

## **URBAN PROBLEMS RELATED TO ENERGY**

*Urbanization is the process of population moving towards towns and cities (urban areas) from rural areas and taking up the culture and work prevailing in urban areas.*

### **Causes of urbanization**

Cities are the main centers of economic growth, trade, education, innovations and employment. This makes the rural people move towards cities. Urbanization may take place due to other casual factors like wars, famines, floods and massive insurgents due to political reasons and refugee problems.

### **Urban Sprawl**

About 50% of world population lives in urban areas and there is increasing movement of rural folk to cities in search of employment. Urban growth is so fast and difficult to accommodate all the commercial, industrial, residential and educational facilities within a limited area. As a result, there is spreading of cities into suburban or rural areas, this phenomenon is *Urban Sprawl*.

### **Energy Requirements**

Energy requirements of urban population are much higher than that of rural ones. This is because urban people have a higher standard of life and then life style demands more energy inputs in every sphere of life. Energy demanding activities include

#### **i) Energy use for transportation**

#### **ii) Energy use for buildings**

Energy used for residential, commercial and industrial buildings is responsible for green house gas emissions. In residential and commercial sectors, most building energy is used for water heating, space heating and space cooling. More than 80% of all energy used for residential buildings.

#### **iii) Energy use for industries**

Large proportion of energy is utilized by industries.

#### **iv) Energy based techniques**

A large amount of waste generation which has to be disposed off properly using energy based techniques. Control and prevention of pollution which need energy dependent technologies

### **Energy Management**

Encourage use of low energy content building materials and agricultural and industrial residues in construction. Speed up commercialization of renewable energy technologies through tax incentives, subsidies and innovative venture (chance) capital schemes. Promote non motorized transport and relate it with public transport system. Energy consumption must be minimized in all aspects. Provide incentives for increasing use of energy efficient household appliances. Imposing strict laws, penalties and energy audit

## Various water conservation techniques

### Water conservation methods

- i) Decreasing run off losses
- ii) Reducing irrigation losses
- iii) Proper treatment of industrial and domestic waste water
- iv) Avoid discharge of sewage
- v) Increasing block pricing
- vi) Rainwater harvesting
- vii) Construction of proper storage, reservoirs and dams

### RAIN WATER HARVESTING

It is a technique of increasing the recharge of ground water by capturing and storing rain water. This is done by constructing dug wells, percolation pits, lagoons, check dams etc.,

#### Objectives of Rain water harvesting

- To reduce run off loss
- To avoid flooding of roads
- To meet increasing demands of water
- To raise water liable by recharging ground water.
- To reduce ground water contamination

Before adopting rain water harvesting system, soil characteristics, topography, rainfall pattern and climatic conditions should be understood.

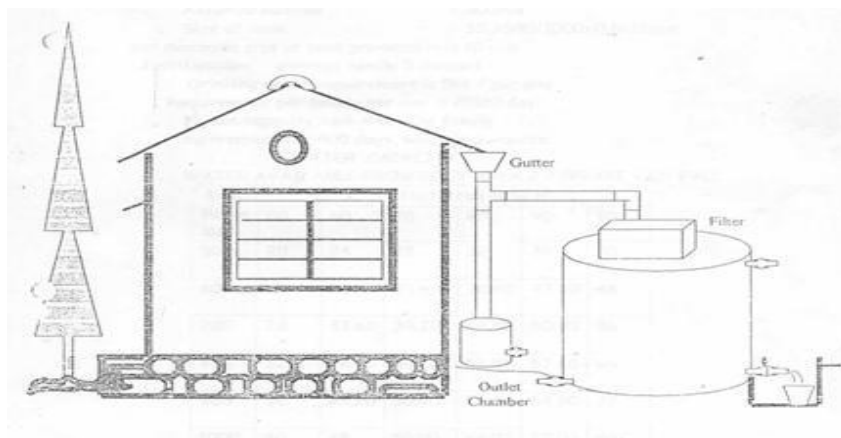
#### Modern technique for rain water harvesting

##### Roof top rain water harvesting

This system is mostly adopted in several parts of the world. This system consists of three basic elements namely,

- i) Collection area
- ii) Conveyance system
- iii) Storage vessels or storage facilities

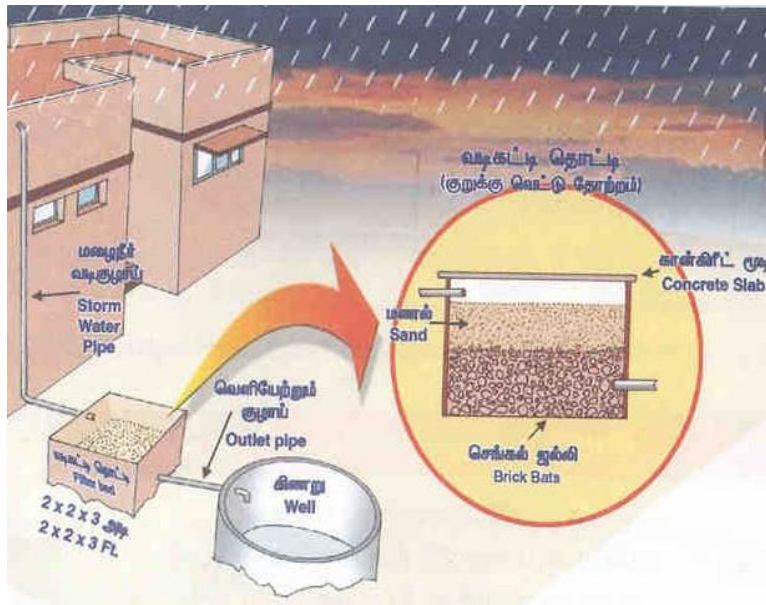
A smooth, cleaner and impervious roofing material contributes to better water quality and greater quantity. Both drainpipes and roof surfaces should be chemically inert such as wood, PVC, aluminum and in order to avoid adverse effects on water quality.



### (i) Through hand pump (or) (ii) Through abandoned dugwell

Storage tanks may be constructed some distance away from the building. This method is suitable where the rainfall exceeds 400 mm per year. Painted surfaces should be avoided as much as possible and overhanging vegetation should be avoided.

It is low cost and effective technique for urban houses and buildings. The rain water from the top of roofs, road surfaces, play grounds, open lands is diverted into surface tank or recharge pits through a delivery system which can be later used for several purposes. The pit base is filled with stones and sand which serves as a sand filter.



### Advantages of rainwater harvesting

- o To coordinate the operation of surface and ground water reservoir.
- o To improve infiltration and reduce the run off.
- o To improve soil moisture.
- o To reduce soil erosion.
- o To reduce land subsidence.

### WATERSHED MANAGEMENT

Water shed is thus the land and water area, which contributes runoff to a common point. Rain falls, snow melting fields, forests, rooftops, lawns, parking lots and streets flows toward a lake or river and forms water shed. Water shed ranges from a few square kilometers to few thousand square kilometers in size.

**“The management of rainfall and resultant run off is called watershed management”**

### Objectives of watershed management

- i) Soil conservation
- ii) Water conservation
- iii) Conservation farming practices to improve agriculture.
- iv) Controlled grazing to keep pasture productive.

v) Development of waste land.

vi) To minimize the risks of flood, droughts and landslides.

### **Watershed Degradation**

Watersheds are degraded due to uncontrolled, unplanned and unscientific land use activities. Mining, overgrazing, deforestation, construction activities, industrialization, soil erosion degrade various watersheds.

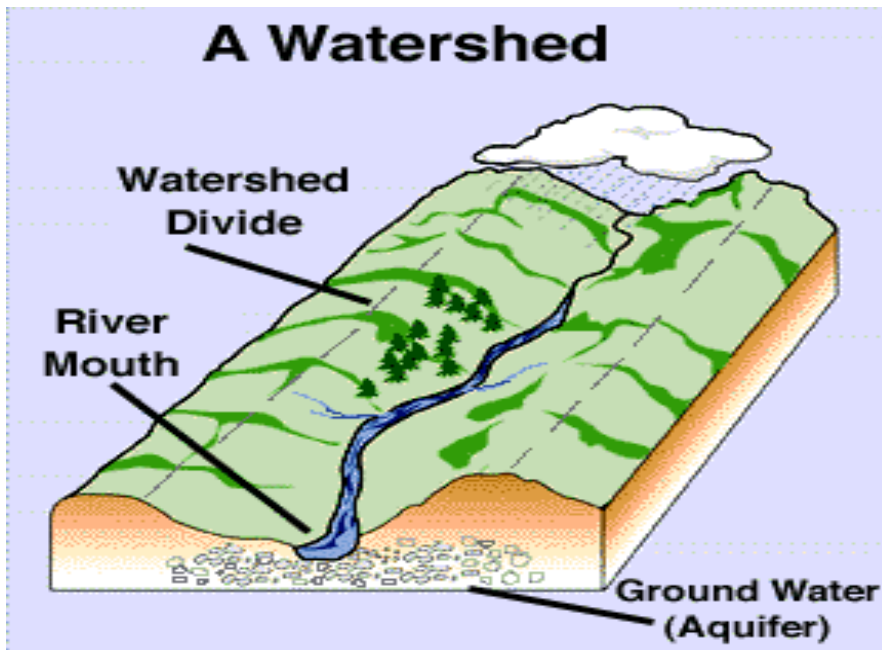
### **Components of Watershed Management**

The three main components in watershed management are land management, water management and bio mass management.

- i) Land Management
- ii) Water Management
- iii) Biomass Management

### **Water Shed Management Practices**

- i) Trenches (pits),            ii) Under ground barriers (Dykes),            iii) Farm pond
- iv) Stone embankment (or) earthen dam



### **Measures to be taken for Watershed Management**

- i) Water harvesting
- ii) Reducing soil erosion by mechanical measures
- iii) Agro forestry and afforestation            iv) Scientific mining & quarrying
- v) Public participation

## **RESETTLEMENT AND REHABILITATION ISSUES**

### **Reasons for displacement**

- i) Due to dams. ii) Due to mining, iii) Due to creation of national parks
- iv) Due to disasters

### **Serious implications of displacement**

- i) Poverty, ii) Women at risk, iii) Children and Adolescents
- iv) Economic set up, v) Traditional activities, vi) Loss of identity and link with people

### **Rehabilitation policy**

Rehabilitation programmes should include the following main components.

- o Land for land is a better policy than cash settlements of displaced people.
- o Secure supply of building materials.
- o Provide expertise for safe construction and siting.
- o Restore social services.
- o Removal of poverty.
- o Oustees should be given assurance of employment.
- o Before starting a project (construction of dams, roads) extent of damage and suffering that the proposed project would cause, should be studied.
- o People should be rehabilitated on “minimum dislocation basis” by choosing adjacent areas.

## **Environmental ethics**

### **Ethics**

*It is the branch of philosophy that tries to understand the nature of good life and our rights and responsibilities towards others, so that we can act on that knowledge.*

### **Environmental Ethics**

*It means the normal relationship of human beings with environment. It is concerned with do's and don'ts of the human beings to the environment.*

### **Environmental problem**

- o Population growth is the root cause of current global environmental crisis
- o Urbanisation
- o Pollution
- o Land degradation and soil erosion
- o Water scarcity
- o Deforestation activities

### **Environmental protection**

A healthy economy depends upon a healthy environment. The environment can be protected by the following activities.

- o One should respect the power of environment
- o Resources should not be wasted or over exploited
- o Soil degradation must be reduced
- o Reduce population growth
- o Creating awareness to the public
- o Recycle and reuse the waste products
- o Protection of biodiversity
- o One should oppose the use of nuclear weapons
- o Sustainable development
- o Prevention of pollution.

## **Environmental Ethics (or) Earth Ethics - Guidelines**

The concept 'Ahimsa' ensures the protection and conservation of all forms of life there by keeping the ecological balance of earth intact; some important guidelines are as follows:

- o Love and honour the earth that provides us life.
- o Keep each day sacred to earth and celebrate the turning of its Seasons.
- o Don't waste the resources.
- o Avoid polluting the environment.
- o Don't hold yourself above other living things and have no Right to drive them to extinction.
- o Should be always grateful to plants and animals as it nourishes the mankind.  
Consume the material goods in moderate amount.

## **CLIMATE CHANGE**

Weather changes all the time. The average pattern of weather called climate, usually remains unchanged for centuries if it is left to itself. People participate in activities that can change the earth and its climate.

The various elements of climate are temperature, pressure, wind, rainfall, humidity and clouds.

### **Causes of climate change**

Human emission is significantly modifying the concentrations of some gases in atmosphere. Greenhouse gases which have a global effect tend to warm the earth by absorbing some of the infrared radiation it emits. Ozone layer depletion also increases global temperature.

### **Effects of climate change**

Climatic change affects land forms, soil types and vegetation.

- o Water resources, marine systems, human settlements, energy, industry and human health are affected by climatic change.
- o Climatic change upset the hydrological cycle results in floods and droughts in different regions of the world cause sea level rise, death of humans as well as lives stock.

The likelihood of many of these changes is probably very low but is expected to increase with rate, magnitude & duration of climate change.

### **Examples**

- i) Slowing of warm North Atlantic currents.
- ii) Large reduction in Greenland and West Antarctic ice sheets.
- iii) Accelerated global warming due to releases of terrestrial carbon from permafrost (permanently frozen subsoil) regions of methane from hydrates in coastal sediments.

### **Control of climate change**

Adaptation could reduce adverse impacts of climate change and enhance beneficial impacts.

## **GREEN HOUSE EFFECT**

*Short wave radiation of sun is absorbed by earth. The earth radiates heat energy back into space in form of longer wave radiation. This radiation is trapped by number of gases and thus heat is again reradiated back to earth. This is called "Green house effect".*

The average global temperature is 15°C. In absence of green house gases, this temperature would have been - 18° C.

## **Green house gases**

### **1. Carbon dioxide**

- o It contributes 55% to global warming from green house gases produced by human activity.
- o Most abundant gas in atmosphere.
- o This is due to burning of fossil fuel, deforestation and change in land use.

### **2. Methane**

- o It accounts for 18% of increased green house gases.
- o It stays in atmosphere for 7-10 years.
- o Concentration is 1.675 ppm and increasing at the rate of 1%.
- o Due to land fills, natural gas leaks, oil and gas production.

### **3. Nitrous oxide**

- o Responsible for 6% of human input of green house gases.
- o It stays in atmosphere for 140-190 years.
- o Concentration is 0.3 ppm and increasing at a rate of 0.2% annually.
- o It is released from nylon products, from burning of biomass and nitrogen rich fuels.

### **4. Chlorofluoro carbons (CFCS)**

- o CFCS are synthetic gaseous compounds of carbon and halogen.
- o Responsible for 24% of human contribution to green house gases.
- o Deplete ozone in stratosphere.
- o Atmospheric concentration is 0.00225 ppm increasing at a rate of 0.5% annually due to leaking of air conditioners, refrigerators, aerosols etc.,

These green house gases in lower levels of atmosphere act like the glass of a green house.

## **GLOBAL WARMING**

The increasing concentration of greenhouse gases in the atmosphere leads to global warming; also affect various climatic and natural processes.



## **Impacts of enhanced Green house effect (Global Warming)**

### **i) Increase of Global temperature**

It is estimated that earth's mean temperature will rise between 1.5 to 5.5°C by 2050, if green house gases continues to rise at present rate.

### **ii) Rise in sea level**

Heating will melt the polar ice sheets and glaciers resulting in further rise in sea level. By 2030, 20cm rise is expected in sea level.



### **iii) Effects on human health**

Global warming changes rainfall pattern and thereby distribution of vector borne diseases like malaria, cholera, elephantiasis etc.,

### **iv) Food production**

Global warming will reduce crop production due to increased plant diseases, pests and explosive growth of weeds.

### **v) Effect on range of species distribution**

Each plant and animal species occur within a specific range of temperature. Many will be at risk from extinction, whereas more tolerant varieties will thrive.

## **Approaches to deal with Global Warmity**

To slow down enhanced global warming, following steps will be important.

- o Use energy more efficiently.
- o Plant more trees.
- o Shift to renewable energy sources.
- o Minimize water logging.
- o Cut town the rate of use of CFCS and fossil fuel.
- o Remove CO<sub>2</sub> from smoke stacks.
- o Reduction of N<sub>2</sub>O emission by minimizing the use of nitrogen fertilizer in agriculture.

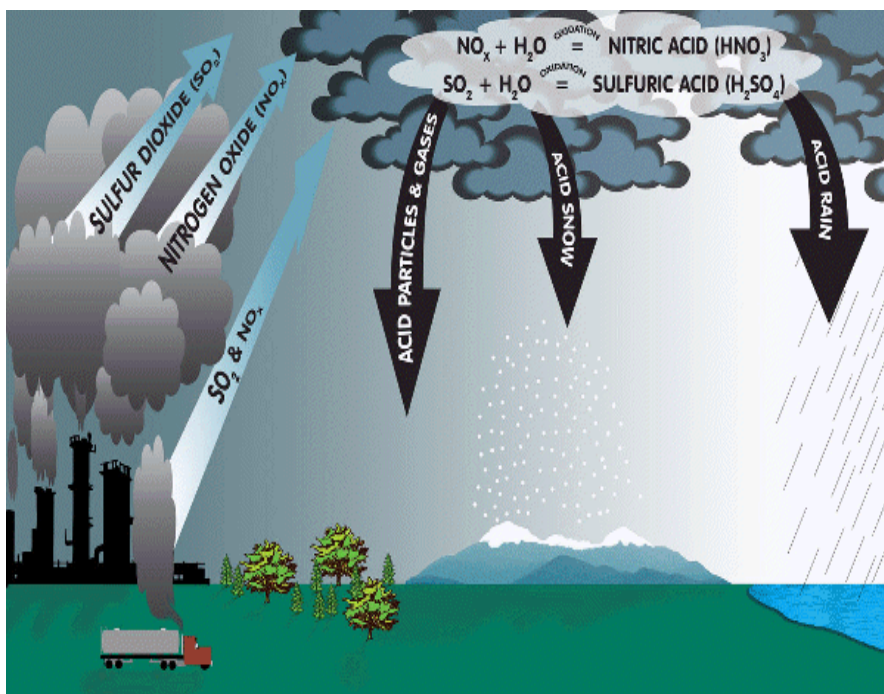
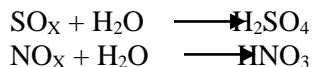


- o Remove atmospheric CO<sub>2</sub> by utilizing photosynthetic algae.
- o Adopt sustainable agriculture.

## ACID RAIN

Acid rain represents one of the major consequences of air pollution.

*Enormous emissions of SO<sub>x</sub> and NO<sub>x</sub> from major industrial areas pollute the atmosphere greatly. In these areas, falling rain reacts with these oxide pollutants to produce a mixture of sulphuric acid, nitric acid and water. This is known as acid rain.*



### Measuring Acid rain

Acid rain is measured using a scale called pH, pH of pure rain water = 5.6 and pH of acid rain < 5.6.

### Consequences of Acidification

#### 1) Health problem

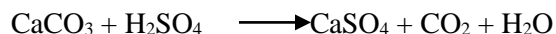
- o Acidified water is known to be capable of dissolving toxic metals like aluminium, copper, lead and mercury.
- o When drinking water source is such acidified lake or stream, these toxic substances reach drinking water distribution systems.
- o It affects human nervous system, respiratory and digestive system.

#### 2) On Building materials

Three types of building materials are damaged by acid rain.

- a) Galvanised steel,    b) Carbonate stone,    c) Surface coatings

Prolonged exposure to acid rain causes serious damages to building marble, limestone (carbonates).



**Ex:** Taj Mahal in Agra suffering at present due to SO<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub> acid fumes released from Mathura refinery. Crystals of CaSO<sub>4</sub> and MgSO<sub>4</sub> are formed due to corrosion by acid rain. Acid rain corrodes statues, bridges, fences and houses. Dry deposition of acidic compounds makes the building dirty, leading to increased maintenance costs.

### 3) Impact on terrestrial and lake ecosystem

- o Death of fish, species of algae, bacteria and plant life inhabiting such water bodies.
- o At low pH, decomposition of organic matter is less and hence water bodies accumulate pollution.
- o Acidity affects the germination of seeds, growth rate and destruction of greenery due to acid bleaching.
- o It affects soil quality, nutrient leaching, kills beneficial microorganisms and earth worms.
- o Aquatic animals suffer from toxicity of metals such as aluminium, mercury and lead which leak from surrounding rocks due to acid rain.
- o Many lakes of Sweden, Norway have become fishless due to acid rain.

### Control Measures

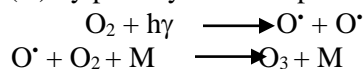
- o By using pollution control equipments, emissions of NO<sub>2</sub> and SO<sub>2</sub> from industries should be reduced.
- o Liming of lakes and soils should be done to correct the adverse effects of acid rain.
- o Improved technologies and switching to clean combustion technologies are essential to monitor air pollution.
- o Replacement of coal by natural gas reduces acid rain.
- o Introduction of alternative energy sources for electrical generation.
- o Coating of protective layer of next polymer should be given in the interior of water pipes for drinking water.

## OZONE LAYER DEPLETION

For the last 450 million years, earth has had a natural sunscreen in the stratosphere called **ozone layer**. This layer filters out harmful ultra violet radiations from sunlight and protects various life forms on earth.

### Ozone Formation

Ozone is a triatomic form of oxygen (O<sub>3</sub>). In stratosphere, ozone is formed by absorption of short wavelength UV radiations. UV radiations less than 242 nm decompose molecular oxygen to atomic oxygen (O) by photolytic decomposition.



M = third body to carry away energy released in the reaction.

Ozone thus formed distributes itself in stratosphere and absorbs harmful UV radiations (200 - 320 nm). The amount of atmospheric ozone is measured by Dobson spectrometer and is measured in **Dobson Unit (DU)**.

### Ozone layer Depletion

Ozone layer is destroyed by man made chlorofluoro carbons (CFC). They are used in coolants in refrigerators & air conditioners. They slowly pass to stratosphere in presence of UV radiation from sun, CFC breaks up into Cl<sup>•</sup> (Chlorine free radical) which consumes ozone.

Thus each atom of chlorine liberated attacks 100,00 ozone molecules. Due to this continuous attack of Cl<sup>•</sup>, thinning of ozone layer takes place & leads to formation of '**ozone hole.**'

### Effects of Ozone layer depletion

#### i) Impact on climate

Depletion of ozone layer will lead to absorption of UV radiation & it reaches the earth's surface. Thus increases the average temperature of earth's surface.

#### ii) Impact on human health

- o Exposure of humans to UV rays will reduce the immunity, retard physiological growth & cause further suppression of mental development.
- o UV-B radiations affect DNA result in cancer.
- o Melanin producing cells of epidermis will be destroyed by UV rays resulting in immune suppression. Fair people will be at risk of UV exposure.
- o Eye ailments such as cataract formation take place.

### iii) Impact on marine life

UV rays directly affect marine forms such as phytoplankton, fish and crabs. Phytoplankton consumes CO<sub>2</sub>. Decrease in population of phytoplankton would leave more amount of CO<sub>2</sub> in atmosphere, results in global warming.

### iv) Impact on biotic communities

Yield of vital crops like corn, rice, soyabean, cotton, bean, pea & wheat will decrease and affect the whole food chain.

### v) Impact on materials

Degradation of plastics, paints & other polymer will result in economic loss.

### Control of Ozone Depletion

- o To stop using of ozone depleting chemicals
- o Use of gases such as methyl bromide which is a crop fumigant also to be controlled

Implementing the use of alternatives to CFCS.

## NUCLEAR ACCIDENTS

Leakages of radioactive substances from nuclear plant always have disastrous impacts on human society.

### Types of nuclear accidents

#### 1. Nuclear power plant accidents

Release of radiation occurs during the accidents

#### 2. Accident during transport

Trucks carrying radio active wastes or fuel are involved in frequent accidents

#### 3. Improper storage of nuclear waste

### Effect of Nuclear radiation

- o Contamination of food & drinking water
- o Contamination of land especially densely populated & agricultural regions.
- o Radiation breaks chemical bonds such as DNA in cells.
- o Exposure at low dose of radiation, people suffer from fatigue, vomiting & loss of hair.
- o Exposure at high dose affects bone marrow, blood cells etc.,
- o Exposure at very high dose kills organisms by damaging tissues of heart & brain.
- o

## NUCLEAR HOLOCAUST

Destruction of biodiversity by nuclear equipments & nuclear bombs these kinds of destructions are happened in a nuclear war.

### Effect of nuclear holocaust

#### 1. Nuclear Winter

Nuclear bombardment will cause combustion of wood, plastics, petroleum, forest etc., Large Quantity of black soot will be carried to stratosphere. Black soot will absorb all UV radiations and will not allow the radiation to reach the earth. So cooling will result. Due to this, water evaporation will also reduce. In stratosphere there won't be significant moisture to rainout

the thick soot. Thus due to nuclear explosions, a process known as opposite to global warming will occur. This is called *nuclear winter*.

### **Effects**

Lowers global temperature even in summer. Crop productivity will be reduced.

2. It ignites all combustible material and destroys all the living being.

### **Examples of Nuclear Holocaust**

#### ***1. Nuclear War***

Hiroshima, Nagasaki is the example, of which had happened at Second World War.

#### ***2. At Chernobyl***

When operators lost the control of water cooled graphite moderated reactor during a low power tests at Chernobyl in Ukraine, nuclear reactor exploded.



#### ***Chernobyl Victims include***

- o A much greater loss of life & damage to health can still be attributed to coal industry.
- o 31 deaths at the time
- o An estimated 2000 extra cases of cancers in Europe over next 50 years.

#### **Control Measures**

- o Constant monitoring of the radiation level has to be carried out, limit exposure to workers.
- o Regular checks & control measures are done by Atomic energy regulatory board under the Department of Atomic energy.
- o Training must be given to people for handling to avoid accidents.

### **WASTE LAND RECLAMATION**

It is the process and methods for conversion of waste land into land suitable for use of habitation or cultivation. Degraded, mined and other wastelands should be reclaimed and put to some productive use. About half of the land area of country is lying as waste land of varying intensities of degradation.

## **Classification of Wastelands**

Culturable wastelands - Degraded forest lands, marsh and saline lands

Unculturable waste lands - Barren rocky lands, steep sloping areas.

## **Objectives of wasteland reclamation**

- o To improve the availability of good quality water for cultivation
- o Preventing soil erosion, flooding and landslides
- o Conserving biological resources
- o To improve the structure and quality of soil.
- o To avoid over exploitation of natural resources.

## **Wasteland reclamation practices**

### **i) Testing of soils**

Soil testing followed by proper method of treatment to remove salinity, acidity, basicity etc.

### **ii) Land Development and Leaching**

For reclamation of salt affected soil, it is necessary to remove salts by process of leaching. By applying excess of water to push down the salts. In continuous leaching 0.5 to 0.1cm water is needed to remove 90% of soluble salts.

### **iii) Methods of irrigation**

Surface irrigation with precise land levelling, smoothening of efficient hydraulic design help to reduce water logging and salinity.

### **iv) Drainage**

This is required for water logged soil reclamation where excess water is removed by artificial drainage.

### **v) Gypsum application**

Soil sodicity can be reduced with gypsum. Calcium of gypsum replaces sodium from exchangeable sites. Their process converts clay back into calcium clay.

### **vi) Afforestation programme**

National commission on Agriculture (NCA) launched several afforestation schemes. National waste land development board has set a target of bringing 5 million hacres of wasteland annually under fire wood and fodder plantation.

### **vii) Social Forestry Programmes**

They involve strip plantation on road, canal sides degraded forest land etc.,

### **viii) Fertilizers and Biofertilizers**

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

## **CONSUMERISM AND WASTE PRODUCTS**

It is an art of protecting the people against unfair prices, bad products and improper advertising claims etc., Modern life styles are more responsible for current degradation of environment.

Developments in science, Engineering and Technologies have instead of reduction of levels of environmental pollution, brought new products, resulting in more wastes. Consumerism is now an explosion.

**“Consumerism refers to consumption of resources by people.”**

## **Objectives of Consumerism**

- o It improves right of powers of buyers.
- o Active consumerism improves good health, happiness and saves resources.
- o Consumerism forces the manufacturer to reuse and recycle the used product.
- o It makes the products cheaper and avoids pollution.
- o It also makes the manufacturer liable for entire life cycle of a product.

## **Waste Products**

Waste products are mainly generated from industries, domestic and agricultural activities. It is important that these waste products are identified and managed properly to protect us in the community and environment.

## **Types of wastes**

### **i) Solid waste**

It means any garbage, sludge from a wastewater treatment plant, water supply treatment plant, soft drink cans, food wastes etc.,

### **ii) Hazardous waste**

Any ignitable, corrosive or explosive waste may be considered as hazardous. It may be solid, semisolid or even liquid.

### **iii) Universal waste**

It includes batteries such as NICAD battery, lead acid battery etc., and agricultural pesticides.

### **iv) E-waste (Electronic and Electrical waste)**

It includes computers, printers, mobile phones, calculators etc. After their usage, they are thrown as wastes.

## **Effects of wastes**

- o Recycling of plastics is difficult because they are non- biodegradable and their combustion produces toxic gases.
- o Dumping of waste make the soil unfit for cultivation.
- o Human life is affected by waste released from chemical industries and from explosives.
- o There are more than 1000 chemicals in E-waste, which are toxic and cause cancer and respiratory problems, resulting in heavy environmental pollution.

## **Waste minimisation Techniques**

Main components of waste minimisation is

- i) Reduction, ii) Recovery, iii) Reuse, iv) Recycle

### **i) Reduction**

Changing practices and processes to reduce or eliminate generation of hazardous wastes. It includes process modification, chemical substitution and improved operating procedures.

### **ii) Recovery**

This process can help eliminate waste disposal costs, reduce raw material cost.

### **iii) Reuse**

Reduce the amount of waste that needs disposal and save on associated environmental and economic cost.

#### **iv) Recycling**

Recycling is when a waste material is used for another purpose, treated and reused in same process. The consumers should be educated to protect the globe's environment.

#### **Factors affecting consumerism of waste generation**

##### **i) People overpopulation**

There are more people than available supply of food and water. It results in degradation of resources, poverty and premature death. This occurs in less developed countries waste generation is less and less consumption of resources.

##### **ii) Consumption over population**

This occurs in more developed countries where population less, more consumption of resources, more waste generation of higher degradation of environment. Thus more consumerism leads to more waste production.

There should be a movement that helps better quality of life, reasonable consumption and sustainable environmental management. Polluters have to pay the price of pollution. The non polluters should be able to see that there are no further pollutions of the environment.

## **Various Environmental Protection act**

### **ENVIRONMENTAL LEGISLATION AND LAWS**

To safeguard our environment from serious environmental degradation events, environmental management is needed. Various sources that cause environmental problems are

- o Environmental pollution
- o Resource depletion
- o Exponential growth and maldistribution of human population
- o Waste management
- o Urbanization

To achieve the goal of clean environment, a two pronged strategy is required to be made are

- i) Effective laws to protect the environment
- ii) Willing cooperation and active participation of the citizens.

#### **Important Acts**

An independent Department of Environment was established by the Government of India in 1980 to create environmental awareness by encouraging research on environmental problems. Besides this, the parliament of India has passed a number of laws to control pollution and to protect the environment.

- i) Water (Prevention and control of pollution) Act, 1974
- ii) Air (Prevention and control of pollution) Act, 1981
- iii) Wildlife (Protection) Act, 1972
- iv) Forest (Conservation) Act, 1980
- v) Environment (Protection) Act, 1986.

#### **Water (Prevention and Control of Pollution) Act, 1974**

This act provides

- o Prevention and control of water pollution.
- o Maintaining or restoring the sources of water for establishment.

### **Salient features of Water Act**

- o To protect the water from all types of pollution and to preserve the quality of water of all types of surface and ground water
- o It provides for establishment of central and state boards for pollution control.
- o It confers them with powers and functions to control pollution.
- o For contravening the standards laid down by the board, the act sanctions prison sentences ranging from three months to six years.
- o This act is not clear about the pollutant, discharge of pollutant, toxic pollutant which allows the scope of misinterpretation at the time of decision whether the law is violated or not.

The water (prevention and control of pollution) act, was amended in 1988. The main regulatory bodies are the pollution control boards which have been, conferred the following duties and powers.

### **Functions of Central Pollution Control Board**

- o To promote cleanliness of streams and wells in different areas of state.
- o It advises the central government in matters related to prevention and control of water pollution.
- o To coordinate the actions of state board and provide them technical assistance and guidance.
- o Organizes training programs.
- o Organizes comprehensive programs on pollution related issues through mass media.
- o Collects, compile and publish technical and statistical data related to pollution.
- o Prepares manuals, codes or guides relating to treatment and disposal of sewage and trade effluents.
- o Plans nation wide programs for prevention, control or abatement of pollution.
- o Establishes and recognizes laboratories for analysis of water, sewage or trade effluent sample.

### **Functions of State Pollution Control Board**

- o The board advises the state government with respect to the location of any industry that might pollute a stream or a well.
- o Prescribes effluent standards for sewage or trade effluents.
- o Inspecting sewage effluents and waste water treatment plants.
- o Establishing laboratories for sample analysis.
- o The board suggests efficient methods of utilization, treatment and disposal of trade effluents.

### **Penalties for violation of the provisions under the act**

In case of violation of order prohibiting discharge of any polluting matter into stream, well or land, the act further empowers the state board to order closure of industry or stoppage of water or electricity supply etc., the penalty imprisonment for one and half years to six years and fine of Rs.5,000 per day.

### **Air (Prevention and Control of Pollution) Act, 1981**



Stockholm Declaration, 1972 brought awareness in all nations and it deals with air pollution problems. The objectives of this act are to provide prevention, control and abatement of air pollution in order to preserve the quality of air.

### **Salient features of Air Act**

- o State boards are to collect, save and publish air pollution statistical data.
- o State board should inspect pollution control equipments, industries, take necessary actions to control air pollution.
- o The state board can advise state government to declare an area within the state as “air pollution control area” and can avoid use of any fuel other than approved fuel in the area causing air pollution.
- o The directions of central board are mandatory on state boards.
- o The industrial unit operation is prohibited in a heavy polluted area without the consent of central board.
- o The central board may lay down the standards for the quality of air.
- o Central board coordinates with state board and provides technical assistance and guidance to state board.
- o State boards are empowered to lay down the standards for emissions of air pollutants from industrial units or automobiles or other sources.

### **Penalties for violations of provisions under the Act**

Violation of law is punishable with imprisonment for a term which may extend to 3 months or fine up to Rs.10,000 or both. The act also empowers state board to closure of industry or stoppage of water supply, electricity if it is highly polluting.

### **Drawbacks**

- o Discharge of any air pollutant into atmosphere by a ship or aircraft is excluded from the purview of act.
- o Main drawback of this act lies in giving the defaulters 60 days notice before taking him to court, by the time offender may destroy the evidence in which case it becomes difficult to prove the offence.
- o Another drawback is that no consent or permission is required to be taken from the board for establishing an industry outside the air pollution control area, even though its emission may reach the air pollution control area also.

### **Wildlife (Protection) Act, 1972**

In order to preserve and protect biodiversity, this act has been implemented. India has 350 species of mammals, 1200 species of birds and about 20,000 known species of insects. Some of them are listed as ‘**endangered species**’

### **Salient features**

- o Restriction and prohibition on hunting animals. The wild life is declining due to human actions, wild life products - skins, furs, feathers, ivory etc., have decimated the population of many species.
- o Protection of specified plants eg. Blue vanda, Pitcher plant etc.,
- o Setting up and managing sanctuaries and national parks.
- o Empowering zoo authority with control of zoo and captive breeding.
- o Control of trade and commerce in wild life and wild life products.
- o The act covers the rights and non rights of forest dwellers.
- o It provides restricted grazing in sanctuaries but prohibits in national parks.

- o The rights of forest dwellers recognized by forest policy of 1988 are taken away by the amended wildlife Act of 1991.

### **Drawbacks**

Major drawback of this act include mild penalty to offender, illegal wild life trade in Jammu and Kashmir, personal ownership certificate for animal articles like tiger and leopard skins and pitiable condition of wild life in mobile zoos.

### **Penalties for violation of provisions under the Act**

The person who contravenes the provisions of this act shall be punishable with imprisonment for a term which may extent to three years or with a fine which may extent Rs.25,000 or with both.

### **Environment (Protection) Act, 1986**

It describes the protection and improving the quality of environment for prevention, control and reduction of environmental pollution.

### **Salient Features**

- o The setting up of standards of quality of air, water or soil for various areas and purposes.
- o It gives the maximum permissible limits of concentration of various environmental pollutants for different areas.
- o Procedures and safeguards for handling of hazardous substances in different areas.
- o Prohibition and restriction on the location of industries and to carry on process and operations in different areas.
- o Prohibition and restrictions on handling of hazardous substances in different areas.
- o The procedures and safeguards for the prevention of accidents which may cause environmental pollution and providing for remedial measures for such accidents.

### **Penalties for violating the provisions under the Act**

Any person who fails to comply or who contravenes any provision of the act shall be punishable with imprisonment for a term extending to 5 years or be punishable with fine up to Rs.1 lakh or both. If violation continues, an additional fine of Rs.5000 per day may be imposed for entire period of violation of rules.

### **Forest (Conservation) Act, 1980**

This act deals with conservation of forest and related aspects. Except Jammu and Kashmir, the act is adopted all over India. The act covers all types of forests including reserved forests, protected forests or any forested land irrespective of its ownership.

### **Salient Features of Forest Act**

- o The state government has been empowered under this act to use the forests only for forestry purposes.
- o It makes provisions for conservation of all types of forests and for this purpose there is an advisory committee which recommends funding for it to central government.
- o Any illegal non forest activity within a forest area can be stopped immediately under this act.

Some construction work in the forest for wildlife or forest management is exempted from nonforest activity. (Example: fencing, pipeline, check posts, wireless communications etc.,)

### **Forest (Conservation) Amendment Act, 1988**

#### **Salient features**

- o Forest departments are not allowed to assign any forest land 'by way of lease or otherwise to any private person' nongovernmental body for reforestation.
- o Clearance of any forest land of naturally grown trees for the purpose of re afforestation is also not allowed.

### **Penalties for violations of provisions under the Act**

Any one who contravenes this law is punishable with imprisonment for a period which may extend to fifteen days.

Various Issues involved in enforcement of environmental legislation – public awareness

### **Important Issues Related to the Acts**

#### **a) Drawbacks of the Wildlife (Protection) Act, 1972**

- o This act has been enacted just as a fall out of Stockholm conference held in 1972 and it has not included any locally evolved conservation measures.
- o The ownership certificates for animal articles are allowed and often serve as a tool for illegal trading.
- o Since Jammu and Kashmir has its own wild life act, hunting and trading of several endangered species prohibited in other states, are allowed in Jammu and Kashmir.
- o Very harsh penalties are not subjected to the offender of the act penalties. It is just up to 3 years imprisonment as a fine of Rs.25,000 or both.

#### **b) Drawbacks of Forest (Conservation) Act, 1980**

- o To decide the conversion of reserve forest lands to nonforest areas, this act transfers the power from state to centre.
- o Local communities have been completely neglected from the decision making regarding the nature of forest area as powers have been centralized at the top.
- o Tribals were totally dependent on forest resources. When they are stopped from taking resources from there, they involve in criminal activities like smuggling, killing etc.
- o This law is more concentrated on protecting the trees, birds and animals but less concentrated on poor people.
- o Tribal communities have a rich knowledge about the forest resources, their importance and conservation. But their role and contribution is not acknowledged.

#### **c) Drawbacks of Pollution Related Act**

- o Little of power is given to state government, and it hinders effective implementation of act in the states. Illegal mining is taking place in many forest areas. In Rajasthan alone, about 14000 cases of illegal mining have been reported. It becomes more difficult to check at the central level.
- o The penalty is much less than the cost of pollution controls equipments.
- o A person cannot file a petition in the court on a question of environment and has to give a notice of minimum 60 days to the central government.
- o Litigation, related to environment is expensive, since it involves technical knowledge.
- o It is very expensive to install effluent treatment plant for a small unit.
- o The position of chairman of awards is occupied by political appointee and so it is difficult to implement the act without political interference.

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### **PUBLIC AWARENESS**

Non governmental programme more particularly measures to protect the environment can become successful without creating public awareness and enlisting the cooperation. In order to conserve our environment, each and every one must be aware about our environmental problems. To achieve a '**pollution free environment**' and have a protected '**green earth**', there should be spontaneous cooperation from the public.

### **Objectives**

- o Every citizen to be aware and made aware of importance of environment.
- o Reject which are harmful and accept ecofriendly ones.
- o Discourage terrorism and report such activities to avoid damage to the ecosystem.
- o To conduct meetings, group discussion on development, tree plantation programmes, exhibitions etc.,
- o To focus on current environmental problems.
- o To train our planners, decision makers, politicians and administrators.
- o To remove poverty by providing employment.
- o

### **Methods to create Environmental Awareness**

Awareness must be created by both formal and informal education to all sections of the society. Various stages that is useful for raising environmental awareness are discussed here.

**i) Among students through education** Environmental education must be imparted to student's right from childhood stage. Following the directives of Supreme court, environmental studies are introduced as a subject at all stages including school and college level.

**ii) Through mass media** Media can play a vital role to educate the environmental issues through articles, environmental rallies, plantation campaigns, street plays, TV and by cable network.

**iii) Cinema** Film about environmental education should be prepared and screened in theatre compulsorily with the relaxation of tax free to attract the public.

**iv) Newspaper** All the newspaper as well as magazines must publish environmental related problems.

**v) Audio visual media** To disseminate the concept of environment, special audio visual and slide shows should be arranged in all public places.

**vi) Voluntary Organizations** The services of voluntary bodies like NCC, NSS should be effectively utilized for environmental awareness.

**vii) Traditional techniques** Rural people are much attracted by folk plays, dramas that are used for spreading environmental messages.

**viii) Arranging competitions** Story writing, essay writing and painting competitions on environmental issues should be organized for students. Attractive prizes should be awarded for the best effort.

**ix) Among Planners decision makers & leaders** It is very important to give necessary orientation and training through workshops and training programmes to all section of society.

**x) Non government organizations (NGO's)** Voluntary organization can help by advising the government about some local environmental issues and at the same time interacting at the grass root levels. They act as a viable link between the two. They can act as an 'action group' or a

'pressure group'. They can be very effective in organizing public movements for the protection of environment through creation of awareness. **WWF** India (World Wide Fund for Nature India), **CSE** (Centre for Science and Environment) and many others play a vital role in creating environmental awareness. The recent report by CSE on more than permissible limits of pesticides in cola drinks sensitized the people all over the country.

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