

## ENVIRONMENTAL STUDIES

### UNIT-IV

#### SOCIAL ISSUES AND THE ENVIRONMENT

##### **BASIC TERMS & DEFINITIONS**

Sustainable development	Meeting the needs of the present generation without compromising the ability of future generation.
Urban sprawl	Spreading of cities in to sub-rural and sub-urban areas.
Urbanisation	The movement of people from rural areas to urban areas
Rain water harvesting	Rain water harvesting is a technique of increasing the recharge of ground water by capturing and storing of rain water .
Watershed management	The land area from which water drains under gravity to a common drainage channel.
Greenhouse effect	Troposphere, the lowermost layer of atmosphere , traps heat by a natural process due to the presence of certain gases.
Waste lands	Economically unproductive lands suffering from environmental deterioration
Wildlife	Undomesticated life forms
Rehabilitation	Re –establishing the outeetes or restructureing the ecological systems that has been degraded.
Drip irrigation	Use of preforated 0 tubes that give out water dropwise to the soil around each plant.

Sustainable development is defined as “meeting the needs of the present without compromising the ability of the future generation to meet their own needs”. Our natural resources are just dividing due to over exploitation. if growth continuous in the same way, very soon we will be facing a doom’s day.

The earth summit held at Riodojaneiro, Brozi. The rio declaration aims at a new & equitable global partnership through the creation of new levels of cooperation among states.

Out of five significant agreements agenda, 21 proposes a global program of action on sustainable development in social, economic and practical context to the 21 century.

These are the key aspects for sustainable development.

##### **(a) Inter-generational equity:-**

1. This emphasized that we should minimize adverse impacts on resources and environment for future generation i.e., we should hand over a safe , healthy & resourceful environment to our future generation.

This can be possible only if we stop over exploitation of resources, reduce waste discharge and emission & maintain ecological balance.

**(b) Intra-generational equity:-**

This emphasized that the development process should seek to minimize the wealth gaps within and between nations. The technology should address the problems of the developing countries, producing drought tolerant varieties for uncertain climates, vaccines for infectious diseases, clean fuels domestic and industrial use.

This type of technological development will support economic growth of the poor and help in narrowing the wealth gap and lead to sustainability.

**MEASURES FOR SUSTAINABLE DEVELOPMENT:-****1. USING APPROPRIATE TECHNOLOGY:-**

It is one which is locally adaptable, eco-friendly resource efficient and culturally suitable indigenous technologies are more useful, cost effective and sustainable.

Nature is often taken as a model, using the natural conditions of that region as its components. This concept is known as design with nature.

The technology should use less of resources and should produce minimum waste.

**REDUCE, REUSE, RECYCLE APPROACH:-**

The 3-R approach advocating of resource using them again and again instead of passing it on to the waste stream and recycling the materials goes a long way in achieving the goal of sustainability.

It reduces pressure on our resources as well as reduces waste generation and pollution.

**PROMPTING ENVIRONMENTAL EDUCATION AND AWARENESS:-**

1. Making environmental education the center of all learning process will greatly help in changing the thinking and attitude of people towards our earth and environment.
2. Introducing the subject right from the school stage will inculcate a feeling of belongingness to earth in the small children.

**RESOURCE UTILIZATION AS PER CARRYING CAPACITY**

Any system can sustain a limited number of organisms on a long term basis which is known as its carrying capacity.

Human beings the carrying capacity concept become more complex. Human beings not only need food to live, but need so many other things to maintain the quality of life.

Sustainability of a system depends largely upon the carrying capacity. Carrying capacity has two basic components

1. Supporting capacity i.e, the capacity to generate.
2. Assimilative capacity i.e the capacity to tolerate different stresses.

**GYPHOSAM AMENDMENT:-**

Amendment of sodic soils with gypsum is recommended for reducing soil sodicity as calcium of gypsum replaces sodium from exchangeable sites

**GREEN-MANURES, FERTILIZERS AND BIOFERTILIZERS:-**

Application of farm yard manure or nitrogen fertilizers have been found to improve saline soil. Blue green algae have been found to be quite promising as bio fertilizers for improving salt affected soils.

**Afforestation programs:**

National commission on agriculture (NCA) launched several Afforestation schemas in the IV to cope up with the problem of spreading wasteland. The national wasteland development board in the ministry of environment & million hectares of wasteland annually under fire wood & fodder plantation

***Social forestry programmers:***

**These programmers mostly involve strip plantation on road rail & annual sider rehabilitation of degraded forest lands , form-forestry wasteland forest development**

**URBAN PROBLEMS RELATED TO ENERGY**

1. Cities are the major centers of economic growth, trade, education innovations & employments.
2. A big majority of human population lived in rural areas & their economic activities centered around agriculture, cattle rearing fishing, hunting or some cottage industry.
3. 50% of the world population in urban area & there is movement of rural folk to cities in search for employment.
4. Thus urban growth is so fast than it is becoming difficult to accommodate all the industrial commercial and residential facilities within a limited municipal boundary spreading of the cities into the sub-urban or rural areas too, a phenomenon known as urban sprawl.
5. in developing counters too urban(growth) population is very fast and in most of the cases it is un-contractible and un planned growth.
6. in contrast, to the rural set up urban set up is densely populated, consumers a lot of energy and material and generates a lot of waste.

Energy requirement of urban population are much higher than that of rural ones b/c urban people have a higher standard life and there life style demand more energy inputs in every sphere of life.

- ❖ Residential and commercial lighting.
- ❖ Transportation means including auto mobiles and public transport for moving from residency to work place.
- ❖ Modern lifestyle using large number of electrical gadgets in everyday life.
- ❖ Industrial plans using a big proportion of energy.
- ❖ A large amount of waste generation which has to be disposed properly using energy based techniques.
- ❖ Control and prevention air and water pollution which need energy dependent technologies.

Due to high population density and high energy demanding activities the urban problem and related to energy or much more magnified as compared to rural population.

**GLOBAL ENVIRONMENTAL PROBLEMS & GOBAL EFFORTS**

The problems caused by pollutants such as NO<sub>x</sub>, Sox etc are now worldwide issues. Heating of earth surface; poor air quality in urban areas; the formation of acid rains, depletion of ozone layer; emission of gases are of our environmental issues which are to be studied.

**Green House Gases (GHG) & Green House Effect:** Greenhouse gases are those that can absorb and emit infrared radiation. In order, the most abundant greenhouse gases in Earth's atmosphere are: water vapor; carbon dioxide; methane; nitrous oxide; ozone. In addition to the main greenhouse gases listed above, other greenhouse gases include sulfur hexafluoride, hydrofluorocarbons, CFC's etc.

Chloro Fluoro Carbons are non – toxic; non-flammable contains fluorine, carbon and chlorine atoms. The five main CFCs are the:

CFC- 11 (Trichloro Fluoro Methane ...  $\text{CFCl}_3$ )

CFC- 12 (Dichloro Fluoro Methane ...  $\text{CF}_2\text{Cl}_2$ )

CFC- 113 (Trichloro Tri Fluoro Ethane ...  $\text{C}_2\text{F}_3\text{Cl}_3$ )

CFC- 114 (Dichloro Tetra Fluoro ethane  $\text{C}_2\text{F}_4\text{Cl}_2$ )

CFC-11 5 (Chloro Penta Fluoro ethane  $\text{C}_2\text{F}_5\text{Cl}$ )

**The major uses of CFCs are:**

→ As coolants in refrigerators (CFC 11, 12, 113,114,115);

→ In air-conditioners and in fire extinguishers (Halogen + HCFC 123);

→ as solvent in cleaning particularly electronic circuit boards (Methyl chloroform and Carbon Tetrachloride).

→ CFC's are used as sterilization agent in medical field (mixture of  $\text{CFC}_{12}$  & ethylene oxide) and propellant in aerosols like deodorants; shaving foam, perfumes etc.

Man made CFC's however, are the main cause of stratospheric ozone depletion. CFCs have a

lifetime in the atmosphere of about 20 to 100 years and as a result one free chlorine atom from CFC molecule can do a lot of damage. Methane ( $\text{CH}_4$ ): The major source of methane is extraction from geological deposits known as Natural gas and used as fuel. Since it is a gas at normal conditions, methane is distributed through pipe lines. It is also called as LNG (Liquefied Natural Gas). Methane reacts with halogens and produce Methyl Chloride ( $\text{CH}_3\text{Cl}$ ), Chloroform ( $\text{CHCl}_3$ ) and Carbon tetrachloride ( $\text{CCl}_4$ ).

Since the beginning of the Industrial Revolution, the burning of fossil fuels has contributed to the increase in carbon dioxide in the atmosphere from 280 ppm to 390 ppm. When these gases are ranked by their direct contribution to the greenhouse effect, the most important are:

Gas	Formula	Contribution (%)
Water vapor	$\text{H}_2\text{O}$	36 – 72 %
Carbon dioxide	$\text{CO}_2$	9 – 26 %
Methane	$\text{CH}_4$	4 – 9 %
Nitrous oxides	$\text{NO}_x$	3 – 7 %
Ozone	$\text{O}_3$	3 – 7 %

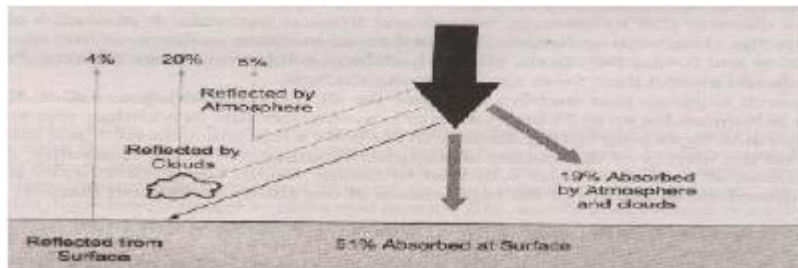
Of these gases,  $\text{CO}_2$  accounts for about 55% of the earth's Green House effect. Other gases are capable of changing the energy balance and causes for increase of temperature of the earth. A number of changes usually take place in the energy which comes from the sun through the atmosphere. In detail: 26% of the energy is reflected back to the space by clouds and particles whereas about 19% of the energy is absorbed by some of the gases especially ozone in the atmosphere. 4% is reflected from the surface back to space. Of the remaining 51% of the solar energy is then used in a number of process including the heating of the ground surface, evaporation of water.

**The main sources of greenhouse gases due to human activity are:**

- Burning of fossil fuels and deforestation leading to higher carbon dioxide concentrations in the air.
- Use of chlorofluorocarbons (CFCs) in refrigeration systems, and use of CFCs and halogens in fire suppression systems and manufacturing processes. Some halogens are used in fire
- extinguishers; they in turn produce CFC's. Hence, CFC emissions increases in the atmosphere and then causing Green House Effect .

- d. → Agricultural activities, including the use of fertilizers that lead to higher nitrous oxide (N<sub>2</sub>O) concentrations.

**Green House effect** is a naturally occurring process that aids the heating of the earth's surface and atmosphere. Green House effect results from the gases such as CO<sub>2</sub>; CH<sub>4</sub> (methane); N<sub>2</sub>O (Nitrous Oxide); CFC's; Halogens (F, Br, Cl, I) and O<sub>3</sub>. Ultimately, the Green House effect may lead to the death of both plants and animals including human beings.



**Global Warming:** Earth has become warmer over the last century. As a result of higher concentrations of gases (especially CO<sub>2</sub>); the earth's climate become warmer and this is referred to as Global Warming. Reports that the average climate / temperature of the earth has increased during the twentieth century by about 0.6°C (+/- 0.2°C). The IPCC (Inter-government Panel on Climate Change), a group established by the World Meteorological Organization (W M O) and The United Nations Environment Programme (UNEP) revealed the following effects of global warming:

- Global warming causes, rate of precipitation decreases on land and causes a decrease of rainfall by 40% all over the world.
- Sea level raises and low lying areas will be inundated (to cover an area of land with water)
- Global Warming change the direction of wind.
- CFC's convert O<sub>3</sub> into oxygen and oxygen radical and thus ozone depletes in the atmosphere.
- Global temperature will increase atleast by 4°C.
- Decrease of earth's albedo (the amount of sun light reflection by the earth's surface to the moon).
- People suffer from many undiagnosible diseases.
- CFC-11; 12 and 113 in the atmosphere for a longer period harmful to the human beings.

#### **Solutions for Global Warming:**

- By reducing the emissions of Green House gases.
- Clean electricity technologies such as wind mills/turbines; solar panels; tidal energy etc are to be used
- Bio-fuels (Ex: ethanol - a type of alcohol) and Bio-diesel could substantially cut down the CO<sub>2</sub> emission.
- By avoiding the driving of vehicles (walking / bicycling is to be followed)

#### **Climate Change & their impacts on Human Environment:**

The weather conditions and seasonal variations in a region over a long period are called the average temperature in many regions has-been increasing in recent decades. Globally, 1990 was the warmest decade on record. Climatologists of the Inter-governmental Panel on Climate changes (IPCC) have carried out several experiments in order to estimate the changes in climate. Accordingly, First Assessment Report (FAR) was completed in 1990 and Second Assessment Report (SAR) in 1997.

#### **Following are the main points from the climate reports:**

- The concentration of Green House Gases in the atmosphere such as CO<sub>2</sub>; Methane; Nitrous Oxide have all increased markedly since 1750 and now exceeded the levels.
- Emissions of Carbon dioxide from fossil fuel has been increased from 1990's onwards. The Third Assessment Report (TAR) on climate change 2001 is the most comprehensive and up-to-date scientific assessment of past, present and future climate change. The report:
  - Analyses an enormous body of observations of all parts of the climate system.
  - Increasing concentrations of atmospheric greenhouse gases.

- Assesses our understanding of the processes and feedbacks which govern the climate system.
- Projects related to scenarios of future climate change using a wide range of models of future emissions of greenhouse gases and aerosols. Fourth Assessment Report was released in 2007 and concluded that 90% of human beings are caused for Global Warming.
- The concentration of the Carbon Dioxide in the atmosphere (379 ppm in 2005) is higher than the past years (180 to 300 ppm) mainly due to fossil fuel usage.
- The studies have also shown that in the near future the Global surface temperature will rise by 1.4°C to 5.8°C and leads to floods and/or droughts.
- The Global mean sea level is projected to rise by 9.88 cm by the year 2100.
- The studies / reports also stated that a few regions such as NILE

**Delta:** in Egypt and Ganges – Brahmaputra delta in Bangladesh may become vulnerable (liable to be damaged). Finally, it was concluded that continued Green House Gas emissions because further Global warming and induce many changes in the Global climate system during the 21st century.

#### **Impacts on Human Beings:**

- Human environment will be seriously affected by extremes of climate by means of Floods and Droughts.
- Due to extreme changes in Climate, Human beings suffer from safe drinking water.
- Changes in climate may affect the distribution of vector species (Ex: mosquitoes) which in turn spread infectious diseases such as Malaria; Filariasis, Dengue, diarrhea; Yellow fever etc.
- The reduction in food production would lead to starvation.
- Climate change could lead to migration of humans.

#### **Ozone Layer and Ozone layer depletion:**

The earth's atmosphere is composed of several layers.

EXOSPHERE:	The outer most layers extended up to 960 ms.
THERMOSPHERE:	Layer extended up to 400 km from Mesosphere.
MESOSPHERE:	Another layer extended up to 80km from the surface of the earth.
STROTOSPHERE:	Next layer extended up to 50 km from the surface of the earth.
TROPOSPHERE:	Lower layer extended up to 18 km from the surface of the earth.

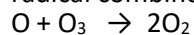
**Ozone Formation:** Ozone is a form of oxygen that has three atoms in each molecule (O<sub>3</sub>). Ozone is bluish colored and highly poisons gas that has a boiling point of 112°C. At atmospheric pressure, ozone can partially dissolve in water. At standard temperature and pressure, the solubility of ozone is thirteen times that of oxygen.

Standard Temperature and Pressure: STP is commonly used to define standard conditions for temperature and pressure which is important for the measurements and documentation of chemical and physical processes. *STP is defined by IUPAC (International Union of Pure and Applied Chemistry) as air at 0°C (273.15 K, 32 °F) and 105 pascals or 100 kPa.*

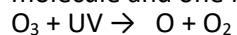
Ozone is formed by the action of sunlight on oxygen. When normal oxygen absorbs solar ultra violet radiation; splitting oxygen molecules into radical oxygen (O). This atomic oxygen quickly combines with further oxygen molecules to form ozone. This action takes place naturally in the atmosphere.



**Destroy of Ozone Layer:** *Two different processes destroy ozone naturally:* The first is when a free oxygen radical combines with an ozone molecule to produce two diatomic oxygen molecules.



The other process when ozone molecules absorb ultraviolet radiation and form one diatomic oxygen molecule and one free oxygen radical.



### Ozone Depleting Substances (ODS)

Ozone Depleting Substances (ODS) are those which deplete the ozone layer. The ODS's Chloro Fluoro Carbons (CFS's) Hydro Chloro Fluoro Carbons (HCFS's)

Methyl Chloroform Carbon Tetrachloride and Halogens (MCCTH's)

#### Effects on human beings:

- Ozone makes human beings eyes itch, burning sensation.
- It lowers the human body resistance power and leads to cold and pneumonia.
- Ozone reacts with tissues and cause for breathing and decrease the working ability of the lungs
- The thinning of the ozone layer may lead to an increase of skin cancers.

### ACID RAINS

When fossil fuels such as coal, oil and natural gas are burned. Chemical like sulphurdioxide and nitrogen oxide are produced. These chemicalreact with water and other chemicals in the air to form sulphuric acid ,nitric acid and other harmful pollutants like sulphate and nitrates. These acid pollutants spread upward into the atmosphere and are carried by air. air currents to finally return to the ground in the form of a acid rain, fog (or)snow.

Acid rain term first used by Robert Angus in 1992 literally means the presence of excessive acids in rain water. Acid rain is a mixture of sulphuric acid and nitric acid. Otherpollutants carbon dioxide, hydrocarbons, suspended particulate matter also acts as precursors to acid rain.

Acid rain is only one component of acid deposition .Acid deposition is the total of wet acid deposition and dry deposition.

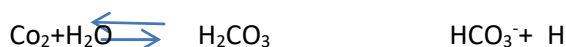
#### DRY DEPOSOSITION:-

Dry deposition is the process by which particulars such as flashy (or) gases so<sub>2</sub> (or) NO are deposited or absorbed onto surface.

#### WET DEPOSITION:-

The process by which acids are deposited through rain (or) snow is frequently called wet deposition acid rain, snow, dew, fog; represent the wet form of deposition.

Rain water is turned acidic when its ph below 5-6 at 20<sup>0c</sup> b/c the formation of carbonic acid due to dissolution of co<sub>2</sub> in water.



The Adirondack lakes located in the state of new-york are known to receive acid rain.

The strong acid like sulphuric acid (H<sub>2</sub>SO<sub>4</sub>)& Nitric acid(HNO<sub>3</sub>) dissolved (or) formed in rain water dissociate(or) release hydrogen ions there by increasing the acidity in rain drop.

Generally sulphuric acid forms a major fraction of acid rain followed nitric acid & a very small fraction of other acid however in urban areas.

Calcium (ca<sup>2+</sup>), magnesium (mg<sup>2+</sup>) & ammonium ions help to neutralize the rain drops shifting the overall H<sup>+</sup> towards basic scale.

In the absence of rain, dry deposition of acid may occur acid forming gases like oxides of sulphur & nitrogen and acid resolves get deposited on the surface of water bodies, vegetation, soil and other materials on moist surface (or) in liquids there acid forming gases & dissolve & form acids similar to that formed in acid rain. Fine particles (or) acid droplets can act as nuclei for water to condense to form rain droplets. By such process  $H_2SO_4$  is incorporated into the droplets .In the clouds additional  $SO_2$ & $NO_2$  contact the droplets & absorbed which can be oxidized by dissolved  $H_2O_2$ .In the droplets falling from the clouds additional decreasing their  $P^h$ . a unit decrease in  $P^h$  value causes 10 times increase in acidity.

#### **EFFECTS:-**

Acid rain indirectly affects plants by removing nutrients from soil in which they grow.it Affects trees more directly by creating holes in the waxy coating of leaves ,causes brown dead spots which affect the plants photosynthesis.

- It damage the metals & car finishes.
- Acid rain also result in corrosion of metallic surface & components in building, railways etc.....
- It causes deterioration of buildings especially mode of marble .e.g. monuments Tajmahal. Crystals of calcium & magnesium sulphate are formed as a result of corrosion caused by acid rain.
- Acid rain that falls (or) flows on ground water to reach river, lakes & wet lands causes water in them to become acidic .This effects plants & animal life in aquatics ecosystem.
- Precipitation results in damage in to leaves & hence plants & trees retards the growth. The injury to leaf includes damage to couplets, spotting & necrosis of leaves.
- Other impacts of acid rain on vegetation/ crops include increased sensitivity of drought & disease.
- Impacts on human physiology includes effects on nervous system, respiratory digestive system. However the severity of the effects depend on ph , age, health condition etc.
- Aquatics life especially fish are badly affected by Lake Acidification.
- It results in reprove life failure & killing of fish.
- Aquatics animals suffer from toxicity of metals such as aluminums, mercury, zinc, from the surrounding rocks due to acid rain.

#### **CONTROL MEASURES:-**

An erosion of  $so_2$ & $NO_2$  from industries & power plants should de- reduced by using pollution control equipments.

- ❖ Liming of lakes & soils should be done to correct the adverse effect of acid air.
- ❖ A coating of protective layer inert polymer should be given in the interior of water for drinking water.
- ❖ The best way to stop the formation of acid rain is to reduce the emissions by using  $H_2SO_4$ & $NO_4$  into the atmosphere. this can be achieved by using less energy from fossil fuel in power plants , vehicles& industries.



If the pollutions have already been formed by burning fossil fuels, they can be prevented from entering the atmosphere by using scrubbers in the smokestacks.

### **WATERSHED MANAGEMENT**

River originate in streams that flow down mountains & hill slopes .A group of small streams flow downhill slides to meet larger streams in the valley, which forms the tributaries of major rivers. The management of a single unit of land with its water drainage system is called water management.

In the water shed the hydrological conditions are such as that water becomes concentrated with in a particular location like a river by which the interactions of soil ,landform, vegetation land use activity & water people & animals are an integral part of a watershed having mutual impacts on each other.

A watershed affects as it is directly involved in sustained food production, water supply for irrigation, power generation, transportation as well as far influencing sedimentation and erosion, vegetation growth floods and drought. Thus management of watersheds treating them as a basic functional unit.

#### **Watershed Degradation:**

The watersheds are very often found into be degraded due to uncontrolled, unplanned& unscientific land use activities

- Overgrazing, deforestation, mining, construction activities, industrialization.
- Shifting cultivation, natural & artificial fires, soil erosion & ignorance of local have been responsible for degradation of various watershed

#### **OBJECTIVES OF WATERSHED MANAGEMENT:-**

- ∑ Conserving soil & water.
- ∑ Improving the ability of land to hold water for more efficient & sustained production.
- ∑ To minimize the risk of floods , droughts & landslides.
- ∑ To develop rural areas in the region with the clear plans for improving the economy of the region.
- ∑ Checking soil erosion & reduce the effect of sediment yield on the watershed.
- ∑ To manage the watershed for beneficial development activities like domestic water supply, irrigation, hydro power generation etc...

#### **WATERSHED MANAGEMENT PRACTICES:-**

In the fifty year plan, water management process was included a number of programs for it & a national policy was developed.

The practices of conservation & development of land & water are taken up W.R.To their suitability for people benefit as well as sustainability.

**VARIOUS MEASURE TAKEN UP FOR MANAGEMENT INCLUDE THE FOLLOWING:-**

❖ **WATER HARVESTING:-**

Proper storage of water is done with provision for use in dry seasons in low rain fall areas. it also helps in moderation of flood.

❖ **AFFOESTATION & AGRO FORESTRY:-**

- The water shed development afforestation crop plantation play a important they help to prevent soil erosion & retention of moisture.
- In high rainfall areas Woodley trees are grown in b/w runoff & loss of fertile soil
- Woody trees grown successfully in such agroforestry programs include dalbergiaSassoon (shisha)acetonegrand's(teak)& acacia Nilotic a (creeker) which have been used in watershed areas of river Yamuna.

**MECHANICAL MEASURES FOR REDUSING SOIL EROSION & RUNOFF:-**

Several machining measures like terracing, binding, bench terracing, no-till farming, contour cropping, strip cropping etc.. are used to minimize runoff & soil erosion particular on the slopes watersheds.

**SCIENTIFIC MINING& QUARRYING:-**

Due to improper mining, the hills lose stability & get disturbed resulting in landslides, rapid erosion etc....

**PUBLIC PARTICIPATION:-**

People's involvement including the farmers & tribalis the key to the success of any watershed management program, particularly the soil& water conservation.

The communities are to be motivated for protecting a freshly planted area & maintain a water a harvesting structure implemented by the government (or) some external agency(NGO) independently or by involving the local people.

Properly educating the about people about campaign and its benefits (or) sometimes paying certain incentives to then can help in effective people's participation.

Watershed management in Himalayan region is of vital importance since most of the watersheds of our country lie here.




Several anthropogenic activities accelerated its slope instability which need to be prevented & efforts should be made to protect the watershed by preventing overgrazing ,terracing& contour farming to check runoff & erosion etc...

**WASTE LAND RECLANATION**

Economically un productive lands suffering from environment loss of vegetation covers lead of soil throw erosion which ultimately creates waste lands. Waste lands include soft affected lands, sandy areas, undulated uplands, barren hill-ridge etc. Maximum wastelands area in our country lie in Rajasthan followed by M.P.&A.P. .in Haryana the wastelands cover about 84% of the land area and most of it comprises saline areas, sandy areas etc...Water lands formed by natural processes ,which include undulated up lands ,snow-covered lands, coastal saline areas , sandy areas etc... Anthropogenic activity

leading to waste land formation are deforestation, overgrazing, mining & erroneous agricultural practices.





Water lands can be classified into three types.

-  Easily reclaimable.
-  Reclaimable with some difficulty.
-  Reclaimable with extreme difficulty.

Easily reclaimable water lands can be used for agriculture.

Reclaimable with some difficulty can be utilized for agro-forestry waste lands that are reclaimable with extreme difficulty can be used for forestry or to recreate natural ecosystem.

#### **WASTE LAND RECLAMATION PARTICES:-**

-  To improve the physical structure & quality of the marginal soil.
-  To improve the availability of good quality water for irrigating these lands.
-  To prevent soil erosion , flooding & landslides.
-  To conserve the biological resources or the land for

sustainable use Some of the important particulars are.....

- ∑ **LAND DEVELOPMENT & LEACHING:-**for reclamation of the salt affected soil, it is necessary to remove the salt from root zone which usually achieved by leaching I.E.by applying the excess amount of the salt. after a survey of the extent of salinity problem, water table, depth of the impermeable layer & water table ,land leaving is done to facilitate efficient & uniform application of water .after leveling &plugging, the field is burned in small plots & leaching is done.  
In continuous leaching ,0.5 to 1.0 water is required to remove 90% of soluble salts from each cm of the soil depending upon texture.
- ∑ **DRAINAGE:-**This is required for water –logged soil reclamation where excess water removed by artificial drainage.
- ∑ **SURFACE DRAINAGE:-** This is used in area where water stands on the fields after heavy rains by providing ditches to runoff the excess water.
- ∑ **SUBSURFACE DRAINAGE:-**Horizontal sub surface drainage is provided in the form of perforated corrugated pvcpipes. Changes of evaporation of water leading to accumulation of salts almost become nil in this method.
- ∑ **IRRIGATION PRACTICES:-**
  - ❖ Surface irrigation which precise land leveling, smoothing & efficient hydraulic design help to reduce water logging & salinity.
  - ❖ High frequency irrigation with controlled amount of water help to maintain better water availability in the upper root zone.

- ❖ Thin & frequent irrigations have been found to be more useful for better crop yield when the irrigation water is used saline as compared to few heavy irrigation

### **SELECTION OF TOLERANT CROPS & CROP ROTATION:-**

- Tolerance of crops to salts is found to range from sensitive, semi-tolerant, tolerant to highly tolerant
- Barley, sugar beet & date palm are high-tolerant crops, do not suffer from any reduction in crop yield even at a high salinity with electric conductivity.
- Wheat, sorghum, pearl millet, soya bean, mustard & coconut are salt-crop-tolerant.
- Rice millets, maize, sunflower, sugar cane & many vegetables like bottle gourd, brinjal etc. are semi-tolerant

### **OZONE LAYER DEPLETION.**

OZONE plays a vital role in maintaining the life on earth & acts as an energy reservoir of the upper atmosphere which is responsible for climate regulation

Ozone (O<sub>3</sub>) occurs naturally in the atmosphere. The earth's atmosphere is composed of several layers. We live in the troposphere where most of the weather occurs such as rain, snow & clouds. Above the stratosphere is an important region in which effects such as the ozone hole & global warming originated.

For the last 450 million years the earth has had a natural sun screen in the stratosphere called as OZONE. This layer filters out harmful U.V radiation from the sunlight & thus protects various life forms on the earth.

Ozone is formed in the atmosphere when U.V radiation from the sun strikes the stratosphere, splitting oxygen molecules (O<sub>2</sub>) into atomic oxygen (O). The atomic oxygen quickly combines with further oxygen molecules to form ozone.



Ozone thus formed distributes itself in the stratosphere & absorbs harmful U.V radiations & continuously being converted back to molecular oxygen.



Absorption of U.V radiation results in heating of the stratosphere. The net result of the above reaction in the equilibrium is distributed by reactive atoms of chlorine, bromine etc... which destroy ozone molecules & result in thinning of ozone layers generally called as ozone hole.

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

1 DU = 0.01 mm thickness of pure ozone.

It is now accepted that chlorine & bromine components in the atmosphere cause the ozone depletion observed in the same ozone hole. Chlorofluorocarbons (CFC's) which are identified as the major cause in ozone destruction were commonly used as refrigerators & air conditioners as propellants, cleaning solvents etc....

When these components escape into the atmosphere, they reach the stratosphere intact as they are basically inert compounds in the stratosphere the cfc's are broken down by sun light releasing chlorine atoms. these chlorine atoms act as catalysts in the destruction of  $\text{CO}_3$

The catalytic reactions leading to the destruction of ozone involves  $\text{Cl}$  &  $[\text{ClO}]$ .

Chlorine monoxide as an intermediary .the same amount of chlorine is present before and after the reaction.

Breakdown products destroy ozone.

### **ANTARCTIC OZONE LAYER FORMATION:-**

The Antarctic ozone hole was discovered by D.r.Joe.C.Farman & his colleagues in the British. During spring season of South Pole .i.e. September to November each year depletion is observed.

At Antarctic region the temp during winter drops to  $-90^\circ\text{C}$ .at winds blowing in a circular pattern over earth's poles create polarvortices from ice crystals cfc's get collected on the surface of these ice crystals & destroy ozone much faster.

Nitrous oxide emitted by supersonic air crafts, during combustion of fossil fuel & use of nitrogen fertilizers breaks ozone molecules .chlorine liberates from cfc's also breaks ozone molecule

### **EFFECTS OF OZONE DEPLETION:-**

- ❖ Ozone depletion in the stratosphere will result in more U.V.radiation reaching the earth especially U.V-B [290-320 nm].the U.V.B-.radiation's affect DNA & the photosynthetic chemicals. Any change in DNA can result in mutation& cancer.
- ❖ Strong UV radiation from the sun can cause inflammation of the cornea, the coating of the eye ball, leading to photo keratosis (or) snow blindness.
- ❖ Melanin producing cells off the epidermis [important for producing immune system] will be destroyed by UV rays resulting in immune suppression.
- ❖ Photoplanktones are sensitive to U.V exposure .ozone depletion will result in decrease in their population there by affecting the population 300 plankton ,fish, marine animals.
- ❖ Yield of vital crops like corn , rice, soybean ,cotton, bean, pea ,sorghum & wheat will decrease.
- ❖ Degradation of paints,plastics & other polymer material will result in economic loss due to effects of UV radiation resulting from ozone depletion.

### **GEEEN HOUSE EFFECT**

The solar energy reaching the earth is absorbed by the earth surface, which increases its temperature. The rest of the heat radiates back to the atmosphere.Some of the heat energy is trapped by greenhouse gases like mostly  $\text{CO}_2$ . As  $\text{CO}_2$  is realized by human activity ,it is rapidly increasing .this is known as global warming.

Greenhouse effect is defined as the progressive warming up of the earth's surface due to rapidly effect of manmade CO<sub>2</sub> in the atmosphere.

In simple words greenhouse effect is the phenomenon due to which the earth retains heat. Excessive presence of greenhouse gases [CO<sub>2</sub>, CH<sub>4</sub>, CFC's, & NO<sub>2</sub>] block the infrared radiation from the earth surface in the atmosphere, leading to an increase in the temp, which in turn make the life difficult on earth.

The amount of heat trapped in the atmosphere depends mostly on the concentrations of heat trapping (Or) greenhouse gases & the length of the time they stay in the atmosphere.

The major greenhouse gases are CO<sub>2</sub>, ozone, methane, nitrous oxide CFC's & water vapor's. The average global temperature is 15°C. in the absence of greenhouse gases. this temperature would have been 18°C. Greenhouse effect contributes a temperature rise to the tune of 33°C.

The two predominant greenhouse gases are water vapors, which are controlled by hydrological cycle. While the levels of water vapors in the stratosphere have relatively remained constant the levels of CO<sub>2</sub> have increased due to human activities are methane, nitrous oxide & CFC's. deforestation has further resulted in elevated levels of CO<sub>2</sub> due to non-removal of CO<sub>2</sub> by plant through photosynthesis.

#### **GREENHOUSE GASES:-**

The phenomenon that worries the environment scientists is that due to anthropogenic activities there is an increase in the concentration of the green house gases in the air that absorb infrared light containing heat and result in the re-radiation at even more of thermal infrared energy, thereby increasing the average surface temperature beyond 15°C enhanced green house effect.

The greenhouse gases present in the troposphere & resulting in an increase in the temperature of air & earth.

Greenhouse gas	Concentration in the year	Present concentration	% change	Natural & anthropogenic source.
CO <sub>2</sub>	280 ppm	360 ppm	29%	Organic decay, forest fires, burning fossil fuels, deforestation, land use change
methane	0.70 ppm	1.70 ppm	1.43%	Wetlands, organic decay, natural gas & oil extraction, biomass burning rice-cultivation
Nitrous oxide	280 ppm	310 ppm	11%	Forest, grass lands, ocean, soil cultivation, fertilizers, biomass burning, burning of fossil fuels.
CFC's	0	990 ppm	Not applicable	Reforestation, aerosol, spray propellants, cleaning solvents
ozone	unknown	Unknown varies with attitude & latitude in atmosphere	Global level have generally Decreased in the Stratosphere & increased near the earth's surface in recent years	Created naturally by action of sunlight on molecular oxygen & artificialty through photo chemical smog product

**EFFECTS OF GLOBAL WARMING:-**

Greenhouse effect will not only cause global warming but also affect various climatic & natural processes.

**GLOBAL TEMPERATURE INCREASES:-**

The earth's mean temperature will rise b/w 1.5 to 5.5<sup>o</sup>c. by 2050 if input of greenhouse gases continues to rise at the present rate.

**RISE IN SEA LEVEL:-**

With the increase in global temperature sea water will be expand. Heating will melt the polar ice sheets , resulting in the rise in sea level. One meter rise in sea level will inundate low, lying area of cities as well agricultural low lands. Life of million people will be affected ,by the sea level rise who have built homes in the deltas of Ganges , the Nile etc..

**EFFECT ON HUMAN HEALTH:-**

The global warming will lead to change in the rainfall pattern in many areas, thereby affecting the distribution of vector born diseases like malaria, filariasis ,elephantiasis etc..

Warmer temperature & more water segmentation would favour the breeding of mosquitoes, snails & some insects , which are the vectores of such diseases.

High temperature& humidity with increasing respiratory & skin diseases.












**EFFECT ON AGRICULTURE:-**

Tropical & sub- tropical regions will be more affected since the average temperature in these regions is already on the higher side even a rise of 2<sup>o</sup>c may be quite harmful to crops

Soil moisture will decrease &evapotranspiration will increase which may drastically affect wheat & maize production.

Increase in the temperature &humidity will increase pest growth like the growth of vectors for various diseases.

**MEASURES TO CHECK THE GLOBAL WARMING:-**

-  Catdown the current rate of use of CFC's & fossil fuels.
-  Shift to renewable energy resources.
-  Increases nuclear power plants for electricity production
-  Shift from coal to natural gas.
-  Reduce beet production.
-  Trap & use methane as fuel.
-  Adopt sustainable agriculture.
-  Stabilize population growth.
-  Plant more trees.
-  Efficiently remove CO<sub>2</sub> from smoke stacks.
-  Remove atmosphere CO<sub>2</sub> by utilizing photosynthetic.

### **NUCLEAR ACCIDENTS & HOLOCAUST**

Nuclear accidents can occur at any stage of the nuclear fuel cycle for possibility of reactor accidents are more drastic. Various parameters like reactor measures which it fall would release large amount of reactor contents, that is radioactive debris affecting a substantial portion of human population with in a particular size in a particular area.

In a single nuclear accident causes loss of life, long term illness & destruction of property on a large scale & for a long period of time.

Radioactivity & its fallout lead to cancer, genetic disorders & death in the affected area for decided after thus affecting all forms of life for generations to come.

Nuclear bombardment will cause combustion of wood plastics, petroleum, forests, large quantity Of black, soot will be carried to atmosphere (stratosphere).black soot will absorb solar radiations to reach the earth. Therefore ,cooling will the atmosphere to the earth will have very less water vapor's& CO<sub>2</sub> to absorb them.it they leave the lower atmosphere the greenhouse effect water evaporation will also reduce .Therefore, IR radiation absorbing water vapors will reduce in the atmosphere. This will cause cooling.

In the stratosphere there won't be signified moisture to rain out the think soot. So, due to nuclear explosions, a phenomenon is opposite to global warming will occur. this is called nuclear winter.it result in lower global temperature even the summer time will experience freezing temperater.it result affect crop production ,causing famines, human surfing.

The Chernobyl nuclear accident, 1986 has resulted in wide spread contaminated by radioactive substance .The devastation caused by nuclear bombs are not only immediate but may be long lasting.

### **CLIMATE CHANGE**

Climate is the average weather of an area it is the general weather conditions, seasonal variation & extremes of weather in region .such conditions which average over a long period at least 30 years is called climate.

The inter government panel on climate change (IPCC) in 1990 & 1992 published best available evidence past climate change , the greenhouse & recent changes in global temperature.

It has experienced several glacial& interglacial periods .However during the past 10,000 years of the current interglacial period the mean average temperature has fluctuated by 0.5- 1<sup>0</sup>c over 100 to 200 year periods.

Even small changes in climatic conditions may be disturb agriculture that wood lead to migration of animals including human.

Human societies will be seriously affected by extremes of climate Such as drought & floods .a climate changing would bring out change in the frequency intensity of these extremes.

The global change in temperature will not be uniform everywhere & will fluctuate in different regions. The places at higher altitude will be warmed up more during rate of autumn & winter than the place in tropics. Pole may experience 2 to 3 times more warming than the global average. While increasing in



warming at poles will reduce the thermal gradient b/w the equator & high latitude regions decreasing the energy available to the heat engine & that drives the global weather machine. This will disturb the global pattern of winds & ocean currents as well as the timing & distribution of rainfall.

By a temp increase of 1.5 to 4.5°C the global hydrological cycle is expected to intensify by 5 to 10%.

Distributed rainfall will result in some areas becoming wetter & the other drier. Although rainfall may increase, high temperature will result in more evaporation-transpiration leading to annual water deficit in crop fields.

Climate represents sum of all statistical weather information of the atmospheric elements, with specified area over a period of time.

It never remains static but is a dynamic process greater or less degree it is changing. It is common deviation from the average as well as extreme condition.

The earth's surface and lowest part of the atmosphere have warmed up on average by about 0.6°C during the last 100 years. If the climate change is at the same rate as no. of global average surface temp could be anywhere between 1.4°C to 5.8°C higher than in 1990 by 2100.

### Causes

1. Variation in the earth's orbital characteristics'
2. Atmosphere CO<sub>2</sub> variation
3. Variation in solar output

### Effect

The climate change has more energy on every part of the earth. It affects both living & non-living components of most of the ecosystem in the world.

1. Mean sea level is increased on an average of around 1.8mm per annum
2. Many ecosystems of the world have to adapt to the rapid change in the global temp.
3. Rate of the species extinction will be increased
4. Human agriculture, forestry, water resources & health will be affected
5. Climate change through increasing surface temp & changing rates of precipitation and evaporation-transpiration will influence the water cycle
6. The frequency & intensity of extreme weather events is possible & it makes unexpected flood and drought

### Consumerism and waste product:

Consumerism refers to the consumption of resources by the people. Consumerism has shown exponential rise related both to the increase in the population size as well as increase in our demand due to life style. Earlier we used to live a much simple life & used to have multiplied and so consumerism of resources has also multiplied.

Changing population trends influence consumerism of natural resources & generation of waste. There are 2 types of population & consumerism.

**People over-population:**

It occurs when there are more people than available supplies of food, water and other important resources in the area. Excessive population pressure causes degradation of limited resources and there is absolute poverty, under nourishment and premature death.

This occurs in less developed countries. Here large numbers of people, adequate resources are not available. Less per capita consumption although overall consumption is high.

**Consumption over population:**

It occurs in more developed countries. Here population size is smaller while resources are in abundance and due to luxurious life style per capita consumption of resources is very high. More the consumption of resources more is the waste generation and greater is the degradation of environment.

This concept can be explained by using the model of Paul Erlich and John Holden.

No. of people "precipitate use of resources" waste generated per unit of resources used = overall environment impact

In LCD no. of people is very high but per capita use of resources and waste generated are less. In MCD no. of people is low, but per capita use of resources and waste generated are high.

The overall environment varies with the country. USA is known for maximum consumerism. The throw away attitude and luxurious life style of the west results in very high resources use as compared to LCD. With every unit of energy, mineral or any resources used there is waste generation and pollution in the environment.

**ENVIRONMENTAL ETHICS ISSUES AND POSSIBLE SOLUTION:**

The word ethics is derived from the Greek word ethos. Ethics generally refers to the character of human being developed during the evolutionary process and is influenced by the need for adaptation to the natural environment.

Environmental ethics is a search for moral value and ethical principles in human relation with natural world.

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

Man is all powerful and the supreme creature on this earth. Man is the master of nature and can harness it all in his will. It refers to our human centric thinking.

On the other hand if we think nature has provided us with all the resources for leading a beautiful life and she nourishes us like a mother we should respect her and nature. This is an earth centric thinking.

There are two world views are discussed here in relation to environment protection.

**ANTHROPO CENTRIC WORLD:**

This view is guiding most industrial societies. It puts human being in the center giving them the highest status. The guiding principles of this view are:

1. Man is the planet most imp species n is the in charge of the rest of nature
2. earth has an unlimited supply of resources n it all belongs to us
3. a healthy environment depends upon a healthy economy
4. eromic growth is very good n more the growth the better it is because it raises our quality of life n the potential for economic growth is unlimited

### **ECO CENTRIC WORLD VIEW:**

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

1. Nature exists not for human beings alone but for all the species
2. Earth resources are limited n they do not belong only to human beings
3. A healthy economy depends upon a healthy environment

### **ENVIRONMENT ETHICS:**

1. You should love n honor the earth since it since it has blessed you with life n governs your survival
2. You should not hold yourself above other living thing n have no right to drive them to extinction
3. You should keep each day sacred them to earth n celebrate the turning of its season
4. You should be grateful to the plants n animals which nourish you by giving you food
5. You should limit your off spring because two-many people will over burden the earth
6. You should not waste your resources on destructive weapons
7. You should not run after gains at the cast of nature rather should strive to restore its damaged majesty
8. You should not steal from future generations their right to live in a clean n safe planet by improvising or polluting it
9. You should consume the material goods in moderate amounts. So that all may stare the earth precious treasure of resources

Our religious n cultural rituals make us perform such actions that would help in the conservation of nature of natural resources. The concept of “ahimsa” in Buddhism n Jainism ensure the protection n conservation of all forms of life there by keeping the ecological balance of the earth intact

### ***RESETTLEMENT N REHABILITATION ISSUES***

Resettlement n rehabilitation is one of the most serious problem posted by developmental activities

**Def: resettlement:** is defined as process of simple relocation or displacement of human population without consideration their individual community

**Rehabilitation:** it is defined as the process or replacing the lost economic assets rebuilding the community system that have been weakened by displacement

### ***Problems n concerns:***

1. Developmental projects are planned to bring benefits to the society in this process of development very n often there is over exploitation of natural resources n degradation of environment
2. Beside this quite often the native people of the project site are directly affected

3. Various types of projects result in the displacement of the native people who undergo tremendous economic n psychological distress as the socio economic n ecological base of local community is disturbed
4. **Displacement problems due to the dams:** The big values project have one of the most serious socio-economics impacts due to large scale displacement of local people from their ancestral home & loss of their tradition profession.
5. EX: Hirakunda dam has displaced more than 20,000 people residing in about 250 villages.
6. Bhakanangal dam was constructed during 1950's&till now it has not been possible to rehabilitate even half of the displacement persons.
7. **Displacements due to mining:** mining is another important development activity which causes displacement of native people. Sometimes displacement of local people is due to accidents occurring in mined areas like subsidence of land that often leads to shifting of people.
8. **Rehabilitation issues:** the united nations universal declaration on human rights has declared that right to
9. Housing is a basic human right.
10. In India, most of the displacements have resulted due to the land acquisition by the govt for various reasons.
11. The major issues related to displacement & rehabilitation are as follows
  - (1). Tribally are using the most effected amongst the displacement who are already poor. Displacement further increases their poverty due to loss of land, home, jobs, food insecurity loss of access to common property assets.
  - (2).break up to families is an imp social issues arising due to the displacement in which the women are the worst effected & they are not even give cash/land compensation.
  - (3). tribal are not familiar with the market policies & trends. even if they get cash compensation, they get alienated in the modern economic steps
  - (4). Kinship systems, marriages, social &cultural functions their folk songs, dances & their activities vanish with their displacement even when they are re-settled , it is individual based resettlement which totally ignores communal settlement.
  - (5).the age long indigenous knowledge which has been inhabited& experienced by them about flora, fauna, their uses etc., gets lost.
  - (6).tribal loss their communitarian basis of economic & cultural existence . They feel like fish out of water

#### **RAIN WATER HARVESTING**

- It is a technique of increasing the recharge of groundwater by capturing & storing rain water. this is done by constructing special water harvesting structures like dug wells peculation pits lagoons,check dam etc.
- Rainwater whenever it falls , is captured & pollution of this water is prevented.
- The annual average rainfall in India is `200mm,in most places it is concentrated over the rainy reason,from June to September.
- Chirapunji the place receiving the second highest annual rainfall as 11000mm still suffers from water scarcity. The water flora with runoff & there is little vegetation to check the runoff & allow infiltration.

- Rainwater harvesting has the following objectives
- To reduce the runoff loss.
- To avoid flooding of roads.
- To meet the increasing demand of water
- To raise the water table by recharging groundwater.
- To reduce ground water contamination
- To supplement ground water supplies during lean season

**Rain water can be mainly harvested by one of the following methods**

**By storing in tanks or reservoirs above or below ground**

- ❖ By constructing pits, dug wells, lagoons, check dams on small rivulets.
- ❖ By recharging the groundwater

**Traditional rain water harvesting**

In India it is an old practice in high rainfall areas to collect rainwater from roof-tops into storage tanks.

- ❖ In Himalayan foothills, people use the hollow bamboos as pipelines to transport the water of natural springs.
- ❖ Rajasthan is known for its “tanks” for harvesting rainwater.

In ancient times we had adequate *Tellabs*, *bawdries*, *jihadsets*., in every city, village, capital cities which were used to collect rainwater & ensured adequate water supply in dry periods.

**MODERN TECHNIQUES OF RAINWATER HARVESTING**

- In semi-arid & arid regions artificial ground water recharging is done by constructing shallow percolation tanks.
- Check dams made of any suitable native materials are constructed for harvesting runoff from large catchment areas.
- Rajendra Singh of Rajasthan popularly known as “water man” has been doing a commendable job for harvesting rain water by building check dams in Rajasthan & he was honored with prestigious *Maugesayra* award for his work.
- In roof top rain water harvesting, which is a low cost & effective technique for urban houses & building the rain water from the top of the roofs is diverted to some surface tank through a delivery system, which can be later used for several purposes. Also it can be used to recharge underground aquifers by diverting the stored water to some abandoned dug-well or by using a hand pump.

**UNIT –IV**

1. What do you mean by sustainable development? What are the major measures to attain sustainability?
2. What is rainwater harvesting? What are the purposes served by it?
3. What is a watershed? critically discuss the objectives and practices of watershed management?
4. What are the major issues and problems related to rehabilitation of the displaced tribals?
5. What are the major impacts of acid rains and how can we control it?
6. Discuss various measures for wasteland reclamation?
7. How do you define pollution as per Water Act, 1974? What are the salient features of the Act?
8. What are the major limitations to successful implementation of our environmental legislation?