

# ENVIRONMENTAL STUDIES

# NATURE OF ENVIRONMENTAL STUDY

## Scope and Importance of Environmental Studies

Environment is derived from the French word Environner, which mean encircle or surrounding. Environment is a complex of many variables, which surrounds man as well as the living organisms. Environmental studies describe the interrelationships among organisms, the environment and all the factors, which influence life on earth, including atmospheric conditions, food chains, the water cycle, etc. It is a basic science about our earth and its daily activities, and therefore, this science is important for one and all.

### Scope of environmental studies

Environmental studies discipline has multiple and multilevel scopes. This study is important and necessary not only for children but also for everyone. The scopes are summarized as follows:

1. The study creates awareness among the people to know about various renewable and nonrenewable resources of the region. The endowment or potential, patterns of utilization and the balance of various resources available for future use in the state of a country are analysed in the study.
2. It provides the knowledge about ecological systems and cause and effect relationships.
3. It provides necessary information about biodiversity richness and the potential dangers to the species of plants, animals and microorganisms in the environment.
4. The study enables one to understand the causes and consequences due to natural and man induced disasters (flood, earthquake, landslide, cyclones etc.,) and pollutions and measures to minimize the effects.
5. It enables one to evaluate alternative responses to environmental issues before deciding an alternative course of action.
6. The study enables environmentally literate citizens (by knowing the environmental acts, rights, rules, legislations, etc.) to make appropriate judgments and decisions for the protection and improvement of the earth.
7. The study exposes the problems of over population, health, hygiene, etc. and the role of arts, science and technology in eliminating/ minimizing the evils from the society.
8. The study tries to identify and develop appropriate and indigenous eco-friendly skills and technologies to various environmental issues.
9. It teaches the citizens the need for sustainable utilization of resources as these resources are inherited from our ancestors to the younger generation without deteriorating their quality.
10. The study enables theoretical knowledge into practice and the multiple uses of environment.

### Importance of environmental study

Environmental study is based upon a comprehensive view of various environmental systems. It aims to make the citizens competent to do scientific work and to find out practical solutions to current environmental problems. The citizens acquire the ability to analyze the environmental parameters like

the aquatic, terrestrial and atmospheric systems and their interactions with the biosphere and anthrosphere.

### **Importance**

- World population is increasing at an alarming rate especially in developing countries.
- The natural resources endowment in the earth is limited.
- The methods and techniques of exploiting natural resources are advanced.
- The resources are over-exploited and there is no foresight of leaving the resources to the future generations.
- The unplanned exploitation of natural resources lead to pollution of all types and at all levels.
- The pollution and degraded environment seriously affect the health of all living things on earth , including man.
- The people should take a combined responsibility for the deteriorating environment and begin to take appropriate actions to space the earth.
- Education and training are needed to save the biodiversity and species extinction.
- The urban area, coupled with industries, is major sources of pollution.
- The number and area extinct under protected area should be increased so that the wild life is protected at least in these sites.
- The study enables the people to understand the complexities of the environment and need for the people to adapt appropriate activities and pursue sustainable development, which are harmonious with the environment.
- The study motivates students to get involved in community action, and to participate in various environmental and management projects.
- It is a high time to reorient educational systems and curricula towards these needs.
- Environmental studies take a multidisciplinary approach to the study of human interactions with the natural environment. It integrates different approaches of the humanities , social sciences, biological sciences and physical sciences and applies these approaches to investigate environmental concerns.
- Environmental study is a key instrument for bringing about the changes in the knowledge, values, behaviors and lifestyles required to achieve sustainability and stability within and among countries.

Environmental studies deals with every issue that affects an organism. It is essentially a multidisciplinary approach that brings about an appreciation of our natural world and human impacts on its integrity. It is an applied science as it seeks practical answers to making human civilization sustainable on the earth's finite resources. Its components include

1. Biology
2. Geology
3. Chemistry
4. Physics
5. Engineering

6. Sociology
7. Health
8. Anthropology
9. Economics
10. Statistics
11. Philosophy

### **Major environmental issues**

Man and nature have lived together and as long as man's wants were in conformity with nature, there was no problem. But unfortunately, man's ambition for limitless enjoyment and comfort has led him towards the exploitation of nature's wealth so indiscriminately as to reduce nature's capacity for self stabilization. The indiscriminate exploitation of nature over centuries has created numerous environmental problems. Man's voracious appetite for resources and his desire to conquer nature has put him on collision course with environment. The demands of his explosive technological society impose intense stress on the state of equilibrium with the environment. Major environmental issues threatening mankind are Global warming, water pollution, pesticide pollution, Hazardous waste, biomedical wastes, e waste, and loss of biodiversity

India today is one of the first ten industrialized countries of the world. Today we have a good industrial infrastructure in core industries like metals, chemicals, fertilizers, petroleum, food etc. What has come out of these?, Pesticides, detergents, plastics, solvents, paints, dyes, food additives etc. Due to progress in atomic energy, there are also been an increase in radioactivity in the biosphere. Besides these there are a number of industrial effluent and emissions particularly poisonous gases in the atmosphere. Mining activities also added to this problem particularly as solid waste.

Such activities of man had adverse effect on all forms of living organisms in the biosphere. The earth planet along with the atmosphere (air, land, water) that sustains life is called the Biosphere. Due to lack of development of a culture of pollution control, there has resulted a heavy backlog of gaseous, liquid and solid pollution in our country. The solid wastes which causes pollution are Hazardous waste, pesticides, medical waste etc. they are become the major environmental issues in addition to automobile pollution, climate change, water pollution, pesticide pollution and biodiversity loss in our country and worldwide.

### **Industrial / Vehicular pollution**

The coolest culprits of environmental degradation in metropolitan cities are vehicular and industrial pollution. Since 1975 the Indian economy has grown 2.5 times, the industrial pollution load has grown 3.47 times and the vehicular pollution load 7.5 times, in Delhi, for example 70% of air pollution is caused by vehicular pollution. Thanks to the 3 million vehicles on its roads-while industries account for 17%. The pollutants emitted by the vehicles could produce inflammatory effects on the respiratory organs, could be toxic or even carcinogenic depending upon the fuel type, In India, vehicles primarily run on diesel or petrol.

### Air pollutants from automobiles



### Climate Change

The rising concentrations of greenhouse gases (GHGs) of anthropogenic origin in the atmosphere such as carbon dioxide ( $\text{CO}_2$ ), methane ( $\text{CH}_4$ ) and nitrous oxide ( $\text{N}_2\text{O}$ ) have increased, since the late 19th century. According to the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change, because of the increase in concentration of greenhouse gases in the atmosphere (for e.g.,  $\text{CO}_2$  by 29 per cent,  $\text{CH}_4$  by 150 per cent and  $\text{N}_2\text{O}$  by 15 per cent) in the last 100 years, the mean surface temperature has risen by 0.4–0.8°C globally. The precipitation has become spatially variable and the intensity and frequency of extreme events has increased. The sea level also has risen at an average annual rate of 1–2 mm during this period. The continued increase in concentration of GHG in the atmosphere is likely to lead to climate change resulting in large changes in ecosystems, leading to possible catastrophic disruptions of livelihoods, economic activity, living conditions, and human health. The United Nations Framework Convention on Climate Change requires the parties to protect the climate system in accordance with their ‘common but differentiated responsibilities’ and respective capabilities. In the year 1990, the developed world (Australia, Canada, USA, Europe, former USSR and Japan) emitted around 66 per cent of the total global GHG emissions, which though has reduced to 54 per cent in 2000, mainly offset by the rise in Chinese emissions. The South Asian region, including three-fourths emission share of India, contributed only 3 per cent of the total global GHG emissions in 1990 and the share of emissions from South Asia has grown merely by 4 per cent in 2000.



## Water pollution

India has 12 major rivers with a total catchments area of 252.8 million hectare. The Indian homes produce about 75 % of the wastewater, and sewage treatment facilities are inadequate in most cities and almost absent in rural India. According to the Central pollution Control Board, of the 8,432 large and medium industries in the country, only 4,989 had installed appropriate measures to treat wastewater before discharge. Of the over two million small scale industrial units, a number of which like tanneries are extremely polluting, very few have any treatment facilities whatsoever and their untreated wastes invariably find their way into country's water systems.

**Polluted tank**



**Marine pollution**



**Industrial pollution**



## Poisoned by Pesticides

Poisoning from pesticides affects 68,000 farmers and workers every day; annually, an estimated 25 million workers suffer from pesticide poisoning throughout the world. Farmers and agricultural workers are exposed to pesticides directly when they are mixing and spraying these pesticides, especially so in developing countries such as Asia. Every year, about 3 million people are poisoned around the world and 200,000 die from pesticide use.

Beyond these reported acute cases of pesticide poisoning, evermore worrying are the chronic long-term effects such as cancers, adverse effects-not only on specific body organs and systems but also on the endocrine system which include reduction in male sperms count and undecided testes as well as increasing incidences of breast cancer. Communities and Consumers are insidiously exposed to pesticides through contamination of the soil, air and water. The chronic effects of pesticides are particularly alarming when new studies link certain pesticides to cancer, lowered fertility and disruption of the endocrine system and to the suppression of immune systems.



## Important pesticide episodes are

- The struggles of common plantation workers in Malaysia against the impact of pesticides such as Parquet as their assertion of their rights as workers.

- The tale of ex-International Rice Research Institute (IRRI) workers in the Philippines poisoned by pesticides used in the IRRI test fields and unfairly healed by IRRI. There were also details about the fisher flock community in Kamukhaan, Philips, that been poisoned and their environment devastated by Pesticides used in the neighboring banana plantation.

The communities living in Kasar code, Kerala who have been poisoned by Endosulfan, which was aerielly sprayed by the plantation corporation of Kerala, India,



- Farming and Agricultural Worker communities in Warangal, Andhra Pradesh, who have been poisoned by Pesticides during spraying, Warangal is already in famous for the large number of cotton farmer suicide deaths, one the main reasons during the farmers to suicide in the resistance being developed by pests to pesticides.

Pesticides Action Network Asia and the Pacific (PANAD) first launched 'No Pesticide Use Day' in 1998 to protest the manufacture and use of pesticides worldwide. The day is held to commemorate the thousand who dies, and the tens of thousand who still suffer and continue to dies, as a result of the 1984 Bhopal Disaster. The tragedy of Bhopal is a powerful and poignant example of chemical pesticide contamination; the victims continue to suffer to this day.

### Pescticides In Soft Drinks

Soft drinks are non-alcoholic water-based flavored drinks that are optionally sweetened, acidulated and carbonated. Some carbonated soft drinks also contain caffeine; mainly the brown-colored cola drinks. The two global majors PepsiCo and Coca-Cola dominate the soft drink market in India.

**Coco cola brands** -Thumps Up, Limca, sprite, minute made, and Gold Spot from Parle Beverages and soft drink brands Crush, Canada Dry and Sport Cola from Cadbury

**Pepsico brands** - Pepsi-Cola Brands ,Frito-Lay Brands ,Tropicana Brands ,Quaker Brands ,Gatorade Brands



## Sample Analysis

A laboratory report prepared by CSE in 2003 detailed some astonishing facts about the extent of pesticide contamination in soft drinks sold in India. CSE found high levels of toxic pesticides and insecticides, high enough to cause cancer, damage to the nervous and reproductive systems, birth defects and severe disruption of the immune system. Market leaders Coca-Cola and Pepsi had almost similar concentrations of pesticide residues. At the same time CSE also tested two soft drink brands sold in the US, to see if they contained pesticides. They didn't. This only goes to show the companies were following dual standards.

- Among the total pesticide found in 18 cities in India, Kolkata is on the top and Guwahati is in the bottom of that list. Kolkata has pesticide content in cold drinks of about 51.7 ppb. The pesticides cause irreparable harm to the human body.
- It has been shown time and again that these pesticides can be used to kill bacteria in bathrooms. The acidic content of these drinks are harmful to the human body.



## Hazardous Waste

Hazardous waste may be liquid, solid or gas and all have one thing in common are dangerous and can pose a substantial hazard to human health and environment when not managed properly. In India, generation of hazardous waste to the tune of 6-7 million tonnes per year and may vary depending on the nature and quantity of hazardous waste generated in India. The major hazardous waste in India is petrochemicals, pharmaceuticals, pesticides, paints, dyes, fertilizers, chlor-alkali and other different industries

### Release of Hazardous waste from industries



The lack of a preventative approach to waste management has led to generation of more and more hazardous wastes and sadly, controlling hazardous waste has become a serious problem in India and no special care is taken in their management. Implementation of the ban on the ground is very negligent and hazardous waste is coming to our shores in regular phenomenon. Apart-from generating their own hazardous wastes, India invites import to such waste in the name of reuse and recycling, though there is lack of environmental friendly technology to reuse and recycle hazardous waste.

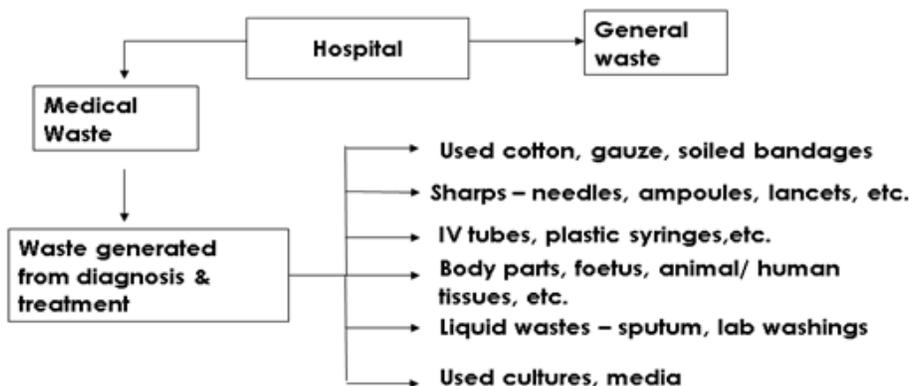
Thus indiscriminate generations, improper handling, storage and disposal of hazardous waste are the main factors contributing to the environmental and human health impact. The pressing need is to rethink the present approach of pollution control and end-of-the-pipe approaches and focus on pollution prevention, waste minimization, cleaner production and toxics reduction.

### Dumping of Tannery Sludge



### Biomedical Waste

Biomedical waste includes both organic and inorganic wastes generated from hospitals. On an average a hospital bed generates 1 kg of waste per day, out of which 10-15% is infectious, 5% is hazardous and rest us general waste. Every day, country's numerous hospitals and medical facilities churn out tonnes of waste. A WHO report documents that Hepatitis – B Virus can survive in a spring for 8 days.



The disposable syringe one uses with a sense of security may actually be giving a false sense of security. It may actually be a used syringe repacked by the mafia, which is involved in medical waste trafficking.



Unmediated and unhealed syringe in the municipal dump may come back in the hospitals and may then be used on a patient, who may get cross-infected.



### Amalgams -poison in the making



- A dentist could generate around 80 gms mercury/month
- 51 kgs of mercury released from amalgams each year in Delhi



The problem of Medical waste has acquired gargantuan proportions and complex dimensions. While the health care establishments are trying to provide better medicare facility of the citizens, the hospital waste disposal systems are undermining such efforts. The rules for management of this waste exist, what is urgently needed now is training of all the health care staff and setting up waste management system in the hospitals.

Plastics constitute a major chunk of medical waste. In fact, in India, the market for medical disposable has grown from US\$2.350 million (1979) to 4,000 million (1986). The use of plastics in medical equipment is now growing at the rate of 6% per annum. Even though plastics reduce the possibility of transmission of infection with in the hospital, there are many problems related to its use and disposal.

Mercury is more poisonous and Dangerous than Lead and Arsenic.



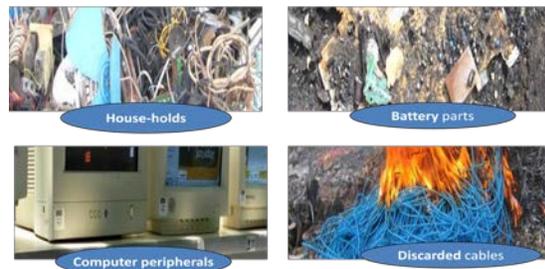
### Cracking down on crackers

Over the years, Diwali has turned into a festival of pollution by noise, crackers, artificially coloured sweets and serious health hazards. On this day, cities turn into gas chambers increases toxic fumes and gases like CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>2</sub>, as well as suspended particulate matter (SPM), in the air. The worst affected are children. Pregnant women and those suffering from respiratory problems. In addition, the factories making crackers float safety norms and exploit child labour. These children work for 16-18 hrs each day in unhygienic dingy, make-shift and suffocating factories-for only Rs.10-15 per day. They handle chemical that cause deadly diseases of the lungs, kidneys, skin and eyes.

### E Waste

- People discard computers every two to four years on average.
- Cell phones have a life-cycle of less than two years in industrialized countries.
- Each computer screen contains about 20% lead by weight.
- A mobile phone, is 19 % copper and 8% iron.

e wastes



- Informal name for electronic products nearing end of their “useful life”.
- Large household appliances - Refrigerators Air conditioners, computers & Stereo systems, Mobile phones.
- Its volume increases by 3-5% per annum.

- Major pollutants are Heavy metals – Hg, Pb, Cd, Cr (VI) and Flame retardants – Polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDEs).

### **International Scenario**

- 20-50 MT / yr of e waste are generated world-wide.
- USA accounts 1% to 3% of the total municipal waste generation.
- EU - 5 to 7 million tonnes per annum or about 14 to 15 kg per capita and is expected to grow at a rate of 3% to 5% per year.
- In developed countries, currently it equals 1% of total solid waste generation and is expected to grow to 2% by 2010.

### **Magnitude of the problem in India**

- India – 1,46,000 tonnes to 4.7 lakh tonnes by 2011.
- India's e-waste generation is growing at the rate of 15per cent and is expected to cross 800,000 tonne by 2012.
- Sixty-five cities generate more than 60% of the total e-waste in India.
- Top cities (70%) – Mumbai, Delhi, Bangalore, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur.
- 50,000 MT / yr illegally imported.

### **Loss of Biodiversity**

The continuous loss of biodiversity due to over exploitation, habitat degradation, deforestation and land pollution has posed serious threat to the very existence of the mankind. It has been calculated that if this trend of biodepletion continues, about 1/4<sup>th</sup> of the world species may be extinct by the year 2050. The rate of destruction which has been of the order of one species per year over the past 600 million years is today feared to be dozens of species a day. Hence, the conservation of biodiversity has become one of the most pressing environmental issues. The challenge is for nations, government agencies, organizations and individuals to protect and enhance biological diversity, while continuing to meet people's need for natural resources.

We are at a major turning point in human history and for the first time, we now have the resources, motivation, and knowledge to protect our environment and to build a sustainable future for ourselves and our children. Until recently, we didn't have these opportunities, or there was not enough clear evidence to inspire people to change their behavior and invest in environmental protection; now the need is obvious to nearly everyone. Unfortunately, this also may be the last opportunity to act before our problems become irreversible.

# NATURAL RESOURCES

## RENEWABLE ENERGY RESOURCES & NON-RENEWABLE ENERGY RESOURCES:

### Renewable Energy Resources:

**Definition:** They are natural resources which can be regenerated continuously

**Examples:** *Solar energy* = Solar cells, Solar heat collectors, Solar water heater

*Wind energy* = Wind mills, Wind farms

*Ocean energy* = Tidal energy, Ocean Thermal energy, Geothermal energy

*Biomass energy* = Biogas, Bio fuel, Hydrogen fuel

### **A) SOLAR ENERGY:**

The Energy that we get directly from the sun is called solar energy

#### Methods of Harvesting Solar Energy

##### **1. Solar cells (or) photovoltaic cells (or) PV cells**

- Solar cells consist of a p-type semiconductor and n-type semi-conductor
- They are in close contact with each other.
- When the solar rays fall on the top layer of p-type semi-conductor, the electrons from the valence band get promoted to the conduction band and cross the p-n junction into n-type semi-conductor.
- Thus potential difference produced between two layers causes flow of electrons (ie.,an electric current)

#### Uses

Used in calculators, electronic watches. Street lights, water pumps to run radios and TVs.

#### Solar Battery

- Large number of solar cells is connected in series to form a solar battery.
- Solar battery produce more electricity which is enough to run water pump, to run street-light, etc.,

##### **2. Solar heat collectors**

- Solar heat collectors consist of natural materials like stones, bricks, (or) materials like glass.
- They can absorb heat during the day time and release it slowly at night.

#### Uses

Used in cold places, where houses are kept in hot condition using solar heat collectors.

##### **3. Solar water heater**

It consists of

- ❖ An insulated box inside of which is painted with black paint.
- ❖ Provided with a glass lid to receive and store solar heat.
- ❖ Inside the box it has black painted copper coil, which heats the cold water.
- ❖ Then flows out into a storage tank.
- ❖ From the storage tank water is then supplied through pipes.

#### **Significance of Solar energy:**

They are noise & pollution free  
Solar water heaters, cookers require no fuels  
Solar cells can be used in remote & isolated forest & hilly regions.

## **b) WIND ENERGY**

### ***Definition***

Moving air is called wind.

- ✓ Energy recovered from the force of the wind is called wind energy.
- ✓ The energy possessed by wind is because of its high speed.
- ✓ The wind energy is harnessed by making use of wind mills.

### **Methods of Harvesting wind energy**

#### **1. Wind Mills**

- The strike of wind on the blades of the wind mill rotates it continuously.
- The rotational motion of the blade drives machines like water pump, flour mills, electric generators etc.

#### **2. Wind farms**

- Wind farm consists of large number of wind mills .
- The wind farms produce a large amount of electricity.

### **Conditions**

The minimum speed required for satisfactory working of a wind generator is 15 km/hr.

### **Advantages**

It does not cause any air pollution  
It is very cheap.

## **c) OCEAN ENERGY**

It can be generated by following ways.

### **1. Tidal energy (or) Tidal power**

Ocean tides, produced by gravitational forces of sun and moon, contain enormous amount of energy.

- The “high tide” and “low tide” refer to the rise and fall of water in the oceans.
- The tidal energy can be harnessed by constructing a tidal barrage.
- During high tide, the sea-water which flow into the reservoir of the barrage, rotates the turbine, which inturn produces electricity by rotating the generators

### ***Significance of tidal energy:***

Do not require large areas  
Pollution free energy source  
No fuel is used & does not produce any wastes.

### **2. Ocean thermal energy (OTE)**

- The temperature difference between the surface level & deeper level of the oceans are used to generate electricity.

- The energy available due to the difference in temperature of water is called ocean thermal energy.

#### **Condition**

The temperature difference should be of 20°C or more between surface water and deeper water.

#### **Process**

- The warm surface water of ocean is used to boil a low boiling liquid like ammonia.
- The high vapour pressure thus produced turns the turbine of the generator and generates electricity.

**Significance:** OTE is Continuous, renewable, pollution free, used to produce H<sub>2</sub>,

### **3. Geo-thermal Energy**

The energy harnessed from high temperature & pressure present inside the earth is called geothermal energy.

#### **1. Natural geysers**

In some places, the hot water (or) steam comes from the ground through cracks naturally

#### **2. Artificial geysers**

In some places, we can drill a hole up to the hot region & make the hot water to rush out through the pipe with very high pressure.

Thus, the hot water (or) steam coming out from the natural (or) artificial geysers is allowed to rotate the turbine of a generator to produce electricity.

#### **Significance:**

Power generation is higher than solar & wind energies,  
Can be brought online quickly,  
Used for direct uses such as hot water bath, resorts, aquaculture, greenhouses.

### **d) BIOMASS ENERGY**

Biomass is the organic matter, produced by plants or animals,  
**Eg:** Wood, crop residues, seeds, cattle dung, sewage, agricultural wastes.

#### **1. Biogas**

- Mixture of methane, carbon dioxide, hydrogen sulphide, etc.
- It contains about 65% of methane gas as a major constituent
- Biogas is obtained by the **anaerobic fermentation** of animal dung or plant wastes in the presence of water.

#### **2. Bio fuels**

Biofuels are the fuels, obtained by the **fermentation** of biomass.

#### **Examples:**

**(a) Ethanol** = Easily produced from the **sugarcane**. Its calorific value is less than petrol,

**(b) Methanol** = obtained from **ethanol or sugar**-containing plants. calorific value is also too low than gasoline and diesel.

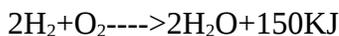
**(c) Gasohol** = Gasohol is a mixture of **ethanol+gasoline**.

### **3. Hydrogen Fuel**

Hydrogen can be produced by **thermal dissociation** or **photolysis** or **electrolysis** of water.

It possesses high calorific value.

It is non polluting, because the combustion product is water.



## NON-RENEABLE ENERGY SOURCES

### ***Disadvantages of hydrogen fuel***

1. Hydrogen is highly inflammable and explosive in nature
2. Safe handling is required
3. It is difficult to store and transport.

### **1. Coal**

Coal is a solid fossil fuel formed in several stages & were subjected to intense heat and pressure over millions of years.

#### Various stages of coal

Wood → Peat (60% carbon) → Lignite(70% carbon) → Bituminous coal (80% Carbon) → Anthracite (90% carbon)

#### Disadvantages

1. When coal is burnt it produces CO<sub>2</sub> causes global warming
2. coal contains impurities like S and N, it produces toxic gases during burning.

### **2. Petroleum**

Petroleum or crude oil = hydrocarbons +small amount S, O, N.

#### **Occurrence**

Petroleum was formed by the decomposition of dead animals and buried under high temperature and pressure for million years

#### **Fractional distillation**

Hydrocarbons are separated by fractioning the crude oil.

### **3. LPG (Liquefied Petroleum Gas)**

1. The petroleum gas, **converted into liquid** under high pressure is LPG
2. LPG is colorless and odorless gas.
3. During bottling some **mercaptans** is added, to detect leakage of LPG from the cylinder.

### **4. Natural Gas**

1. Mixture of **50-90% methane** and small amount of other **hydrocarbons**.
2. Its calorific value ranges from 12,000-14,000 k-cal/m<sup>3</sup>

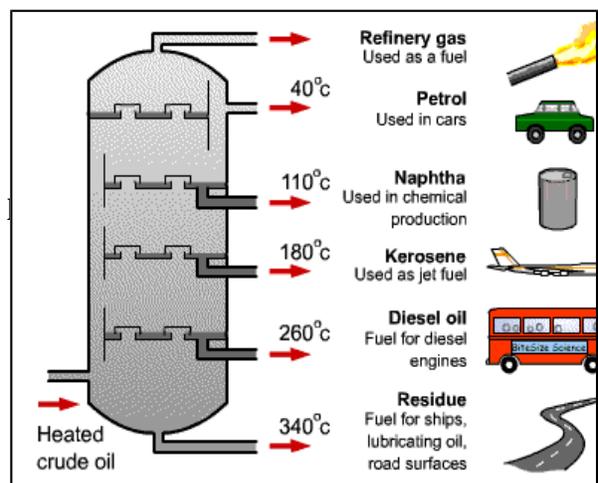
(i) **Dry gas** = the natural gas + lower hydrocarbons like methane and ethane, is called dry gas.

(ii) **Wet gas** = natural gas + higher hydrocarbons like propane, butane along with methane is called wet gas.

### **5. Nuclear Energy**

Dr. H. Bhabha –father. India has 10 nuclear reactors, which produce 2% of India's electricity.

#### **a) Nuclear Fission**



Heavier nucleus is split into lighter nuclei, on bombardment by fast moving neutrons, and a large amount of energy is released.

Eg:

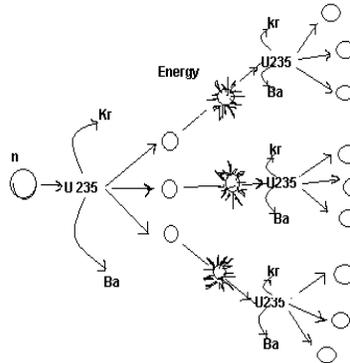
Fission of  $U^{235}$

When  $U^{235}$  nucleus is hit by a thermal neutron, it undergoes the following reaction with the release of 3 neutrons.



- Each of the above 3 neutrons strikes another  $U^{235}$  nucleus causing  $(3 \times 3)$  9 subsequent reactions.
- These 9 reactions further give rise to  $(3 \times 9)$  27 reactions.
- This process of propagation of the reaction by multiplication in threes at each fission is called **chain reaction**.

**Fission reaction of  $U^{235}$  is given below.**



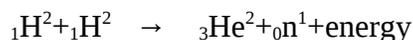
**Nuclear fission-chain reaction**

### b) Nuclear fusion:

Lighter nuclei are combined together at extremely high temperatures to form heavier nucleus and a large amount of energy is released.

Eg:

Fusion of  $H^2_1$ . Two hydrogen-2 (Deuterium) atoms may fuse to form helium at 1 billion $^{\circ}C$  with the release of large amount of energy



### Nuclear power of India

- ✓ Tarapur (Maharashtra),
- ✓ Ranapratap Sagar (Rajasthan)
- ✓ Kalpakkam (Tamilnadu)
- ✓ Narora (U.P).

### Two Marks:

1. State the environmental effects of extracting & using mineral resources?

2. What are renewable & non-renewable energy resources? Give examples?
3. State the problems caused by the construction of Dams?
4. Write any two functions of forests?
5. What are the causes of deforestation?
6. Compare the merits & problems of dams?
7. Define the term deforestation?
8. What is eutrophication?
9. What is geothermal energy?
10. List the adverse effects of mining?
11. Enumerate the desired qualities of an ideal pesticide?

**12. Define sustainable forestry?**

It is the optimum use of forest resources, which meet the needs of the present & future generations.

**13. What is desertification? Give Two reasons for it?**

It is a progressive destruction / degradation of arid or semi arid lands to desert.  
Reasons: Deforestation, overgrazing, mining & quarrying, climate change, pollution.

**14. Define overgrazing?**

It is a process of “eating away the forest vegetation without giving it a chance to regenerate”.

**15. What are the conventional sources of energy for the mankind?**

Non-renewable energy resources are natural resources which cannot be regenerated once they are exhausted. They cannot be used again.

**16. Explain Soil leaching?**

The process in which materials in or on the soil gradually dissolve and are carried by water seeping through the soil.

Effects: Removes valuable nutrients from the soil, may carry buried wastes into ground water & contaminates it.

**17. Define Environmental impact statement?**

It is the effect on the natural environment caused by various human actions. It includes 2 types  
Indirect effects = (ex) Pollution  
Direct effects = (ex) Cutting down trees

**18. What is meant by soil erosion? & mention the factors causing soil erosion?**

It is the process of removal of superficial layer of the soil from one place to another. It also removes the soil components & surface liter.

Factors: Water, Wind, Biotic agents, Landslides, Construction

**19. Differentiate between deforestation & forest degradation?**

Forest degradation	Deforestation
Process of deterioration of forest materials	Process of destruction of forest materials
Slow process	Rapid process
Can be recovered.	Cannot be recovered

**20. Differentiate renewable & nonrenewable energy?**

Renewable Energy	Non-renewable energy
Regenerated continuously	Cannot be regenerated

In exhaustible	Exhausted
Can be used again & again	Cannot be used again
It is pollution free	It pollutes the atmosphere
Available in limited amount in nature	Available in unlimited amount in nature
It is developed in a long period	It is developed in a short period
Ex. Wood, Solar energy, Wind energy	Ex. Coal, Petroleum, Nuclear fuel

# NATURAL RESOURCES

## 1. OVER EXPLOITATION OF FOREST:

Due to overpopulation, the forest materials like food, medicine, shelter, wood & fuel are not sufficient to meet the people's demand. Hence exploitation of forest increases day by day

### *Reason for over exploitation in India:*

In India forest area required to maintain good ecological balance is 33% but at present is only 22% there. Hence over exploitation of forest occur.

### *Causes of over exploitation:*

- Increasing agricultural production
- Increasing industrial activities
- Increase in demand of wood resources

### *Effects of Over exploitation:*

- Led to migration of the farmers
- Environment damage is heavy
- Tropical forests are destroyed very fastly
- Countless plants and animal species are endangered
- Marine population will go into extinction
- Dumping of wastes into land, water, & air is a severe problem

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## 2. HYDROLOGICAL CYCLE:

### *Evaporation:*

Heat energy from the sun evaporates water from oceans, rivers, streams, lakes, ponds etc.

### *Condensation & Precipitation:*

Precipitation (rainfall) occurs due to the condensation of water & falls to earth.

Once water condenses, it is pulled into the ground by gravity.

### *Transpiration & respiration:*

Plants absorb water through their roots & loose water through their leaves to the atmosphere & this process is transpiration.

Animals & plants break down sugars and produce energy with liberation of CO<sub>2</sub> & H<sub>2</sub>O is respiration.

**Thus the process of evaporation, condensation & transpiration is called hydrological cycle.**

---

### **3. DEFORESTATION**

Deforestation means destruction or removal of forests due to natural or man-made activities.

#### **Deforestation in India:**

Deforestation is a continuous process in India.

About 1.3 hectares of forest land has been lost.

The presence of waste land is a sign of deforestation in India.

#### **Causes of Deforestation**

1. Developmental projects                      *(Ex) Bigdams, hydroelectric projects, road construction etc*
2. Mining operations                              *(ex) Mica, coal, manganese, limestone etc.*
3. Raw materials for industries                *(ex) for making boxes, furnitures, plywood, match boxes, pulp etc.*
4. Fuel requirements                              *(ex) Both rural & tribal population depend on forests for fuel*
5. Shifting cultivation    - *Replacement of natural forest ecosystem lead to loss of plants & animal species*
6. Forest Fires                                      - *Due to human interruption & increase in temperature forest fire happens*

#### **Effects or Consequences of deforestation:**

1. **Global Warming** ► Cutting & burning of forest trees increase CO<sub>2</sub> content in atmosphere  
This causes global warming and depletion of ozone layer.
2. **Soil erosion** ► Forest trees act as natural barrier to reduce the wind velocity & reduce soil erosion.  
Deforestation causes soil erosion, floods, landslides, and drought.
3. **Loss of genetic diversity** ► Destroy the genetic diversity on earth which provides food & medicines for entire world.
4. **Loss of Biodiversity** ► When plants does not exist, animals that depend on them for food & habitat become extinct.
5. **Loss of Food grains** ► Due to soil erosion, the countries loose the food grains.
6. **Flood & land slides** ► frequent floods, landslides in hilly areas and wind speed are heavy.
7. **Unemployment Problems** ► people living around forest areas losses their livelihood.

#### **Preventive measures of conservation of forests**

- Planting trees to replace the cut down trees
  - Use of wood for fuel should be discouraged
  - Controlling forest pest by spraying pesticides using aeroplanes
  - Controlling forest fire by modern techniques
  - Controlling over grazing by cattle
  - Discouraging migration of tribal people by the government.
  - Conducting education & awareness programmes
  - Strict implementation of law of forest conservation act.
- 

### **4. DAMS & THEIR EFFECTS ON FORESTS & TRIBAL PEOPLE:**

**Definition:** Dams are artificial structures built across the river to create reservoir to store water.

**Indian Scenario:** Maharashtra = more than 600 dams, Gujarat = more than 250 dams  
Madhya Pradesh = more than 130 dams

**Effects of dam on forest:**

- Thousands of hectares of forest are cleared for river valley projects
- Forest is also cleared for residential, office, buildings, storing materials, laying roads etc
- Hydro electric projects have led to loss of forest.
- Dam construction kills wild animals & aquatic life
- Hydro electric projects spread water borne diseases.
- Water logging leads to salinity & reduces the fertility of land.

**( Examples)**

**Narmada Sagar Project** = submerged 3.5 lakhs hectares of forest  
**Tehri dam** = submerged 1000 hectares of forest

**Effects of dam on tribal people:**

- Displacement of tribal people
- Cultural change affects the tribal people mentally & physically
- They do not accommodate the modern food habits & life styles.
- Tribal's are ill treated by modern society
- They are recognized and compensated
- Their body condition will not suit the new area & are affected by many diseases.

**Benefits of Constructing Dams:**

- Control flood & store water
- Divert water from river into a channel
- Used for drinking & agricultural purposes
- Built for generating electricity
- Used for recreational purposes
- Navigation & fishery can be developed in dam areas
- Help for the socio economic development of the society
- Used for irrigation during dry seasons
- Prevent drought

**Problems of Constructing Dams:**

**Upstream Problem:**

- Displacement of tribal people
- Loss of forests, flora & fauna
- Soil erosion, sedimentation, siltation occurs
- Water logging retards plant growth
- Spread of vector-borne & water borne diseases
- Reservoir Induced Seismicity (RIS) causes earthquake

**Down stream problems:**

- Water logging causes salinity
- Silt deposition in rivers
- Salt water intrusion in river
- As nutrients deposits in reservoir, land losses its fertility
- Structural defects of dam destroy many living organisms

## 5. ENVIRONMENTAL EFFECTS/ IMPACTS OF EXTRACTING & USING MINERAL RESOURCES:

**Definition:** Mining is the process of extracting of metals from the mineral deposit.

**Types:** 1. **Surface mining:** It is process of extraction of raw materials form surface.

2. **Underground mining:** It is the process of extraction of raw materials below the earth's surface

**Open-Pit mining:** machines dig holes & remove the ores. (ex) Iron, copper, limestone, marble etc

**Dredging:** Scraping the minerals from under-water mineral deposit by chained buckets & draglines.

**Strip mining:** The ore is stripped off by using bulldozers, stripping wheels.

### Effects of over exploitation of mineral resources

- Rapid depletion of mineral deposits
- Wastage & dissemination of mineral deposits
- Causes environmental pollution
- Needs heavy energy requirements.
- Vibration developed during mining causes earthquake
- Causes Noise pollution
- Reduces size & shape of forest areas
- Continuous mining causes landslides, Causes migration of tribal people.

### Environmental Damage caused by mining activities:

<b>1. De-vegetation &amp; defacing of landscape</b>	<ul style="list-style-type: none"> <li>• Topsoil &amp; vegetation are removed from mining areas.</li> <li>• De-vegetation leads to severe ecological losses.</li> </ul>
<b>2. Groundwater contamination</b>	<ul style="list-style-type: none"> <li>• Mining pollutes the ground water.</li> <li>• Sulphur present in many ores, is converted into sulphuric acid by microbial action.</li> <li>• Hence water becomes acidic.</li> <li>• Some heavy metals also leach into ground water.</li> </ul>
<b>3. Surface water pollution</b>	<ul style="list-style-type: none"> <li>• The drainage of acid mine contaminates streams &amp; lakes.</li> <li>• Radioactive substances like Uranium contaminate the surface water &amp;</li> <li>• Kill the aquatic animals.</li> </ul>
<b>4. Air pollution</b>	<p>* Smelting &amp; roasting done to purify the metal causes air pollution &amp; affects the nearby vegetation.</p> <p>*The SPM (suspended particulate matter) like Arsenic, cadmium, lead etc. contaminate the atmosphere &amp; affects public health.</p>
<b>5. Subsidence of Lands</b>	Mining results in cracks in houses, tilting of buildings, bending of rail tracks etc.

## **6. EFFECTS / IMPACTS OF MODERN AGRICULTURE:**

### **1. Problems in using Fertilizers:**

✓ ***Micronutrient imbalance:***

- Chemical fertilizers used in fields contain nitrogen, phosphorus & potassium (NPK)
- Excess of fertilizers used in fields causes micronutrient imbalance.

✓ ***Blue Baby syndrome:***

- Nitrogenous fertilizers used in fields, contaminate the ground water.
- When the nitrate concentration exceeds 25 mg/lit, they cause serious health problem called “**Blue Baby syndrome**”
- This disease affects infants & leads to death.

✓ ***Eutrophication:***

- A large proportion of N & P fertilizers used in fields is washed off & causes over nourishment of the lakes. This process is known as Eutrophication.
- Eutrophication leads lakes to get attacked by algal blooms.
- Life time of algal blooms are less & they die quickly & pollute water & affect the aquatic life.

### **2. Problems in using pesticides:**

✓ ***Ist generation Pesticides:*** Sulphur, arsenic, lead or mercury are used to kill the pests.

✓ ***IInd generation pesticides:*** DDT Dichlorodiphenyltrichloromethane is used to kill the pests.

These chemicals produce number of side effects. They are as follows

*Death of non-target organisms* = Insecticides not only kill the target species, they also kill the non-target species.

*Producing new pests:* Some pest species survive even after the pesticide spray; they are immune & are called super pests.

*Bio-magnification:* Many pesticides are non-biodegradable & keep on concentrating in food chain.

The process is called bio-magnification & is harmful to the human beings.

*Risk of cancer:* It directly acts as carcinogens, It indirectly suppress the immune system.

### ***Quality of an ideal pest:***

Must kill only the target species

Must be biodegradable

Should not produce new pests

Should not produce any toxic pesticide vapour

Excessive pesticides should not be used

Chlorinated & organophosphate pesticides are hazardous & they should not be used.

### **3. Water logging:**

Water logging is the land where water stand for most of the year

#### ***Problems in water logging:***

Pore-voids in the soil get filled with water & the soil-air gets depleted.

So, the roots of the plants don't get adequate air for respiration.

So, mechanical strength of the soil & crop yield

#### ***Remedy:***

#### ***Causes of Water logging:***

Excessive water supply to the croplands.

Preventing excessive irrigation

Preventing water-logging by

Sub-surface drainage technology

Bio-drainage by eucalyptus tree etc

Heavy rain, Poor drainage.

#### **4. Salinity:**

**Definition:** \* Water evaporation leaves behind a thin layer of salts in the topsoil.  
& this process of accumulation of salts is called salinity of soil.

\*Saline soils are due to Sodium chloride, calcium chloride, magnesium chloride, sodium sulphate, sodium bicarbonates & sodium carbonates.

\*The pH of the water exceeds 8.0

#### ***Problems in salinity***

Due to salinity the soil becomes alkaline & crop yield decreases

#### ***Remedy:***

The salt deposit is removed by flushing them by good quality water

Salt water is flushed out by using sub-surface drainage system.

---

### **7. OVER UTILIZATION OF WATER:**

<b>1. Decrease of Ground water:</b>	<b>Reason:</b> Increased usage of ground water Inadequate rainfall Construction activities reduces the area for percolation of rainwater
<b>2. Ground subsidence:</b>	When the groundwater withdrawal is more than recharge rate ground subsidence occur. <b>Problems:</b> Structural damage in buildings <ul style="list-style-type: none"> <li>• Fracture in pipes</li> <li>• Reversing flow of canals &amp; tidal flooding</li> </ul>
<b>3. Lowering of Water table:</b>	Water pressure is lower than the atmospheric pressure, hence disturb the hydrological cycle. <b>Problems:</b> Lowering of water table Decreased pressure of water changes the speed & direction of water flow.
<b>4. Intrusion of salt water:</b>	<ul style="list-style-type: none"> <li>• Over-exploitation of ground water lead to rapid intrusion of salt water from the sea</li> <li>• Water cannot be used for drinking &amp; agricultures.</li> </ul>
<b>5. Earthquake &amp; landslides:</b>	Over utilization of ground water leads to earthquake, landslides & famine.
<b>6. Drying up of wells:</b>	<ul style="list-style-type: none"> <li>• the groundwater withdrawal is more than recharge rate</li> <li>• this leads to drying up of dug wells &amp; bore wells</li> </ul>
<b>7. Pollution of water:</b>	Water containing nitrogen as nitrate fertilizer, percolates rapidly into ground & get polluted. <ul style="list-style-type: none"> <li>• Water becomes unsuitable for potable when nitrate concentration exceeds 45 mgs/lit.</li> </ul>

## **8. ROLE OF INDIVIDUAL IN CONSERVATION OF NATURAL RESOURCES:**

### **1.Conservation of energy**

- Turn off lights, fans and other appliances when not in use.
- Dry the clothes in sun instead of drier
- Use solar cooker for cooking food on sunny days and will cut down LPG expenses.
- Grow trees and climbers near the houses and get a cool breeze and shade. This will cut off electricity charges on coolers and A/C
- Ride bicycle or just walk instead of using your car or scooter.
- Always use pressure cooker.

### **2.Conservation of water:**

- Use minimum water for all domestic purpose
- Check for water leaks in pipes & toilets & repair them properly
- Reuse the soapy water after washing clothes for washing courtyards, drive ways etc.
- Use drip irrigation to improve irrigation efficiency & reduce evaporation
- The waste water from kitchen, bath tub can be used for watering the plants
- Build rainwater harvesting system in your home

### **3.Conservation of soil:**

- Grow plants, trees & grass which bind the soil & prevent its erosion
- Don't irrigate the plants using strong flow of water, as it will wash off the top soil
- Soil erosion can be prevented by the use of sprinkling irrigation
- Use green manure in the garden, which will protect the soil
- Use mixed cropping, so that specific soil nutrients will not get depleted
- While constructing the house don't uproot the trees

### **4.Conservation of food resources:**

- Eat minimum amount of food, avoid over eating.
- Don't waste the food, instead give it to someone before getting spoiled.
- Cook only required amount of food
- Don't cook food unnecessarily
- Don't store large amounts of food grains & protect them from insects.

### **5.Conservation of forest:**

- Use non-timber products
- Plant more trees & protect them
- Grassing, fishing must be controlled
- Minimize the use of papers & fuel wood
- Avoid developmental work like dam, road, construction in forest areas.

## **9. CONFLICTS OVER WATER:**

### **1.Conflicts through use:**

Unequal distribution of water led to inter-state or international disputes.

#### ***a.Internation conflicts:***

- India & Pakistan fight to water from the Indus
- Iran & Iraq fight for water from Shatt-al-Arab water
- India & Bangladesh fight for Bhramaputra river
- Mixico & USA fight over Colorado river

#### ***b. National Conflicts:***

Cavery problem between Karnataka & Tamilnadu  
Krishna problem between Karnataka & Andhra Pradesh  
Siruveni water problem between Tamilnadu & kerala

### **2.Construction of Dams/Power stations:**

For hydroelectric power generation, dams built across the rivers, initiates conflict between the states.

### **3.Conflict through pollution:**

Rivers & Lakes are used for electricity, shipping & for industrial purpose.

Disposal of waste water & industrial waste decrease the quality of water & causes pollution.

## **EXAMPLES OF WATER CONFLICTS:**

### **Conflicts on Indian river:**

*Damodar river* → It is the most polluted river, carrying 43 industries discharges/

*Yamuna river* → 19,000 cubic meters of Water containing DDT derivatives are dumped in the river.

*Ganga river* → 1000 cubic meters of polluted water from 68 industries are discharged in the river.

*Periyar river* → The River is dying due to mining of 4,37,000 tonnes of sand everyday & become salty due to intrusion of sea water

*Suriyapalayam river* → 34 tanneries located around this river contaminate drinking water, & make soil unfit for agriculture.

*Thamraparani river* → Continous brick making on its bank has converted the river into mud pools.

### ***Cavery water dispute:***

The Cauvery water dispute Tribunal set up on 2<sup>nd</sup> June 1990, directed Karnataka to ensure 205 TMCF of water to Mettur dam every Year

### **Water conflicts in the middle east:**

In Ethipia, Sudan & Egypt:

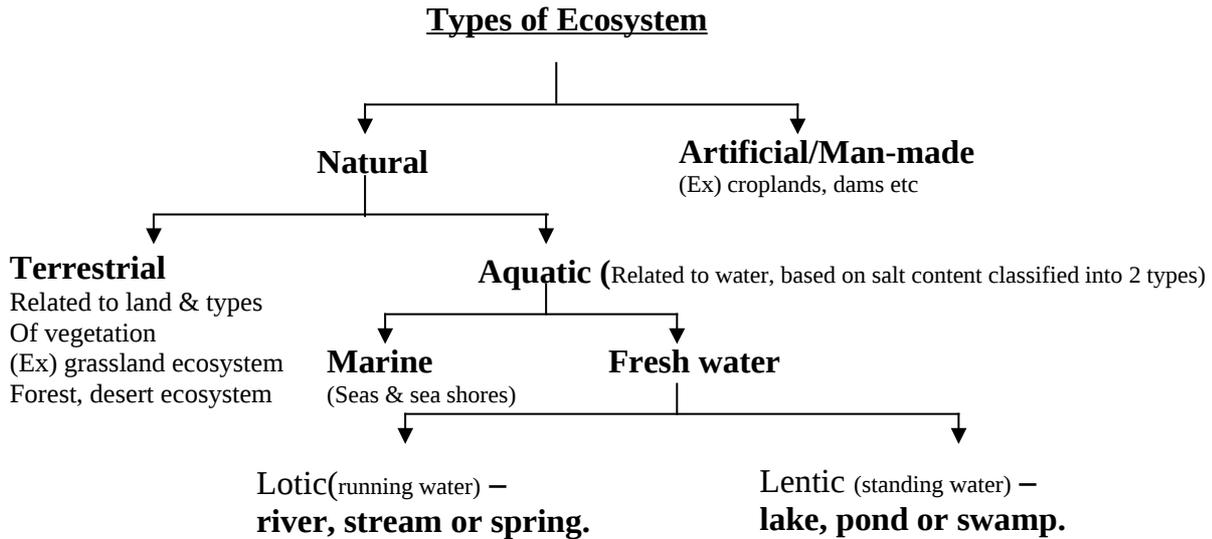
Problems in sharing Jordan, Tigris-Euphrates & Nile river water resources by middle east countries

In Jordan, Syria & Israel:

Problems in sharing of Jordan river water between Jordan, Syria & Israel.

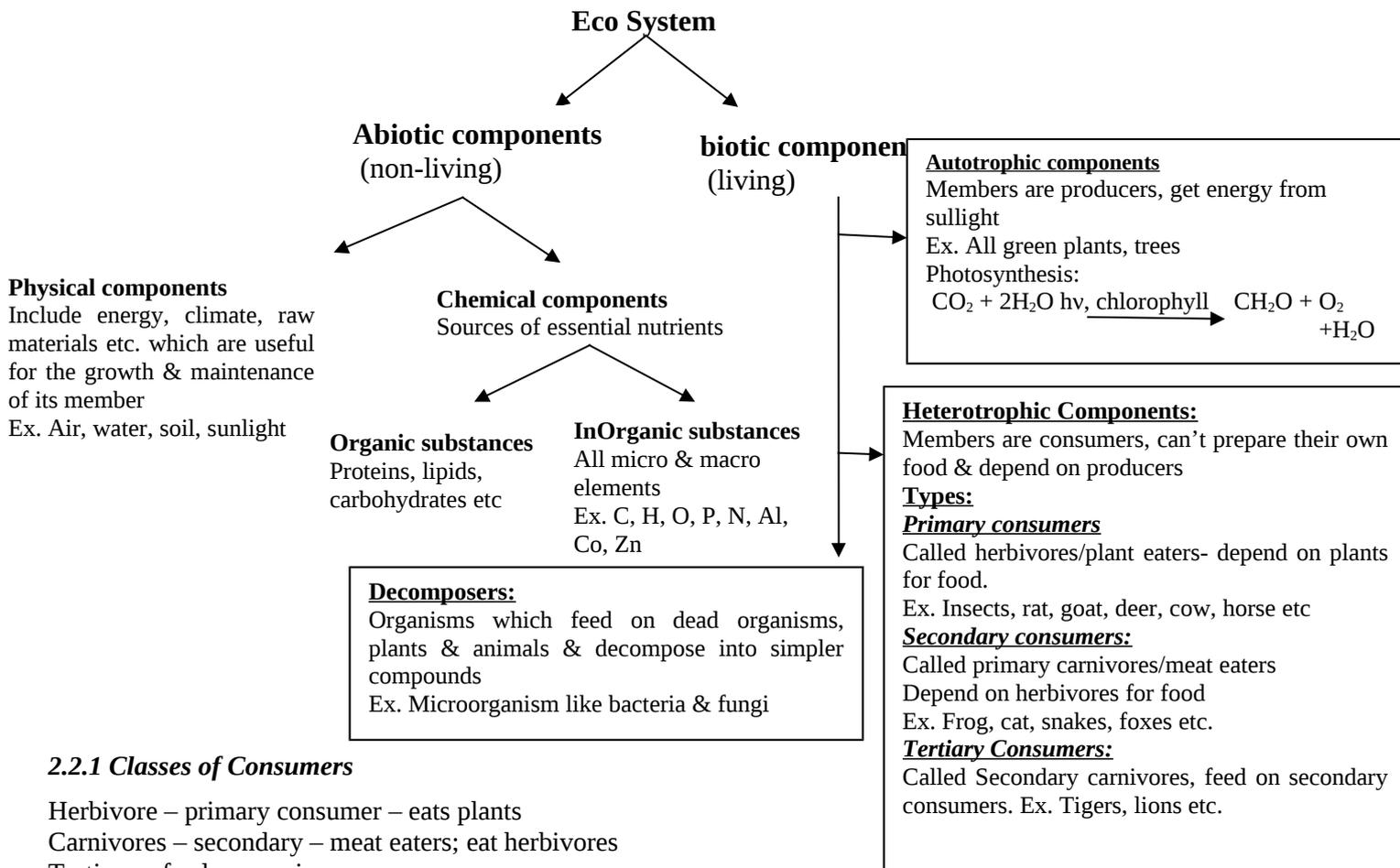
# SYSTEMS

**Ecosystem**—A group of organisms interacting among themselves and with environment is known as ecosystem.



**Ecology** - Study of interactions among organisms, with their environment. the flows of energy and materials between abiotic and biotic components of ecosystems.

## Structure/ Components of an Ecosystem:



### 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.

## Energy flow through atmosphere to an ecosystem:

Sun the ultimate source of energy is absorbed by producers (plants) to produce organic matter through photosynthesis. The conversion of solar energy is governed by law of thermodynamics.

### **Ist Law of Thermodynamics:**

Energy can neither be created, nor be destroyed, but it can be converted from one form to another

(Ex) photosynthesis- solar energy converted to chemical energy.

**Photosynthesis Equation:**  $\text{CO}_2 + 2\text{H}_2\text{O} \xrightarrow{\text{hv, sunlight}} \text{CH}_2\text{O} + \text{O}_2 + \text{H}_2\text{O}$

Plants are used by herbivores, herbivores are used by carnivores as their food.

Thus energy is transferred & conversion of solar energy is governed by law of thermodynamics

### **IIInd law of thermodynamics:**

Whenever energy is transformed, there is a loss of energy through the release of energy in the form of heat.

(Ex). Respiration process:  $\text{CH}_2\text{O} + \text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

### **Relationship between structure & function:**

Hence biotic components and abiotic components are linked through energy flow and nutrient cycle.

Sun → Plants → Animals → Bacteria

## **FOREST ECOSYSTEM**

**Introduction:** A forest ecosystem is the one in which a tall & dense trees grow which support many animals & birds. In India 19% occupies forest of total land area.

### **Types of Forest ecosystem:**

Tropical rain forests → found near the equator, high temperature, have broad leaf trees like sandal, lion, tiger

Tropical deciduous forest → Found away from equator, warm climate, deciduous trees like maple, oak, deer, fox, rabbit etc.

Temperate rain forests → adequate rainfall areas, coniferous trees like pines, firs, squirrels, fox, cats, bear etc.

Temperate deciduous forest → found in moderate temp., trees like oak, hickory, animals – deer, fox, bear etc.

Tropical scrub forests → dry climate for longer time, small deciduous trees & shrubs, animals – deer, forx etc.

### **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

### **Structure and Function of Forest Ecosystem**

- I. Abiotic Components → abiotic components are physical components present in soil & atmosphere  
(Ex) temperature, light, rainfall, minerals
- II. Biotic Components
  1. Producers → plants absorbs sunlight & produce food by photosynthesis. Ex-trees, shrubs, plants
  2. Consumers

Primary consumers → Called herbivores/plant eaters- depend on plants for food. Ex. Insects, rat, goat, deer, cow, horse etc

Secondary consumers → Called primary carnivores/meat eaters. Depend on herbivores for food Ex. Frog, birds, cat, snakes, foxes etc.

Tertiary consumers → Called Secondary carnivores, feed on secondary consumers. Ex. Tigers, lions etc.

3. Decomposers → Organisms which feed on dead organisms, plants & animals & decompose into simpler compounds Ex. bacteria & fungi

## GRASSLAND ECOSYSTEM

**Introduction:** Occupies 20% of earth's surface. Grass species, shrubs, trees are present.

**Types:** Tropical grassland → *High temperature, moderate rainfall, known as Savanna-type, zebra, giraffe*

Temperate grassland → *found in centers of continents, very cold winters, hot summers, summer fires, no trees or shrubs*

Polar grassland → *severe cold, strong wind with ice & snow. Animals -Arctic wolf, fox, small plants grow.*

**Structure and functions of Grassland Ecosystems**

*Same as forest ecosystem*

## AQUATIC ECOSYSTEMS

**Introduction:** Aquatic ecosystem deals with water bodies.

**Types:** 1. Fresh water life zones → (ex) Ponds, streams, lakes, rivers

2. Salt water life zones → (ex) oceans, estuaries

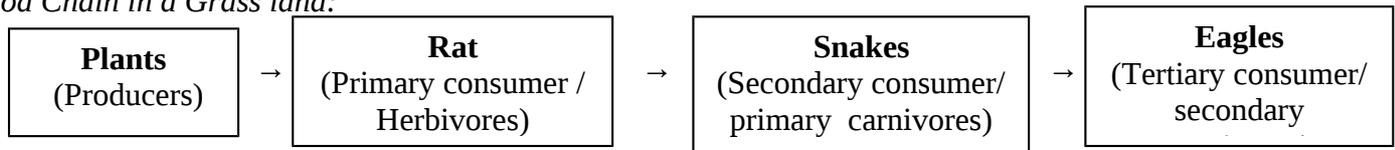
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## FOOD CHAIN

**Definition :** The sequence of eating & being eaten in an ecosystem is food chain (or)

Transfer of food energy from the plants through a series of organisms is food chain.

1. Food Chain in a Grass land:



2. Food Chain in a Pond: Phytoplankton → Zooplankton → Small fish → large fish → Man

3. Food Chain in a forest: Plants → Deer → Tigers/Lions

**Types of Food Chain:** *Grazing Food Chain* → starts with green plants & goes to decomposer food chain/

*Detritus food chain* → starts with dead organic matter & goes to decomposer food chain.

**Tropic Levels:**

The various steps through which food energy passes in an ecosystem is called as tropic level.

$T_1 \rightarrow T_2 \rightarrow T_3 \rightarrow T_4 \rightarrow T_5$

$T_1$ = Producers,  $T_2$ = Primary consumers,  $T_3$ = Secondary consumers,  $T_4$ = Tertiary consumers,  $T_5$ = decomposers

---

## 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
- Grass → cattles → tigers
- Grass → rats → snakes → eagles → tigers
- Grass → rats → eagles → tigers

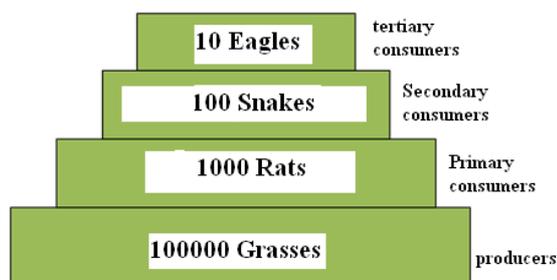
**Difference between food chain & food web:** In food chain, if one species gets affected, then species in all trophic levels are also affected. But in food web if one species gets affected, it does not affect other trophic levels.

## ECOLOGICAL PYRAMIDS

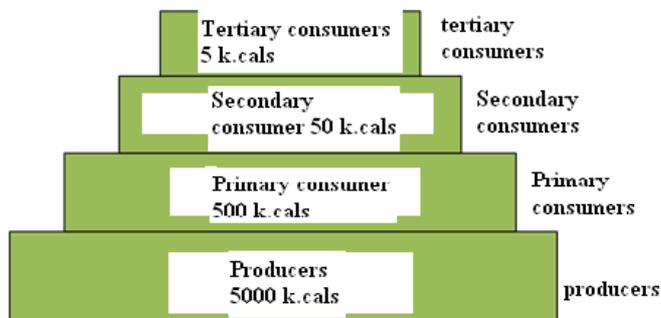
Graphical representation of structure and function of trophic levels of an ecosystem is ecological pyramid.

Types:

**Pyramid of Numbers** → Represents the number of energy individual organisms present in each trophic levels.



**Pyramid of Energy:** Represents the amount of Present in each trophic level.



**Producer** – occupy Ist trophic level

**Primary consumer** occupy IInt trophic level

Bcoz no of rats are lower than no of grasses.

**Secondary consumer** occupy IIIrd trophic level

Bcoz no of snakes are lower than no of rats

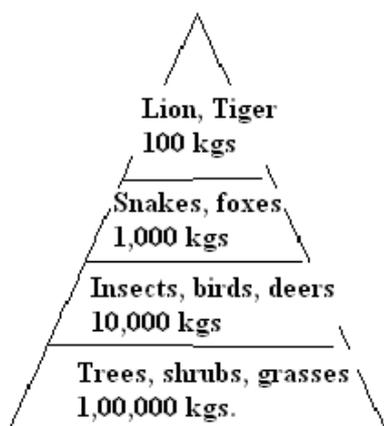
**Tertiary consumer** occupy IVth trophic level

No & size is very low.

\* At each trophic level there is a heavy loss of energy

\* Hence there is a sharp decrease in energy at all level

**2.10.2 Pyramid of Biomass** → The amount of living or organic matter present in a particular environment is called biomass. – There is a decrease in the biomass from the lower trophic level to the higher trophic level.



## ECOLOGICAL SUCCESSION

The progressive replacement of one community by another till the development of stable community in a particular area is ecological succession.

**Stages of ecological succession:**

Pioneer community → first group of organism in an area

Seral stage → various developmental stages of community

**Types of ecological succession:**

**Primary succession** → involves gradual establishment of biotic communities on a lifeless ground

Hudrarch / Hydrosere → establishment starts in watery area like pond and lake

Xerarch / Xerosere → establishment starts in a dry area like desert and rock

### **Process of Ecological Succession**

Nudation

Invasion → Migration, Establishment

Competition

Reaction

Stabilization

*Secondary succession* → Involves establishment of biotic communities in an area, where biotic community already present there.

## **BIODIVERSITY**

**Definition:** *The variety and variability among all groups of living organisms and the ecosystem in which they occur.*

Levels/Classification of Biodiversity:

- 1) **Genetic diversity** → Diversity within the species is genetic diversity. (ex) teak wood varieties, Indian, Burma, Malaysian
- 2) **Species diversity** → diversity between different species. (ex) plant species = apple, mango, grapes, animal species = lion, tiger, elephant etc.
- 3) **Community/Ecosystem diversity** → Diversity at the ecological or habitat level is ecosystem diversity. Ex. River ecosystem.

---

## **VALUES OF BIODIVERSITY**

### **1. Consumptive use:**

**Drugs:** Many plants are used in primary health care.

70% of modern medicines are derived from plant and plant extracts.

(Ex) Penicillin – fungus is the source – Antibiotic

Quinine – Chincona bark - Malaria treatment

Morphine – Poppy bark – Analgesic

**Fuels:** Fire woods are directly consumed by villagers.

**Food:** A large number of wild plants and wild animals are consumed by human beings as food.

### **2. Productive use:**

Biodiversity products have commercial value.

These products are marketed and sold. These are derived from animals and plants.

**Animal products:** Silk from silk worm

Wool from sheep

Musk from musk deer

Leather from animals

**Plant Products:** Wood for paper and Plywood

Cotton for textile industry

Pearl for pearl industry

### **3. Social value:**

\*It refers to the manner in which the bio-resources are used in the society.

\*These are associated with the social life, religion and spiritual aspects of the people.

e.g., Holy plants: Tulsi, Lotus, Neem trees

Holy animals: Cow, snake, bull, peacock

### **4. Ethical value:**

It means that a species may or may not be used but its existence in nature gives us pleasure.

e.g., Holy river: River Ganga

Holy tree: Tulsi, Vengai

### **5. Aesthetic value:**

The beautiful nature of plants and animals insists us to protect the biodiversity. Ex) eco-tourism, colour of butterfly, flowers etc.

### **6. Optional value:**

The optional value of biodiversity suggests that any species may be proved to be a valuable species after someday.

---

## **HOT- SPOTS OF BIODIVERSITY**

The hot spots are the geographic areas which possess high endemic species.

An area is designated as a hot spot when it contains at least 0.5% of plant species as endemic.

**Area of hot spot:** There are 25 Hotspots of biodiversity worldwide. Out of which 2 are present in India.

Eastern Himalayas → Nepal, Bhutan, Indo-Burma region, 30% of endemic species

Western Ghats → Srilanka region, ex – Maharashtra, Karnataka, Tamil Nadu, Kerala. 1500 endemic species.

Plants → *Ternstroemia japonica*, *Hypericum* 31 / 62

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## VALUES OF BIODIVERSITY

### 1. Consumptive use:

**Drugs:** Many plants are used in primary health care.

70% of modern medicines are derived from plant and plant extracts.

(Ex) Penicillin – fungus is the source – Antibiotic

Quinine – Chincona bark - Malaria treatment

Morphine – Poppy bark – Analgesic

**Fuels:** Fire woods are directly consumed by villagers.

**Food:** A large number of wild plants and wild animals are consumed by human beings as food.

### 2. Productive use:

Biodiversity products have commercial value.

These products are marketed and sold. These are derived from animals and plants.

**Animal products:** Silk from silk worm

Wool from sheep

Musk from musk deer

Leather from animals

**Plant Products:** Wood for paper and Plywood

Cotton for textile industry

Pearl for pearl industry

### 3. Social value:

\*It refers to the manner in which the bio-resources are used in the society.

\*These are associated with the social life, religion and spiritual aspects of the people.

e.g., Holy plants: Tulsi, Lotus, Neem trees

Holy animals: Cow, snake, bull, peacock

### 4. Ethical value:

It means that a species may or may not be used but its existence in nature gives us pleasure.

e.g., Holy river: River Ganga

Holy tree: Tulsi, Vengai

### 5. Aesthetic value:

The beautiful nature of plants and animals insists us to protect the biodiversity. Ex) eco-tourism, colour of butterfly, flowers etc.

### 6. Optional value:

The optional value of biodiversity suggests that any species may be proved to be a valuable species after someday.

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## HOT- SPOTS OF BIODIVERSITY

The hot spots are the geographic areas which possess high endemic species.

An area is designated as a hot spot when it contains at least 0.5% of plant species as endemic.

**Area of hot spot:** There are 25 Hotspots of biodiversity worldwide. Out of which 2 are present in India.

Eastern Himalayas → Nepal, Bhutan, Indo-Burma region, 30% of endemic species

Western Ghats → Srilanka region, ex – Maharashtra, Karnataka, Tamil Nadu, Kerala. 1500 endemic species.

Plants → Ternstroemia japonica, Hypericum

Animals → Blue bird, lizard, hawk

## **THREATS TO BIODIVERSITY**

Any disturbance in a natural ecosystem tends to reduce its biodiversity. Various threats to biodiversity are:

**1. HABITAT LOSS:** Loss of population of interbreeding organism.

### **Factors influencing Habitat Loss:**

#### **Deforestation:**

- Forest & grasslands are cleared for agricultural lands or developmental projects.
- Many species disintegrate due to loss of natural habitat.

#### **Destruction of wetlands:**

- Wetlands are destroyed due to pollution, draining etc.

#### **Developmental activities:**

- Construction of dams in forest, industrial effluents kill birds & aquatic organisms.

#### **Habitat fragmentation:**

- Habitat is divided into small & scattered
- So, many animal & birds are vanishing.

#### **Raw materials:**

- For the production of hybrid seeds, wild plants are used as raw materials.

#### **Production of Drugs:**

- Pharmaceutical companies collect wild plants for drugs production.
- So, no of medicinal plants are on the verge of extinction.

#### **Illegal Trade:**

- Trade on wild life reduces bio-diversity

## **2. POACHING:**

Killing / Hunting of animals is poaching.

### **Types:**

*Subsistence Poaching*- killing animals for surviving.  
*Commercial Poaching*- hunting animals for selling

### **Factors influencing Poaching:**

***Human Population:*** increase in population increases pressure on forest resources.

***Commercial activities:*** Smuggling of wild life products for high profit.

***Wildlife products***=Furs, horns, tusk, live specimen, herbal products.

***Importers of wild life*** = Europe, North America, Japan, Taiwan, Hong Kong

### **Examples:**

- Male gorilla for its body parts
- Blue morpho butterfly – making attractive trays
- Snowy large egret – used for white feather in ladies hat.US
- Elephant feet – for making Ash trays
- Elephant – for ivory
- Bengal tiger – soled for \$1,00,000 in foreign market
- Dynamite fishing – high tech fishing, exhaust marine life Sea horses Sea turtles

## **2. MAN-WILDLIFE CONFLICTS:**

### **Examples:**

#### **Sambalpur – orissa:**

195 humans were killed by elephants,  
In retaliation- 98 elephants were killed,  
30 injured by villagers.

#### **Kote – Chamrajanagar –Mysore:**

Sugarcane & cotton crop, explosives

#### **Royal Chitwan National Park – Kathmandu**

Man-eating tiger killed 16 nepalese, 4 yrs child

#### **Sanjay Gandhi National Park – Mumbai**

Leopards killed– 14 persons

### **Factors Influencing man-animal conflicts:**

1. Shrinking of forest compels wildlife to move outside the forest
2. Electric wiring around crops
3. Animals suffer pain and attack humans
4. Female wildlife attack human more to safe its cubs.
5. Forest dept. don't cultivate foods for wild
6. Cash compenstn by Govt – 400/- per quintal  
But market price 2400/-
7. Garbage near human settlement attract wild

### **Remedial Measures for conservation of biodiversity:**

Make Available of Adequate food & water for wildlife  
Construction works in forest must be stopped.

Solar powered fencing must be used to prevent animals

### **ENDANGERED & ENDEMIC SPECIES OF INDIA:**

Species are classified into various types:

**Extinct species** → No longer found in the world

**Endangered species** → A species is said to be endangered when its no has been reduced to a critical level. Unless it is protected it is in danger of extinction.

**Vulnerable species** → when its population is facing continuous decline due to habitat loss.

**Rare species** → when it is localized within restricted area.

### **ENDANGERED SPECIES OF INDIA:**

A species is said to be endangered when its no has been reduced to a critical level. Unless it is protected it is in danger of extinction

#### **No of threatened species of India:**

Plants	250
Birds	70
Mammals	86
Reptiles	25
Amphibians	3
Fishes	3
Molluscs	2, Insects -50

#### **Important Endangered Species:**

Reptiles → Tortoise, green sea turtle, gharial, python  
Birds → Peacock, Siberian white crane, pelican, Indian Bustard  
Mammals → Indian wolf, red fox, tiger, Indian lion, golden cat, desert cat.  
Primates → lion tailed monkey, capped monkey, golden monkey  
Plants → medicinal plants, sandal wood tree

**RED-data Book** = Data book which contains the list of endangered species of plants and animals.

#### **Factors affecting Endangered Species:**

- **Pollution:** Human disposal in nature. Travel through food chain and leads to death
- **Over-exploitation:** over usage of natural resources & poaching leads to extinct of wild life
- **Climate change:** ozone depletion, flood etc, threatens organisms and ecosystem

#### **Remedial Measures:**

- CITES – Convention on International Trade in Endangered Species is signed
- 2900 and other 900 endangered species are restricted for trade.

### **ENDEMIC SPECIES:**

- The species, which are found only in a particular region are known as endemic species.
- 62% of endemic species are found in Himalayas and Western Ghats

#### **Fauna:**

- Animals present in a particular region or period is Fauna.
- 62% amphibians & 50% lizards are endemic to Western Ghats.
- (ex) Monitor lizards, reticulated python, Indian salamander, viviparous toad.

#### **Flora:**

- Plants present in a particular region or period is Flora
- (ex) Sapria himalayana, ovaria lurida, pteridophyta, angiosperms etc.

#### **Factors affecting endemic species:**

Habitat loss, fragmentation, pollution

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## CONSERVATION OF BIODIVERSITY

**Definition :** The management of biosphere for the sustainable benefit to meet the needs of future generation.

**Factors affecting biodiversity:**

- Human activities like construction of dams in forest, industrial wastes, using pesticides etc
- Poaching of wild animals, over exploitation of natural resources.
- Discharge of effluents disturbs the marine ecosystem
- The climatic factors-global warming, ozone depletion, acid rain affect the biodiversity

**Advantages or Need of Biodiversity:**

- Recreation, tourism, Drugs, herbs, food, important raw materials, preserves plants & animals, hence leads to life supporting systems.

**Types of Biodiversity:**

- In-situ conservation (within habitat)
- Ex-situ conservation (outside habitat)

**Methods of In-Situ conservation:**

Biosphere reserves –	7
National Parks	80
Willife sanctuaries	420
Gene sanctuaries	120

**IN-SITU CONSERVATION:**

Involves protection of fauna & flora within its natural habitat.

**1. Biosphere Reserves:**

- Covers area of more than 5000 sq. km.
- Protect species for long time

<b>(ex)</b> Nanda devi	U.P
Nokrek	Meghalaya
Nilgiri	Kerala, TN, Karnataka
Manas	Assam
Sunderbans	West Bengal
Gulf of Mannar	TN

**Role of Biosphere reserves:**

- Protects endangered species
- Site of recreation & tourism
- Useful for education & research purpose
- Gives long term survival

**Restriction:**

No tourism & explosives are permitted.

**3. Wildlife Sanctuaries:**

- Conserve animals & Birds only

**(examples)**

Mudumalai wildlife sanctuary	-TN
Vedanthangal Bird sanctuary	- TN
Sultanpur Bird sanctuary	- Haryana
Ghana Bird sanctuary	- Rajasthan
Wild Ass sanctuary	-Gurajat

**Role of wildlife Sanctuaries:**

Protects animals only  
Harvesting of timber,  
Collection of forest products

**2. National Park:**

- Covers area of about 100 to 500 sq.kms
- Conserves wildlife & environment

<b>(ex)</b> Gir National Park	Gujarat
Periyar	Kerala
Dudwa	UP
Sariska	Rajasthan
Ranthambore	Rajasthan
Kaziranga	Assam

**Role of National Park:**

- For tourism without affecting environment
- Protect, propagate & develop wild life

**Restrictions:**

**4. Gene Sancturay:**

- Conserve Plants

**Examples:**

Citrus sanctuary	- North India
Pitcher plant	-North India

**5. Other Projects for conservation of animals:**

**Examples:**

Gir Lion Project, Crocodile Breeding Project, Project Elephant, Project Tiger etc.

**Merits of In-situ conservation:**

Very cheap & convenient method  
Species adjust to floods, drought, forest fires etc.

**Demerits**

Large area is needed, Maintenance is not proper due to pollution and lack of staff.

**Restrictions:**

Killing, hunting, shooting of wildlife is prohibited

**EX-SITU CONSERVATION:**

Involves protection of fauna & flora outside the natural habitats.

***Role of Ex-situ conservation:***

Maintenance of endangered plant & animal species under controlled conditions

Preserves more important species

**Methods of Ex-situ conservation:**

**1. NBPGR**

National Bureau of Plant Genetic Resources → uses cryo technique

Cryo Technique: Preservation of seeds, vegetables, fruits, crops, etc by using liquid nitrogen at -196° C

**2.NBAGR :**

National Burea of Animal Genetic Resources → preserves semen of bovine animals

**3.NFPRCR:**

National Facility for Plants Tissue Culture Respository → preserves crops or trees by tissue culture

**Merits**

Survival / life span of species increase by special care  
Species are assured for food, water, shelter etc  
Endangered species are preserved

**Demerits:**

Expensive method  
Freedom of wildlife is lost  
Animal cant survive in natural environment

# ENVIRONMENTAL POLLUTION

## 1. AIR POLLUTION

The presence of one or more contaminants like dust, smoke, mist and odour in the atmosphere which are injurious to human beings, plants and animals.

### *Common air pollutants sources & their effects:*

Substance	Nature	Sources	Health effects	Environmental effects
Carbon monoxide (CO)	Colourless, odourless, poisonous gas. Formed during incomplete combustion of fuels $2C + O_2 \rightarrow 2CO$	Cigarette smoking, incomplete burning of fuels, motor vehicle exhaust	Causes headaches, anemia, coma, irreversible brain cell damage & death	Increases the globe temperature
Nitrogen dioxide (NO <sub>2</sub> )	Reddish-brown irritating gas & gives photochemical smog, Can be converted to nitric acid $NO_2 + \text{Moisture} \rightarrow HNO_3$	Fuels burning in vehicles, industrial plants	Lung irritation & damage	HNO <sub>3</sub> acid deposition damage trees, soils, & aquatic life. It corrode metals, stones on buildings, statues, monuments etc.
Sulphur dioxide (SO <sub>2</sub> )	Colourless, irritating gas. Formed by combustion of coal & oil. Can be converted to sulphuric acid in atmosphere	Burning of coal, industrial process	Breathing problems	Reduce visibility, acid deposition on trees, soils & aquatic life
Suspended particulate matter (SPM)	Includes variety of particles & droplets (aerosols).	Burning coal in industries, diesel in vehicles, agriculture, unpaved roads, etc	Nose & throat irritation, lung damage, bronchitis, asthma, cancer	Reduce visibility, acid deposition, H <sub>2</sub> SO <sub>4</sub> droplets damage trees, soils & aquatic life
Ozone (O <sub>3</sub> )	Highly reactive irritating, unpleasant odour gas. A major component of photochemical smog.	Nitrogen oxides, chemical reaction with volatile organic compounds	-	Moderates the climate
Photochemical smog	Brownish smoke formed during automobile traffic	Formed due to chemical reaction among nitrogen oxides & hydrocarbon	Breathing problems, cough, eye, nose & throat irritation, heart diseases,	Damage plants & trees. Smog reduce visibility
Lead (Pb)	Solid toxic metal	Paint, smelters, lead manufacture, storage batteries, leaded petrol	Brain & nervous system damage, mental retardation in children, digestive & other health problems, cause cancer	Can harm wild life
Chromium	Solid toxic metal ,	Paint, smelters, chromium manufacture, chromium plating	Perforation of nasal septum, chrome holes, ulcer, central nervous system disease, cancer.	

## **Sources of air pollution**

- Natural pollution - volcanic eruptions, forest fires, biological decay.
- Man – made activities – Thermal power plants, agricultural activities.

## **Classification**

- *Primary pollutant* – these are those emitted directly in the atmosphere in harmful form like CO, NO.
- *Secondary pollutant* – these may react with one another or with the basic components of air to form new pollutants.

## **Control Measures**

### **1. Source control**

- ❖ Use only unleaded petrol
- ❖ Use fuels that have low sulphur and ash content
- ❖ Plant trees along busy streets because they remove particulates and carbon monoxide and absorb noise.
- ❖ Industries and waste disposal sites should be situated outside the city centre.
- ❖ Use catalytic converters to help control the emissions of carbon monoxide and hydrocarbons.
- ❖ Houses, schools, restaurants & park should not be located on busy street

### **2. Control measures in Industrial centers**

- ❖ Emission rates should be restricted to permissible levels
- ❖ Air pollution control equipments must be made mandatory
- ❖ Continuous monitoring of the atmosphere to know the emission level

## **Equipments used to control air pollution:**

Mechanical devices such as scrubbers, cyclone separator, bag houses & electro-static precipitators, reducing particulate pollutants.

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## **2.ROLE OF AN INDIVIDUAL IN PREVENTION OF POLLUTION**

- Plant more trees
- Help more in pollution prevention than pollution control
- Use water, energy and other resources efficiently
- Purchase recyclable, recycled and environmentally safe products
- Reduce deforestation
- Remove NO from motor vehicular exhaust
- Use of eco friendly products.
- Use CFC free refrigerators
- Use natural gas than coal
- Use machines in well ventilated areas
- Use less polluting substances for cleaning agents, paints & other products
- Increase use of renewable resources
- Don't use polystyrene cups that have chloro fluoro carbon (CFC) which destroy ozone
- Use rechargeable batteries which will reduce metal pollution
- Use organic manure instead of inorganic fertilizers
- Reduce garbage by recycling & reuse, Slow population growth

## **3. WATER POLLUTION**

It may be defined as “the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on human and aquatic life.

## **Types, effects and sources of water pollution**

### **1. Infectious agents:**

**Example:** Bacteria, viruses, protozoa and parasitic worms.

**Sources:** Human and animal wastes.

**Effects:** Variety of diseases.

### **2. Oxygen demanding wastes:**

**Example:** Animal manure and plant debris that can be decomposed by aerobic bacteria.

**Sources:** Sewage, paper mills, and food processing facilities.

**Effects:** Wastes can degrade quality by depleting water of dissolved oxygen, make aquatic life to die

### **3. Inorganic Chemicals:**

**Example:** Water soluble inorganic chemicals. Compounds of toxic metals such as lead, arsenic and selenium. Salts such as NaCl in water.

**Sources:** Surface runoff, industrial effluents, household cleansers

**Effects:** skin cancers & neck damage  
Damage nervous system, liver & kidneys  
Lower crop yields, Harm fish & other aquatic life  
Accelerate corrosion of metals

### **4. Organic Chemicals:**

**Examples:** Oil, gasoline, plastics, pesticides, cleaning solvents, detergents

**Sources:** Industrial effluents, household cleansers, runoff from farms

**Effects:** Causes nervous system damage, cancer, harm fish & wild life.

### **5. Radio active materials:**

**Example:** radioactive isotopes of iodine, radon, uranium, cesium, and thorium

**Sources:** Nuclear power plants, mining, nuclear weapons production.

**Effects;** genetic mutation, birth defects, and certain cancers.

### **6. Point and non-point sources of water pollution**

**Point sources:** These are discharged pollutants at specific locations through pipes, ditches or sewers  
eg: factories, sewage treatment plants

**Non-point sources:** They are usually large areas or air shed that pollute water by runoff

**Eg:** runoff of chemical from cropland to surface water.

### **Testing of river water:**

**Dissolved oxygen (DO)** = It is the amount of oxygen dissolved in a given quantity of water at a particular pressure & temperature.

**Biochemical Oxygen Demand (BOD)** = It is the amount of oxygen required for the biological decomposition

of organic matter present in the water

Chemical Oxygen Demand (COD) = It is the amount of oxygen required for chemical oxidation of organic matter using oxidizing agent like  $K_2Cr_2O_7$  &  $KMnO_4$

### **Control measures of water pollution**

- The administration of water pollution should be in the hand of state or central government.
  - Scientific techniques are needed to control pollution in river, ponds or streams.
  - Industrial plants should be based on recycling operations.
  - The national goal should be “conservation of forests” and campaign should be “plant more trees”.
  - Highly qualified and effective persons should be consulted for effective control or water pollution.
  - Awareness to public through radio, tv etc>
  - Suitable laws, standards and practices should be framed to regulate pollution.
  - Basic and applied research in public health engineering be encouraged.
  - The possible of reuse or recycling of waste material should be encouraged.
  - Companies should not discharge any type of waste either treated or untreated into rivers, lakes, ponds etc.
- 

### **4.BHOPAL GAS TRAGEDY:**

On night of 3<sup>rd</sup> December 1984 in Bhopal city of Madhya Pradesh

At Union carbide India Ltd, which manufacture carbonate pesticides using methyl isocyanate (MIC)

Due to failure of coolant, the reactor got exploded & 40 tons of MIC leaked over 40 sq.km area.

**Nature of MIC:** It is a toxic gas, affects lungs, eyes & causes irritation in skin. Remove oxygen from lungs & cause death.

**Effects in Bhopal:** About 5000 persons died, 1000 became blind, 65,000 people suffered from eye, respiratory, neuromuscular problems.

### **CHERNOBYL NUCLEAR DISASTER:(Nuclear pollution)**

In April 26 1986, melt down of the Chernobyl nuclear reactor in Russia, has leaked out the radioactive rays & radioactive materials.

**Effects:** about 2000 persons died, more suffered due to degeneration of cells, severe bleeding, anaemia, skin cancer, animals plants was also affected more.

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### **4.SOIL POLLUTION**

It may be defined as “the contamination of soil by human and natural activities which may cause harmful effects on living beings”.

## ***Types***

### **1. Industrial wastes**

**Sources:** Pulp and paper mills, chemical industries, oil refineries, sugar factories, tanneries, textile, steel, fertilizers etc.

**Effects:** Affect and alter the chemical and biological properties of soil.

Hazardous chemicals enter into human food chain from the soil and finally lead to serious effects.

### **2. Urban wastes**

**Sources and effects:** Plastics, Glasses, metallic cans, fibers, papers, rubbers, street sweepings, and other discarded manufactured products. These are also dangerous.

### **3. Agricultural practices**

**Sources and effects:** Huge quantities of fertilizers, pesticides, herbicides, and weedicides are added to increase the crop yield. Apart from these farm wastes, manure, slurry, are reported to cause soil pollution.

### **4. Radioactive pollutants**

**Sources and effects:** These are resulting from explosions of nuclear dust and radio active wastes penetrate the soil and accumulate there by creating land pollution.

### **5. Biological agents**

**Sources and effects:** Soil gets large quantities of human, animal and birds excreta which constitute the major source of land pollution by biological agents.

### ***Control measures of soil pollution (give explanation for each topic on your own)***

- ✓ Population growth
  - ✓ Decrease of the available farm land due to urbanization
  - ✓ Forestry and farm practices
  - ✓ Proper dumping of unwanted materials
  - ✓ Production of natural fertilizers
  - ✓ Proper Hygienic condition
  - ✓ Public awareness
  - ✓ Recycling and Reuse of wastes
  - ✓ Ban on Toxic chemicals.
- 

## **5. MARINE POLLUTION**

It may be defined as “the discharge of waste substances into the sea resulting in harm to living resources hazards to human health, hindrance to fishery and impairment of quality for use of sea water”.

### **Source of marine pollution**

### ***Dumping the wastes:***

Huge amounts of sewage, garbage, agricultural discharge, pesticides, heavy metals, plastics are dumped in sea. **Effects:** So many marine birds are affected by gastro-intestinal disorders.

### ***Oil pollution of Marine water:***

Caused by petroleum and its products.

**Effects:** Oil films inhibit photosynthesis & formation of oxygen.  
This inhibit the growth of marine plants

### **Effects of marine pollutants**

- Cause more damage in birds as thinning of eggshell and tissue damage of egg.
- Oil spilling causes low body temperature in birds resulting in hypothermia.
- Oil films decreases the rate of oxygen uptake by water.
- Cause damage to marine fauna & flora including algae, fish, birds, invertebrates
- Oil films inhibit photosynthesis & inhibit the growth of the plants
- Hydrocarbon & benzpyrene accumulate in fish & consumption of fish by man cause cancer.

### **Control measures of marine pollution**

- ❖ Plants for conserving marine biodiversity must be taken into account of human needs.
  - ❖ People should be educated about marine ecosystems and the benefits offered by them.
  - ❖ Local communities must be involved in protecting and managing their coastal resources.
  - ❖ Social and economic incentives must be offered for conserving and sustainable use of marine resources.
  - ❖ Governments must manage their own water while extending cooperation to the neighboring states.
- 

## **6.NOISE POLLUTION**

It may be defined as “the unwanted, unpleasant or disagreeable sound that causes discomfort for all living beings”. Sound intensity is measured in decibel (dB).

### **Types of noise**

- Industrial noise (drilling sound, mechanical saws)
- Transport noise (bus, trucks, motors, scooters, rail traffic noise)
- Neighborhood noise (Musical instruments, TV, VCR, Radios, telephones, loudspeakers ets)

### **Effects of Noise pollution**

- ✓ This affects human health, comfort and efficiency.
- ✓ It causes muscles to contract leading to nervous breakdown, tension.
- ✓ It affects health efficiency and behavior.
- ✓ loss of hearing due to excessive noise,
- ✓ impulsive noise also causes psychological and pathological disorders.
- ✓ Brain is also adversely affected by loud and sudden noise as that of jet and aero plane noise.
- ✓ Ultrasound sound can affect the digestive, respiratory, cardio vascular system.

- ✓ Rate of heart beat decrease or increase depending on the type of noise
- ✓ Blood is also thickened by excessive noises
- ✓ Optical system is also affected by noise pollution & lead to colour perception & loss of night vision

### **Control and preventing measures**

- ❖ **Source control** – acoustic treatment to machine surface, design changes, limiting the operational timings.
- ❖ **Transmission path intervention**- the source inside a sound insulating enclosure, construction of a noise barrier or provision of sound absorbing materials.
- ❖ **Oiling** – Proper oiling will reduce the noise from the machines.
- ❖ **Receptor control**: Protection of the receiver by altering the work schedule, by using ear plugs etc
- ❖ **Planting trees also act as effective noise barriers**
- ❖ **Different absorptive materials can be used to control interior noise.**

## **7.THERMAL POLLUTION**

It may be defined as the “addition of excess of undesirable heat to water that makes it harmful to man, animal or aquatic life or otherwise causes significant departures from the normal activities of aquatic communities in water”

### **Sources of thermal pollution**

1. **Nuclear power plants** (drainage from hospitals, research institutes, nuclear experiments & explosions, emission from nuclear reactors)
2. **Coal fired power plants** (some thermal power plants use coal as fuel, condenser coil are cooled & discharge the hot water back to the nearby lake, & kills the fish & marine organisms)
3. **Industrial effluents** (Textile, paper, pulp, sugar industries discharge wastes)
4. **Domestic sewage** (Municipal sewage has higher temperature which decrease the dissolved oxygen content & result in foul & offensive smell in water)
5. **Hydro – electric power.**

### **Effects of thermal pollution**

- Reduction in dissolved oxygen
- Increase in Toxicity
- Interference with biological activities
- Interference with reproduction
- Direct mortality
- Food storage for fish.

### **Control measures of thermal pollution**

- Cooling towers - This is used as a coolant wet cooling tower, dry cooling tower.
- Cooling ponds and spray ponds.
- Artificial lakes – The heated effluents can be discharged into the lake at one end and the water for cooling purposes from the other end.

## **8.NUCLEAR HAZARD:**

The radiation hazard in the environment comes from ultraviolet, visible, cosmic rays & microwave radiation which produce genetic mutations in man

### **Sources of Nuclear Hazards:**

Natural sources: Space which emits cosmic rays, soil, rocks, air, water, food, radioactive radon-222 etc.

Man-made sources: Nuclear power plants, X-rays, nuclear accidents, nuclear bombs, diagnostic kits etc.

### **Effects of Nuclear Hazards:**

- Causes delirium, convulsions & death within hours or days with brain exposure
- Eye cell die, forming cataracts with eye exposure
- Vomiting, bleeding of the gums, mouth ulcers etc.
- Blood vessel damage is indicated by red spots on the skin
- Nausea, vomiting & Infection of the intestinal wall can kill weeks afterwards
- Unborn children are affected by mental retardation or brain damage.

***Control measures from Nuclear Hazards:***

- Nuclear devices should never be exploded in air.
- In nuclear reactor coolants may be used to prevent extraneous activation products
- Tightly sealed boxes & closed cycle system can be used to decrease the radioactive emissions
- Production of radioisotopes should be minimized
- Minimum no of nuclear installations should be commissioned
- Fission reactions should be minimized
- The use of radio isotopes may be carried under jet of soil or water instead of gaseous forms
- Wet drilling may be employed along with underground drainage
- Extreme care should be exercised in disposal of industrial wastes
- Use of high chimneys & ventilations at the working place for dispersing radio-pollutants
- Disposal methods are the possible ways to distribute the radio-pollutants

***Disposal of Radioactive wastes:***

High level wastes (HLW) = They are dangerous & so converted them into inert solids & then buried deep into earth or stored in deep salt mines. Ex. Spent nuclear fuel

Medium level wastes (MLW) = MLW are solidified & are mixed with concrete in steel drums before buried in deep mines

Low level wastes (LLW) = LLW are disposed off in steel drums in concrete lined trenches

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# SOCIAL ISSUES AND THE ENVIRONMENT

## 1. SUSTAINABLE DEVELOPMENT

Meeting the needs of the present, without compromising the ability of future generations, to meet their own needs.

### **Dimensions of sustainable development**

Derived from interactions between society, economy and environment.

### **Aspects of sustainable development**

- Inter-generational equity = states to hand over safe, healthy & resourceful environment to future generation.
- Intra-generational equity = Technological development of rich countries should support the economic growth of poor countries.

### **Approaches for sustainable development**

- Developing appropriate technology - locally adaptable, eco-friendly, resource efficient and culturally suitable.
- Reduce, reuse, recycle [3R] approach – reduces waste generation and pollution
- Providing environmental education and awareness – changing attitude of the people
- Consumption of renewable resources – attain sustainability
- Conservation of non renewable resources – conserved by recycling and reusing
- Population control.

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## 2. WATER CONSERVATION

The process of saving water for future utilization is known as water conservation.

### **Need for water conservation**

- ✓ Changes in environmental factors
- ✓ Better lifestyles need more water
- ✓ Increase in population
- ✓ Deforestation decreases annual rainfall
- ✓ Over exploitation of ground water leads to drought
- ✓ Agricultural and industrial activities require more water.

### **Strategies of water conservation**

Reducing evaporation losses → can place asphalt below the soil surface

Reducing irrigation losses → sprinkling, drip irrigation, irrigation in early Morning / later evening reduces evaporation

Re use of water → treated waste water from washings, bathrooms can be used for gardening

Preventing of wastage of water → closing taps when not is use, repairing leakage, using small capacity taps etc

Decreasing run-off losses → Can be done by using contour cultivation or terrace farming

Avoid discharge of sewage. → discharge of sewage into water resources should be prevented

Methods of water conservation = 1. *Rain water harvesting*      2. *Watershed management*

## 3. RAINWATER HARVESTING:

It is technique of capturing & storing of rainwater for further utilization

**Roof top Rainwater Harvesting Method:(2)**

Method of collecting rainwater from roof of the building & storing it in the ground for future use.

Rain water is collected by PVC / aluminium pipe to the pit

The pit base is filled with stones & sand, which serve as sand filters

**Objectives of rain water harvesting (1)**

- To meet the increasing demands
- Raise the water table by recharging the ground water
- Reduce ground water contamination
- Reduce the surface run off loss & soil erosion
- Increase in hydro static pressure.
- Minimise water crisis & water conflicts

**Advantages of Rain water Harvesting (3):**

- Reduces the use of current
- Prevent drought
- Increase the water level in well
- Rise in ground water level
- Minimise soil erosion & flood hazards
- Upgrading the social & environmental status
- Future generation is assured of water.

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**4. WATER SHED MANAGEMENT –**

**Watershed** is defined as the land area from which water drains due to gravity into stream, lake etc.

The management of rainfall and resultant run-off is called **watershed management**.

**Objectives (1)**

- To minimize of risk of floods
- For improving the economy
- For developmental activities
- To generate huge employment opportu
- To promote forestry
- To protect soil from erosion.

**Factors affecting watershed (2)**

- Unplanned, uncontrolled, unscientific land use activities
- Deforestation, overgrazing, mining, construction activities
- Droughty climates affects the watershed.

**Watershed management Techniques (3):**

- Trenches (Pits)
- Earthen dam
- Farm pond
- Underground barriers (Dykes)

**Maintenance of Watershed (4):**

- Water harvesting
- Afforestation
- Reducing soil erosion
- Scientific mining & Quarrying
- Public participation
- Minimizing livestock population

**5. RESETTLEMENT AND REHABILIT**

**Causes**

Due to Developmental activities = dams, mining, roads, airports, etc

Due to Disaster (Natural disaster = earthquake, floods, droughts, landslides, avalanches, volcanic eruptions etc.)  
(Manmade disasters = Industrial accidents, nuclear accidents, dam bursts etc)

Due to conservation initiatives = national park, sanctuary, forest reserves, biosphere reserve etc.

**Resettlement:**

It is simple relocation / displacement of human population.

**Rehabilitation:**

Involves making the system to work again by replacing the lost economic assets, employment, land for building, repair damaged building etc.

**Rehabilitation issues**

- ✓ Displacement of tribal's increases poverty by losing home, land, jobs, food security etc
- ✓ Breakup of families
- ✓ Communal ownership of property
- ✓ Vanishing social and cultural activities like folk songs & dances
- ✓ Loss of identity between the people.

**Examples:** Sardar Sarovar Dam, the Theri dam Project, Pong Dam.

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## **6. ENVIRONMENTAL ETHICS**

Environmental ethics refers to the issues, principles and guidelines relating to human interactions with their environment.

**Function of Environment (1):**

- A life supporting medium for all organisms
- It provides food, air, water, & other natural resources
- Moderates the climatic conditions
- Disintegrates the waste discharged by the society
- Healthy economy depends on healthy environment.

**Environmental problems (2)**

- Deforestation
- Population growth & urbanisation
- Pollution due to effluent and smoke
- Water scarcity
- Land degradation.

**Solutions to environmental problems (3)**

- Reducing the energy sources & waste production
- Recycle and reuse of waste products
- Soil degradation must be minimized
- Sustainable development by conservation on resources
- Over-exploitation of natural resources must be reduced
- Protection of Bio – diversity
- Reducing the population & increase the economic growth

**Ethical Guidelines (4)**

- Love & honour the earth
- Should be grateful to plants & animals
- Should not waste your resources
- Should not steal from future generation
- Should not pollute & hold other living things
- Should not consume more materials
- Should share the precious earth resources

## **7. GREEN HOUSE EFFECT**

The progressive warming of earth surface due to blanketing effect of man made CO<sub>2</sub> in the atmosphere is ***green house effect***.

Green house gases- causing global warming are CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CFCs.

CO<sub>2</sub> is the most important green house gas.

Human activities increase the green house effect & raise the atmospheric temperature & this is called ***global warming***.

### ***Effect on global warming***

1. ***Sea level*** → glacial melting & thermal expansion of ocean raise the sea level
2. ***Agriculture and forestry*** → Climatic pattern shifts, rainfall is reduced, soils are dried, result in drought, less crop production
3. ***Water resources*** → Rainfall pattern change, Drought & Floods will become common, Rise in temperature will increase water demand
4. ***Terrestrial ecosystems*** → Animals & plants will have problems in adapting, They will be in Risk of extinction
5. ***Human health*** → As earth become warmer, floods & droughts become frequent, This increase waterborne diseases, infectious diseases caused by mosquitoes.

### ***Preventive Measures of Global Warming:***

- ❖ Reducing CO<sub>2</sub> emission by reducing use of fossil fuels
- ❖ Utilizing renewable resources like wind, solar, hydro power etc.
- ❖ Plant more trees
- ❖ Adopt sustainable agriculture.
- ❖ Use natural gas instead of coal
- ❖ Stabilize population growth
- ❖ Remove CO<sub>2</sub> by photosynthetic algae.

## **8. ACID RAIN**

- Normal rain is slightly acidic due to CO<sub>2</sub> gas.
- The pH of the rain water is further acidic due to SO<sub>2</sub> & NO<sub>2</sub> gases.

- This type of precipitation of water is called acid rain.

### **Formation of Acid rain:**

Thermal power plants, industries, & vehicles release nitrous oxide & sulphur dioxide into atmosphere

When these gases react with water vapour they form acids



### **Effects of acid rain**

#### **1. On Human beings**

- Destroy life – nervous, respiratory and digestive system
- Causes premature death from heart and lung disorders like asthma & bronchitis.

#### **2. On Buildings**

- Taj Mahal in Agra suffer due to  $\text{H}_2\text{SO}_4$  acid fumes released from Mathura refinery.
- British Parliament building suffered due to  $\text{H}_2\text{SO}_4$  rain
- Acid rain reduce the value of building, bridges, cultural objects etc.
- This increases the maintenance cost.

#### **3. On terrestrial and Lake Ecosystem**

- Reduces rate of photosynthesis, growth of crops, Fish population.
- Flies, mosquitoes & worm occur on the dead fishes
- Nitrogen, & phosphorous stay up in dead wastages.
- Biomass production is reduced & fish population decreases.

### **Control measures**

- ✓ By Clean combustion technologies
- ✓ Using pollution control equipments
- ✓ Replacement of coal by natural gas
- ✓ Liming of lakes and soils.
- ✓ Coal with lower sulphur content can be used
- ✓ Emission of  $\text{SO}_2$  &  $\text{NO}_2$  from industries can be reduced

## **9. OZONE LAYER DEPLETION**

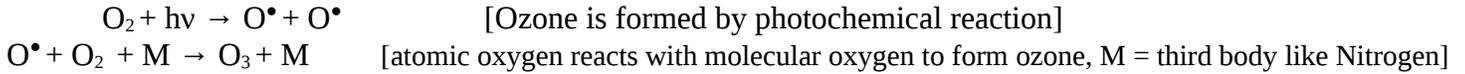
- Ozone gas  $\text{O}_3$  found throughout the atmosphere is formed in the stratosphere by photo - chemical reaction.
- It protects us from the Ultraviolet radiation of the sun.

- Recent evidence shown that ozone layer is becoming thinner & holes have developed.

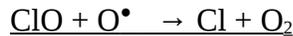
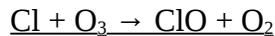
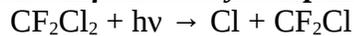
### Ozone depleting chemicals

- Chloro Fluro carbon (CFC) [Used in refrigerators, propellent, spray cans, blowing agent, foam agent],
- Hydro chloro fluoro carbon (HCFC), [Used in refrigerants, blowing agents]
- Bromo fluoroCarbon (BFC) [ Used in fire extinguisher].

### Formation of Ozone:



### Mechanism of Ozone layer depletion:



- In 1970 it was found that ozone layer was attacked by CFCs
- Each Chlorine atom attack ozone molecule.
- Loss in ozone increases the UV radiation reaching the earth surface.

### Effects

- On human health – Skin cancer, Non melanine skin cancer, slow blindness called keratitis,cataracts, Allergies, reduces human resistivity, infectious diseases etc.
- On aquatic systems- Affects phyto plankton which absorb more CO<sub>2</sub>, affects fish, larval crabs
- On materials- Degradation of paints, plastics, & other polymeric material result in economic loss.
- On climate – increasing the average temperature of the earth surface & cause global warming.

The amount of ozone is measured by Dobson spectrometer & expressed in Dobson units (DU).

1 DU is equivalent to a 0.01 mm thichkness of pure ozone at 1 atm pressure.

### Control Measures

- Replacing CFCs by less damaging materials
- Use of methyl bromide – crop fumigant should be controlled
- Manufacturing & using of ozone depleting chemicals should be stopped.

## 10. NUCLEAR ACCIDENTS & HOLOCAUST

The release of large amounts of nuclear energy and radioactive products into the atmosphere.

## **Examples**

### **1. Bhopal gas tragedy:**

On night of 3<sup>rd</sup> December 1984 in Bhopal city of Madhya Pradesh

At Union carbide India Ltd, which manufacture carbonate pesticides using methyl isocyanate (MIC)

Due to failure of coolant, the reactor got exploded & 40 tons of MIC leaked over 40 sq.km area.

**Nature of MIC:** It is a toxic gas, affects lungs, eyes & causes irritation in skin. Remove oxygen from lungs & cause death.

**Effects in Bhopal:** About 5000 persons died, 1000 became blind, 65,000 people suffered from eye, respiratory, neuromuscular problems.

### **2. Chernobyl Nuclear Disaster:(Nuclear Pollution)**

In April 26 1986, melt down of the Chernobyl nuclear reactor in Ukraine, Russia, has leaked out the radioactive rays & radioactive materials. This was happened due to poor reactor design & human error.

**Effects:** about 2000 persons died, more suffered due to degeneration of cells, severe bleeding, anaemia, skin cancer, animals plants was also affected more.

### **3. Nuclear holocaust in Japan:**

\* In 1945 two nuclear atom bombs were dropped on Hiroshima & Nagasaki cities in Japan.

\* This explosion emitted neutrons, gamma radiations, strontium (Sr\*<sub>90</sub>)

\*This Sr90 has the property of replacing calcium in the bones & so many people were affected by bone deformities

\*1,00,000 people were killed,

### **Effects of nuclear holocaust:**

- Nuclear winter [Black soot formed will absorb all UV-radiations & prevent UV radiation to reach the earth. This result in cooling effect & water evaporation will also reduce. This process opposite to global warming is called nuclear winter.
- Ignition of all combustible material, destroy all living beings, material crushing, destruction of homes

### **Control Measures**

- Suitable precautions to avoid accident
- Constant monitoring of the radiation level
- Checks and control measures done by Atomic Energy Regulatory Board.

## **11. WASTE LAND RECLAMATION**

**Waste land:** - The land which is not in use – unproductive, unfit for cultivation another economic uses.

### Types of waste land

1. **Uncultivable waste land** – Barren rocky areas, hilly slopes, sandy deserts.
2. **Cultivable waste land**- degraded forest lands, gullied lands. Marsh lands, saline land etc.

### Causes for waste land formation

- Soil Erosion, Deforestation, Water logging, Salinity.
- Excessive use of pesticides.
- Developmental activities, [Construction of dams, power projects, causes water logging].
- Over-exploitation of natural resources.
- Sewage and industrial wastes.
- Mining destroy forests & cultivable land.
- Growing demands for fuel, fodder, wood and food causes degradation and loss of soil productivity.

### Objectives of waste land reclamation

- To improve the physical structure and quality of the soil
- To prevent soil erosion
- To avoid over – exploitation of natural resources
- To conserve the biological resources.
- To improve the availability of good quality of water
- To supply fuel, fodder, timber for local use
- To provide source of income to the rural poor

### Methods of waste land reclamation

- Drainage
- Leaching
- Irrigation practices
- Green manures and bio fertilizers
- Application of Gypsum
- Afforestation programmes
- Social forestry programmes

## 12. CONSUMERISATION OF WASTE PRODUCTS

- Consumerisation – Consumption of resources.
- Traditionally favorable rights of sellers
- Right to introduce product, price, Incentives
- Traditionally buyer rights
- Right to buy, right to expect the product to perform as claimed

### Important information to be known by buyers

- About ingredients,
- Manufacturing dates,
- Expiry date, etc.
- Health and happiness.

### Objectives of Consumerisation

- Improves rights and power of the buyers
- Making the manufacturer liable
- Reuse and recycle the product
- Reclaiming useful parts
- Reusable packing materials
- Health and happiness.

SOURCES OF WASTES = Glass, papers, garbage's, food waste, automobile waste, dead animals etc.

E – Waste = Computers, printers, mobile phones, Xerox machines, calculators etc.

### Effects of wastes

Dangerous to human life

Degrade soil

Non biodegradable plastics reduce toxic gases.

Cadmium in chips, Cathode ray tube, PVC causes cancer and other respiratory problems.

### Factors affecting consumerisation and generation of wastes

- ✓ People over – Population
- ✓ Consumption over – Population.

## 13. ENVIRONMENTAL LEGISLATION AND LAWS – IMPORTANT PROTECTION ACTS

## **WATER ACT 1974:**

This act provides for maintaining & restoring the source of water  
Provides for preventing & controlling water pollution.

### ***Objectives:***

- To protect water from all kinds of pollution
- To preserve the quality of water
- Establishment of Central & State Boards for preventing water pollution
- Restrain any person for discharging sewage/effluent into any water body
- Any contravention of the standards leads to prison for 3 to 6 months
- Requires permission to set up an industry which discharges effluent.

### ***State pollution Control Board:***

- Take step to establish any industry, disposal system, extension/addition in industry, discharge of effluent into river
- Use any new / altered outlet for discharge of sewage
- Begin to make any new discharge of sewage.

***Punishment:*** Stoppage of supply of electricity, water / any other services  
Imprisonment for 1½ years to 6 years & Rs. 5000/- fine.

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## **AIR ACT 1981:**

Enacted in the Conference held at Stockholm in 1972.  
Deals with problems related to air pollution, quality of air etc.

### ***Objectives of air act:***

To prevent, control & abatement of air pollution  
To maintain the quality of air

### ***Important features of air pollution:***

- The Central Board settle disputes between state boards, provide technical assistance & guidance to State board.
- The State Board verify the emissions of air pollutants from industrial / automobile units
- The State Board Collect information about air pollution
- SB examine the standards of manufacturing process & control equipment
- SB can advise State Government to declare the heavily polluted areas & advice to avoid burning of waste products.
- Operation of industrial unit is prohibited in a heavily polluted areas
- Violation of law is punishable with imprisonment & Fine

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## **FOREST ACT 1980:**

Provides conservation of forests & related aspects.  
Arrest deforestation

### ***Objectives:***

To protect & conserve the forest  
To ensure judicious use of forest products

### ***Important Features of Forest Act:***

Forests are not diverted without the prior permission of the Central Government  
Land registered for forest may not be used for non-forest purposes  
Any illegal activity in a forest area can be stopped immediately  
Clearance of forest land for re-afforestation is forbidden  
One who violates the forest law is punishable.

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### **Wildlife Act 1972:**

Aimed protect & preserve wildlife.  
Wildlife refers to all animals & plants  
It is declining due to human actions for wildlife's skins, furs, feathers, ivory etc.

### ***Objectives:***

To maintain ecological process & life supporting system  
To preserve biodiversity  
To ensure a continuous use of species.

### ***Important Features:***

Covers the right & non-rights of forest dwellers  
Provides restricted grazing in sanctuaries & prohibits in national parks  
Prohibits the collection of non-timber forest.

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### **Environment Act 1986:**

It is a general legislation law to rectify the gaps & laps in above acts.  
This act empowers the Central Govt. to fix the standard of quality of air, water, soil & noise.

### ***Objectives:***

To protect & improvement of the environment  
To prevent hazards to all living creatures & property  
To maintain peaceful relationship between humans & their environment

### ***Important Features of Environment Act:***

Empowers safeguard measures to Prevent accidents which cause pollution.  
Gives remedial measures if accident occurs.  
The Govt. has authority to close or prohibit or regulate any industry & its operation  
One who violates the act will be punishable with fine upto one lakh  
If the violation continues, an additional fine of Rs. 5000/- per day is imposed  
The act empowers the officers of Central Government to inspect the site / plant / machinery for preventing pollution.  
Collects samples of air, water, soil or other material from any factory / its premises for testing.

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## **14. PUBLIC AWARENESS**

Our environment is presently degrading due to many activities like pollution, deforestation, overgrazing, rapid industrialization and urbanization.

### **Objectives of public awareness**

- Create awareness among people of rural and city about ecological imbalances, local environment, technological development and various development plants.
- To organize meetings, group discussion on development, tree plantation programmes exhibitions.
- To learn to live simple and eco-friendly manner.

### **Methods to create environmental awareness**

- ✓ In schools and colleges
- ✓ Through mass – media
- ✓ Cinema
- ✓ Newspapers
- ✓ Audio - Visual media
- ✓ Voluntary organizations
- ✓ Traditional techniques
- ✓ Arranging competitions
- ✓ Leaders appeal
- ✓ Non – government organizations.



- Unemployment and low living standard of people

## FAMILY WELFARE PROGRAMME

### Objectives

- Slowing down the population explosion
- Reducing Over exploitation of natural resources

### **Population Stabilization Ratio:**

*Developed Countries:* → Stabltn ratio = 1, indicate zero population growth  
*Developing countries* → stabltn ratio = nearing 3, expected to slow down by 2025

## FAMILY PLANNING PROGRAMME

### Objectives

- Reduce infant mortality rate.
- Achieve 100% of birth, death, marriage, pregnancy registration
- Encourage late marriages, late child-bearing.
- Improve women's health, education, employment.
- Prevent & Control of communal diseases.
- Promote small family norms
- Making free & compulsory education upto 14 yrs
- Constraint spread of AIDS

### **Fertility control methods:**

*Traditional method* → taboos and folk medicine

- Modern method* →
1. **Permenant method** (Sterlization done by minor surgery)
    - a) Tubectomy = female sterilization done by tying the tubes carrying ovum to uterus.
    - b) Vasectomy = male sterilization, done by tying the tubes carrying the sperms.
  2. **Temporary method**
    - a) Condoms = used by males to prevent sperms
    - b) Copper Ts = small objects placed by doctor in the uterus
    - c) Oral contraceptive pills, drugs

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## ENVIRONMENT AND HUMAN HEALTH

1. Physical Hazards – Radioactive and UV radiations, = affects the body cell, causes skin cancer  
Global warming = cause famine & mortality, Chlorofluro carbons = damage ozone layer,
2. Chemical Hazards – Combustion of Fossil fuels = Asthma & lung diseases, industrial effluence = cause cancer & death, pesticides = affect food chain, heavy metals = contaminate water.
3. Biological Hazards- Bacteria, Viruses, Parasites = Diarrhoea, malaria, parasitic worms, cholera\.

## HUMAN RIGHTS

Human rights are the fundamental rights, which are possessed by all human beings irrespective of their caste, nationality, sex and language.

IN 1948 Universal Declaration of Human Rights UNKHR was established by UN.

- Human right to freedom [*express views, forming union, building houses, choose any profession*]
- Human right to property [*right to earn property*]
- Human right to freedom of religion [*freedom to choose religion to his wishes*]
- Human right to culture and education [*right to conserve culture, language, establishing educational institution*]
- Human right to constitutional remedies [*can go to court, if fundamental rights are denied*]
- Human right to equality [*all citizens are equal before law without discrimination of religion, sex, caste, place*]
- Human right against exploitation [*children should not be employed as labours*]
- Human right to food and environment [*right to get sufficient food, safe, water, healthy environment*]

- Human right to good health [*right to have very good physical and mental health*].
- 

## **INDIAN CONSTITUTION**

Article 14 → provides equality

A15 → prohibits discrimination on caste,sex, religion

A 16 → equal opportunity for all citizens

A 19 → freedom of speech, expression,forming union

A 20 → protection from convection

A 22 → rights of person in custody

A 23 → prohibits traffic in human being

A 24 → prohibits explosion of labour children

A25 → freedom of profession, religion & practice

A2 → right to establish charitable & religious institution

A 27 → prohibits paying tax for any religion

A 28 → guarantees secular character in educational institution

A29 → guarantees to conserve language of minorities

A 30 → right of linguistic minority

A 32 → right to constitutional remedies

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## **VALUE EDUCATION**

It is nothing but learning about the particular thing through knowledge. We can identify our values and ourselves with the help of knowledge and experience.

### ***Types***

1. Formal education-

*Self related learning process, all will read, write, get jobs, tackle any problem with formal education .*

2. Value education –

*Analyze our behavior, provide proper direction to youth, know right & wrong.*

3. Value-based environment education-

*knowledge about principles of ecology, biodiversity, care for natural resources, know to safe and clean environment.*

### ***Objectives***

- ✓ To improve the integral growth of human begins.
- ✓ To create attitudes and improvement towards sustainable lifestyle.
- ✓ To increase awareness about our national history our cultural heritage, constitutional rights, national integration, community development and environment.
- ✓ To create and develop awareness about the values and their significance and role.
- ✓ To know about various living and non- living organisms and their interaction with environment.

### ***Concept of value Education:***

- Why & how can we use less resources & energy?
- Why do we need to keep our surrounding clean?
- Why should we use less fertilizers & pesticides?
- Why it is important to save water & keep our water sources clean?

### ***Methods of Imparting value Education:***

Telling

Modeling

Role Playing

Problem Solving

Studying biographies of great man

= presenting ideas to leaner's as model

= Acting the role of another person

= Asking the learners about their decision during dilemma

= use of great man good deeds & worthy thoughts.

### ***Types of values***

#### **Universal values-**

*[Importance of the human conditions, reflect in life, joy, love, compassion, tolerance, truth etc].*

#### **Cultural values**

-[Right, wrong, good and bad, behavior of human being].

Individual values-

[Individual personality and experiences, parents & teachers are main key to shape individual values].

Global values-

[Human civilization, if harmony is disturbed anywhere there will be an ecological imbalance].

Spiritual values- [Self-restraint, discipline, reduction of wants]

HIV /AIDS

AIDS is the abbreviated form for **Acquired Immuno Deficiency Syndrome** caused by a virus called HIV (**Human Immune deficiency Virus**).

**Scenario in India:** India ranks 2<sup>nd</sup> with 5.1 million HIV affected people. The % is lower than Thailand, Myanmar & South Africa

**Origin of HIV/AIDS**

1. Through African Monkey or Chimpanzees to human.
2. Through Vaccine Programme  
(a) Polio, small pox vaccine prepared from monkey's kidney-Africa.  
(b) spread through Hepatitis-B viral vaccine-Los Angles and New York.  
(c) through small pox vaccine programme of Africa

**Factors influencing modes of Transmission of HIV**

1. Unprotected sex with infected person.
2. Using needles or syringes from HIV positive person.
3. During pregnancy, breast feeding HIV transmits from mother to infant babies.
4. Blood transfusion during accident and pregnancy.
5. Biologically the male to female transmission is 2 to 4 time more efficient than female to male transmission.
6. Women's cervical tissue is more vulnerable to HIV than men.
7. Transmission of HIV to new born babies happen easily

**Factors not influencing transmission of HIV**

1. Tears, food, air, cough, handshake and normal kissing.
2. Mosquito flies and insect bites.
3. Sharing of utensils, clothes, toilets and bathroom.

**Functions of HIV in human body**

- White blood cells (WBC) are responsible for the formation of antibodies called T-helper cells'
- T- helper cells are the key infection fighters in the immune system.
- Once HIV cells are enter into the boy they destroy the T-cells & cause many infection diseases.

**Symptoms**

**I. Minor symptoms**

- ✓ Persistent cough for more than one month.
- ✓ General skin disease.
- ✓ Viral infection.
- ✓ Fungus infection in mouth and throat.
- ✓ Frequent fever, headache and fatigue.

**II. Major symptoms**

- ✓ Fever for more than one month
- ✓ Diarrhea for more than one month.
- ✓ Cough & TB for more than one month.
- ✓ Fall of hairs.
- ✓ 10% of body weight loss within short period.

**Control and Preventive measures**

- Education. → [health education, avoid sharing razors, needles and syringes]
- Prevention of Blood borne HIV transmission. → [screening of blood for HIV before transmission & following strict sterilization in hospitals]
- Primary health care → [AIDS awareness programme, participation of voluntary health agencies].
- Counseling services → [counseling through phone or through telephone].
- Drug treatment → [Early medical care, taking nutritious diet, maintaining stress free mind].

### **Effects**

- Death
- Loss of labor & level of production decreases
- Inability to work due to lack of energy & frequent fever & sweating
- More water is needed for maintaining hygiene in AIDS affected locality.

### **WOMANS WELFARE**

#### ***Need of Women Welfare***

Women suffer gender discrimination  
Devaluation at home, matrimony, workplace, public & power  
Dowry death, rape, domestic violence, mental torture to women,  
Human rights are violated, decision making are neglected

#### ***Objectives***

- ❖ To provide education
  - ❖ To impart vocational training
  - ❖ To generate awareness
  - ❖ To improve employment opportunities
- To restore dignity, equality and respect.  
To aware problems of population

#### ***Objectives of A National Commission For Women***

To examine constitutional & legal rights for women  
To review existing legislations  
To sensitize the enforcement & administrative machinery to women's causes.

#### ***Various Organisation Towards Women Welfare:***

The National Network for Women & Mining (NNWM) → fighting for gender audit of India's mining companies

United Nations Decade for Women → inclusion of women welfare related issues on international agenda.

International Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW)

→ Protection & Promotion of women's upliftment

Non-Government Organizations (NGO's) → Empower, educate village women & making self-dependent

Ministry for Women and Child Development → work for upliftment of women by family planning, health, education & awareness

### **CHILD WELFARE:**

#### ***Reason for child Labours:***

Poverty → work in unhealthy conditions  
Want of Money → parents need money for their family

#### ***Various Organisation towards Child Welfare:***

1. UN Conventions on Rights of Child or International Law → promote & protect children in our society

Rights of the Child:

The right to survival → emphasizes on good health, nutrition, standard of living

The right to participation → freedom of thought to the child

The right to development → ensures education, care, support, social security & recreation

The right to protection → freedom from exploitation, inhuman treatment & neglect

2. World summit on children → well being of the children is targeted

3. Ministry of Human Resource Development (MHRD) → concentrate on child's health, education, nutrition

Environmental degradation & child welfare → children are most affected due to pollution, even child

in mother's womb is affected by environmental toxins

Center for Science & Environment (CSE) → keeping environment clean for healthy life of children

## ROLE OF INFORMATION TECHNOLOGY IN ENVIRONMENT

Information technology means collection, processing storage & dissemination of information.

### 1. **REMOTE SENSING [RS]**

- Gathering information about an object without coming in contact with it is called remote sensing.
- Any force like acoustic, gravity, magnetic, electromagnetic etc. could be used for remote sensing.

#### **Applications**

In agriculture → *RS provide information about land, water management, use of seeds, fertilizer input etc*  
Forestry → *Information on type, density & extent of forest cover, wood volume, forest fire, pest etc.*  
Land cover → *Gives spatial information on land, RS data is converted to map*  
Water resources → *surface water body mapping, ground water targeting, flood monitoring, water quality monitoring, run-off modeling, irrigation water management*

**2. DATA BASE-** Collection of inter related data on various subjects.

#### **Applications**

\*Ministry of environment and forest → *compile data on biotic communities, diseases like HIV, malaria, fluorosis*  
\*National Management Information System (NMIS) → *DB on R&D projects, research scientists etc.*  
\*Environmental Information System (ENVIS) → *DB on pollution control area, clean technology, biodiversity, remote sensing, environmental management, desertification etc*

### 3. **GEOGRAPHICAL INFORMATION SYSTEM (GIS)**

It is a technique of superimposing various thematic maps using digital data on a large number of inter-related aspects.

#### **Application**

- Thematic maps are super imposed using soft wares.
- Interpretation of polluted zones, degraded lands
- To check unplanned growth and related environmental problems.

### 4. **SATELLITE DATA**

- ❖ Helps in providing reliable information and data about forest cover
- ❖ Provide information about forecasting weather, smog, ozone depletion
- ❖ Reserves of oil, minerals can be discovered.

**5. WORLD WIDE WEB** → It provides **Current data**.

#### **Applications**

- Online learning
  - Digital files or photos, animations on environmental studies.
- 

## **ROLE OF INFORMATION TECHNOLOGY IN HUMAN HEALTH**

The health service technology involves three systems

- Finance and accounting
- Pathology

- Patient Administration – clinical system.

### **Applications**

- Data regarding birth and death rates, immunization, sanitation programme are maintained
  - Helps doctor to monitor the health of the people effectively
  - The information regarding the outbreak of epidemic diseases.
  - Online Consultation with expert doctors for better treatment.
  - Drugs and its replacement
-