

**BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALLI- 620 024**

**ENVIRONMENTAL STUDIES 19UGCES**

**(Applicable to the candidates admitted from the Academic year 2019-20 onwards)**

**By**

**Dr. N. PRAKASH, M.Sc., M.Phil., B.Ed., Ph.D.,**

**HOD & Assistant Professor**

**Department of Chemistry**

**Annai Vailankanni Arts and Science College**

**Thanjavur-07**

**Unit: 6**

**Social Issues and the Environment**

**Sustainable development**

Sustainable development is defined as the meeting the needs of the present, without compromising the ability of future generations, to meet their own needs.

**True sustainable development**

 True sustainable development is the optimum **use** of natural resources with high degree of reusability, minimum wastage, least generation of toxic byproducts and maximum productivity.

**Dimensions of sustainable development**

It is the multi dimensional concept. It may be derived from interactions between society, economy and environment.

**Aspects (or) aim of sustainable development:**

* Inter-generational equity
* Intra-generational equity.

**Inter-generational equity:**

It states that we should hand over a safe, healthy and resourceful environment to our future generations.

**Intra-generational equity:**

It states that the technological development of rich countries should support the economic growth of the poor countries and help in narrowing the wealth and lead to sustainability.

**Approaches (or) Concept (or) Significance for sustainable development**

To build the sustainable development the following methods are proposed.

**Developing appropriate technology :**

* It is the one, which is locally adaptable, eco-friendly, resource efficient and culturally suitable.
* It uses local labours, less resources and produces minimum waste.

**Reduce, reuse, recycle [3R] approach:**

* It insists optimum use of natural resources using it again and again instead of throwing it on the waste.
* It reduces pressure on our natural resources, reduces waste generation and pollution

**Providing environmental education and awareness:**

By providing environmental education and awareness, the thinking and attitude of the people towards our environment can be changed.

**Consumption of renewable resources:**

 To attain sustainability, the consumption of natural resources should not exceed the regeneration capacity.

**Conservation of non renewable resources:**

Non-renewable resources should be conserved by recycling and reusing

**Population control:**

For sustainable development, we should control population growth.

**URBAN PROBLEMS RELATED TO ENERGY**

**Urbanization:**

Urbanization is the movement of human population from rural areas to urban areas for the want of better education, communication, health, employment, etc.

**Urban Sprawl:**

50% of world population lives in urban area and people from rural area is moving to cities for employment. Thus the urban growth is very fast. This leads to spreading of cities into sub-urban or rural areas. This phenomenon is known as urban sprawl.

**Urban problems related to energy:**

* Energy demanding activities
* Solution for urban energy problem.

**Solution for Urban energy problems:**

* Urban people may use public transport instead of using motor cycles and cars.
* Energy consumption must be minimized in all aspects.
* Production capacity may be increased.
* Use energy efficient technology.
* Use solar energy and wind energy.
* Imposing strict laws, penalties and energy audit.

**WATER CONSERVATION**

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

**Need for water conservation**

* The quality and reliability changes in environmental factors
* Better lifestyles require more fresh water.
* Increase in population leads to requirement of more water.
* Due to deforestation the annual rainfall is decreasing.
* Over exploitation of ground water leads to drought.
* Agricultural and industrial activities require more fresh water.

**Strategies (or) measures of water conservation:**

**Reducing evaporation losses:**

* Evaporation of water in humid region can be reduced by placing horizontal barriers of asphalt below the soil surface.
* It increase the water availability and crop yield.

**Reducing irrigation losses:**

The water losses during irrigation can be reduced by using the following methods,

* Use Sprinkling irrigation and drip irrigation.
* Use growing hybrid seeds require less water.
* Irrigation in early morning or later evening reduces evaporation losses.

**Re use of water:**

* Treated waste water can be used for ferti-irrigation.
* Grey water from washings, bath-rooms, etc may be used for washing cars, watering gardens etc.

**Preventing of wastage of water:**

Wastages of water can be prevented by ,

* Closing the when not in use.
* Repairing any leakage from pipes.
* Using small capacity of taps.

**Decreasing run-off losses:**

* Run-off on most of the soils can be reduced by allowing most of the water to infiltrates into the soil.
* This can be done by using contour cultivation and terrace forming.

**Avoid discharge of sewage:**

The discharge of sewage into natural water resources should be prevented.

**Methods of Water Conservation**

The important methods of water conservation are,

1. Rain Water Harvesting
2. Water Shed management

**1.Rain water harvesting:**

Rain water harvesting- is a technique of capturing and storing of rain water for further utilization.

**Need (or) Objectives of rain water harvesting**

* To meet the increasing demands of water.
* To raise the water table by recharging the ground water.
* Reduce the ground water contamination by intrusion of salt water.
* Reduce the surface run-off loss.
* Reduce the storm water run-off and soil erosion.
* To increase the hydro static pressure to land subsidence.
* To minimize water crisis and water conflicts.

**Method (or) Type of rain water Harvesting:**

* Before adapting a rain water harvesting method, the soil characteristics, topography, rainfall pattern and climatic conditions should be encouraged.
* The rain water yield varies with the size and texture of the catchment area.
* A smoother, cleaner and more impervious roofing material contributes better water quality and quantity.

The most common method of rain water harvesting is roof top rain water harvesting.

**Roof Top Rainwater Harvesting Method:**

* It is the method of collecting rain water from roof of the building and storing it on the ground for future use.
* It is the low cost and effective technique for urban houses and buildings.
* The rainwater from the top of the roofs, road surfaces, play grounds, open lands is diverted into the surface tank (or) recharge pits through a delivery system.
* The pit base is filled with stones and sand, which serves as a sand filter.
* Uses:
* It is used for several purposes.
* It can be used to recharge underground aquifers by diverting the water from stored water to dug well or bore wells.



**Advantages (or) Significance of Rain water Harvesting:**

* Reduction in the use of current for pumping water.
* Mitigating the effects of droughts and achieving drought proofing.
* Increasing the availability of water from well.
* Rise in ground water levels.
* Minimizing the soil erosion and flood hazards.
* Upgrading the social and environmental status.
* Future generation is assured of water.

**WATERSHED MANAGEMENT**

**Watershed (or) Drainage basin:**

 Watershed is defined as the land area from which water drains under the influence of gravity into steam a stream, lake, reservoir or other body of surface water.

**Watershed management:**

The management of rainfall and resultant runoff is called watershed management.

**Factors affecting watershed:**

* Watersheds are degraded due to uncontrolled, unplanned and unscientific land use activities.
* Overgrazing, deforestation, mining, construction activities also affect and grade watersheds.
* Droughty climates also affects the watershed.

 **Objectives(or) Need of watershed management:**

* To minimize of risk of floods, droughts and landslides.
* To develop rural areas in the region and improving the economy of the region.
* To manage watershed for developmental activities like domestic water supply, irrigation, hydropower generation etc.
* To generate huge employment opportunities in the backward rain-fed areas.
* To promote forestry and horticultural activity on all suitable areas.
* To protect soil from erosion by runoff.
* To raise the ground water level.

**Watershed management techniques:**

* The following structures to be constructed in the catchment area to improve groundwater storage.
* Trenches:
* Trenches were dug at equal intervals to improve ground water storage.
* Earthen dam (or) Stone Embankment:
* To check the runoff water, earthern dam must be constructed in the catchment area.
* Farm Pond:
* A farm pond can be built to improve water storage capacity.
* Underground barriers (Dykes):
* Underground barriers should be built to raise the water table.

**Maintenance of Watershed (or) Components of integrated watershed management:**

**Water harvesting:**

Proper storage of water in watershed is done with provisions that the water can be used in dry seasons in low rainfall areas.

**Afforestation and Agro forestry:**

Afforestation and agro forestry help to prevent soil erosion and retention of moisture in watershed areas.

**Ex:** In high rainfall areas woody trees are grown in between crops to reduce the surface runoff and loss of nutrients in the soil.

**Reducing Soil Erosion:**

Terracing, bunding, contour cropping, etc are used to minimize soil erosion and runoff on the slopes of watersheds.

**Scientific mining and quarrying :**

* Due to improper mining, the stability of the hills get disturbed resulting in landslides and rapid soil erosion.
* Planting soil binding plants, contour trenching at an interval of 1 meter in the mined area minimizing the destructive effects of mining in watershed areas.

**Public participation:**

* People’s co-operation and participation is essential for watershed management.
* Peoples must be motivated for protecting a freshly planted area and maintaining a water harvesting structure, implemented by the government.

**Minimizing livestock population:**

Livestock population, present in the surrounding villages of the watershed should be reduced.

**RESTTLEMENT AND REHABILITATION OF PEOPLE**

* Resettlement and Rehabilitation is one of the most serious problems caused by the developmental activities.
* Through the developmental project raises the quality and standard of living of the people of the country loses.
* This leads to over- exploitation of natural resources and degradation of the environment.

**Causes of displacement of people:**

There are so many factors which contribute to the large scale displacement of native people. The important factors are,

**Due to Developmental activities:**

* Developmental activities include construction of dams, mining, roads, airports urban expansion etc.,
* These activities cause large scale displacement of local people from their home and loss their traditional profession or occupation.

**Ex: Tehri Dam :** It has displaced more than 10,000 residents of Tehri town.

**Other problems on construction of dams:**

* Submergence of valuable forest cover
* Water logging and its adverse effects.
* Extinction of wild life and plant species.
* Possibility of an earthquake

**Due to Disaster :**

Disastermay be of natural or manmade.

**Natural Disaster :**

It includes, earthquake, floods, droughts, Landslides, avalanches, Volcanic eruptions, etc

**Manmade Disaster :**

 It includes, industrial accidents, nuclear accidents, dam burst etc..

**Due to conservation initiatives:**

These include national park, sanctuary, forest reserve, biosphere reserve etc.

**RESETTLEMENT**

Resettlement is simple relocation or displacement of human population. This process does not focus on their future welfare.

**Rehabilitation:**

* Rehabilitation involves making the system to work again by allowing the systems to function naturally.
* It includes replacing the lost economic assets, safeguard employment, provide safe land for buildings, restore social services, repair damaged infrastructures, etc

**Rehabilitation issues:**

* In India most of the displacements have resulted due to land requirements by the government for various reasons.
* Government has the land Acquisition Act, 1897 for this purpose, which empowers, the government to serve notice to the people to vacate their land .
* Provision of cash compensation is exists in the Act.

**Important Issues:**

* Tribals are usually the most affected among the displaced, who are already very poor.
* Displacement further increases their poverty due to loss of home, land, jobs, food security and social isolation
* Break up of families is an important social issue in which the women are the worst affected and they are even not given cash compensation.
* The land acquisition laws ignore the communal ownership of property, which is an in built system among the tribals.
* Even if the tribals get cash compensation, they are not familiar with the market policies and trend.
* Marriages, social and cultural functions, their folk-songs, dances and activities vanish with their displacement.
* Loss of identity and loss of the intimate link between the people and the environment is one of the big loss.

**Rehabilitation policy:**

A sound national policy on rehabilitation and resettlement of affected people is essential.

* The extent of damage and suffering that the proposed project would cause should be studied and ascertained before starting the project.
* The rehabilitation and resettlement work should be a part of the project and all those affected should be rehabilitated before the commencement of the project
* The people should be rehabilitated on “minimum dislocation basis” by choosing adjacent areas.
* The extent of rehabilitation should meet the ends of social justice and balanced development.
* The advantages of rehabilitation should be on par with those of the beneficiaries of the proposed project.

**ROLE OF NON – GOVERMENTAL ORGANISATION (NGO)**

* Non- Governmental Organizations (NGO) are the legally constituted organisations created by voluntary organisations or people.
* They play on important role in all stages of project development ( planning, execution).
* Mainly it requires the participation and commitment of the public.

**Important rules of NGO’s:**

* To protect environment resources and their economical use.
* To organise courses like lectures, seminars.
* To create informational materials like newsletters, brochures, booklets, articles and videos.
* To analyse and monitor the resources independently.
* To protect the rights of the citizens to the healthy environment and the consumers rights to clean environment.
* To keep vigil in the surrounding area, well, river, lake, land and air against pollution and reporting to state board / central board.
* To conduct sampling and analysis of well/river water to establish its quality.
* To publish the notified restricted areas were industries; industrial operations should not be carried out.
* To provide information on fish killing to the environment not noticed by the state board.

**Some important NGO’s in India:**

1. Centre for science and environment (CSE), New Delhi.
2. Centre for environment Education, (CEE) Ahmadabad.
3. Environmental Society of India, Chandigarh
4. Madras Environmental Society, Chennai.
5. Indian Society for Nature Volunteer, Sonepat.
6. Centre for Himalayan Environment and development. Chamoli.
7. Orissa Environmental Society (OES), Bhuvaneswar.
8. Society for Conservation of forest and wild life, Pune.
9. Rajasthan Environment preservation Society, Jaipur.
10. Environmental Society of Tirupathi, Tripati.

**ENVIRONMENTAL ETHICS**

**Definition:**

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

**Functions of Environment:**

* It is life supporting medium for all organisms.
* It provides food, air, water and other important natural resources to the human beings.
* It disintegrates all the waste materials discharged by the modern society.
* It moderates the climate conditions of the soil.
* A healthy economy depends on a healthy environment.

**Environment Problems (or) Issues:**

* Deforestation activities
* Population growth and urbanisation.
* Pollution due to discharge of effluent and smoke discharge from the industries.
* Water scarcity.
* Land degradation and degradation of soil fertility.

**Solution to Environmental problems:**

The environment can be protected due to the following activities.

* Reduce the waste of matter and energy resources.
* Recycle and reuse our waste products and resources as possible.
* Over- exploitation of natural resources must be reduced.
* Soil degradation must be minimized.
* Sustainable development is essential on, conservation of resources, harvesting of non- conventional energy and waste management.
* Biodiversity of the earth must be protected.
* Reduce population and increase the economic growth of our country.

**Ethical Guidelines:**

* You should love and honour the earth since it has blessed you with life and governs your survival.
* You should keep each day scared to earth and celebrate the turning of its seasons.
* You should not hold yourself above other living things and have no right to drive them to extinction.
* You should be grateful to the plants and animals which nourish you by giving you food.
* You should not waste your resources on destructive weapons.
* You should not steal from future generation’s right to live in clean and safe planet by polluting it.
* You should consume material goods in moderate amounts so that all may share the earth’s precious treasure of resources.

**GREEN CHEMISTRY**

Green chemistry is the chemistry that involves designing and production of chemicals without polluting the environment.

Green chemistry is the pollution free chemistry.

**Goal (or) 12 Principles of Green Chemistry**

**1. Prevention of wastes:**

It is better to prevent wastes than to treat or clean up wastes after they have been created.

**2. Aton Economy:**

Synthetic methods should be designed to maximize the process of formation of final product.

**3**. **Less hazardous chemical synthesis:**

Synthetic methods should be designed to use and generate materials, which process no toxicity or little to human health and the environment.

**4.** **Designing safer chemicals:**

Chemical substances should be designed to affect their desired functions during minimizing their toxicity.

**5. Safer solvents and auxiliaries:**

The use of auxiliary substances (e.g: toxic solvents, separation agents, etc...) should be made unnecessary wherever possible and not harmful when used.

**6. Design for energy efficiency:**

* Energy requirements, during the chemical processes, should be minimized.
* If possible, synthetic methods should be carried out at ambient temperature and pressure.

**7. Use of renewable feedstock:**

Raw material or feed stocks used should be renewable rather than depleting.

**8. Reduce derivatives:**

Unnecessary derivatives should be minimized or avoided if possible, because such steps require additional reagents and generate wastes.

**9. Catalysis:**

Catalysis reagents are superior to stoichiometric reagents.

**10. Design for degradation:**

Chemical products should be designed in such a way that at end of their function they break down in to harmless degradation products and do not persist in the environment.

**11. Real time analysis for pollution prevention:**

Analytical methodologies need to be developed to allow for real time, in- process monitoring and control prior to the formation of hazardous substances.

**12. Inherently safer chemistry for accident prevention**

Substances and some form of a substance, used in a chemical process, should be chosen to minimize the chemical accidents, including releases, explosions and fires.

**NUCLEAR ACCIDENTS AND HOLOCAUST**

**Nuclear energy:**

Energy released during a nuclear reaction is called nuclear energy. Nuclear reactors produce the nuclear energy either by nuclear fission or nuclear fusion.

**Nuclear energy and Nuclear accidents:**

The most serious hazard to human and environmental health from the nuclear accident is the release of large amounts of nuclear energy and radioactive products in to the atmosphere.

**Type of Nuclear Accidents**

**Nuclear Test:**

Nuclear explosions, carried out in underground, cause settling down the radioactive materials on the earth’s surface and radioactive particles, radioactive rays in to the atmosphere.

**Nuclear power plant accidents:**

* The release of radiation occurs during the accidents.
* The nuclear power plants located in the seismic vulnerable area may cause nuclear accidents.

**Improper disposal of radioactive waste:**

* It is another source of accident.
* Drums stored underground can rust and leak radioactive materials in to water, land and air.

**Accident during transport:**

Trucks carrying radioactive wastes or fuels are involved in frequent accidents.

**Core melt down:**

The major accident at a nuclear power plant is a “core melt down’.

**Effects of nuclear radiation**

* Radiation breaks the chemical bonds of the DNA cells. These effects may be instantaneous, prolonged or delayed types. It may affect future generations also.
* Exposure at low dose of radiation (100 – 250 rads) people does not die, but begin to suffer from fatigue, vomiting and loss of hair.
* Exposure at higher dose of radiation (400-500 rads) affects marrow, blood cells, natural resistance and blood to fail clot.
* Exposure at very high dose of radiation (10,000 rads) kills the organism by damaging the tissues of heart and brain.

**Nuclear Holocaust**

* It means destruction of biodiversity by nuclear equipments and nuclear bombs.
* In a holocaust, a large number of living beings are totally destroyed.
* These kinds of destructions are happened in a nuclear war.

**Effect of Nuclear holocaust**

**Nuclear winter:**

* Nuclear bombardment will cause combustion of wood, plastics, petroleum, forest etc., large quantity of black soot will be carried to the stratosphere.
* Black soot will absorb all UV radiations and will not allow the radiation to each the earth.
* Therefore, cooling will result.
* Due to this cooling effect, water evaporation will also reduce.
* In stratosphere there won’t be significant moisture to rain out the thick soot.
* Thus, due to nuclear explosions, a process known as opposite to global warming will occur.
* This is called Nuclear winter.

**Effect of nuclear winter:**

* Lower the global temperature, even in summer the temperature will be at around freezing temperature.
* Crop productivity will be reduced causing famines and human suffering.

**Example of Nuclear Holocaust:**

**Nuclear war:**

Japan, Hiroshima and Nagasaki are the examples of nuclear holocaust, which had happened at II world war.

**At Chernobyl:**

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

Chernobyl victims include,

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

**Control measures:**

* Suitable precautions are to be taken and training must be given to people for handling these materials to avoid accidents.
* Constant monitoring of the radiation level has to be carried out, limit exposure to the workers.
* Regular checks and control measures are done by Atomic Energy Regulatory Board under the Department of Atomic Energy.

**Nuclear Holocausts (Case Study)**

**In Japan ( Bhopal Gas tragedy)**

* In 1945, two nuclear bombs were dropped on Hiroshima and Nagasaki cities in Japan.
* This holocaust killed about 100,000 people and destroys the total city.
* This explosion emitted forceful neutrons and gamma radiations.
* The radioactive strontium (Sr\*90 ) liberated in the explosion has the property of replacing calcium in the bones.
* This leads to large scale of deformities occurred in the inhabitants of these cities.

**Chernobyl Nuclear Disaster:**

* On April 26th 1986, the world worst nuclear explosion occurred in one of the reactors in Chernobyl power plant in Ukraine.
* This disaster was mainly caused due to the poor reactor design and human error.
* It killed more than 20,000 people and 3.5 million people have suffered ill because of the accident.
* Nearly 1, 35,000 people evacuated at around Chernobyl.

**WASTE LAND RECLAMATION**

**Waste land:**

* The land which is not in use is called waste land.
* The waste land is unproductive, unfit for cultivation, grazing and another economic uses.

**Types of Waste land:**

Waste land can be divided in to two types

1. Uncultivable waste lands
2. Cultivable waste lands

**1. Uncultivable waste land:**

 Lands cannot brought under cultivation.

**Ex:** Barren rocky areas, hilly slopes, sandy deserts.

**2. Cultivable waste land:**

* Lands are cultivable but not cultivated for more than five years.
* It is important for agricultural purposes.

 **Ex:** Degraded forest lands, Marsh lands, saline land etc.

**Causes of Waste land Formation:**

* Due soil erosion, deforestation, overgrazing, water logging, salinity.
* Increasing demand for fire – wood and excessive use of pesticides.
* Developmental activities like construction of dams and power projects damage the land due to water logging.
* Over exploitation of natural resources.
* By the sewage and industrial wastes.
* Mining activities destroy the forest and cultivable land.
* Growing demands for fuel, fodder, wood and food cause degradation and loss of soil productivity.

**Objectives (or) Need of waste land reclamation:**

* To improve the physical structure and quality of the soil.
* To prevent soil erosion, flooding and landslides.
* To avoid over exploitation of natural resources.
* To improve the availability of good quality of water for agricultural purposes and industrial operations.
* To conserve the biological resources and natural ecosystem.
* To provide a source of income to the rural poor.
* To supply fuel, fodder and timber for local use.

**Methods of waste land reclamation (or) integrated waste land development programme:**

**Drainage:**

* Excess water is removed by artificial drainage.
* This process is used for water-logged soil reclamation.

**Leaching:**

* Leaching is the process of removal of salt from the salt affected soil by applying excess amount of water.
* It is done by dividing the field in small plots.
* In continuous leaching 0.5 to 1.0 cm water is required to remove 90% of soluble salts.

**Irrigation practices:**

High frequency irrigation with controlled amount of water helps to maintain better water availability in the land.

**Green – manures and biofertilizers:**

Application of green manure is improve the saline soils.

**Application of Gypsum:**

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

**Afforestation programmes:**

* The National Commission on Agriculture has launched several afforestation schemes.
* The National Development Board has decided to bring 5 million acres of waste land annually for firewood and fodder plantation.

**Social Forestry Programmes:**

It involves strip plantation on road, canal sides, degraded forest land etc.

**CONSUMERISM AND WASTE PRODUCTS**

**Consumerism:**

* Consumerism refers to the consumption of resources by the people.
* It is an organized movement of citizens and government.

**Traditionally favourable rights of Sellers:**

* The right to introduce any product.
* The right to charge any price.
* The right to spend any amount to promote their product.
* The right to use incentives to promote their products.

**Traditional buyer rights:**

* The right to buy or not.
* The right to expect a product a product to be safe.
* The right to expect the product to perform as claimed.

**Important informations to be known by buyers:**

* Ingredients of a product.
* Manufacturing date and expiry date:
* The product must be manufactured against an established law of nature or involved in rights violation.

**Objectives of Consumerism:**

* It improves the rights and powers of the buyers.
* It makes the manufacturer liable for the entire life cycle of a product.
* It forces the manufacturer to reuse and recycle the product after usage.
* Items which are difficult to decompose like polymeric goods, computers, televisions, etc can be return to the manufacturer for reclaiming useful parts and disposing the rest.
* The reusable packing materials like bottles can be taken back to the manufacturer. It makes the product cheaper and avoids littering and pollutions.
* Active consumerism improves human health and happiness and saves resources.

**Sources of Wastes:**

The important sources of waste materials are agriculture, mining, industrial and municipal wastes.

**E- Waste :( Electronic and Electrical wastes)**

Electronic equipments like computers, printers, mobile phones, Xerox machines, calculators etc.

**Effects of wastes:**

* The waste released from chemical industries and explosives are dangerous to human life.
* The dumped wastes degrade soil and make unfit for irrigation.
* E-waste contains more than 1000 chemicals, which are toxic and environmental pollution. It causes cancer and other respiratory problems.
* Plastics are difficult to recycle or incinerate safely because they are non biodegradable and produces toxic gases.

**Factors affecting consumerism and generation of wastes:**

**People Over population:**

* It occurs due to the availability of more people than the supply of food and water.
* Over population causes degradation of resources, poverty and premature death.

**Consumption over population:**

* It occurs due to the presents of less people than the available resources.
* Due to luxurious life the per capita consumption of natural resources is very high.
* If the consumption is more the generation of waste also very high and degradation of environment also more.

**ENVIRONMENTAL LEGISLATION AND LAWS**

The major environmental pollution around us are,

* Air and water pollution by industries.
* Forestry
* Land resources
* Urbanization
* Waste management

**Important protection Acts:**

The Government of India and State governments have implemented a number of product acts,

* Environment (Protection) Act, 1972.
* Air (Prevention and control of pollution) Act, 1981 amended in 1987.
* Water (Prevention and control of pollution) Act 1974, 1978.
* Water (Prevention and control of pollution) Amended Act, 1987.
* Wildlife (Protection) Act, 1972.
* Forest (Conservation) Act, 1980.

**ENVIRONMENT (PROTECTION) ACT, 1986**

* This is the general legislation law to rectify the gaps and laps in the Acts.
* It empowers the Central Government to fix the standards for quality of air, water, soil and noise.
* It formulates procedures and safe guards for handling of hazard substances.

**Objectives of Environmental Act:**

* To protect and improvement of the environment.
* To prevent hazards to all living creatures and property.
* To maintain harmonious relationship between humans and their environment.

**Important features of Environment Act:**

* It empowers the Government to lay down the procedures and safe guards for the prevention of accidents which cause pollution and its remedial measures.
* Government has the authority to close or prohibit or regulate any industry or its operation if the violations of the provisions of the Act occur.
* The penal sections of the Act contain more stringent penalties those who fail or contravenes of the Act punishable with imprisonment for a term extending five years or punishable with fine up to Rupees one lakh or both.
* .If the violation continues an additional fine of Rupees five thousand per day for the entire period of violation of rules.
* The Act fixes the liability of the offence punishable under act on the person who is directly in charge.
* It empowers the officer of Central Government to inspect the site or the plant or the machinery for preventing pollution; and to collect samples of air, water, soil or other material from any factory or its premises for testing.

**AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981**

* This Act was enacted in the Conference held at Stockholm in 1972.
* It deals with the problems related to Air pollution.

**Objectives of Air pollution Act:**

* To prevent, control and abatement of air pollution.
* To maintain the quality of air.
* To establish a board for the prevention and control of Air pollution.

**Important features of Air Act:**

* Central Board lay down the standards for the quality of air.
* Central Board coordinates and settle disputes between State boards, in addition to providing technical assistance and guidance to State boards.
* State Boards are empowered to lay down standards for emission of air pollutants from industrial units or automobiles or other sources etc.
* State Boards are top collect and disseminate information related to air pollution.
* State boards are to examine the manufacturing processes and the control of equipment to verify whether they meet the standards prescribed.
* State Board can advise the State Government to declare the heavily polluted areas as pollution control areas.
* The directions of the Central Board are mandatory on State Boards.
* The operation of an industrial unit is prohibited in a heavily polluted area without the consent of the central board.
* Violation of Law is punishable with imprisonment may extend to three months or fine up to Rupees Ten thousand or both.

This Act applies to all pollution industries.

**WATER (PREVENTION AND CONTROL OF POLLUTION) ACT,1974**

* This Act provides for maintaining and restoring the sources of water.
* It also provides for preventing and controlling of water pollution.

**Objectives of the Water Act:**

* Prevention and control of water pollution.
* Maintaining or restoring the wholesomeness of water.
* Establishing Central and State Boards for the prevention and control of water pollution.

**Important Features of Water Act:**

* This Act aims to protect the water from all kinds of pollution and preserve the quality of water in all aquifers.
* It provides establishment of Central and State Boards for prevention of water pollution.
* The States are empowered to restrain any person from discharging a pollutant or sewage or effluent into any water body without the consent of the Board.
* Violation of Law is punishable with imprisonment may extend to three to six years.
* The Amendment Act of 1988 requires permission to set up an industry which may discharge effluent.

**State pollution control board:**

The consent of the state pollution control board is needed to,

* Take steps to establish any industry or any treatment or disposal system.
* Use any new or altered outlet for the discharge of sewage.
* Begin to make any new discharge of sewage.

The Act further empowers the State Board to order closure or stopping of supply or electricity, water or any other services to the polluting unit.

**WILDLIFE (PROTECTION) ACT, 1972, AMENDED IN 1983, 1986 AND 1991.**

This Act is aimed to protect and preserve wildlife.

India has rich wildlife heritage.

It has 350 species of mammals,1200 species of birds and about 20,000 species of insects.

Wildlife is an integral part of our ecology and plays essential role in its functioning.

* **Objectives of Wildlife Act:**To maintain essential ecological processes and life supporting systems.
* To preserve biodiversity.
* To ensure continuous use of species.

**Important features:**

* The Act covers the rights and non- rights of forest dwellers.
* It provides restricted grazing in sanctuaries but prohibits in National parks.
* It also prohibits the collection of non – timber forest.
* The rights forest dwellers recognized by the Forest Policy of 1988 are taken away by the Amended Wildlife Act of 1991.

**FOREST (CONSERVATION (OR) PRESERVATIVE) ACT, 1980**

* This Act provides conservation of Forest and related aspects.
* This Act is enacted in 1980.
* It aims at to arrest Deforestation.

**Objectives of Forest Act:**

* To protect and conserve the forest.
* To ensure the judicious use of forest products.

**Important features of Forest Act:**

* The reserved forest shall not be diverted or dereserved without the prior permission of the Central Government.
* The land has been notified for forest land may not be used for non forest purposes.
* Any illegal non-forest activity within a forest area can be immediately stopped under Act.

**Important features of Amended Act of1988:**

* Forest departments are forbidden to assign any forest land by way of lease or to any private person or non-government body for re-forestation.
* Clearance of any forest land of naturally grown trees for the purpose of re-afforestation is forbidden.
* The diversion of forest land for non forest uses is cognizable offence and any one who violates the law is punishable.

**ENVIRONMENTAL AUDITS**

**Definition:**

Environmental audits are intended to quantify environmental performance and environmental position. In this way they perform analogous function to financial audits. It is also aims to define what needs to be done to improve on indicators of such performance and position.

**Types of Audits:**

It is divided into three types.

**Liability Audit:**

It assess compliance with legal obligations.

**A management Audit:**

It verifies an environmental management strategy meets its stated objectives.

**A Functional Audit (Activity (or) Issues Audit):**

It investigates a specific area such as energy (or) water use.

**BIO** - **MEDICAL WASTES**

**Definition:**

Bio – medical wastes are one type of biowastes generated from health care activities (hospitals, nursing homes, health centres laboratories, research centres , blood banks etc.

**Bio-medical wastes rules 1998 and amendments:**

* To regulate the bio-medical wastes, Ministry of Environment and Forest, Government of India notified bio-medical wastes management and handling.
* These rules apply to all hospitals, nursing homes, laboratories etc.

**Steps involved in the management of bio-medical wastes:**

The steps involved in the management and handling of bio-medical wastes are,

* Generation and Accumulation
* Handling and Storage
* Transport and Disposal.

**I. Generation and Accumulation:**

* The waste generated from biomedical centres should be collected in the containers, which are leak proof and prevent breakage from handling.
* It should not be mixed with other wastes.
1. Containers of bio-medical wastes are marked with bio hazard symbol.

The colour of marking is red (or) offer red.

1. Discarded sharp materials are collected in specialized boxes called needle boxes.

**Classification of bio-medical wastes:**

 During segregation bio-medical wastes are classified into 10 categories.

|  |  |  |
| --- | --- | --- |
| **S.No** | **Types of Wastes** | **Treatment (or) Disposal** |
| 1. | **Human anatomical wastes:**Body parts, Organs, Body tissues. | Incineration (or) deep burial |
| 2. | **Animal wastes:**Body parts, bleeding parts, body fluid | Incineration (or) deep burial |
| 3. | **Microbiology and biotechnology wastes:**Wastes from laboratory cultures, specimens of micro organisms | Microwaving (or)incineration |
| 4. | **Waste Sharps:**Needle, syringes, blade, glass. | Disinfection (or) microwaving |
| 5. | **Discarded medicines and cytotoxic drugs:**Outdated wastes, contaminated medicine. | Incineration (or) microwaving. |
| 6. | **Solid** **wastes:**Items contaminated with blood, cotton, beddings. | Incineration (or) microwaving. |
| 7. | **Solid wastes:**Wastes generated from disposal items. | Autoclaving (or) microwaving. |
| 8. | **Liquid wastes:**Laboratory washing, cleaning. | Discharged into drains. |
| 9. | **Incineration ash:**Ash of any bio-medical wastes | Disposal in municipal landfill. |
| 10. | **Chemical wastes:**Chemicals used in hospitals, laboratories. | Chemical treatment. |

**II. Handling and Storage:**

* Handling refers to the act of manually moving bio-medical wastes between the point of generation, accumulation areas, storage locations and on-site treatment facilities.
* No untreated wastes should be stored beyond 48 hours

**III. Treatment and Disposal:**

The aim of biomedical waste treatment is to reduce the wastes and make the waste unrecognizable.

It occurs in two places.

i) On-site treatment:

ii) Off-site treatment.

**i) On-site treatment:**

It involves use of expensive equipments and used only in very large hospitals and major universities.

**ii) Off-site treatment:**

It involves hiring of a bio-medical waste disposal service.

Type of treatment:

**Incinerator:**

It will destroy pathogens and sharps.

**Autoclave:**

It uses steam and pressure to sterilize the waste (or) reduce its micro-biological contents.

**For liquids:**

1-10% solution of bleach load can be used to disinfect bio-medical wastes.

**Disposal:**

Waste liquids may be disposed off to a sanitary sewer that leads to sewage treatment plant.

**ISSUES INVOLVED IN ENFORCEMENT OF ENVIRONMENTAL LEGISLATION**

* There are number of environmental laws in the form of Acts for safeguarding our environmental quality.
* But cannot implement it strictly, still we are losing our wildlife and natural resources.
* There are many drawbacks and problems in implementing environmental legislations.

**Problems in enforcing the legislations:**

The important problems are,

* We have not achieved the target of bringing 33% of our land cover under forest.
* We lose our wildlife continuously.
* The rivers are now opened to sewer.
* The air in towns is badly polluted.
* Lot of drawbacks in our environmental laws and their implementations.

**Major Issues related to this legislation:**

**1. Drawbacks of the Wildlife –Protection Act:**

* This Act has been enacted as fallout of Stockholm Conference held in 1972; it has not included any locally evolved conservation measures.
* The ownership certificates for some animal articles acts as a tool for illegal trading.
* Jammu and Kashmir has its own Wildlife Act, hunting and trading of endangered species prohibited in other states, are allowed in Jammu and Kashmir.
* The offenders of the Act are not punished by harsh fines. It is just a fine of Rs.25, 000 or imprisonment for up to 3 years.

**Drawbacks of the Forest Conservation Act 1980:**

* This Act just transfers the powers from state to centre to decide the conversion of reserve forest land to non-forest areas.
* The power has been centralized at the top, local communities are completely neglected from the decision making process regarding the nature of forest area.
* The tribal’s who lived in the forest were totally depend on forest resources. When they are stopped from taking any resources from there they involved in criminal activities like smuggling, killing etc.
* This law is concentrated on protecting the trees, birds and animals, but is less concentrated on poor people.
* The forest – dwelling tribal communities have a rich knowledge about the forest resources, their importance and conservation. But their role and contribution is not acknowledged.

**Drawbacks of Pollution related Act:**

* The power and authority has given only to Central Government with little power to State. It hinders the effective implementation of the Act in the States.
* The penalties in the Act is very small compared to the damage caused by the big industries due pollution.
* A person cannot directly file a petition in the court.
* Legislation related to environment is expensive since it involves technical knowledge.
* For small unit it is very expensive to install Effluent Treatment – Plant.
* The position of Chairman of the board is occupied by political appointee. Hence it is difficult to implement the Act without political interference.

**Role of Central and State pollution control boards**

Central and State pollution control boards takes many step to control pollution.

**1. Functions of Central Board:**

* It advises the Central Government regarding the prevention of pollution.
* It plans for the prevention and control of pollution.
* It lays down standards for the well water and air.
* It establishes labs for the analysis of air and water samples.
* It provides technical assistance and guidance to State boards regarding water, air pollution.
* It identifies areas or industries causing air pollution.
* It encourages industries to recycle and reuse the wastes.
* It advises the industries to treat waste water and gases with modern technology.
* Central and State boards emphasize to use **“Clean Technology “**by the industries to reduce pollution.

**Functions of the State Board:**

* It advises the State Government for concerning prevention and control of pollution.
* It has the right to inspect all the pollution control equipment, industrial part and gives order to control pollution.
* It encourages research and investigations regarding pollution.
* It organizes educational programme in collaboration with Central government.
* The analyst of the board is expected to analyze the sample, submit a report to the board and respective industry.

**DISASTER MANAGEMENT**

**Hazard:**

Hazard is a perceived natural event which threatens both life and property.

**Disaster (Calamities):**

A disaster (or) calamities is the realization of this hazard.

**Ex:** Earthquakes, floods, cyclones, droughts and volcanoes etc.

**Definition for Disaster (or) Calamities:**

Disaster is a geological process and is defined as an event, concentrated in time and space, in which a society, or sub-division of a society undergoes severe danger and causes loss of its members and physical property.

**Types of Disaster:**

Based on origin disaster is divided into two types,

* Natural disasters
* Man-made disasters

**Natural Disasters:**

Disasters that are generated by natural phenomena.

Ex: Cyclones, floods, earthquakes etc.

**Manmade Disasters:**

Disasters that are generated by man-made hazards.

**Ex:** Accidents, Pollution, fire etc,

**Important Disasters:**

The important disasters are,

1. Floods

2. Cyclones

3. Landslides

4. Earth-quakes

5. Tsunami

**FLOODS**

**Definition:**

Whenever the magnitude of water flow exceeds the carrying capacity of the channel within its banks, the excess of water over flows on the surroundings causes floods.

**Causes Floods:**

* Heavy rain, rainfall during cyclone causes floods.
* Sudden snow melt raises the water in streams and causes flood.
* Reduction in the carrying capacity of the channels due to the accumulation of sediments causes floods.
* Sudden and excess release of impounded water behind dams
* Human activities like construction of roads, buildings and parking space that covers the earth’s surface prevents infiltration of water in to the soil and speeds up the run off.
* Clearing of forests for agriculture has also increased severity of floods.

**Effects of floods:**

Flood causes heavy suffering to people living in low lying areas because houses and the properties are washed away.

It damage standing crops and livestock

It causes a great economic loss and health related problems due to widespread contamination.

**Flood management:**

Floods management involves the following activities

* Encroachment of flood ways should be banned
* Building walls prevent spilling out of the flood water over flood plains
* Diverting excess water through channels are canals to areas like lakes, rivers, etc where water is not sufficient
* Build check dams on small streams, move building off the flood plains.
* Restore wetlands; replace ground cover on water - course.
* Instead of raising building on flood plain, it can be used for wildlife habitat, parks, recreational areas, which are not susceptible to flood damage.
* River –networking in the country also reduce flood.
* Satellite pictures of pre - flood, flood and post flood with other informations contribute to the flood management process.
* Optical and microwave data from IRS is also used for flood management.
* Flood forecasts and flood warning are also given by the central water commission.
* Reduction of runoff by increasing infiltration through appropriates afforestation.

**CYCLONE**

**Definition:**

Cyclone is a meterological phenomena, intense depressions forming over the open oceans and moving towards the land. On reaching the shores, it moves into the interior of the land or along the shore lines.

**Occurrence:**

* Tropical cyclones in the warm oceans are formed because of heat and moisture.
* The main requirement of formation of tropical cyclone is the sea surface temperature must be below 250C.
* It move like a spinning top at the speed of 10-30 km/hour
* In India cyclones are originating from Bay of Bengal are more in number and intensity.
* They are relatively less in South West Indian Ocean and Arabian Sea.
* In India cyclone occurs during October- December (Or) April – May.

**Effects of Cyclone:**

* The damage depends on the intensity of Cyclone.
* The damage to human life, Crops, roads, transport, communications, tanks, canals and livestock could be very high.
* Its occurrence slows down the developmental activities of the area.

**Cyclone Management:**

* Satellite images are used by meteorological departments for forecasting the weather conditions, which reveal the strength and intensity of the storm.
* Radar system is used to detect the cyclone and used for cyclone warning.
* For observing the exact location of Cyclone, every half an hour satellite pictures are analysed.
* It is difficult to stop the formation of Cyclones, but its effect is minimized by planting more trees on coastal belt, construction of dams, dykes, embankments, wind breaks.

**LANDSLIDES**

**Definition:**

The movement of earthy materials like coherent rock, mud, soil and debris from higher region to lower region due to gravitational pull is called landslides.

**Causes of Landslides:**

* Down hill movement of earth is mainly caused by rain, forces or increasing the material weight, lubricating the various layers or making the slope too steep.
* Movement of heavy vehicles on the unstable sloppy regions creates landslides.
* Earthquake, shocks, vibrations and cyclone create landslides.
* Erosion in the hilly tract due to surface runoff leads to landslides.
* Underground caves and underground mining activities also lead to subsidence.
* Unconsolidated sediments exposed due to logging, road or house building also cause landslides.

**Effects of Landslides:**

* A landslide blocks the roads and diverts the passage.
* Erosion of soil increases.
* Sudden landslides damage the houses, crop yield, livestock etc.

**Landslides Management:**

It is very difficult to control landslides. But it can be minimsed by,

* Unloading the upper parts of the slope.
* Improving cultivation in the sloppy region it reduces the erosion capacity.
* Steepness of the slope can be reduced by developing benches.
* Concrete support can be made at the base of the slope.
* Draining the surface and sub surface water from the sloppy regions.
* Soil stabilization using some chemicals like quick lime is also effective in weak areas.

**EARTH - QUAKES**

**Definition:**

An earthquake is a sudden vibration caused on the earth’s surface due to the sudden release of tremendous amount of energy stored in the rocks under the earth’s crust.

**Occurrence:**

* The earth crust has several tectonic plates of solid rock.
* These plates move slowly along their boundaries.
* When friction prevents these plates from slipping, stress develops and results in sudden fractures along the fault lines within the plates.
* This causes earthquakes and the violent vibrations in the earth.

**Causes of Earthquakes:**

* Earthquakes caused due to disequilibrium in any part of the earth crust.
* Underground nuclear testing.
* Decrease of underground water level.

**Severity of an Earthquake:**

The severity of earthquake is measured by Richter Scale.

|  |  |
| --- | --- |
| **Richter Scale** | **Severity of Earthquake** |
| Less than 4 | Insignificant |
| 4 - 4.9 | Minor |
| 5 – 5.9 | Damaging |
| 6 – 6.9 | Destructive |
| 7 – 7.9 | Major |
| More than 8 | Great |

**Effects of Earthquake:**

* The shocks produced by earthquakes in hilly and mountainous area may cause landslides, it damage the settlements and transport system.
* It collapses houses and other structures due to poor construction thousands of people die depending on the severity of the earthquake.
* Severe earthquake results in deformation of ground surface.

**Tsunami:**

The seismic waves caused by earthquakes travel through sea water and generate high sea waves called tsunami. This causes great loss of life and property.

**Earthquake Management:**

* Damage to property and life can be prevented by constructing earthquake resistant buildings in the earthquake prone areas.
* Wooden houses are preferred in earthquake prone areas in Japan.
* Seismic hazard map should give the information about the magnitude of intensity of anticipated earthquakes.

**PUBLIC AWARENESS**

* Our environment is presently degrading due to many activities like pollution, deforestation, overgrazing, rapid industrialization and urbanization.
* To conserve our environment each and everyone must be aware of our environmental problems.

**Objectives of public awareness:**

* Create awareness among people of rural and city about ecological imbalances, local environment, technological development and various development plants.
* To organize meetings, group discussion on development, tree plantation programmes and exhibitions.
* To focus on current environmental problems and situations.
* To train our planners, decision makers, Politicians and administrators.
* To eliminate poverty by providing employment that overcomes the environmental issues.
* To learn to live simple and eco-friendly manner.

 **Methods to create environmental awareness**

* Environmental awareness in schools and colleges
* Through mass – media
* Cinema
* Newspapers
* Audio - Visual media
* Voluntary organizations
* Traditional techniques
* Arranging competitions
* Leaders appeal
* Non – government organizations.

.....................................