

Govt. Degree College Kilam
Department of Environmental Science
Study Material for BG 1st and 2nd Semester (CBCS)
Compiled By:

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Credit IV: Environmental Issues, policies and practices

- 4.1 Causes, effects and control measures of: Air, water, Soil, Noise and solid waste pollution
- 4.2 Concept of natural disasters and Global environmental issues: Increase in green house gases, Climate change, Acid rain and stratospheric ozone layer depletion.
- 4.3 Salient features of:
 - 4.3.1 Water (Prevention and control of pollution) Act, 1974.
 - 4.3.2 Air (Prevention and control of pollution) Act, 1981.
 - 4.3.3 Environmental Protection Act, 1986.
- 4.4 Environmental education, Environmental Movements (Chipko, Silent valley) and Environmental Ethics

Environmental Pollution: Pollution is an undesirable change in the physical, chemical or biological characteristics of air, water and soil that may harmfully affect the human life. The undesirable change is brought by solid, liquid or gaseous substances present in such concentration as may be or tend to be injurious to the environment.

Pollutants are often the residues of materials we make rise or throw away e.g. smoke from industries and automobiles, sewage from homes and hotels, radioactive substances from nuclear plants, discarded households articles.

Air pollution: Air pollution can be defined as the presence of materials in the air in such concentration which are harmful to man and his environment. A number of substances find their way in the air and these are mostly gases, which rapidly spread over wide areas.

Sources of Air pollution: **Point Sources:** It includes fossil fuels, industries, etc.

Line or Mobile sources: It includes those sources which do not cause pollution at a specific point but are moving sources. These include automobiles as the major sources.

Area sources: It includes those sources of pollution which are prevalent in certain specific area e.g., natural sources like volcanic eruptions, pollen grains; mining activities etc.

Effects of Air Pollution

- Increased higher concentration of green house gases in air (e.g. CO₂, CH₄, NO₂, SO₂, CFC's, water vapour etc) have caused increase in average global temperature (Global warming) which can lead to serious consequences.
- Depletion of ozone layer by CFC's is yet another serious effect of air pollution. It was led to increased inflow of ultraviolet radiations reaching the earth's surface which can lead serious health hazards in humans and animals. Constant exposure can damage the vegetation as well.
- Acid rain is another consequence of air pollution. Gases like oxides of carbon; Sulphur, nitrogen etc combine with water and fall down as acid rain which causes damage to flora, fauna and abiotic structural assets like historical monuments etc. The effects are more pronounced in aquatic systems.
- Carbon monoxide proves to be fatal even in small concentrations as it blocks hemoglobin for binding of oxygen and reduces the oxygen carrying capacity of blood.
- Increased ozone concentration in air can lead to pulmonary edema. It along with aldehydes irritates eyes and respiratory organs. Air pollution leads to many respiratory diseases including bronchitis and asthma due to the presence of particulate and irritating gasses.
- Lead and other metallic particulates have adverse effects on various physiological and biochemical processes of organisms. Fluorides cause fluorosis in animals.
- Crops are adversely affected by increased concentrations of oxides of sulphur, nitrogen, ozone etc.
- Air pollution adversely affects the climate in terms of rain fall, humidity and temperature fluctuations.

Control of Air Pollution: Air pollution can be minimized by the following methods,

- Sitting of industries after proper environmental impact Assessment studies.
- Using low sulphur coal in industries.
- Removing sulphur from coal (by washing or with the help of bacteria).
- Removing (NO) during the combustion process.
- Vehicular pollution can be checked by regular tune up of engines, replacement of more polluting vehicles, installing catalytic converters etc.
- Using mass transport system like bicycles.
- Shifting to less polluting fuels (hydrogen gas).
- Using non-conventional sources of energy.
- Planting more trees.
- Use of biological filters and bioscrubbers.
- Enactment of environment laws.
- Creating public awareness through debates, discussion, seminars, symposia, etc about the hazards of air pollution

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Water pollution: Water pollution can be defined as the presence in water, of some foreign substances or impurities (organic, inorganic, radiological or biological) in such quantity, so as to constitute a health hazard by lowering the water quality and making it unfit for use. In nature water is in its pure form. Impurities get added to it as it percolates beneath the surface of earth and also when it is used for human activities.

Sources of Water Pollution:

Point Sources: In which almost definite, constant and fixed composition of effluents are discharged directly into a water body like industrial discharge and sewage etc.

Non Point or Diffused Sources: In which the effluents are added at different positions with varied composition and volume. These are generally dispersed and diverse in nature e.g. agricultural and domestic run off etc.

Effects of water pollution:

Water is a vital resource essential for sustaining life therefore its contamination has immediate as well as far reaching effects on the health and environment of living beings. The main effects of water pollution are listed below:

- Water polluted with domestic sewage can spread such epidemic diseases as cholera, typhoid, dysentery or diarrhea and a number of minor ailments and water borne diseases.
- Heavy influx of nutrients like nitrates and phosphates from adjoining areas increases growth of weeds in aquatic bodies there by leads to process of eutrophication.
- .Influx of methyl mercury into aquatic ecosystem was responsible for infamous disease called Minamata epidemic. Problems like loss of hearing, speech, sight and many deaths were reported during this epidemic.
- Excess of fluoride in drinking water causes defects in teeth and bones called fluorosis.
- Excess nitrates in drinking water are harmful for human health and may be fatal for infants. At a concentration of 25 mg per liter nitrates cause blue baby syndrome or methaemoglobinemia in human beings.
- Insecticides and herbicides are very harmful. These destroy a number of valuable aquatic food organisms by destroying the larval stages. By the food chain process the phytoplankton are seen in the body of carnivores in high concentration and produce fatal effects so that large numbers of fishes are found dead in areas polluted with DDT. The bird population also reduces. In Man DDT enters by eating the carnivores and may cause cancer, nervous disorders and leukemia and other serious ailments.

Control of water pollution

- Prohibition should be enforced to avoid contamination of main sources of drinking water. Bathing and washing in rivers and streams and discharging untreated or treated domestic, commercial and industrial sewage in water bodies should be prohibited.
- Strict check should be maintained on the quality of drinking water. Improved methods for handling and disposal of sewage, garbage and night soil should be introduced.

- To control the epidemics and other disease, proper methods of sterilization of water drawn from shallow wells, should be developed. The city waste and sewage needs proper treatment.
- For effective water pollution control, legal provisions regarding water pollution should be enforced by special administered machinery comprising of highly qualified and experienced personal.

Soil Pollution: It is considered as a major challenge for healthy environment. The weathering of earth's crust forms, soil over the centuries that supports the variety of microscopic and macroscopic life-forms.

Dumping of various types of materials especially domestic and industrial wastes in the soil due to which it becomes unsuitable for environment and reduces productivity, is called soil pollution.

Sources of Soil Pollution

Soil pollution mainly occurs due to the following:

1. **Industrial wastes:** disposal of industrial wastes is the major problem for soil pollution. Industrial pollutants are mainly discharged from various origins such as pulp and paper mills, chemical industries, oil refineries, sugar factories, textiles, steel etc. These pollutants affect and alter the chemical and biological properties of soil.
2. **Urban wastes:** Urban wastes consist of both commercial and domestic wastes including sludge and sewage. All the urban solid wastes are commonly referred to as refuse. The refuse consists of garbage and rubbish materials like plastics, glasses, metal cans, fibers, paper, street sweepings, fuel residues etc.
3. **Agricultural practices:** Agricultural wastes causing soil pollution include excessive use of fertilizers, pesticides, herbicides, weedicides etc.

Effects of Soil Pollution: Soil pollution is a very serious problem throughout the world. Soil contamination has several negative impacts on the soil and the environment. These are some of the effects soil pollution:

- **Poor crop output:** Increased use of inorganic fertilizers, chemical fertilizers, as well as pesticides, eventually decreases the soil fertility at a faster rate. It also alter the soil structure. Reduced soil quality will lead to poor crop output. Soil can become less productive for growing crops when it is heavily polluted.
- **Unstable chemical composition:** Different soil types naturally have different chemical compositions that are carefully balanced. The introduction of pollutants such as mercury or sulfides can destabilize this balance.
- **Effect on ecosystem and biodiversity:** Soil pollution can lead to the lack of biodiversity in an ecosystem. The life of bird, insect, mammal and reptile species who live in the soil can get affected by pollution. The soil is an important habitat.
- **Effect on Human health:** Living, playing or working on polluted soil can cause skin complaints, respiratory issues and other ailments. Drinking contaminated water as a result of surface run-off can also cause health problems.
- **Contamination of water sources:** When it rains, surface run-off carries contaminated soil into water sources causing water pollution. The contaminated water is thus unfit for both animal and human consumption. It will also affect aquatic life since the organisms that live in these water bodies will find their habitats inhabitable.

Control of soil pollution: Soil pollution can have a devastating impact on plant and animal life, and as such it should be halted. If we act now, we can prevent soil pollution from taking hold. Some useful preventative measures that we can take to this end are listed below.

1. **Go organic:** Organic agriculture uses much fewer chemical fertilizers and pesticides, preventing chemicals from seeping into the soil.
2. **Proper farming methods:** Finding alternatives to chemical fertilizers and pesticides is an ideal way to avoid soil erosion. Rotational and mixed farming are also encouraged.
3. **Dispose of household waste responsibly:** Recycling waste and not dumping it in landfill will keep the soil free of pollution. Not throwing batteries and electrical items into household waste bins will help to keep the soil free of dangerous chemicals.
4. **Prevent or Manage industrial waste:** Properly managing industrial and domestic waste can help prevent soil erosion. Solid waste treatment is also a good preventive measure. Regular health and safety checks and adequate waste disposal methods will ensure that industrial chemicals and other waste are not allowed to contaminate our precious soil.
5. **Community Awareness:** Creating awareness about the effects of soil pollution can help prevent its occurrence.
6. **Burn fewer fossil fuels:** Cleaner air makes it easier for us to have cleaner soil. Fresh, pure rain will keep the soil free of pollutants.

Noise pollution: Noise is considered as environmental pollution, even though it is thought to have less damage on humans than water, air or land pollution. But people who are affected by severe noise pollution know that it is a massive issue that needs attention. The word noise (Latin nausea) is usually defined as an unwanted or unpleasant sound that causes discomfort. Noise is also defined as the wrong sound in the wrong place at the wrong time. Noise pollution means an unwanted sound dumped into the atmosphere leading to health hazards. The unit of measurement of intensity (or loudness) of noise is decibel (dB).

Sources of noise pollution

- Household sources causing noise pollution include gadgets like food mixer, grinder, vacuum cleaner, washing machine, cooler, air conditioners, T.V etc
- Social events like places of worship, parties and other social events also create a lot of noise by using loud speakers.
- Commercial and industrial activities like printing presses, manufacturing industries, construction sites, automobile repair shops etc also cause noise pollution.
- Various modes of transportation also result in noise pollution

Effects of Noise pollution

- **Auditory effects** include both hearing loss and speech interference. The most immediate and acute effect of noise pollution is impairment of hearing. A sudden loud noise can cause severe damage to the ear drum. Long exposure to loud noise can cause hearing loss which may become permanent.

- **Sociological or Psychological effects.** Psychological /sociological effects include an acoustical privacy. Noise pollution increases the rate of heart beat. It causes constriction of blood vessels and cause dilation of the pupils of the ear. Fluctuations in arterial blood pressure, impairment of night vision, are some effects. It causes headache, irritability (annoyance) and extreme emotional disturbances. It aggravates existing disease by disturbing peace of mind and sleep.

Control of Noise Pollution: The noise pollution can be controlled by the following ways:

- Technically/modifying and fabricating the machines and using the quieter machines to replace the noisy ones.
- Regular replace of machinery can reduce noise because much of this noise may be due to inefficiency of the machinery.
- Construction of walls in the highly noisy polluted area can reduce noise in that area.
- Restricting the use of public address systems.
- Growing plants can absorb and dissipate sound energy and thus act as a buffer zone.
- Noise produced by vehicles can be reduced by banning pressure horns and strictly following the traffic laws.
- Use of silencers, improvement in design and better installation of machinery in industries can minimize the noise.
- Each industrial establishment must have such facilities in order to have a check on the intensity of noise pollution, being produced throughout the working period.
- Industrial areas should be planned in such a way that these should be away from residential areas.

Solid Waste pollution: Solid waste is any waste generated by every day human activities. Solid waste may be in the form of house hold garbage, leftovers of food and other wastage that include old house hold items such as papers, plastic waste in the form of kitchen equipment or any other products that are consumed during every day activities.

The solid wastes include the materials; food wastes, paper, metals, plastics, ceramics, worn-out clothes, garden wastes, agriculture wastes, Building wastes, hazardous wastes, dust from mining, hospital wastes including discarded cotton, bottles etc; broken utensils ashes from fires, and a variety of other wastes.

Sources of urban and industrial wastes

Urban solid waste consists of:

Waste from homes (domestic waste) like discarded polythene bags, metal cans, glass bottles, waste paper, waste food etc.

Waste from shops (commercial wastes) like waste paper, bottles, polythene bags, egg shells etc. Biomedical wastes (hospital waste) like needles, syringes, gloves, waste medicine etc. Construction or demolition waste like debris, wood, concrete etc.

Horticulture waste& waste from slaughter houses include vegetable parts, residues and remains of animals. The urban solid wastes that can be degraded by micro-organisms are called bio-degradable wastes. e.g. vegetable wastes, food wastes, dry wastes etc. wastes that cannot be degraded by micro-organisms are called non-biodegradable wastes e.g. polythene bags, glass bottles etc.

An **industrial waste** consists of large number of materials including factory rubbish, packaging material etc. The main sources of industrial wastes are chemical industries, metal and mineral processing industries.

Radioactive wastes are generated by nuclear power plants. Solid wastes from other types of industries include scrap metal, rubber, plastic, paper, glass, leather etc.

Effects of Wastes

On Health: For the general public, the main risks to health are indirect and these arise from the breeding of disease vectors primarily flies and rats. The most serious is the transfer of pollution to water, air and soil. Industries are also introducing danger of different kinds like hazardous wastes during transport and disposal, entry of heavy metals in the food chain etc.

On Environment: The environmental damage caused by solid wastes mostly pertains to aesthetics. Also there is the danger of water pollution when the refuse dump enters the water resources. In addition, uncontrolled burning of open dumps can cause air pollution. Water will pollute air and land filling may leach the water and pollute ground water.

Control of Wastes

- Utilization of wastes for generating electricity and biomass.
- Recycling of the waste.
- Composting for the generation of organic material and its use as soil conditioner.
- Land fill disposal
- Re-organization of the man-power.
- Incineration
- Hydro pulping and Pyrolysis.
- Re-use of waste materials

Natural disasters: A natural disaster is a major adverse event resulting from natural processes of the earth e.g floods, hurricanes, tornadoes, volcanic eruptions, tsunamis etc. A natural disaster can cause loss of life or property damage and typically leaves some economic damage in its wake, the severity of which depends on the affected population's resilience, or ability to recover and also on the infrastructure available.

Earthquake: An **earthquake** occurs when the earth releases pent-up energy and causes the ground to shake. Earth's ground is made up of several very large pieces of land called tectonic plates. Most earthquakes occur when these plates rub against each other in some way. These same plates also create mountains when they push against each other. As the mountains are formed, earthquakes may be felt. Sometimes, people cause earthquakes when they do mine blasts or nuclear tests.

Tsunamis: A **tsunami** consists of huge waves caused by either an underwater earthquake or volcanic eruption. In Japanese, the word means 'harbor wave.' These waves can get as high as 100 feet and aren't the gentle waves that you surf on. No, these are destructive waves that can knock down buildings, trees, and anything else in their path.

Floods: A flood is an overflow of water that covers the earth. This overflow can damage buildings and cars in its path. In a severe flood, the water can seep into houses and completely cover them, ruining everything. And, if people get caught up in the flood, they can be washed away with the flood and drown.

Hurricanes, typhoons, and cyclones refer to the same weather phenomenon, where a really large storm swirls in circles. You'll see the cloud of the storm turning in a spiral, touch down on the ground, and then reach toward the sky. When a storm reaches a wind speed of over 74 miles per hour, it gets classified as a hurricane, typhoon, or cyclone depending on where the storm is located. The storm is called a hurricane if it happens in the Atlantic and northern Pacific. If the storm occurs in the northwestern part of the Pacific, then it is called a typhoon. In the southwestern Pacific and the Indian Ocean, the same type of storm is called a cyclone.

Increase in Green house gases: A green house gas is any gas in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. By increasing the heat in the atmosphere, green house gases are responsible for the green house effect, which ultimately leads to global warming.

Green house effect can be defined as the progressive warming up of the earth's surface due to blanketing effect of manmade CO₂ and other gases in the atmosphere. **Global warming** may be defined as increase in average mean global temperature due to increase in the concentration of green house gases like carbon dioxide, ozone, methane, nitrous oxide etc. the main causes of global warming are industrialization and deforestation.

The increasing green house gases responsible for global warming are as follows:

Carbon dioxide: It is the most abundant green house gas contributing to about 50% to green house effect. The concentration of CO₂ in the atmosphere has increased mainly due to fossil fuel burning in homes and industries etc., deforestation and change in land use. Its concentration in 2016 was 400 ppm. Currently its concentration is increasing at a rate of 1.5 ppm every year.

Methane: It is another green house gas contributing to 18% to green house effect. It is produced by incomplete decomposition of organic matter, paddy fields, wetlands, ruminant's stomach and biomass burning.

Chlorofluorocarbons(CFC's) are non toxic, non flammable, chemically inert synthetic gaseous compounds of carbon and halogens. These are 24% responsible for green house effect. These are released by refrigerators, air conditioners, jet fuels, foams etc.

Nitrous oxide(N₂O): It contributes to 6% in green house effect. The main sources of N₂O are agriculture, biomass burning, industrial processes.

The other green house gases are Ozone, water vapor etc.

Climate change : When any major change occurs in temperature, precipitation, wind patterns and it extends for longer periods of time (decades) is called as climate change.

Over the last several years' extensive growth in population, rapid industrialization, excessive use of fossil fuels, deforestation, increase in automobiles and jet-aero planes caused a drastic change in climate. Due to the natural and anthropogenic activities like soil erosion, flood, landslides, volcanic eruption, earthquake, drought, forest fire, population growth, over-grazing, transportation, urbanization, consumerism etc. several problems arise which are harmful to both humans and nature. These activities release greenhouse

gases like CO_2 , CH_4 , N_2O , and CFC's etc. in the atmosphere and cause increase in the average global temperature. The implications of greenhouse gases are serious. The Inter-Governmental Panel on Climate Change (IPCC) has predicted that this rise of one degree will happen by the year 2025.

Effects of Climate change: A rise in global temperature cause sea levels to rise as polar ice caps and glaciers begin to melt, along with thermal expansion of water.

- More droughts and floods.
- More terrible storms.
- Many more hot days.
- More diseases like malaria and dengue.
- Impacts on ecosystem would change the crop production potential of a region, especially in Asia, Africa and south and Central America.
- Sea level rise
- Global temperature rise
- Erratic precipitation
- Extreme events
- Ocean acidification

Acid rain: Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic. The term acid rain was first used by Robert Angus Smith.

Causes of Acid rain: Acid rain results when sulfur dioxide (SO_2) and nitrogen oxides (NO_x) are emitted into the atmosphere and transported by wind and air currents. The SO_2 and NO_x react with water, oxygen and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground.

While a small portion of the SO_2 and NO_x that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels. The major sources of SO_2 and NO_x in the atmosphere are:

- Burning of fossil fuels to generate electricity. Two thirds of SO_2 and one fourth of NO_x in the atmosphere come from electric power generators.
- Vehicles and heavy equipment.
- Manufacturing, oil refineries and other industries.

Measuring acid rain: Acidity and alkalinity are measured using a pH scale for which 7.0 is neutral. The lower a substance's pH (less than 7), the more acidic it is; the higher a substance's pH (greater than 7), the more alkaline it is. Normal rain has a pH of about 5.6; it is slightly acidic because carbon dioxide (CO_2) dissolves into it forming weak carbonic acid. Acid rain usually has a pH between 4.2 and 4.4.

Winds can blow SO_2 and NO_x over long distances and across borders making acid rain a problem for everyone and not just those who live close to these sources.

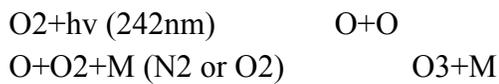
Effects of acid rain:

- Acid rain dissolves and washes away nutrients in the soil, which are needed by plants.

- Acid rain affects the trees by creating holes in the waxy coating of leaves, causing brown dead spots which affect photosynthesis.
- Acid rain that falls on ground Reach Rivers and lakes causes the water in them to become acidic. This affects the plant and animal life in aquatic ecosystems.
- Acid rain causes extensive damage to building and sculptural materials, marble, automobiles, car finishes, paints etc.

Ozone layer depletion: A layer of ozone in the upper atmosphere that prevents dangerous radiation from the sun from reaching the surface of the Earth is called as stratospheric ozone layer. An atmospheric layer at heights of about 20 to 30 miles (32 to 48 kilometers) that is normally characterized by high ozone content which blocks most solar ultraviolet radiation from entry into the lower atmosphere. The concentration of ozone in stratosphere is 10ppm and in troposphere 0.5 ppm.

Formation of ozone: Ozone is formed by a photo chemical reaction, followed by a three body reaction.



The third body (M) absorbs the excess energy liberated by the above reactions and thereby stabilizes the O₃ molecule.

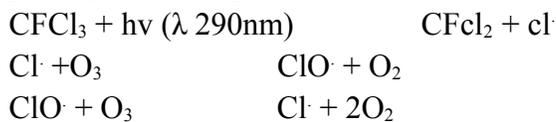
Ozone strongly absorbs ultraviolet light in the region 220- 330nm and thereby protects life on earth from severe radiation damage.

Depletion of ozone: The rate of destruction of ozone is enhanced by the oxides of Nitrogen released from exhausts of large supersonic aircrafts. Nuclear explosions also produce large quantities of NO which directly enter into stratosphere. Following reactions exists between NO and O₃.

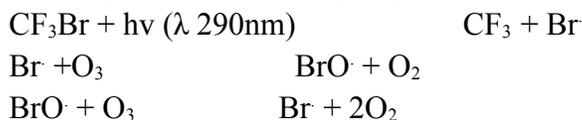


The major contribution in ozone depletion is of CFC's or of Halons. (Halon is the bromine analogue of CFC's e.g. CF₂ClBr)

CFC's and halons are entirely manmade with wide applications in air conditioning, refrigeration, aerosols and modern fire fighters. Widely used CFC's are CFC₁₁ and CFC₁₂ which are in use since 1930. It takes about 20-40 years for these chemicals to travel and reach the stratosphere. In stratosphere they undergo UV photolytic decomposition as:



Also depleted in following ways:



Chemicals containing Bromine are much more reactive than chlorine analogues in terms of ozone depletion. Methyl bromide used as fumigant for soils, plants and seed stocks are known to destroy ozone layer. It can release Br, which is 30- 60 times as destructive to the ozone layer than CFC's.

Water (Prevention and Control of Pollution) Act 1974: This is an Act which is meant for the prevention and control of water pollution and for the matters which are connected with the abatement of pollution. Under the Act, water pollution is defined as such contamination of water, or such alteration of the physical, chemical or biological properties of water, or the discharge of any sewage or trade effluent (whether directly or indirectly) which is likely to render such water harmful or injurious to

- (a) public health or safety
- (b) domestic, commercial, industrial, agricultural or other uses.
- (c) life and health of plants, animals or aquatic organisms.

Objectives of the Act

- To provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.
- To establish Central and State Boards for the prevention and control of water pollution.
- To establish Central and State water testing laboratories.

Silent features

- Prevention, control and abatement of water pollution.
- The water act is designed to assess pollution levels and punish polluters.
- The central government and state governments have set-up pollution control boards to monitor water pollution.
- The water act of 1974 along with amendments in 1978 is an extensive legislation with more than sixty sections for prevention and control of water pollution.
- Central and state boards have been created under this act for preventing water pollution.

The Act empowers the board to take:

- Water samples for analysis
- Govern discharge of sewage.
- Trade effluents
- Study or inspect appeals.
- Set minimum and maximum penalties
- Publication of names of offenders.
- Offences by companies or departments
- Establish or recognize water testing laboratories and standard testing procedures.
- Any person discharging effluents into a water body can be given the penalty of imprisonment up to 3 months or fine up to Rs.10,000 or both.
- In case of damaging or destroying the property of Board, the penalty is imprisonment of 3 months or fine up to Rs. 10,000 or both.

Air (Prevention and Control of Pollution) Act 1981: The Government passed this Act in 1981 to clean up our air by controlling pollution and it came into force on 30 March, 1981. The Act extends to whole of India including the state of J&K. the silent features of the Act are as follows:

- **Objectives of the Act:**

- Prevention, control and abatement of air pollution.
- Maintaining the quality of air.
- Establishment of boards for the prevention and control of air pollution.
- The Air act provides for establishment of central and state boards for implementation of rules under the act.
- The Air act aims at prevention, control and abatement of air pollution.
- Pollution beyond certain limits due to various pollutants discharged through industrial emission is monitored by pollution control boards set up in every state.
- The Central Pollution Control Board (CPCB) implements legislation to improve quality of air, prevent and control air pollution in the country.
- The board advises the central government on matters concerning quality of air. It also coordinates activities, provides technical assistance and guidance to state boards in addition to setting the standards for quality of air.
- It collects and disseminates information in respect to air pollution and performs functions prescribed by the act.
- The state boards advise the state government on matters concerning prevention and control of air pollution.
- The state boards possess the right to inspect at all reasonable times any control equipment, industrial plant or manufacturing process and give orders to take necessary steps to control pollution.
- The state board inspects air pollution control areas at regular intervals or whenever necessary.
- They are empowered to provide standards for emissions to be laid down for different industrial plants with regard to quantity and composition of emissions.
- A state board may recognize or establish a laboratory for this purpose.
- State government has powers to declare air pollution control areas after consulting with state boards. In the same manner, state government can give instructions to ensure standards of emission from automobiles and restrict operation of certain industrial units.
- Penalties are imposed by the state board and it might appeal to the court to restrain persons for causing air pollution.

Penalties :

- Any person who violates any provision of the act is punishable with imprisonment for a term extending to three months or a fine of Rs.10, 000 or both. If the offence continues, an additional fine may extend to Rs. 5000 per day for everyday during which the violation continues after conviction for the first violation.

Environment Protection Act 1986: This Act has been brought into force from November,19, 1986 and extends to whole of India including the State of J&K. The objectives of the Act are as follows:

- Protection and improvement of the environment.
- Prevention of hazards to all living creatures (plants, animals and humans) and property.
- Maintenance of harmonious relationship between humans and their environment.

Its silent features are:

(a) Conferring powers on the Central Government to:

(i). Take all necessary measures for **protecting** quality of **environment**,

(ii). Co-ordinate actions of States, officers and other authorities under this Act.

(iii). Plan and execute a nationwide programme for prevention, control and abatement of environmental pollution.

(iv). Lay down standards for discharge of environmental pollutants.

(v). Empower any person to enter, inspect, take samples and test.

(vi). Establish or recognize environmental laboratories.

(vii). Appoint or recognize government analysts.

(viii). lay down standards for quality of environment.

(ix). Restrict areas in which any industries, operations or processes may not be carried out subject to certain safeguards.

(x). Lay down safeguards for prevention of accidents and take remedial measures in case of such accidents.

(xi). Lay down procedures and safeguards for handling hazardous substances.

(xii). Constitute an authority for exercising powers.

(xiii). Issue directions to any person, officer or authority including the power to direct closure, prohibition or regulation of any industry, operation or process.

(xiv). Require any person, officer or authority to furnish any prescribed information.

(xv). Delegate powers to any officer of a state or authority.

(b). It confers powers on persons to complain to courts regarding any violation of the provisions of the Act, after a notice of 60 days to the prescribed authorities.

(c). The Act makes it obligatory for the person in charge of a place to inform the prescribed authorities regarding any accidental discharge of any pollutant in excess of prescribed standards.

The concerned authorities, on receipt of such information, shall take remedial measures to prevent or mitigate pollution caused by such accidents and expenses incurred by the authorities in respect of remedial measures are recoverable with interest from the polluter.

(d). It prescribes stringent penalties for violation of the provisions of the Act.

(e). Jurisdiction of civil courts is barred under the Act.

A comprehensive Environment (Protection) Act came into being in 1986 to remedy the lacunae noticed in the earlier laws and to serve as a single legislation on the subject.

The Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974 were amended to bring their provisions at par with those of The Environment (Protection) Act, 1986 and to give more powers to the implementing agencies.

Environmental Education: Environmental education may best be defined as a **process** directed at creating **awareness and understanding about environmental issues that leads to responsible individual and group actions**. Successful environmental education focuses on processes that promote critical thinking, problem solving, and effective decision-making skills. Environmental education utilizes processes that involve students in observing, measuring, classifying, experimenting, and other data gathering techniques. These processes assist students in discussing, inferring, predicting, and interpreting data about environmental issues.

Goals of Environmental Education: In 1977, the goals of environmental education were agreed in the Tbilisi declaration at the Intergovernmental Conference on Environmental Education held at Tbilissi. They were amended at UNESCO meetings in the Asia-Pacific region in order to capture the notion of sustainability.

The three goals of environmental education agreed upon are:

1. To foster clear awareness of, and concern about, economic, social, political and economic interdependence at local, regional, national and international levels.

2. To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment.

3. To develop and reinforce new patterns of environmentally sensitive behavior among individuals, groups and society as a whole for a sustainable environment.

Objectives of Environmental Education:

Awareness: to help social groups and individuals acquire awareness and sensitivity towards, “the environment as a whole, and, “issues, questions and problems related to environment and development.

Attitudes: to help individuals, groups and societies acquire: “a set of values and feelings of concern for the environment, and “the motivation to actively participate in protection of the environment.

Knowledge: to help individuals, groups and societies gain a variety of experience in, and acquire a basic understanding of what is required to create and maintain a sustainable environment.

Skills: to help individuals, groups and societies acquire the skills for: “identifying, anticipating, preventing and solving environmental problems.

Evaluation ability: i.e. evaluates environmental measures and education programs in terms of ecological, economic, social, aesthetic and educational factors.

Participation: to provide individuals, groups and societies with an opportunity and the motivation to be actively involved at all levels in creating a sustainable environment.

Environmental movements in India: An environmental movement can be defined as a social or political movement, for the conservation of environment or for the improvement of the state of the environment. The terms ‘green movement’ or ‘conservation movement’ is alternatively used to denote the same.

Chipko Movement:

- Year: 1973
- Place: In Chamoli district and later at Tehri-Garhwal district of Uttarakhand.
- Leaders: Sundarlal Bahuguna & Chandi Prasad Bhatt
- Aim: The main objective was to protect the trees on the Himalayan slopes from the axes of contractors of the forest.

Mr. Bahuguna enlightened the villagers by conveying the importance of trees in the environment which checks the erosion of soil, cause rains and provides pure air. The women of Advani village of Tehri-Garhwal tied the sacred thread around trunks of trees and they hugged the trees, hence it was called ‘Chipko Movement’ or ‘hug the tree movement’. The main demand of the people in these protests was that the benefits of the forests (especially the right to fodder) should go to local people. The Chipko movement gathered momentum in 1978 when the women faced police firings and other tortures. The then state Chief Minister, Hemwati Nandan Bahuguna set up a committee to look into the matter, which eventually ruled in favor of the villagers. This became a turning point in the history of eco-development struggles in the region and around the world.

Silent Valley Movement:

- Year: 1978
- Place: Silent Valley, an evergreen tropical forest in the Palakkad district of Kerala, India.
- Leaders: The Kerala Sastra Sahitya Parishad (KSSP) an NGO, and the poet-activist Sughathakumari played an important role in the Silent Valley protests.
- Aim: In order to protect the Silent Valley, the moist evergreen forest from being destroyed by a hydroelectric project.

What was it all about: The Kerala State Electricity Board (KSEB) proposed a hydroelectric dam across the Kunthipuzha River that runs through Silent Valley. In February 1973, the Planning Commission approved the project at a cost of about Rs 25 crores. Many feared that the project would submerge 8.3 sq km of untouched moist evergreen forest. Several NGOs strongly opposed the project and urged the government to abandon it. In January 1981, bowing to unrelenting public pressure, Indira Gandhi declared that Silent Valley

will be protected. In June 1983 the Center re-examined the issue through a commission chaired by Prof. M.G.K. Menon. In November 1983 the Silent Valley Hydroelectric Project was called off. In 1985, Prime Minister Rajiv Gandhi formally inaugurated the Silent Valley National Park.

Environmental ethics or Eco ethics: Ethics is a branch of philosophy which seeks to define fundamentally what is right and what is wrong, regardless of cultural differences. e.g. most cultures have a reverence for life and feel that all individuals have a right to live. It is considered unethical to deprive an individual of life.

Morals differ somewhat from ethics because morals reflect the predominant feelings of a culture about ethical issues. e.g. when a country declares war, most of its people accept the necessity of killing the enemy. Environmental issues also evolve a consideration of ethics and morals. As ethics and morals are not always the same, thus, it is often difficult to clearly define what is right and what is wrong. Some individuals view the world's energy situation as serious and have reduced their own consumption. Others do not believe there is a problem, and therefore, have not modified their energy use. Other similar issues are population growth and pollution.

Most of the attitudes towards the environment can be divided into following three groups.

1. **Development ethic:** It assumes that human race in and should be the master of nature and that the earth and its resources exist for our benefit and pleasure.
2. **Preservation ethic:** It considers nature is special in itself and should be preserved at social and economic cost.
3. **Conservation ethic:** It is related to scientific preservationist view, but extends the rational consideration to the entire earth and for all times. It recognizes the desirability of decent living standards, but it works towards a balance of resource use and resource availability. It stresses a balance between total development and absolute preservation.