring (carrying capacity for sediment).

Vegetation

Soil erosion potential is increased if the soil has no or very little vegetative cover of plants and/or crop residues. Plant and residue cover protects the soil from raindrop impact and splash, tends to slow down the movement of surface runoff and allows excess surface water to infiltrate.

The erosion-reducing effectiveness of plant and/or residue covers depends on the type, extent and quantity of cover. Vegetation and residue combinations that completely cover the soil, and which intercept all falling raindrops at and close to the surface and the most efficient in controlling soil (e.g. forests, permanent grasses). Partially incorporated residues and residual roots are also important as these provide channels that allow surface water to move into the soil. Soil erosion potential is affected by tillage operations, depending on the depth, direction and timing of plowing, the type of tillage equipment and the number of passes. Generally, the less the disturbance of vegetation or residue cover at or near the surface, the more effective the tillage practice in reducing erosion.

Conservation Measures

Certain conservation measures can reduce soil erosion by both water and wind. Tillage and cropping practices, as well a land management practices, directly affect the overall soil erosion problem and solutions on a farm. When crop rotations or changing tillage practices are not enough to control erosion on a field, a combination of approaches or more extreme measures might be necessary. For example, contour plowing, strip cropping, or terracing may be considered.

Effects

1. Sheet and Rill Erosion

Sheet erosion is soil movement from raindrop splash resulting in the breakdown of soil surface structure and surface runoff; it occurs rather uniformly over the slope and may go unnoticed until most of the productive topsoil has been lost. Rill erosion results when surface runoff concentrates forming small yet well-defined channels . These channels are called rills when they are small

enough to not interfere with field machinery operations. The same eroded channels are known as gullies when they become a nuisance factor in normal tillage.

2. Gully Erosion

There are farms in Ontario that are losing large quantities of topsoil and subsoil each year due to fully erosion . Surface runoff, causing gull formation or the enlarging of existing gullies, is usually the result of improper outlet design for local surface and subsurface drainage systems. The soil instability of fully banks, usually associated with seepage of ground water, leads to sloughing and slumping (caving-in) of bank slopes. Such failures usually occur during spring months when the soil water conditions are most conducive to the problem.

3. Stream and Ditch Bank Erosion

Poor construction, or inadequate maintenance, of surface drainage systems, uncontrolled livestock access, and cropping too close to both stream banks has led to bank erosion problems. The direct damages from bank erosion include:

1. The loss of productive farmland.
2. The undermining of structures such as bridges.
3. The washing out of lanes, roads and fence rows.

Poorly constructed tile outlets may also contribute to stream and ditch bank erosion. Some do not function properly because they have no rigid outlet pipe, or have outlet pipes that have been damaged by erosion, machinery, inadequate or no splash pads, and bank cave-ins.

On-Site Effects: The implications of soil erosion extend beyond the removal of valuable topsoil. Crop emergence, growth and yield are directly affected through the loss of natural nutrients and applied fertilizers with the soil. Seeds and plants can be disturbed or completely removed from the eroded site. Organic matter from the soil, residues and any applied manure, is relatively light-weight and can be readily transported off the field, particularly during spring thaw conditions. Pesticides may also be carried off the site with the eroded soil.

Off-Site Effects: Off-site impacts of soil erosion are not always as apparent as the on-site effects. Eroded soil, deposited down slope can inhibit or delay the emergence of seeds, bury small seedling and necessitate replanting in the affected areas. Sediment can be deposited on down slope properties and can contribute to road damage.

Soil conservation: is fundamentally a matter of determining a correct form of land use and management. A correct form of land use and management is one that provides a higher level, or a different form of productivity from that available in the natural state. This new form of productivity must, however, be one that must be capable of being sustained indefinitely.

Soil conservation can be defined as the combination of the appropriate land use and management practices that promotes the productive and sustainable use of soils and, in the process, minimizes soil erosion and other forms of land degradation. Confronted with the problem of land degradation, over the centuries farmers have developed ingenious strategies and systems of land use and management to protect and rehabilitate their lands. Many of these have been very effective and the remains of some of them can still be seen in old terracing systems in several countries.

Methods of Soil Conservation

Soil conservation measures should aim at preventing or at least minimising the soils loss. In order to do this proper land utilisation coupled with agricul tural practices should be adopted.

Broadly categorizing there are two methods of soil conservation. These are biological and mechanical. The biological measures are again divided into Agronomic, Agrostilogical and Dry farming

1. **Agronomic practices:** Normally, the land will possess a vegetational cover so as to prevent erosion
2. **Contour farming:** Crops are cultivated along the contour of the land. The plough marks will be on level and can hold the rain. Even in heavy rain, the runoff is checked by the plants growing along the contour. Tillage: contour tilling will prevent the excess run of water.
3. **Mulching:** Interculturing operations will kill weeds and soil mulches help the plants to be rooted firmly in the soil.

4. **Crop rotations:** Alternatively growing a cereal and a legume in the same field will not only increase the yield, but also increase the fertility of the soil. They also help in checking soil erosion.
5. **Strip cropping:** This is an agricultural practice of growing plants in suitable strips in the field. This is of the following types.
6. **Contour strip cropping:** This is cultivation of soil protecting crops in strips alternating with erosion permitting crops. The strips should be across the slope.
7. **Field strip cropping:** Plants are cultivated in parallel strips across the slopes. Wind strip cropping: Crops are planted across the slopes to prevent soil loss. These may be legumes or grasses.
8. **Dry farming method:** This may be practised where rainfall is low, indefinite and variable. In dry farming methods only crops are grown that can sustain even a very low rain fall. The most important aspects of dry farming are conservation of soil mois ture and fertility.
9. **Mechanical -Measures:** The main aims of mechanical measures are to al low for the absorption of runoff, dividing the slope into short ones and protection against run off. A few of the mechanical measures are discussed below:
10. **Basin listing:** Small basins are formed along the contour with an implement called basin lister. These will hold water for some time.
11. **Sub soiling:** Soil is broken with a sub soiler into fine grains to increase their absorptive capacity.
12. **Contour terracing:** Along the contour, series of ridges or bunds of mud are formed to check the run off. This is of four types. In channel terrace a shallow channel is dug and the mud is deposited along the lower edge of the canal. In broad base ridge terrace a canal is formed on the contour by exavating the mud. The canal is wide. If it is narrow it is called narrow based ridge terrace. In bench terracing a series of platforms are formed along the contour across the general slope of the plant.
13. **Contour trenching:** Several 2 feet by one foot trenches are formed across the slopes at suitable intervals. Tree seedlings are to be planted above the trench.
14. **Terrace outlet:** Outlets are to be constructed for the safe disposal of runoff water.

15. **Gully control:** Suitable water conservation measures are to be taken so as to prevent the formation of gullies.
16. **Ponds:** Construction of small ponds at suitable places to store water is a good practice.
17. **Stream bank protection:** Banks of channels or rivers usually cave in during floods. To prevent this, construction of stone or concrete protective walls should be undertaken. In addition to this, planting some useful tree species will also prevent stream bank erosion.

ENVIRONMENT CONSERVATION LAWS

1. The Water (Prevention and control of pollution) Act 1974 –

It is deeply felt in 60s only, that the water resources are being polluted and it is an urgent need to assure that domestic and industrial effluents must not be allowed to be discharged in the water resources. The water (Prevention & control of pollution) Act was made in the same context. It received the consent of president of India on March 23, 1974. This act is related with prevention and control of water pollution. It also provides guidelines for maintaining and restoring water reservoirs. The establishment of Pollution Control Board at Central and state level is consequence of this act only. The Board consists of a chairman, secretary and 15 other nominated members. The Board advices central of state governments on issues related with prevention and control of water pollution.

According to section 63 of this act following two rules are made –

1) Water (Prevention and Control of Pollution) Rules, 1975.
2) The Central Board for the prevention and control of water pollution (Procedures for Transaction of Business) Rules 1975.

The act is twice amended is 1978 and 1988.

2. The Air (Prevention & Control of Pollution) Act 1981 –

This act is made on the basis of United Nations Conference on Human Environment held at Stock Holm from June 5-16, 1972. The main objectives of the act are –

- To prevent, control & abate air pollution.
- To establish central & state level boards to implement aforesaid purpose to empowerise the boards.

The functioning and basic rules of this act are similar with the water (prevention & control) act 1974. The PCBs also suggest & advice the central and state governments regarding the air pollution & its prevention & control.

The act came into force on 16[th] may 1981. The act was once amended in 1987. The rules of this act are –

- The Air (Prevention & Control of Pollution) Rules 1982.
- The Air (Prevention & Control of Pollution) Union Territories Rule 1983.

3. The Environment Protection Act 1986 –

This act is a set of comprehensive legislation regulating activities which cause damage to the environment. This act came into force on November 19, 1986.

- Under section 3(1) the act provides sweeping powers to central government to take necessary actions against pollution
- The section 3(2) specifies the major concerns with respect of which the central government may institute necessary actions.
- As per section 6(1) and 6(2) the central government is empowered to make rules.

4. Indian Forest Act (1927) –

This act was made in British India. It's major provisions were related with extraction of forest products for the benefit of British rulers.

5. The Wildlife Protection Act 1972 –

This act was signed by president on 9[th] September 1972 and was amended four times in 1982, 1986, 1991 & 1993.

It empowers central government to –

- Create machinery for wildlife conservation.
- Prohibit killing & hunting of specified animals.
- Protect specific flora & fauna.
- Constitute sanctuaries, national parks and zoo authorities.
- Restrict, regulate or prohibit trade & commerce of wild animals & their products.
- Prevent & detect offences against wild life.
- Frame rules & code of conduct.

6. Environmental issues for human health –

Environmental is the surrounding in which we all live but these days this environment is being polluted day by day. This is causing grave health problems to the human being Industrialization, use of modern technologies, westernized life style has spoiled the natural balance of the environment. Hence we have to environmental health problems. Here are some major points which deal with the environmental issues and are very necessary in present scenario –

- Saving powers – Wastage of electricity must be checked. The non-conventional energy resources & solar energy could be used.
- Environmental education – Every citizen from his childhood must be aware of the environmental issues.
- Check population – It is the need of the hour because increasing population demands for more energy supply.
- Stop wars & violence – Due to wars & violence, the environmental pollution increases. The danger of use of nuclear weapons also increase which the possibilities of war.
- Less use of vehicles – The urbanization caused a by-product i.e. increasing number of vehicles. These vehicles pollute the environment very badly.
- Deforestation – The plants absorb the environmental pollutants and cause raining. But excessive deforestation caused severe problems.
- Laws & legislations for industries – The industrialization is a consequence of development. But this also causes pollution to every level. Tough rules must be made against the pollution caused by the industry.

- Worldwide efforts – This is the need of the hour that the whole world must came along against pollution and to protect the environment.

Role of health education in environmental issues –

Health education deals with importing knowledge amongst people about the various practices, which will ensure a healthy community life and healthy and wealthy citizens. It creates awareness for health and hygiene. It also gives idea about proper diet. It also make people aware common diseases caused due to the pollutants and their treatment.

The contaminable diseases are caused and spread by the pollutants and changed life style. The international organizations like WHO, UNICEF etc. provide financial help to check such diseases and make people aware of them. Precaution is the only remedy for certain diseases even the governments are also running plans and programmes to check the diseases. Vaccination provides safety from various lethal diseases at the very childhood.

7. Stockholm Declaration of human environment, 1972 –

(i) 5[th] June was declared as world environment day.

(ii) Principle 22 states that all the nations will co-operate to develop international laws against pollution & environmental damage

(iii) The natural resources will be protected.

(iv) Principle 8 says that social & economic development is necessary.

(v) The review & evaluation must be done through the earth watch

Rio Declaration –

Important points of this declaration are as follows –

- 27 principles were adopted in this declaration.
- It works on the principle of sustainable development without any damage to environment.
- Environmental legislation is necessary.
- Major concerns of the declaration were Global Warming, Deforestation, Ozone layer Depletion.

1. LANDSLIDES

Landslides are rock, earth or debris flow on slopes. They can occur on any terrain. Landslides serve to redistribute soil and sediments in a process that can be in abrupt collapses or in slow slides. They can be triggered by rains, floods, Earthquakes and others natural causes as well as human made causes, like terrain cutting, excessive development etc. they can occur in developed areas, undeveloped areas or where the terrain was altered roads, bridges, houses etc. a landslide begins with a loud rumbling noise and has the momentum to wipe anything on its way. One such devastating landslide wiped the entire towns of Colombia in 1985. As weathering is an ongoing process, steep mountain slopes often see rocks falling down slopes. In cold countries or mountain areas, snow melt can be a key mechanism by which landslides occur. It can be significant with a sudden rise in the temperature leading to rapid melting of snow pack. This water can infiltrate into the ground, which may have layers below the surface due to still frozen soil or rock, leading to rapid increase in pore water pressure and resultant landslide activity. The passage of the earthquake waves through the rock and soil produce a complex set of acceleration leading to landslides. The most common cause for a landslide can be earthquake or a tremor. A blast can also trigger landslide.

2. VOLCANO

A volcano is an opening on a planet's surface or crust, which allows magma, gas and ash to escape from below the surface. Volcanoes that erupt frequently are called Active Volcano, those that have erupted in the past but are quiet now are called Dormant Volcano and those that have not erupted are called Extinct Volcano. Volcanoes can be caused by mantle plumes. Volcanoes are generally found where tectonic plates are diverging. Volcanoes are usually not created where two tectonic plates slide past one another. There can also form where there is stretching and thinning of the earth's crust. The most common perception of a volcano is a conical mountain, spewing lava and gas from a crater at its summit.

3. EARTHQUAKE

An earthquake is the result of a sudden release of energy in the earth's crust that creates seismic waves. Earthquakes are recorded with a seismometer. At the earth's surface, earthquake manifests

themselves by shaking and sometime displacing the ground. Earthquake are caused by rupture of geological faults, landslides, mine blasts and nuclear activity. An earthquake point of initial rupture is called its focus. Most earthquake form part of a sequence, related to each other in terms of location and time. Most earthquake cluster consists of small cluster tremors which cause little or no damage, but there is a theory that earthquake repeat themselves. During an earthquake there is a small jerking motion followed by a more intense jerking motion. The jerking depends on the earthquakes magnitude, distance from the epicenter.

4. FLOOD

The term flood is a temporary or complete inundation of normally dry land areas of inland or tidal waters from the unusual rapid accumulation of surface water. Flooding and flash floods are the deadliest of natural disaster. Floods can occur anywhere. It result from excess water or rivers or a heavy downpour. Heavy downpour in the form of rains brings down more water than can be disposed off by combined factors natural and man made systems causes flooding. Generally, rains following storm and hurricane are heavy and bring unimaginable amount of water causing flash floods. Floods occur due to rainfall from cyclones or hurricanes, rivers rising, ice melting, tides, tsunamis. Some floods are artificial.

5. TSUNAMIS

A tsunamis is a series of water that is caused by the displacement of a large volume of a water body, such as an ocean. Due to the immense volumes of water and energy involved, tsunamis can devastate coastal regions and casualties can be high as waves move faster than human can run. Earthquake, volcanic eruption and under water explosions, landslides and other disturbance above or below water have the potential to generate a tsunamis. Tsunamis and tides produce waves of water that move inland, but in the case of a tsunamis the inland movement of water is much greater and lasts for a longer period. A tsunamis can be generated when destructive plate boundaries abruptly move and vertically displace the overlying water. Tsunamis have a small wave height offshore and a long wavelength. Most of the tsunamis occur in the Pacific Ocean. A large tsunamis may feature multiple waves arriving over a period of hours, with significant time between the wave crests. Trough or a drawback can serve as brief warning. People who observe drawback can survive

only if they run for a high ground. A tsunamis cannot be precisely predicted. When the tsunamis devastate the coastal regions the casualties can be torrential rains, high waves and storm surge and tornadoes. They develop over large water bodies of warm water, and lose their strength if they move over land. That is why coastal regions receive sufficient damage from a tropical cyclone, while inland are relatively safe. Many tropical cyclones develop when the atmosphere conditions around a weak disturbance in the atmosphere are favorable. All tropical cyclones are areas of low atmosphere pressure near the earth's surface. At any given altitude, except close to the surface, the environment inside the cyclone is warmer than its outer surroundings. Tropical cyclone activity peaks in late summer, when the difference between temperatures aloft and sea surface temperature is the greatest. Each particular basin has its own seasonal pattern.

Tropical cyclones out at sea large waves, heavy rain and high winds. On land. Small winds cause destruction on life and vehicles. The storm surge or the increase in the sea level due to cyclones Is typically the worst effect from land falling tropical cyclones.