MAR GREGORIOS COLLEGE OF ARTS & SCIENCE

Block No.8, College Road, Mogappair West, Chennai – 37

Affiliated to the University of Madras
Approved by the Government of Tamil Nadu
An ISO 9001:2015 Certified Institution

DEPARTMENT OF

COMPUTER APPLICATION

SUBJECT NAME: ENVIRONMENTAL STUDIES

SUBJECT CODE: ENV4B

SEMESTER: IV

PREPARED BY: PROF. T.BALACHANDAR

EVS SYLLABUS

Ability Enhancement Compulsory Courses (AECC – Environmental Studies)

Unit 1: Introduction to environmental studies

- Multidisciplinary nature of environmental studies; components of environment – atmosphere, hydrosphere, lithosphere and biosphere.
- Scope and importance; Concept of sustainability and sustainable development.

(2 Lectures)

Unit 2: Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 Lectures)

Unit 3: Natural Resources: Renewable and Non-renewable Resources

- Land Resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Heating of earth and circulation of air; air mass formation and precipitation.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

(8 Lectures)

Unit 4: Biodiversity and Conservation

- Levels of biological diversity :genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5: Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil, chemical and noise pollution

- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste..
- Pollution case studies.

(8 Lectures)

Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
- Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC).
- Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

(7 Lectures)

Unit 7: Human Communities and the Environment

- Human population and growth: Impacts on environment, human health and welfares.
- Carbon foot-print.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquakes, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

(6 Lectures)

Unit 8: Field work

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

(Equal to 5 Lectures)

UNIT-I
INTRODUCTION TO ENVIRONMENTAL STUDIES
Part A

Introduction to Environmental Studies And its Multidisciplinary Nature of

The word 'Environment' is derived from the French word 'Environner' which means to encircle, around or surround. The biologist Jacob Van Uerkal (1864-1944) introduced the term 'environment' in Ecology. Ecology is the study of the interactions between an organism of some kind and its environment. As given by Environment Protection Act 1986, Environment is the sum total of land, water, air, interrelationships among themselves and also with the human beings and other living organisms. It studies the sources, reactions, transport, effect and fate of a biological species in the air, water and soil and the effect of and from human activity upon these. Environmental Science deals with the study of processes in soil, water, air and organisms which lead to pollution or environmental damages and the scientific basis for the establishment of a standard which can be considered acceptably clean, safe and healthy for human beings and natural ecosystems.
The word environment is derived from the French word '**environ**' meaning surroundings.
Hence, everything surrounding us is called "ENVIRONMENT".

Environment – Scope and Importance

Environmental Protection Act (1986) defined "Environment as the sum total of water, air and land, their interrelationship among themselves and with the human beings, other living beings and property."
Scope:
It deals with the study of flow of energy and materials in the environment.
2. It deals with the study of nature and its function.
3. It deals with the exchange of various materials between the biotic and abiotic components of environment. E.g., Biogeochemical cycles.

The importance of environmental studies are as follows:

1. To clarify modern environmental concept like how to conserve biodiversity.
2. To know the more sustainable way of living.
3. To use natural resources more efficiently.
4. To know the behaviour of organism under natural conditions.
5. To know the interrelationship between organisms in populations and communities.
6. To aware and educate people regarding environmental issues and problems at local, national and international levels.

Environment and Its Components (Explained With Diagram)

Components

I Physical, II Biological, III Social

I Physical

(a) The Physical Constituent of environment includes soil, water, air, climate, temperature, light etc. These are also called abiotic constituents of the environment. This part of the environment mainly determines the type of the habitat or living conditions of the human population. This physical constituent of the environment is again divided into three parts.

These are:

(i) Atmosphere (gas)
(ii) Hydrosphere (liquid)
(iii) Lithosphere (solid)

II The biological constituent of environment

The biological constituent of environment is also called biotic component of environment. This component consists of all living things like plants, animals and small micro-organisms like bacteria. This component interacts with the abiotic component of the environment. This interaction of two components forms various ecosystems like pond ecosystem, marine ecosystem, desert ecosystem etc. The self sufficient large ecosystem of the earth is called Biosphere.

These three types are named as:

a. Producers are generally green plants and other photosynthetic bacteria which produces various organic substances such as carbohydrates, proteins etc. with the help of water, soil and light energy.

b. Consumers depend for their nutrition on the organic food produced by the green plants

c. Decomposers bring about the decomposition of dead plants and animals and return various important minerals for the running of the biogeochemical cycles.

III The social constituent of environment

The social constituent of environment mainly consists of various groups of population of different living organisms like birds, animals etc. Man is the most intelligent living organism. Like other living creatures, man builds house, prepares food and releases waste materials to the environment. Man is a social animal as told by Greek philosopher, Aristotle.

1. **Physical components Environment**
    1. **Atmosphere:**

The earth's atmosphere, a complex fluid system of gases and suspended particles, did not have its origin in the beginning of the planet. The gases like Nitrogen. Oxygen, Argon, Carbon dioxide and water vapour etc. together make up the total volume of atmosphere.

2. **Hydrosphere:**

It includes the surface water and its surrounding interfaceThe movement of water from earth surface to atmosphere through hydrological cycle appears to be a close system. Water is the most abundant substance on the Earth's surface. The oceans cover approximately 71% water of the planet, glaciers and ice caps cover additional areas.

3. **Lithosphere:**

It is the outer boundary layer of solid earth and the discontinuity within the mantle. The outer boundary forms a complex interface with the atmosphere and hydrosphere and is also the environment in which life has evolved. The inner boundary is adjacent to rock, which is near its melting point and is capable of motion relative to the lithosphere above.

4. **Biosphere:**

The biosphere encompasses all the zones on the Earth in which life is present, i.e. entire bio-resources of the earth. At the top of the lithosphere, throughout the hydrosphere and into the lower atmosphere, life of diverse type exists. These bio-resources and their surrounding constitute the "Biosphere" where ankind acts as the most evolved creature.

Atmosphere layers

1. **Troposphere**

The troposphere is the lowermost and densest layer. Its height varies from 18 km at the Equator to 8 km at the Poles. Seventy-five percent of the atmosphere is found in this layer.

2. **Stratosphere**

Stratosphere lies above the tropopause. There is a total absence of water vapor in this layer. It extends to a height of 50 km from sea level. The temperature here is around −55 degree Celcius.

3. **Mesosphere**

Mesosphere layer lies above the stratosphere and extends to a height of 90 km from ground level. This temperature in this layer decreases with height and reaches a minimum of −110 degree Celcius.

4. **Exosphere**

The outermost layer of the atmosphere is the exosphere and it fades in the space. It lies between 400-1500 km above the earth. The air here is extremely thin.

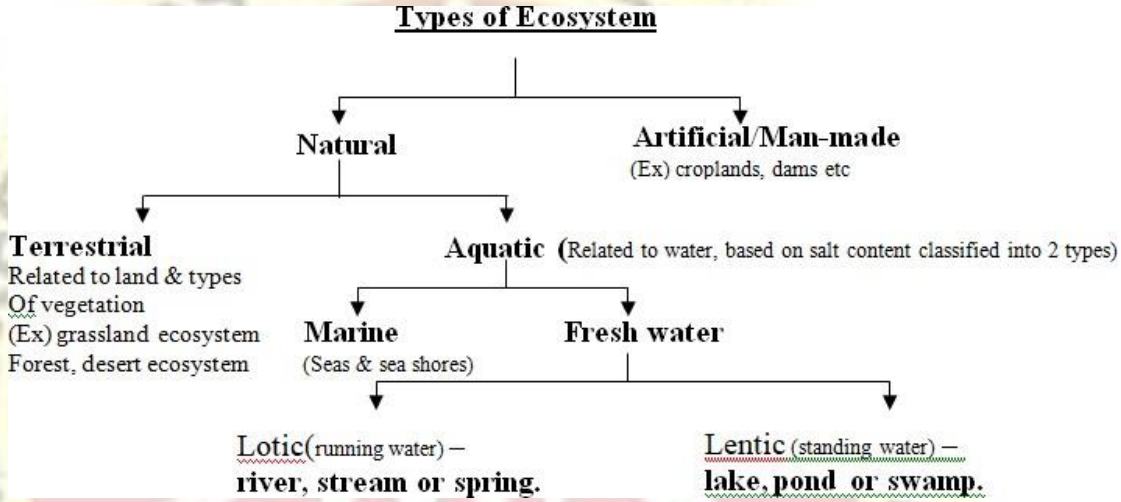
5. **Thermosphere**The thermosphere is the layer of the Earth's atmosphere directly above the mesosphere. It extends from mesopause and consists of two layers (a) Ionosphere and (b) Exosphere.

UNIT II

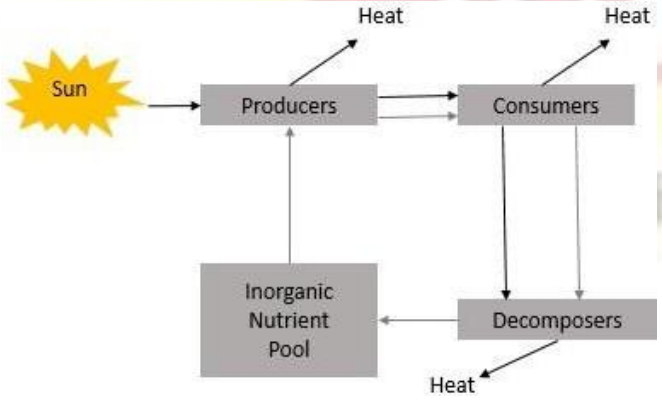
ECOSYSTEMS

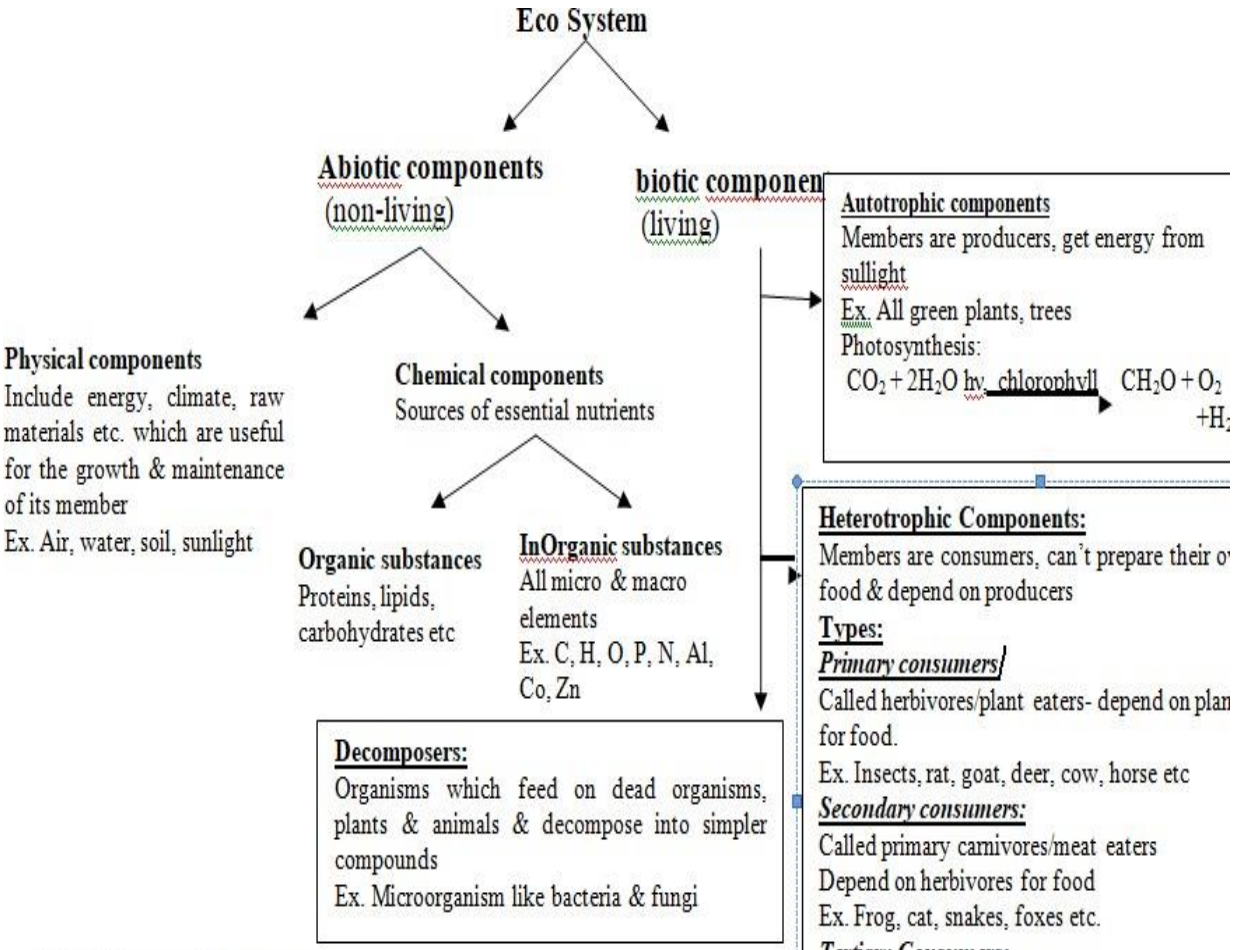
An **ecosystem** is a large community of living organisms (plants, animals and microbes) in a particular area. The living and physical components are linked together through nutrient cycles and energy flows. **Ecosystems** are of any size, but usually they are in particular places. Each **ecosystem** has its own community.

TYPES OF ECO-SYSTEM



Energy flow in eco system





2.2.1 Classes of Consumers

Herbivore – primary consumer – eats plants
Carnivores – secondary – meat eaters; eat herbivores
Tertiary – feed on carnivores
Omnivores – eat plants/animals.

Types of Eco System:

I. Forest ecosystem :

A forest ecosystem is a natural woodland unit consisting of all plants, animals and micro-organisms

Characteristics of forest ecosystem:

- Characterized by warm temperature, adequate rainfall
- Maintain climate & rainfall
- Support many wild animals & protect biodiversity
- Soil is rich in minerals, so support growth of trees
- Penetration of light is poor so conversion of organic matter is very fast

II. Grassland Ecosystem

Grassland Ecosystem is an area where the vegetation is dominated by grasses and other herbaceous (non-woody) plants.

Features

1. Vegetation structure that is dominated by **grasses**.
2. Semi-arid climate.
3. Rainfall and soils insufficient to support significant tree growth.
4. Most common at mid-latitudes and near the interiors of continents.
5. **Grasslands** are often exploited for agricultural use.

III. Desert ecosystem:

Features

A **desert ecosystem** is defined by interactions between organisms in the region associated with warm temperatures, however cold deserts also exist.

1. Less moisture
2. Less Rainfall
3. Less Humidity
4. High Temperature
5. High velocity of Wind
6. Scarcity of Water

IV. Aquatic ecosystem

An **aquatic ecosystem** is an **ecosystem** in a body of **water**. Communities of organisms that are dependent on each other and on their **environment** live in **aquatic ecosystems**.

Features

1. Being underwater,
2. Being based around water.
3. Being a community of organisms.
4. Being a distinct community that is more or less self contained

FOOD WEB IN ENERGY ECO SYSTEM

FOOD WEB

Definition: The interlocking pattern of various food chains in an ecosystem is food web. Many food chains are interconnected.

Energy Flow in Food web:

Grass → insects → fishes → birds → tigers
Grass → insects → birds → tigers
Grass → deer → tigers

Grass → insects → birds → tigers

Types of Consumers in Food Chain

Herbivores – primary consumer – eats plants
Carnivores – secondary – meat eaters; eat herbivores
Tertiary – feed on carnivores
Omnivores – eat plants/animals.

Unit III

Natural Resources: Renewable and Non-renewable Resources

Land and Land Resources refer to a delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes and swamps), the near-surface sedimentary layers and associated groundwater and geo-hydrological reserve, the plant and animal populations, the human settlement pattern and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings, etc.)

Deforestation is the clearing of trees, transforming a wooded area into cleared land. The first step in turning the wilderness into a shopping center is **deforestation**. **You** can see the word forest in **deforestation**. The prefix de- **means** "remove" and the suffix -ation signals the act or state of.

Causes for Deforestation

1. Agricultural Expansion
2. Livestock Ranching
3. Logging
4. Infrastructure Expansion
5. Overpopulation

Land degradation means Deterioration or loss of the productive capacity of the soils for present and future.

Soil erosion is defined as the wearing away of topsoil. Topsoil is the top layer of **soil** and is the most fertile because it contains the most organic, nutrient-rich materials. One of the main causes of **soil erosion** is water **erosion**, which is the loss of topsoil due to water.

Use and over Utilization of Surface and Ground Water

1. **Agriculture Needs of Water for the Crops:**

Most of these crops are shallow rooted, thus water being extracted from top layers of the soil. Soil moisture available in the top layers is essential for such crops.

2. **Groundwater.**

Water that is available in the deeper layers of the earth is known as Groundwater. This water has been trapped inside the earth’s crust for several centuries.

3. **Groundwater and Wells:**

Wells are used to bring groundwater to the land surface by means of pumps. Wells can be deep wells and shallow wells depending upon the depth at which ground water is available.

4. **Floods and Droughts:**

Floods:

Flooding takes place when the river channels are unable to contain the discharge.

Drought:
Drought is lack or insufficiency of rain for an extended period that causes considerable hydrologic imbalances and consequently water shortages, stream flow reductions and depletion of groundwater levels and soil moisture

Heating of earth and circulation of air; air mass formation and precipitation

Even with disruptions like weather fronts and storms, there is a consistent pattern to how air moves around our planet's atmosphere. This pattern, called atmospheric circulation, is caused because the Sun heats the Earth more at the equator than at the poles. It's also affected by the spin of the Earth.

In the tropics, near the equator, warm air rises. When it gets about 10-15 km (6-9 miles) above the Earth surface it starts to flow away from the equator and towards the poles. Air that rose just north of the equator flows north. Air that rose just south of the equator flows south. When the air cools, it drops back to the ground, flows back towards the Equator, and warm again. The, now, warmed air rises again, and the pattern repeats. This pattern, known as **convection**, happens on a global scale. It also happens on a small scale within individual storms.

But because Earth is spinning, the air that moves north and south from the equator also turns with the spin of the Earth. Air going north turns to the right. Air traveling south turns to the left. The power of Earth's spin to turn flowing air is known as the Coriolis Effect. If the Earth didn't spin, there would be just one large convection cell between the equator and the North Pole and one large convection cell between the equator and the South Pole. But because the Earth does spin, convection is divided into three cells north of the equator and three south of the equator.

Air Mass
An **air mass** is a volume of air defined by its temperature and water vapor content. Air masses cover many hundreds or thousands of miles, and adapt to the characteristics of the surface below them. They are classified according to latitude and their continental or maritime source regions. Colder air masses are termed polar or arctic, while warmer air masses are deemed tropical.

Precipitation

It is a chemical reaction in which you mix two solutions of two ionic substances and a solid ionic substance (a precipitate) forms.For example, precipitation occurs when a part of the atmosphere saturates itself with water vapour and when the right temperature comes its condenses and precipitates. The two processes which make the air saturated are the cooling of air molecules and the addition of water vapour.

Nonrenewable Resources

According to the U.S. Energy Information Administration, nonrenewable resources are any resources that "do not form or replenish in a short period of time." The most common nonrenewable resources include fossil fuels like crude oil, natural gas, and coal, as well as uranium nuclear energy.

The Most Common Nonrenewable Resources

1. **Oil**

Crude oil is a fossil fuel that's used to make gasoline, diesel fuel, jet fuel, heating oil, lubricating oils, and asphalt. This nonrenewable resource is a liquid that's extracted from underground reservoirs, sedimentary rocks, and tar sands. The crude oil is shipped to refineries where it's separated into petroleum products.

2. **Natural Gas**

Natural gas is obtained by drilling into rock formations that contain natural gas deposits. There are several places natural gas can be obtained:
Conventional natural gas is found in large cracks and spaces in rock formations
Shale gas or unconventional natural gas is found in tiny pores within rocks

3. **Coal**

Coal is a sedimentary rock that contains carbon and hydrocarbons. It's a fossil fuel that takes millions of years to form and contains energy stored by plants. There are four types of coal: Anthracite has the highest heating value and contains 86-97 percent carbon; it's used in the metals industry.

4. **Uranium**

Uranium isn't a fossil fuel, but it's still considered a common nonrenewable resource. While uranium is a common metal found in rocks, U-235 is a component of uranium that's very rare. U-235 is extracted from uranium and processed to be used as fuel in nuclear plants for nuclear fission.

How to Protect Nonrenewable Resources

Our society is dependent on nonrenewable resources that have expiration dates. For this reason, it's important to promote alternative energy sources, including renewable resources like solar and wind power.

Reducing our reliance on nonrenewable resources and expanding our renewable energy usage is one of the keys to a sustainable future. This movement includes both big, sweeping structural changes like the Paris Agreement, and the choices that businesses and individuals can make every single day.

Actions like driving electric and hybrid vehicles, installing solar panels on and properly insulating your business and home, and using energy-efficient appliances are all smaller-scale changes that you can make to reduce your nonrenewable resource usage.

Renewable Energy

Renewable energy, often referred to as clean energy, comes from natural sources or processes that are constantly replenished. For example, sunlight or wind keep shining and blowing, even if their availability depends on time and weather.

Types of Renewable Energy Sources

I. Solar Energy

Humans have been harnessing solar energy for thousands of years—to grow crops, stay warm, and dry foods. According to the National Renewable Energy Laboratory, "more energy from the sun falls on the earth in one hour than is used by everyone in the world in one year." Today, we use the sun's rays in many ways—to heat homes and businesses, to warm water, or power devices.

II. Wind Energy

We've come a long way from old-fashioned wind mills. Today, turbines as tall as skyscrapers—with turbines nearly as wide in diameter—stand at attention around the world. Wind energy turns a turbine's blades, which feeds an electric generator and produces electricity.
Wind, which accounts for a little more than 6 percent of U.S. generation, has become the cheapest energy source in many parts of the country.

III. Biomass Energy

Biomass is organic material that comes from plants and animals, and includes crops, waste wood, and trees. When biomass is burned, the chemical energy is released as heat and can generate electricity with a steam turbine.
Biomass is often mistakenly described as a clean, renewable fuel and a greener alternative to coal and other fossil fuels for producing electricity. However, recent science shows that many forms of biomass—especially from forests—produce higher carbon emissions than fossil fuels. There are also negative consequences for biodiversity. Still, some forms of biomass energy could serve as a low-carbon option under the right circumstances. For example, sawdust and chips from sawmills that would otherwise quickly decompose and release carbon can be a low-carbon energy source.

IV. Geothermal Energy

If you've ever relaxed in a hot spring, you've used geothermal energy. The earth's core is about as hot as the sun's surface, due to the slow decay of radioactive particles in rocks at the center of the planet. Drilling deep wells brings very hot underground water to the surface as a hydrothermal resource, which is then pumped through a turbine to create electricity. Geothermal plants typically have low emissions if they pump the steam and water they use back into the reservoir.

V. Hydroelectric Power

Hydropower is the largest renewable energy source for electricity in the United States, though wind energy is soon expected to take over the lead. Hydropower relies on water—typically fast-moving water in a large river or rapidly descending water from a high point—and converts the force of that water into electricity by spinning a generator's turbine blades.

UNIT IV

BIODIVERSITY AND CONSERVATION

Definition of Biodiversity

It is defined as "*the variety and variability of living organisms and the ecological complexes in which they exist."*

Role of Biodiversity

- **Biodiversity and Food –** Around eight percent of the food supplies come from 20 kinds of plants but we use around 40,000 species for clothing, food and shelter. It is the biodiversity that provide us the variety of food.
- **Biodiversity and Human Health –** Biodiversity plays an integral in the discovery of drugs and medical resources. Medicines from the nature accounts for eighty percent of the usage in the entire population of the world.
- **Biodiversity and Industry –** Biodiversity helps in providing several industrial materials as well. It includes fibers, dyes, rubber, oil, food, paper and timber.
- **Biodiversity and Culture –** Biodiversity boosts recreational activities like trekking, bird watching, fishing, etc. It inspires musicians, painters, as well.

Objectives of Conservation of Bio-diversity.

There are three main **objectives of Conservation of Biodiversity –**

- **1.** To preserve the species diversity
- **2.** Make the sustainable utilization of species and ecosystem
- **3.** Maintain the important ecological process and life supporting systems

1. **Explain the Types of Bio-Diversity Conservation.**

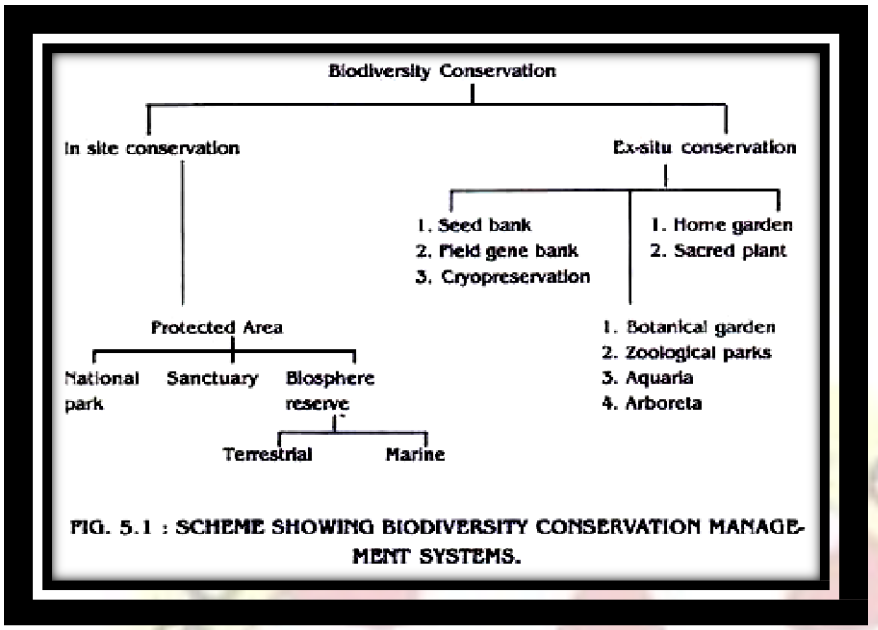


FIG. 5.1 : SCHEME SHOWING BIODIVERSITY CONSERVATION MANAGEMENT SYSTEMS.

Biodiversity Conservation

In situ conservation

(1) The most appropriate method to maintain species of wild animals and plants in their natural habitats. This approach includes conservation and protection of the total ecosystems and its biodiversity through a network of protected areas.

(2) The common natural habitats (protected areas) that have been set for in-situ conservation of wild animals and plants include:

(i) National parks

(ii) Wild life sanctuaries

(iii) Biosphere reserves

(iv) Several wetlands, mangroves and coral reefs.

(v) Sacred grooves and lakes.

(3) Hot spot of biodiversity are those regions of rich biodiversity which have been declared sensitive due to direct or indirect interference of human activities.

(4) There are 25 terrestrial hot spots in the world including two from India.

Ex situ conservation

(1) Threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care.

(2) Ex situ conservation includes the following:

(i) Sacred plants and home gardens

(ii) Seed banks, field gene banks, cryopreservation.

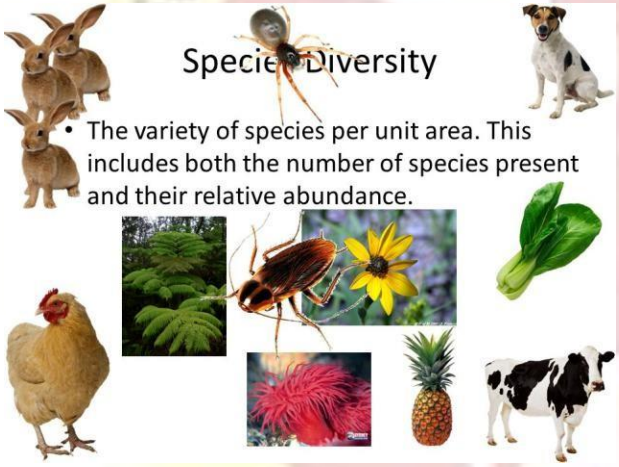
(iii) Botanical gardens, Arborata, Zoological gardens, Aquaria.

Biodiversity is of three types:

1. Species diversity
2. Genetic diversity
3. Ecological diversity

1. Species Diversity

It is the biodiversity observed within a community. It stands for the number and distribution of species. The number of species in a region varies widely depending upon the varied environmental conditions. For example, it is usually observed that civilizations residing beside water bodies show more species than the one compared to the areas away from water bodies.



2. Genetic Diversity

It is basically the variety of species expressed at the genetic level by each individual in a species. No two individuals belonging to the same species are exactly similar. For example, in the species of human beings, each human shows a lot of diversity in comparison to another human. People living in different regions show a great level of variation.

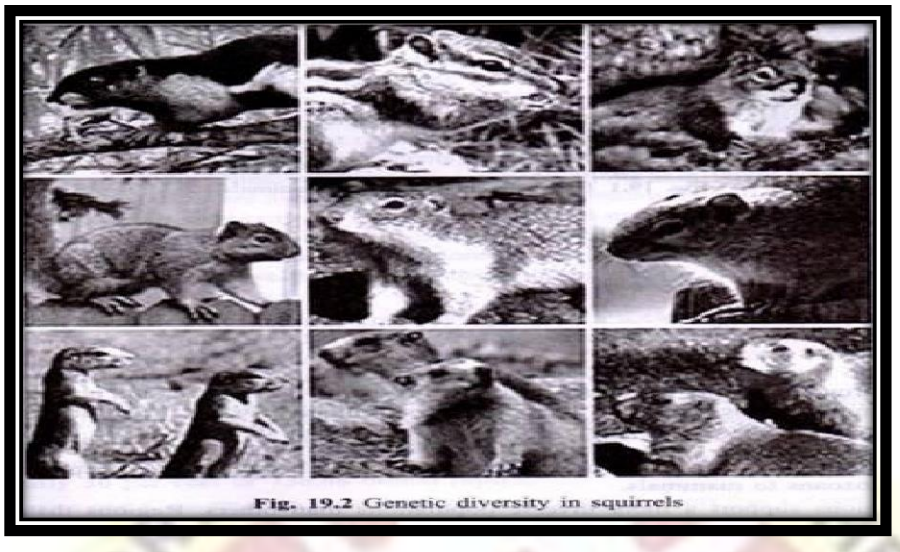


Fig. 19.2 Genetic diversity in squirrels

3. Ecological diversity

It defines the diversity observed among the ecosystems in a particular region. Different ecosystems like mangroves, rainforests, deserts, etc., show a great variety of life forms residing in them.

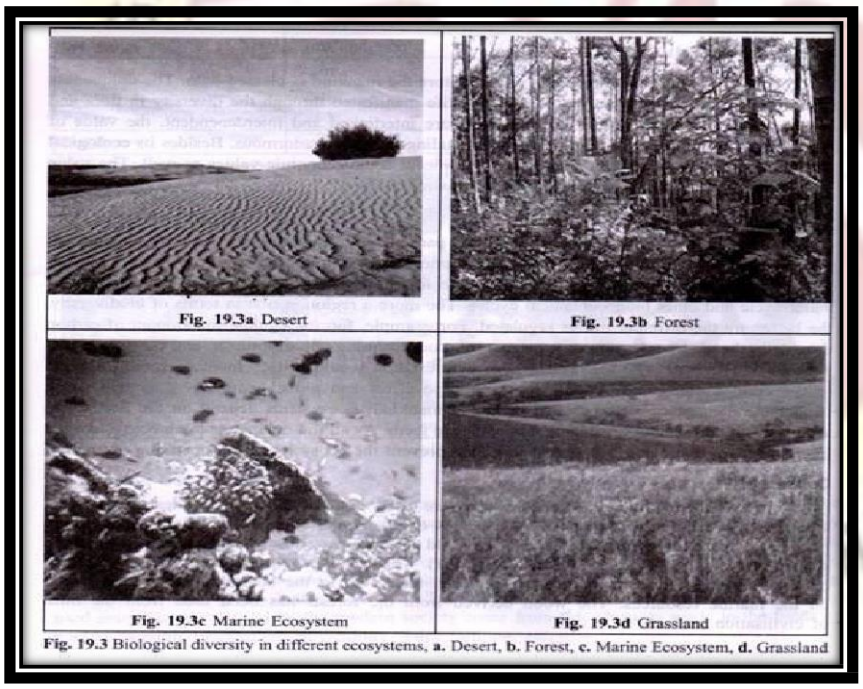


Fig. 19.3a Desert

Fig. 19.3b Forest

Fig. 19.3c Marine Ecosystem

Fig. 19.3d Grassland

Fig. 19.3 Biological diversity in different ecosystems, **a.** Desert, **b.** Forest, **c.** Marine Ecosystem, **d.** Grassland

THREATS TO BIO DIVERSITY

1. **Human Activities and Loss of Habitat:**

Human activities are causing a loss of biological diversity among animals and plants globally estimated at 50 to 100 times the average rate of species loss in the absence of human activities. Two most popular species in rich biomes are tropical forests and coral reefs.2.

2. **Climate Change:**

As climate warms, species will migrate towards higher latitudes and altitudes in both hemisphere. The increase in the amount of CO_2 in the air affects the physiological functioning of plant and species composition. Moreover, aquatic ecosystems, particularly coral reefs, mangrove swamps, and coastal wetlands, are vulnerable to changes in climate.

3. **Deforestation:**

Forest ecosystems contain as much as 80 percent of the world's terrestrial biodiversity and provide wood fiber and biomass energy as well as critical components of the global cycles of water, energy and nutrient. Forest ecosystems are being cleared and degraded in many parts of the world.

4. **Desertification:**

Desertification and deforestation are the main causes of biodiversity loss. Both processes are decisively influenced by the extension of agriculture. The direct cost of deforestation is reflected in the loss of valuable plants and animal species.

5. **Polluted Marine Environment:**

Oceans play a vital role in the global environment. Covering 70 per cent of the earth's surface, they influence global climate, food production and economic activities. Despite these roles, coastal and marine environment are being rapidly degraded in many parts of the globe.

Increasing Wildlife Trade:

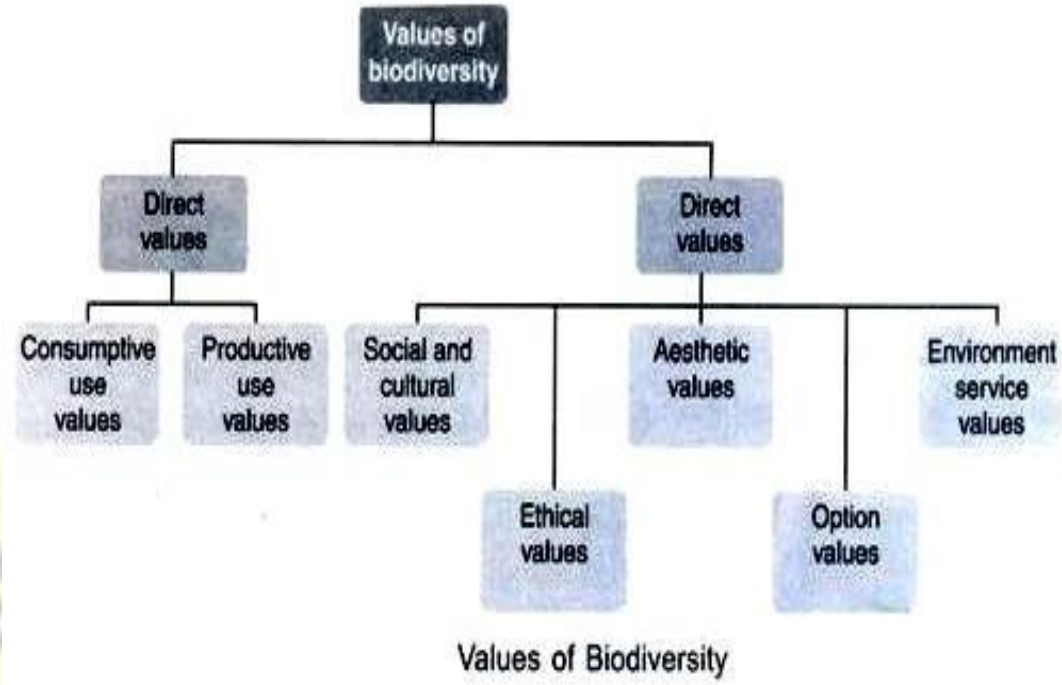
According to Nick Barnes, "Trade is another cause of biodiversity depletion that gives rise to conflict between North and South." Global trade in wildlife is estimated to be over US $ 20 billion annually.

Some of the major values of biodiversity are as follows: 1. Environmental Value 2. Social Value

3. Ecosystem Services 4. Economic Value 5. Consumptive use value 6. Productive Use Value 7. Ethical and Moral Value 8. Aesthetic Value.

Biodiversity is the most precious gift of nature mankind is blessed with. As all the organisms in an ecosystem are interlinked and interdependent, the value of biodiversity in the life of all the organisms including humans is enormous.

The health and diversity of ecosystems can have a significant effect on the overall stability of nearby communities.



Values of Biodiversity

1. **Environmental Value:**

The environmental value of biodiversity can be found by examining each ecosystem process and identifying the ecosystem services that result. For instance, in wetlands the vegetation captures water- carried sediment and the soil organisms break down a range of nutrients and pollutants washed into the area.

2. **Social Value:**

The social value of biodiversity includes aesthetic, recreational, cultural and spiritual values. To this can be added health benefits resulting from recreational and other activities. While traditional societies which had a small population and required less resources had preserved their biodiversity as a life supporting resource, modern man has rapidly depleted it even to the extent of leading to the irrecoverable loss due to extinction of several species.

3. **Ecosystem Services:**

These services also support human needs and activities such as intensely managed production ecosystems.

4. Economic Value:

The economic potential of biodiversity is immense in terms of food, fodder, medicinal, ethical and social values. Biodiversity forms the major resource for different industries, which govern the world economy.

5. Consumptive use value:

This is related to natural products that are used directly for food, fodder, timber, fuel wood etc. Humans use at least 40,000 species of plants and animals on a daily basis. Many people around the world still depend on wild species for most of their needs like food, shelter and clothing. The tribal people are completely dependent on the forests for their daily needs.

6. Productive Use Value:

This is assigned to products that are commercially harvested and marketed. Almost all the present date agricultural crops have originated from wild varieties. The biotechnologists continuously use the wild species of plants for developing new, better yielding and disease resistant varieties. Biodiversity represents the original stock from which new varieties are being developed.

7. Ethical and Moral Value:

It is based on the principle of 'live and let others live'. Ethical values related to biodiversity conservation are based on the importance of protecting all forms of life. All forms of life have the right to exist on earth. Man is only a small part of the Earth's great family of species.

8. Aesthetic Value:

The beauty of our planet is because of biodiversity, which otherwise would have resembled other barren planets dotted around the universe. Biological diversity adds to the quality of life and provides some of the most beautiful aspects of our existence. Biodiversity is responsible for the beauty of a landscape.

Unit V:

Environmental Pollution

Pollution:

"Pollution is the introduction of substances (or energy) that cause adverse changes in the environment and living entities ."

1. **Types of Pollution.**

As stated before, there are different types of pollution, which are either caused by natural events (like forest fires) or by man-made activities (like cars, factories, nuclear wastes, etc.) These are further classified into the following types of pollution:

I. Air Pollution
II. Water Pollution
III. Soil Pollution
IV. Noise Pollution
V. Chemical pollution

I. Air Pollution

Air pollution refers to the release of harmful contaminants (chemicals, toxic gases, particulates, biological molecules, etc.) into the earth's atmosphere. These contaminants are quite detrimental, and in some cases, pose serious health issues.

Causes of Air Pollution

1. Burning fossil fuels
2. Mining operations
3. Exhaust gases from industries and factories

Effects or consequences of Air Pollution

1. Increased risk of respiratory illness and cardiovascular problems
2. Increased risk of skin diseases
3. May increase the risk of cancer
4. Global warming
5. Acid rain
6. Ozone depletion
7. Hazards to wildlife

II. Water Pollution

Water pollution is said to occur when toxic pollutants and particulate matter are introduced into water bodies such as lakes, rivers and seas. These contaminants are generally introduced by

human activities like improper **sewage treatment** and oil spills. However, even natural processes such as eutrophication can cause water pollution.

Causes of Water Pollution

1. Dumping solid wastes in water bodies
2. Disposing untreated industrial sewage into water bodies
3. Human and animal wastes
4. Agricultural runoff containing pesticides and fertilizers.

Effects or Consequences of Water Pollution

1. Disruption of the ecosystem
2. Threats to marine life
3. Increased risk of water-borne diseases
4. Increases toxic chemicals (such as mercury) in water bodies
5. Eutrophication (increase of algae-micro organism)

III. Soil Pollution:

Soil pollution, also called **soil contamination**, refers to the degradation of land due to the presence of chemicals or other man-made substances in the soil. The xenobiotic substances alter the natural composition of soil and affect it negatively

These can drastically impact life directly or indirectly.For instance, any toxic chemicals present in the soil will get absorbed by the plants. Since plants are producers in an environment, it gets passed up through the food chain.

Causes for Soil Pollution

1. Improper industrial waste disposal
2. Oil Spills
3. Acid rain which is caused by air pollution
4. Mining activities
5. Intensive farming and agrochemicals (like fertilisers and pesticides)
6. Industrial accidents

Effects or Consequences of Soil Pollution

1. Loss of soil nutrients, which renders the soil unfit for agriculture
2. Impacts the natural flora and fauna residing in the soil
3. Degrades vegetation due to the increase of salinity of the soil
4. Toxic dust (such as silica dust) can cause respiratory problems or even lung cancer

IV. Noise Pollution

Noise pollution refers to the excessive amount of noise in the surrounding that disrupts the natural balance. Usually, it is man-made, though certain natural calamities like volcanoes can contribute to noise pollution.

Causes of Noise Pollution

1. Industry-oriented noises such as heavy machines, mills, factories, etc.
2. Transportation noises from vehicles, aeroplanes, etc.
3. Construction noises
4. Noise from social events (loudspeakers, firecrackers, etc.)
5. Household noises (such as mixers, TV, washing machines, etc.)

Effects or Consequences of Noise Pollution

1. Hearing loss
2. Tinnitus (ringing in the ears or constant Noise)
3. Sleeping disorders
4. Hypertension (high BP)
5. Communication problems.

5. Chemical Pollution

Chemical pollution can be **caused** by a variety of **chemicals** from a variety of **sources** and can involve a variety of health effects from simple digestive problems to **chemical** intoxication and sudden death by poisoning. The effects are usually related to the exposure to high amounts of **chemicals**.

Causes of Chemical pollution

1. Pesticides in Agriculture
2. Emission of Transports
3. Household chemicals (usuage)
4. Hazardous chemicals from Industry and Factory.

NUCLEAR HAZARDS

The radiation hazard in the environment comes from ultraviolet, visible, cosmic rays and micro waveradiation which produces genetic mutation in man.

1 Sources of Nuclear Hazards

Natural Sources – This is in space which emits cosmic rays.

Man made Sources – (Anthropogenic sources) these are nuclear power plants, X-rays, nuclear accidents,nuclear bombs, diagnostic kits.

2 Effects of Nuclear Hazards

1. Exposure of the brain and central nervous system ot high doses of radiation causes delirium,convulsions and death within hours or days.

2. The use of eye is vulnerable to radiation. As its cell die, they become opaque forming cataractsthat impair sight.

3. Acute radiation sickness is marked by vomiting; bleeding of gums and in severe cases mouthulcers.

4. Nausea and vomiting often begin a few hours after the gastrointestinal tract is exposed.Infection of the intestinal wall can kill weeks afterwards.

5. Unborn children are vulnerable to brain damage or mental retardation, especially if
6. irradiation occurs during formation of the central nervous system in early pregnancy.

3**. Control measures**

Nuclear devices should never be exploded in air.

In nuclear reactors, closed cycle coolant system with gaseous coolant may be used to preventextraneous activation products.

Containments may also be employed to decrease the radio active emissions.

Extreme care should be exercised in the disposal of industrial wastes contaminated with radio nuclides.

Use of high chimneys and ventilations at the working place where radioactive contamination is high. Itseems to be an effective way for dispersing pollutants.

Solid waste management: Control measures of urban and industrial waste..

Solid-waste management, is the process of collecting, treating, and disposing of solid material that isdiscarded because it has served its purpose or is no longer useful.

Control Measures of Urban and Industrial Wastes (with statistics)!

Indiscriminate disposal of solid wastes, especially of hazardous wastes causes adverse environmentaleffects.

The main objective of solid waste management is to minimise these adverse effects before it becomestoo difficult to rectify in the future.

Solid waste management is a manifold task involving many activities like:

(i) Collection of solid wastes.

(ii) Disposal of solid wastes.

(iii) Waste utilisation.

(i) Collection of Solid Wastes:

Collection includes all the activities associated with the gathering of solid wastes and the hauling of the wastes collected to the location from where the collection vehicle will ultimately transport it to the site of disposal. There are three basic methods of collection.

(a) Community storage point:

The municipal refuse is taken to fixed storage bins and stored till the waste collection agency collects it daily for disposal in a vehicle.

(b) Kerbside Collection:

In advance of the collection time, the refuse is brought in containers and placed on the footway from where it is collected by the waste collection agency.

(c) Block Collection:

Individuals bring the waste in containers and hand it over to the collection staff who empties it into the waiting vehicle and returns the container to the individuals.

(ii) Disposal of Solid Wastes:

Before the solid waste is ultimately disposed of it is processed in order to improve the efficiency of solid waste disposal system and to recover usable resources out of the solid wastes. The processing techniques such as compaction i.e. mechanical volume reduction or incineration i.e. thermal volume reduction and manual component separation i.e. manual sorting of the waste are employed to increase the efficiency of solid waste management.

Due to heterogeneity of the city refuse it is important to select the most appropriate solid waste disposal method keeping in view the following objectives:

(a) It should be economically viable i.e. the operation and maintenance costs must be carefully assessed.

(b) It should not create a health hazard.

(c) It should not cause adverse environmental effects.

(d) It should not be aesthetically unpleasant i.e. it should not result in offending sights, odours, and noises.

(e) It should preferably provide opportunities for recycling of materials.

UNIT VI

Environmental Policies & Practices
Part-A

Climate Change:

Climate change is a long-term shift in global or regional climate patterns. Often climate change refers specifically to the rise in global temperatures

Global Warming

Global warming, the phenomenon of increasing average air temperatures near the surface of Earth

Ozone depletion

Ozone depletion, gradual thinning of Earth's **ozone layer** in the upper atmosphere caused by the release of chemical compounds containing gaseous chlorine from industry and other human activities.

Acid Rain

Acid rain is rain polluted by acid that has been released into the atmosphere from factories and other industrial processes. Acid rain is harmful to the environment.

Acid Rain and explain its impact on the community

Acid rain is rain polluted by acid that has been released into the atmosphere from factories and other industrial processes. Acid rain is harmful to the environment.

The Effects of Acid Rain

Acid rain can be carried great distances in the atmosphere, not just between countries but also from continent to continent. The acid can also take the form of snow, mists and dry dusts. The rain sometimes falls many miles from the source of pollution but wherever it falls it can have a serious effect on soil, trees, buildings and water.

Forests

It is thought that acid rain can cause trees to grow more slowly or even to die but scientists have found that it is not the only cause. As acid rain falls on a forest it trickles through the leaves of the trees and runs down into the soil below. Some of it finds its way into streams and then on into rivers and lakes.

Acid rain can effect trees in several different ways, it may:

1. dissolve and wash away the nutrients and minerals in the soil which help the trees to grow.
2. cause the release of harmful substances such as aluminium into the soil.
3. wear away the waxy protective coating of leaves, damaging them and preventing them from being able to photosynthesise properly.

Lakes and Rivers

It is in aquatic habitats that the effects of acid rain are most obvious. Acid rain runs off the land and ends up in streams, lakes and marshes - the rain also falls directly on these areas.
As the acidity of a lake increases, the water becomes clearer and the numbers of fish and other water animals decline. Some species of plant and animal are better able to survive in acidic water than others. Freshwater shrimps, snails, mussels are the most quickly affected by acidification followed by fish such as minnows, salmon and roach.

Buildings

Every type of material will become eroded sooner or later by the effects of the climate. Water, wind, ice and snow all help in the erosion process but unfortunately, acid rain can help to make this natural process even quicker. Statues, buildings, vehicles, pipes and cables can all suffer. The worst affected are things made from limestone or sandstone as these types of rock are particularly susceptible and can be affected by air pollution in gaseous form as well as by acid rain.

Explain the Environment Protection Act, 1986t.

India's Environment Protection Act, 1986- An overview

In India, environmental protection was not much of an issue till the mid-1980's. That is, environmental protection as a whole was never seriously considered. The government did enact various legislation pertaining to the environment in the 1970's and 80's; most notably the Water Act, 1974, Air Act, 1981, Indian Forest Policy, 1988. But it took two major pushes, one from the international community and one from the national community, to create the Environment Protection Act.

The EPA 1986 came into force in all of India in November of 1986, under an official notification. The Act contains 26 sections divided into 4 chapters. The Act has its genesis in Indian Constitution's Article 48(A) and Article 51(A)g. The Act is a part of Article 253 of the Indian Constitution

.Some of the special features

1. The Act covers all forms of pollution; air, water, soil and noise.
2. It provides the safe standards for the presence of various pollutants in the environment.
3. It prohibits the use of hazardous material unless prior permission is taken from the Central Government.
4. It allows the central government to assign authorities in various jurisdictions to carry out the laws of this Act.

Section 15- Penalties.

1. The penalty for the contravention under this Act is imprisonment of 5 years, or fine of Rs. 1 lakh or both.
2. Failure to comply with this punishment will result in a further penalty of 5000/- per day, followed by an extended imprisonment of 7 years.
3. If the offence is committed by a company, the company as well as the director, officer in charge and any other relevant personnel is liable to be held guilty under this Act.
4. If the offence is conducted by a government department, the HOD and any other relevant officer shall be held guilty. The HOD can be exempted if he/she can prove that the offence took place without their knowledge, or if they can prove that they did their utmost to prevent the offence.
5. *The section also states that a case/prosecution cannot be filed if the government entity or an officer of the government did actions under good faith.*

India's Water (Prevention and Control of Pollution) Act, 1974.

The Water (Prevention and Control of Pollution) Act, 1974 the first of a series of legislation passed by the Government of India pertaining to regulation of environmental aspects in the country. Rising water pollution due to industrial and domestic activities became a cause of concern, leading to the enaction of this legislation

Salient features of the Act

Section 3 and Section 4: Constitution of the Central Pollution Control Board and State Pollution Control Boards, respectively, are provided the authority to exercise the powers conferred to them under this Act.

Section 13: Constitution of a Joint Board.

Under this Section, the Act prescribes the constitution of a Joint Board for pollution control if there is an agreement between

(a) two or more State Governments of contiguous states or,

(b) Central Government (representing one or more Union Territories) and State Governments contiguous to one or more Union Territories.

Functions of the Central Board are described,:

1. Advise the Central Government on any matter concerning the prevention and control of water pollution
2. Co-ordinate the activities of the State Boards and provide technical assistance and guidance
3. Collect, compile and publish technical and statistical data relating to water pollution
4. Establish or recognize a laboratory or laboratories to enable the Board to perform its functions

India's Wildlife Protection Act, 1972- An overview

Objectives

The underlying objective of this Act is to protect the animals and birds of the country.

Salient Features

The Act has 7 Chapters, 66 Sections and 6 Schedules as of today.

The 6 Schedules of the Act specify the level of protection for different species.

Schedule I and II are for endangered species, that deserve rigorous protection and the breach of these rules results in serious punishment. A famous case where this was applied was when Salman Khan was sentenced to 5 years in prison for hunting a black buck.

Schedule III and IV is for species that are not endangered, but the protection and punishments are equally rigorous.

Schedule V delineates the animal species that can be hunted, like deer or ducks, and the rules pertaining to their hunting.

Schedule VI covers the protection and trade of medicinal plants as well as agricultural species of plants.

Protected Areas
The Act talks about the setting up of three types of Protected Areas for the protection of wildlife. These are-

Wildlife Sanctuaries-
A state government can declare any area as a wildlife sanctuary if it feels that the area has the necessary ecological importance. The setting up of the sanctuary is then taken up by the concerned District Collector. This includes the resettlement of people, if required, and the land acquisition process.

National Parks-
The state governments are again responsible for taking initiative in declaring a site as National Park. National Parks are more strictly regulated than Wildlife Sanctuaries, with absolutely no other activity taking place within it's premises. The boundary of a National Park is fixed and clearly specified, unlike a sanctuary.

Punishments for offenses
This has been described in Chapter VI of the Act. All offenses under this Act are considered non-bailable and cognizable; meaning no search warrant is required by the authority if they think a person/party is guilty of breaking any rules of this act, particularly the trade of animal parts. If a person is found guilty of breaching this Act (unless provisions are stated), it can lead to an imprisonment of a minimum of three years and a fine of minimum of 25,000 rupees.
If a company commits a crime against this Act, all persons in-charge of the company/project in question, as well as the company itself, will be the liable party.

Rights of Schedule Tribes

The Constitution of India seeks to secure for all its citizens, among other things, social and economic justice, equality of status and opportunity and assures the dignity of the individual. All Rights available to the Citizens of India, enshrined in the Constitution or any law of the land or any order of the Government are equally available to the Scheduled Tribes also.

Are there any privileges or special rights for Scheduled Tribes? *Scheduled Tribes being backward and isolated from the rest of the population are not able to exercise their rights. In order to empower them to be able to exercise their rights special provisions have been made in the Constitution. Framers of the Constitution took note of this fact and incorporated enabling provisions in the Constitution in the form of reservation and measures to be taken to empower them to be able to avail the opportunities. Some people call these provisions as privileges for the Scheduled Tribes but these are only the enabling provisions so that Scheduled Tribes can avail the opportunities and exercise their rights and safeguards.*

Human-Wildlife Conflict.

Human-wildlife conflict is defined by the world wide fund for nature as "any interaction between humans and wildlife that results in negative impact on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment.

Explain Human-wildlife conflict and its causes and consequences.

1. Interaction between wild animals and people and the resultant negative impact on people or their resources, orwild animals or their habitat.

2. When growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals.

3. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

Causes

1. As human populations expand into wild animal habitats.
2. Natural wildlife territory is displaced.
3. Reduction in the availability of natural prey/food sources
4. New resources created by humans draw wildlife resulting in conflict

Outcomes of conflict

1. Injury and loss of life of humans and wildlife.
2. Crop damage, livestock depredation, predation of managed wildlife stock.
3. Damage to human property.
4. Trophic cascades.
5. Destruction of habitat.
6. Collapse of wildlife populations and reduction of geographic ranges.

UNIT- VII
HUMAN COMMUNITIES AND THE ENVIRONMENT

Human population and growth: Impacts on environment, human health and welfares.

The term overpopulation is used to describe a situation in which the world or area has a population so large that the people there are suffering as a result. In other words, the population exceeds the region or planet's carrying capacity--the number of people, other living organisms, or crops that can be supported without environmental degradation. Their suffering may include a shortage of food, limited access to healthcare and other public services, overcrowding, and high unemployment.

Causes of Overpopulation

1. **Farming impacts**

A growing agricultural base to feed an expanding world population comes with its own complications. As the global population increases, more food is needed. Such measures may be met through more intensive farming, or through deforestation to create new farm lands, which in turn can have negative outcomes. Agriculture is responsible for about 80 percent of deforestation, worldwide.

2. **Deforestation**

Deforestation in turn leads to a reduced ability to capture CO2, thus exasperating the greenhouse gas problem. Tropical rainforests in South America are responsible for producing 20 percent of the Earth's oxygen. Human population increase is related to all of these deforestation pressures. More people means we need more food, more wood products, and more firewood.

3. **Eutrophication**

Agricultural runoff is one of the main causes of eutrophication, the presence of excessive nutrients in bodies of waster, such as large pockets like the Dead Zone of the Gulf of Mexico. Worldwide, there are more than 400 marine 'dead zones' caused by eutrophication, collectively covering an area six times the size of Switzerland.

4. **Loss of Fresh Water**

While there is plenty of water on the planet, it is very much a scarce resource. Only 2.5 percent of water resources are fresh water, and just a small fraction of that is available as unpolluted drinking water.

5. Global Warming

Human population growth and climate change have grown hand in hand as the use of fossil fuels has exploded to support industrialized societies. "

Corbon Footprint

> **Carbon footprint**, amount of carbon dioxide (CO_2) emissions associated with all the activities of a person or other entity (e.g., building, corporation, country, etc.). It includes direct emissions, such as those that result from fossil-fuel combustion in manufacturing, heating, and transportation, as well as emissions required to produce
> the electricity associated with goods and services consumed

Awareness of Disaster management through Mass Media:

a. Media plays a significant role in educating the population about] disaster and its management.
b. Without media we could not aware people about disaster in remote areas of the country.

Central Sector Scheme for Disaster Management:

a. Human resource Development
b. Setting up of National Centre for Disaster Management (NCDM)
c. Setting up of Disaster Management Faculties in States
d. UNDP is a united nation's global development programs working in 166 countries.
e. Programs for Community Participation and Public Awareness
f. Observing National Disaster Reduction Day

Resettlement and rehabilitation of project affected persons; case studies.

Development projects that displace people involuntarily generally give rise to severe economic, social, and environmental problems: production systems are dismantled; productive assets and income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community structures and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished. Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefullyplanned and carried out.

The World Bank was the first multilateral lending agency to adopt a policy for Resettlement and Rehabilitation (R&R).

The treatment of resettlement issues beyond hydropower and irrigation projects to all types of investment operations. It emphasizes the need for:

- Minimizing involuntary resettlement;
- Providing people displaced by a project with the means to improve, or at least restore, their former living standards, earning capacity, and production levels;
- Involving both resettles and hosts in resettlement activities;
- A time-bound resettlement plan; and
- Valuation and compensation principles for land and other assets affected by the project.

A full EA is required if a project is likely to have significant adverse impacts that may be sensitive, irreversible, and diverse. The impacts are likely to be comprehensive, broad, sector-wide, or precedent-setting. Impacts generally result from a major component of the project and affect the area as a whole or an entire sector.

- Dams and reservoirs; Forestry production projects;
- Industrial plants (large-scale) and industrial estates;
- Irrigation, drainage, and flood control (large-scale);
- Land clearance and leveling;
- Mineral development (including oil and gas);
- Port and harbor development;
- Reclamation and new land development;
- Resettlement and all projects with potentially major impacts on people;
- River basin development;
- Thermal and hydropower development; and
- Manufacture, transportation, and use of pesticides or other hazardous and/or toxic materials.

The impacts are not as sensitive, numerous, major, or diverse as category A impacts; remedial measures can be more easily designed. Preparation of a mitigation plan suffices for many category B projects. Few category B projects would have a separate environmental report. Examples of Category B projects are:

- Agro-industries (small-scale);
- Electrical transmission;
- Aquaculture and mariculture;
- Irrigation and drainage (small-scale);
- Renewable energy;
- Rural electrification;
- Tourism;
- Rural water supply and sanitation;
- Watershed projects (management or rehabilitation); and
- Rehabilitation, maintenance, and upgrading projects (small-scale).

An EA or environmental analysis is normally not required for Category C projects because the project is unlikely to have adverse impacts. Professional judgment finds

the project to have negligible, insignificant, or minimal environmental impacts.Category C projects might be:

- Education,
- Family planning,
- Health,
- Nutrition,
- Institutional development,
- Technical assistance, and
- Most human resource projects.

Social analysis is a part of the EA process, and resettlement is one of five topics that are required, where they are relevant, be explicitly addressed in an EA. The five topics are:

- involuntary resettlement,
- new land settlement,
- induced development,
- indigenous peoples,
- and cultural property

The objective of the resettlement policy is to ensure that the population displaced by a project receives benefits from it. Involuntary resettlement is an integral part of project design and should be dealt with from the earliest stages of project preparation, taking into account the following policy considerations:

- Involuntary resettlement should be avoided or minimized where feasible, exploring all viable alternative project designs. For example, realignment of roads or reductions in dam height may significantly reduce resettlement needs.
- Where displacement is unavoidable, resettlement plans should be developed. All involuntary resettlement should be conceived and executed as development programs, with resettles provided sufficient investment resources and opportunities to share in project benefits. Displaced persons should be (i) compensated for their losses at full replacement cost prior to the actual move; (ii) assisted with the move and supported during the transition period in the resettlement site; and (iii) assisted in their efforts to improve their former living standards, income earning capacity, and production levels, or at least to restore them. Particular attention should be paid to the needs of the poorest groups to be resettled.
- Community participation in planning and implementing resettlement should be encouraged. Appropriate patterns of social organization should be established, and existing social and cultural institutions of resettles and their hosts should be supported and used to the greatest extent possible.

- Resettles should be integrated socially and economically into host communities so that adverse impacts on host communities are minimized. The best way of achieving this integration is for resettlement to be planned in areas benefiting from the project and through consultation with the future hosts.
- Land, housing, infrastructure, and other compensation should be provided to the adversely affected population, indigenous groups, ethnic minorities, and pastoralists who may have usufruct or customary rights to the land or other resources taken for the project. The absence of legal title to land by such groups should not be a bar to compensation.

Resettlement and outlines of the main point's planners should consider when preparing a resettlement plan. Depending on the magnitude of displacement and other factors, the resettlement plan will normally contain a statement of objectives and policies, an executive summary, a budget, a timetable coordinated with the physical works of the main investment project, and provision for:

- Organizational responsibilities;
- Community participation and integration with host populations;
- Socioeconomic survey;
- Legal framework;
- Alternative sites and selection;
- Valuation of and compensation for lost assets;
- Land tenure, acquisition, and transfer ;
- Access to training, employment, and credit;
- Shelter, infrastructure, and social services;
- Environmental protection and management ; and
- Implementation schedule, monitoring, and evaluation.

The foregoing is meant to be an indicative, not authoritative, discussion of the World Bank's involuntary resettlement policy. For more information, visit the World Bank's Public Information Center or the Environmental Management for Power Development page supported by the World Bank and other sponsors.

Case studies:

The Case study of a village to be affected by the indira sagar pariyojana

Indira Sagar Pariyojana (ISP) has been under planning and construction since decades. Work on the project has gained momentum in the last decade. Since then, the construction has been on and off depending on the availability of funds. On 24 April, 2002, an announcement was published both in Nai Duniya and Dainik Bhaskar1 stating that the village Jabgaon would be inundated with water in the coming monsoons owing to the increase in the height of the dam. The village was being askedto evacuate the area by 20 May, 2002. In March 2002, with the release of funds from

the Center to the Narmada Hydro Development Corporation, a decision was taken to increase the height of the dam to 212 m by June 2002. In fact since October 2001, there was a sudden spurt in announcements of the Section 4 notices of land acquisition in the regional Hindi newspapers making it evident that the project would soon be underway again. Meanwhile there had also been reports in the press that the rehabilitation had been lagging behind.

Manthan Adhyayan Kendra, which had been following the events in the history of the construction of this dam, decided to attempt to bring to fore the ground realities regarding the status of resettlement and rehabilitation of villages affected by this project. It was thought that the situation would be analysed at 3 points in time: pre- monsoon, monsoon and post-monsoon. Accordingly, 2 visits to this village had been undertaken: the first in the first week of May and the second in the third week of August. There have been less than normal monsoons this year and therefore while thevillage has not been submerged, some farms had been flooded.
The Kendra is a centre set up to monitor, analyse and research water and energy related issues, with a special focus on the latest developments resulting from the liberalisation, globalisation and privatisation of the economy. The Centre is located at Badwani, a district town in Madhya Pradesh five kilometers from the banks of Narmada. While the focus of the work is on water and energy issues, this will be in the larger context of equitable, just and sustainable development.

Uttaranchal's disaster management

Uttaranchal's location and geographical features render it vulnerable to minor changes. Hence any activity disapproved by mountain ecosystem triggers a disaster. One cannot stop disaster happening but can certainly take some steps to reduce its effects. If disasters cannot be averted, then reduction of losses of any type caused by disaster becomes a focal point of the policy for disaster management. To devise Uttaranchal's disaster management mechanism for reduction of effects of disaster, i.e. damage to property and loss of life and the rapid and effective rescue, relief and rehabilitation of the victims.

The study reveals that 83 villages in Uttaranchal need rehabilitation but, to date, Uttaranchal has no resettlement and rehabilitation policy. In India only three States, Maharashtra, Madhya Pradesh and Punjab, have state-wide resettlement and rehabilitation (R&R) policies. Other States have issued Government Orders or Resolutions, sometimes sector-wide but more often for specific projects. The study is based on secondary data; however, sufficient care has been taken to consider all important factors while suggesting Rehabilitation Policy for Uttaranchal State. A disaster of rare severity requires a high level of resettlement and rehabilitation assistance from the State. Sound Resettlement and Rehabilitation Policy helps the

Government to tackle the problem immediately and efficiently.

Disaster management: floods, earthquakes, cyclones and landslides

Disaster Management: Types, Awareness and Schemes for Disaster Management!
Geological processes like earthquakes, volcanoes, floods and landslides are normal natural events which have resulted in the formation of the earth that we have today.

Types of Disasters:

There are two types of disasters:

(i) Natural Disasters:
The disasters that are caused by nature are termed as natural disasters e.g., earthquake, cyclone etc.
(ii) Man-made Disaster:
The disasters which are caused as a result of human activities are termed as Man-Made Disasters e.g., Road accident, terrorist attack.

I. Natural Disasters:
1. Earthquake:

Earthquake is a sudden and violent shaking of ground causing great destruction as a result of movement of earth's crust. An earthquake has the potential to tsunami or volcanic eruption. Earthquake of magnitude 9.2 on the Richter's scale in 2004 in Indonesia is the second largest earthquake ever recorded. The deadliest earthquake happened in Central China, killing over 800,000 in 1556. People during that time and region lived in caves and died from the caves collapsing.

Earthquake mitigation strategies:

a. Existing critical facilities built on reclaimed land should be inspected and retrofitted if necessary to ensure earthquake resistance.
b. Future critical facilities should not be located on reclaimed land because of the high potential for liquefaction.
c. Older unreinforced masonry buildings should be inspected and retrofitted if necessary to increase earthquake resistance.
d. Older unreinforced masonry buildings should not be used for critical functions.

2. Cyclone:
Cyclones (or more properly called Tropical Cyclones) are a type of severe spinning storm that occurs over the ocean near the tropics.

Cyclone mitigation strategies:

a. Future critical facilities should not be located in areas of accelerated winds.
b. The most significant aspect of structural damage to buildings by high velocity wind results from roof damage. The roofs of existing buildings should be inspected and if necessary retrofitted to adequate standards.
c. The roofs of existing critical facilities should be retrofitted to a higher standard to ensure wind resistance.
d. Building openings such as windows and doors also suffer damage from high velocity winds. These openings if not constructed of wood or metal should be protected with shutters or temporary covers of adequate design.

3. Tsunami:

Tsunamis are giant waves, initiated by a sudden change, usually in relative position of underwater tectonic plates. The sudden jerk is enough to propagate the wave; however, its power can be enhanced and fed by lunar positioning and boundaries that focus its energy.

Tsunami mitigation strategies:

a. In some tsunami-prone countries earthquake engineering measures have been taken to reduce the damage caused onshore.
b. Japan, where tsunami science and response measures first began following a disaster in 1896, has produced ever-more elaborate countermeasures and response plans. That country has built many tsunami walls of up to 4.5 metres (15 ft) to protect populated coastal areas.
c. Other localities have built floodgates and channels to redirect the water from incoming tsunami.

Volcanic disasters mitigation strategies:

a. Learn about community warning systems and of disasters that can come from volcanoes (earthquakes, flooding, landslides, mudflows, thunderstorms, tsunamis)

b. Make evacuation plans to higher ground with a backup route.

C. Have disaster supplies on hand (flashlight, extra batteries, portable battery-operated radio, first aid kit, emergency food and water, nonelectric can opener, cash and credit cards, and sturdy shoes)

5. Floods:

Flooding is the unusual presence of water on land to a depth which affects normal activities. Flooding can arise from: overflowing rivers (river flooding), heavy rainfall over a short duration (flash floods), or an unusual inflow of sea water onto land (ocean flooding). Ocean flooding can be caused by storms such as hurricanes (storm surge), high tides (tidal flooding), seismic events (tsunami) or large landslides.

Flood mitigation strategies:

a. Watercourses which pass through significant settlement areas should be properly configured and lined with concrete.

b. Existing bridges should be inspected to determine which ones are too low or which have support pillars within the watercourse channel.

c. Future bridges should not be built with these undesirable features.

d. Buildings constructed adjacent to watercourses should be elevated by at least one meter to prevent potential flood inundation.

e. Critical facilities should not be located adjacent to watercourses.

II. **Man-made Disasters:**

1. Road Accidents:

Road accidents are common in India due to reckless driving, untrained drivers and poor maintenance of roads and vehicles. According to Lifeline Foundation, the Ahmedabad based organization working for road safety, India accounts for 13 per cent of road accident fatalities worldwide.

2. Building and Bridge Collapse:

Building collapses are frequent in India where construction is often hastily done, with little regard for safety regulations, particularly in the western part of the country.

3. Terrorist Attack:

Devastating acts such as the terrorist attacks on the World Trade Centre and the Pentagon have left many concerned about the possibility of future incidents in the United States and their potential impact. Terrorism may involve devastating acts using weapons of mass destruction ranging from chemical agents, biological hazards, a radiological or nuclear device, and other explosives.

Mitigation strategies for man-made disasters:

a. For road accidents, traffic rules and regulations need to be followed strictly.
b. For building and bridge collapse, standard building materials should be used.
c. Moreover, more and more public awareness should be made to minimize the effects of man-made disasters.

If a Terrorism-Related Event Happens:

a. Stay calm and be patient.
b. Listen to a local radio or television station for news and follow the instructions of emergency service personnel.
c. Be vigilant. If the incident occurs near you, look out for secondary hazards such as falling debris or additional attacks.
d. Check for injuries and summon help for seriously injured people.

Environmental ethics: Role of Indian and other religions and cultures in environmental conservation

I. ENVIRONMENTAL PROTECTION IN VEDAS

In Rig Veda it is mentioned that universe consists of five basic elements namely Earth, Water, Air, Fire and Space (Ether). These five elements provide basis for life in everything and man is ordained to conserve them.

II. ENVIRONMENTAL PROTECTION IN PURANAS

1. During the puranic period (320 BC on ward) a popular belief emerged that each tree had its own deity. People offered water and circled trees with sacred threads in order to protect them.

2. Matsya purana regards planting of single tree is equivalent to leaving a progeny of ten sons.

3. Vishnu purana says that God is pleased with a person who does not harm or destroy other non-speaking creatures or animals.

4. In Padma purana and Kama purana it is mentioned that the trees like peepal, bel, her, neem etc. are the abode of God and they are not to be cut.

5. Durga saptsati says that so long the earth has mountains, forests, trees plants etc. human race will continue to survive.

III. ENVIRONMENT AND BUDDHISM

Buddhism is the religion full of love, understanding and compassion committed to the ideals of non violence. The basic tenets of Buddhism are simplicity and ahimsa. The principle of simplicity based on sustainability teaches that man should not over exploit the natural resources. The principle of ahimsa or non violence of not killing the animals shows the love for fauna

IV. ENVIRONMENT AND JAINISM

Jainism places great emphasis on the principle that one should reprise from avoidable acts that are harmful to oneself or others.5 Ahimsa(non-violence) is the fundamental tenet of Jain way of life, a term that is clearly allied with realism, common sense, personal worth and responsibility.

V. ENVIRONMENT AND SIKHISM

Guru Nanak,the founder of Sikh religion assigned divine attributes to nature. According to Sikhism people should respect God’s creations and know the eternal truth regarding their place in the universe.

VI. ENVIRONMENT AND ISLAM

In Islam the Holy Qur'an and the divinely inspired words of Prophet Mohammed form the foundation of and rules for the conservation of nature.7The Qur'anic message is one of unity, harmony, balance and order. It stresses that nature's laws must be observed and that defined limits should not be exceeded.

The Holy Qur'an declares that everything is created from water. Allah is considered to be the owner of land and mankind is the trustee or guardian whereas other living creatures are considered to be the beneficiaries.

VII. ENVIRONMENT AND CHRISTIANITY

The Christianity also says that harmonic triadic relationship exists between the divine and humanity, among human beings and nature and failure to maintain the harmony may alienate humanity from its creator and also from Nature. As the Lord said "I am the Alpha and the Omega the first and the last the beginning and the end"10 Consequently every part of creation has His divine hand in it: no human being has absolute right to destroy it. It is from this perspective that Rev. Father Lanfranco Serrihi (Minister General, Order Friars Minor Conventual, Rome) said "All human effort in the world must therefore lead to mutual enrichment of man and creatures

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