

CONCEPT OF NATURAL DISASTERS AND ENVIRONMENTAL ISSUES

A disaster is an event of nature or man-made that leads to sudden disruption of normal life of society, causing damage to life and property, to such an extent that normal social and economic mechanisms available are inadequate to restore with a high frequency of natural causes like droughts, floods, cyclones and earthquakes and occasional tragedies like the gas leak at Bhopal.

Disasters are

Natural: Water and Climate related Disasters: Floods, cyclone, Tornadoes, hurricanes, Hailstorm, Cloud burst, Heat and cold wave, Snow avalanches, Droughts, sea erosion and thunder and lightning. It also include Geology related disasters like Landslides and mudflows, Earthquakes etc.,

Manmade: Chemical industrial and Nuclear related Disasters: Chemical disasters, nuclear disasters.

Accident related disasters: Forest fires, urban fires, Mine flooding, Oil spills, building collapse, Bomb blasts, festival related disasters, Electrical disasters and fires, Air, road and rail accidents, Boat capsizing, Village fire etc.

Biologically related disasters: Biological disasters and epidemics, Pest attacks, cattle epidemics, Food poisoning etc. In the 1970's and 1980s earthquakes, droughts and famines were the biggest killers, the situation stands altered now. It is probable that a combination of factors like better management and food security measures has greatly reduced the deaths caused by droughts and famines. Floods, high winds and earthquakes dominated the reported injuries (98%), with ever increasing number in the last decade.

MANAGEMENT OF DISASTERS

1. Preparedness: The approach towards coping with the effect of natural disasters has been post disaster management involving many problems like law and order, evacuation and warnings, communications, search and rescue, fire-fighting, medical and psychiatric assistance, provision of relief and sheltering, etc. After the initial trauma of the occurrence of the natural disaster is over within the first few days or weeks, the phase of reconstruction and economic, social and psychological rehabilitation is taken up by the government authorities

2. Emergency response: Many thousands die instantly and many other thousands are either buried alive in the rubble or are carried away by the hurried water. Response speed and its quality are of great importance in saving lives in the immediate aftermath of a disaster. The failure to respond quickly for lack of a good Emergency response Plan (ERP) is the other direct reason for the high death toll. Due to the lack of a good ERP it took six hours for the Gujarat Government to find out the location of the quake's epicenter, and another 10 hours to make contact with the Bhuj collector. Following situation like the Orissa Super cyclone (October 1999) the HPC has highlight the need for the central government to respond at the earliest in the most appropriate manner.

3. Prevention: Natural occurrences such as floods, earthquakes, cyclones etc. simply cannot be stopped from taking place. What can be done, however, is to take preventive measures at various levels of society in order to make the impact of such natural hazards as harmless as possible for people and people's properties. The impact of a natural hazard can be reduced; its worst effects can be prevented. Natural disasters kill an average of 1,00,000 persons and cause property damage of Rs.20,000 crores worldwide each year.

Certain elements which can be helpful in mitigating natural disasters are:

1. **Zonation** of different areas that offer natural hazard risk levels. e.g. earthquake hazard zoning map
2. The design and construction of earthquake resistant engineered buildings and land use zoning.
3. Development of network of seismological stations, like cyclone and flood measuring stations.
4. Public participation, the person most motivated to reduce risk are the risk bearers. The best way to involve them is by making them active agents in the assessment and management of risks

GLOBAL WARMING

Global warming can be described as increase in the average temperature of the atmosphere, oceans, and land masses of earth. The planet has warmed and cooled many times during the 4.65 billion years of its history. At present Earth appears to be facing a rapid warming, which is mostly believed to be as a result of human activities. The chief cause of this warming is thought to be the burning of fossil fuels, such as coal, oil and natural gas, which releases into the atmosphere carbon dioxide and other substances known as greenhouse gases. As the atmosphere becomes richer in these gases, it becomes a better insulator, retaining more of the heat provided to the planet by the sun.

The average surface temperature of Earth is about 15°C (60°F). Over the last century, this average has risen by about 0.5°Celsius (1°Fahrenheit). Scientists predict further rise in temperature of 1.0 to 3.5°Celsius (1.8 to 6.3°Fahrenheit) by the year 2100. This temperature rise is expected to warm the oceans, which will expand their volume and raise sea level by at least 15 cm, flooding some regions in warmer climates will receive more rainfall than before, but soils will dry out faster between storms. This soil desiccation may damage food crops, disrupting food supplies in some parts of the world. Plants and animal species will shift their ranges towards the poles or to higher elevations seeking cooler temperature and species that cannot do so many become extinct.

GREEN HOUSE GASES

Green houses gases occur naturally in the environment and also result from human activities. Carbon dioxide is the important green house gas. It flows in to the atmosphere from many natural processes, such as volcanic eruptions; the respiration of animals, and the burning and decay of organic matter, such as plants and fossil burning. Carbon dioxide from the atmosphere is consumed by absorbing into oceans water and photosynthesis. Photosynthesis breaks up carbon dioxide, releasing oxygen into the atmosphere and incorporating the carbon into new plant tissue.

Due to burning of fossil fuels, solid wastes and wood and wood products is the consequence of human activities which resulted in carbon dioxide release into the atmosphere at much faster rates than earth's natural processes can cycle this gas. One hundred years ago, there were about 281 parts per million of carbon dioxide in the atmosphere. Today there are 400 parts per million, which reflects a over 30 percent increase. This concentration is double the levels prior to the Industrial Revolution. If people continue to burn fossil fuels at an increasing rate, the carbon dioxide level in the atmosphere could eventually reach four times what it was in the 1800s. Methane is an even more effective insulator trapping over 21 times more heat than does the same amount of carbon dioxide. Methane is emitted during the production and transport of coal, natural gas, and oil. Methane also comes from decomposing organic waste in landfills, and it is released from certain animals, especially cows, as a byproduct of digestion. Since the beginning of Industrial Revolution, the amount of methane in the atmosphere has more than doubled. Nitrous oxide is a powerful insulating gas released chiefly by burning fossil fuels and plowing farm soils. Nitrous oxide traps over 270 times more heat than does the same amount of carbon dioxide. The concentration of nitrous oxide in the atmosphere has increased 15 percent over pre-industrial levels. In addition, green house gases are produced in many manufacturing processes, per fluorinated compounds result from the smelting of aluminum, Hydro fluorocarbons during the manufacture of many products, including the foams used in insulation, furniture, and car seats. Refrigerators built in some developing nations still use chlorofluorocarbons as coolants. Chlorofluorocarbons are best known for their tendency to destroy Earth's high-altitude ozone layer, but they also act as atmospheric heat retainers.

GREEN HOUSE EFFECT

The warming of the globe as is believed to be due to release of Green House Gases in the atmosphere is called Green House Effect. The energy that lights and warms Earth comes from the Sun. Most of the energy that floods onto our planet is short-wave radiation including both visible and ultraviolet (a type of light that humans cannot see). When this energy strikes the surface of Earth, the energy changes from light to heat and warms Earth. The earth's Surface in turn, releases some of this heat especially at night, as long-wave infrared radiation. Much of this long-wave infrared radiation makes it all the way back out to space, but a portion remains trapped in Earth's atmosphere. Certain gases in the atmosphere, including water vapour, carbon dioxide, and methane, provide the trap. Absorbing and reflecting infrared waves radiated by Earth, these gases conserve heat as the glass in a green-house does and are thus known as greenhouse gases. As the concentration of these greenhouse gases in the atmosphere increases, more solar energy remains trapped below. All life on Earth relies on this greenhouse effect. Without it, the planet would be colder by about 33 Celsius degrees (59 Fahrenheit), and ice would cover Earth from pole to pole. However, a growing excess of green house gases in Earth's atmosphere threatens to tilt the balance in the other direction towards continual warming.

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. Climate refers to the physical environmental factors including duration and quantity of light, temperature, humidity, and wind pressure and evapo-transpiration rate of an area. From the various sources it has been proven that the earth's average atmospheric temperature has risen and there is increase in the concentration of carbon dioxide and other greenhouse gases. The increased concentrations of the greenhouse gases and its effects may contribute to global warming or climate change which may adversely affect the agriculture, hydrological cycle, wind pattern, distribution of rainfall, migration of birds etc. The climate change is regularly in the news. The concentrations of GHG's in the atmosphere are rising. The earth is rapidly warming and its climate is changing. In the years to come there could be more frequent, intense floods and droughts, more powerful storms, polar ice sheet melting, more diseases and the sea level rise.

CLIMATE CHANGE IMPACTS:

SEA LEVEL RISE: there is clear scientific evidence that the global sea level has increased about 6.5 inches in the last one hundred years. This increase is almost double than the last century. Due to the climate change, the oceanic temperature has increased, the polar ice has melted with the result sea level has risen. The ice cover is shrinking at an alarming rate.

GLOBAL TEMPERATURE RISE: there is clear cut evidence that the global surface temperature has warmed and it has been recorded that since 1970's onwards about 20 warmest years have been evidenced. The average global temperature increased by approximately 1°C.

ERRATIC PRECIPITATION: this is another phenomenon of climate change in which extreme variations of precipitation has been recorded. The wet areas are becoming wetter and the dry areas are becoming arid.

EXTREME EVENTS: this phenomenon of climate change includes extreme events globally like high temperatures, very cold temperatures, intense rainfall, snow storms, hail storms, droughts, landslides etc.

OCEAN ACIDIFICATION: the oceanic acidification occurs due to increased levels in carbon dioxide. When the level of carbon dioxide in the atmosphere increases, it results into more absorption into the oceans. An amount of about 2 billion tons per year of carbon dioxide gets absorbed by the upper layers of the oceans.

CAUSES OF 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 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 AND ITS REMEDIES

Forests are already subjected to multiple stresses including over extraction, insect outbreaks, live-stock grazing, forest fires and other anthropogenic pressures. Climate change will be an additional stress. Disturbed and fragmented forests and monoculture forests are likely to be more vulnerable to climate change.

Increased concentration of greenhouse gases (GHGs) in the atmosphere resulted in warming of the global climate system, the trends of rise in temperature, heat waves, droughts and floods, and sea level amply indicate the climatic anomalies. Agriculture, particularly in India with nearly 60% rain fed area, has been a highly risky venture with vagaries of monsoon besides the interplay of other abiotic and biotic factors. Efforts are required for mitigation and adaptation to reduce the vulnerability of Indian agriculture to the adverse impacts of climate change and making it more resilient.

Soil can act as a major sink of carbon and can play an important role in reducing level of greenhouse gases (GHGs) in the atmosphere through carbon (C) sequestration. Mitigation of CO_2 emission from agriculture can be achieved by increasing C sequestration in soil, which implies storage of C as soil organic matter. Soil management practices such as tillage, fertilizer, irrigation, crop residue management, etc. modify soil C stocks to varying degrees. Reducing the intensity and frequency of ploughing and leaving crop residues on the soil surface as mulch are important strategies for enhancing soil organic carbon (SOC) content. Judicious nutrient management is crucial to SOC sequestration in tropical soils. Long-term manure application increases the SOC pool, and the effects may persist for a century. Although both organic and inorganic forms of C are found in soils, land use and management typically have a larger impact on organic Carbon

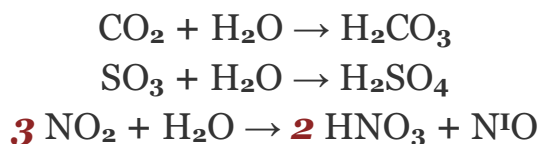
The lakes, rivers, ponds, wells are important source of water to the people. The climate change is expected to influence the water cycle (hydrological cycle) likely to increase the stress on the requirement of water in different regions of India. The increased temperatures and change in rainfall pattern might decrease the overall fresh water. The other factors like increased rate of evaporation and evapo-transpiration, loss of glaciers and reduction in snowfall cover will severely impact the water resources. The lowering of ground water resource, decrease in percolation of water in the soil, loss of mountain lakes and springs is also a serious concern. Therefore, adaptive measures like canal irrigation, pond irrigation, rainfall run-off harvesting ponds, roof top rain water harvesting, check dams and wells are a few to initiated immediately.

The change in the seasons, rainfall, snowfall, temperature, will directly impact the tourism industry in India and the world. The increased frequency of natural disasters, changed weather pattern, bad health conditions etc will diminish the prospectus of the tourism industry.

The climate change is a major challenge today we are facing. This is a threat which is all around and it has caused significant environmental, economic, social and political challenge of the present and the future generations to come.

ACID RAIN

Acid rain occurs when the pollutants that come from immobile sources such as smoke stacks, power plants, and mobile sources such as cars rise up into the clouds and fall back to earth as contaminated rainfall. The rain becomes acidic because of gases which dissolve in the rain water to form various acids. As the name suggests, acid rain is just rain which is acidic. It can be described as the presence of excessive acids in rain waters. Un-polluted rain is naturally acidic because carbon dioxide from atmosphere combines with water to a sufficient extent to form carbon acid (weak). The pH for pure rain water is in the range of 5.6 – 6.5. , so the term acid rain is now used to describe rain with a pH below 5. Acid rain is formed by the reaction of rain water to a combination of various gases. The basic components of acid rain are SO₂ ,NO_x, VOC's (volatile organic compounds) and several others. Most of the sulphur present in the atmosphere of the Northern Hemisphere is from anthropogenic sources. Coal and lignite power stations contribute to a large amount of this pollution.



THE EFFECTS OF ACID RAIN

SOILS AND VEGETATION

Acid rain leaches nutrients from soil and cause nutrient depletion

FORESTS

Trees in forests have been found to be affected by pollutants in the air. The main causes of this degradation is acid rain. Pollutants can also be absorbed from the soil affected by acid rain. This causes the tree to be affected from its roots upward

WATER

Excess deposition of nitrogen can lead to increased amounts of nitrate which aid in the acidification of lake waters. Acidic deposition affects aquatic life. Acidification may eliminate sensitive algae species and decrease phosphorous and inorganic carbon concentrations. It can also cause damage to fish populations. Heavy metals removed from the soil during acid rains could cause death to aquatic life. Fish absorb polluted water through their gills and this can have harmful effects on them such as the amount of oxygen taken up by the blood is reduced and the blood circulation is affected.

WILDLIFE

The damage from acid rain to terrestrial wildlife is basically through the food chain. Accumulated heavy materials cause great damage through bio-magnification. This occurs because each successive level of the food chain accumulates more of the pollutant and passes it on to the next level.

BUILDINGS

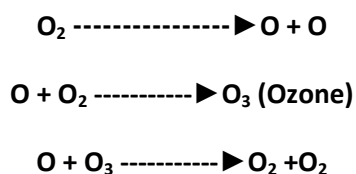
A large variety of materials are affected by acid rain. These extend from sandstone and limestone to metals such as zinc, aluminium, copper, plastics, paper, textiles, etc, However, the corrosion processes are not very well understood as yet. Limestone and marble are particularly affected. The acid dissolves the calcium carbonate in the stone, and this solution evaporates, forming crystals within the stone. As these crystals grow, they break apart the stone, and the structure crumbles

Acid precipitation has an accelerated effect on corrosion by forming a layer of moisture on the metallic surface and by adding hydrogen and sulfate ions. However, rain can also wash away sulfates deposited during dry deposition and can, therefore, retard corrosion. The most disastrous effects of acid rain that are visible to the naked eye, are the effects on old monuments and buildings of historical importance. These include the Taj Mahal in India, the Acropolis in Greece and many others around the world.

STRATOSPHERIC OZONE LAYER DEPLETION

Ozone forms a layer in the stratosphere, thinnest in tropics (around then equator) and denser towards the poles. This layer extends from 19 to 48 kilometers above the earths surface. The concentration of ozone in stratosphere occurs up to 10ppm. The formation of ozone by the action of sunlight on oxygen, this action has been taking place for many millions of years, but naturally occurring nitrogen compounds in the atmosphere apparently have kept the ozone concentration at a fairly stable level. The presence of this ozone up in the stratosphere absorbs some of the potential harmful ultraviolet (UV) radiation from sun (at wavelength between 240nm and 320nm) which otherwise can cause skin cancer and damage vegetation among other things. Although ozone at ground level is a health hazard causing respiratory ailments such as bronchitis and asthma. It also damages vegetation and causes rubber and some plastics to deteriorate.

The loss of ozone (Greek, ozein “to smell”), a pale blue, highly poisonous gas with a strong odour was not known till two American scientists discovered the capabilities of chlorine atom released from chlorofluorocarbons(CFC’s) of eating ozone. The ozone which is present in the stratosphere is continuously being produced and destroyed. The production takes place when molecular oxygen is split by UV-solar radiation and the resulting oxygen atom (O) attach themselves to other oxygen molecules. The destruction of ozone takes place by the reaction



Sometimes these reactions are also known as “Chapman reaction”. The layer of ozone formed in the stratosphere by these reactions is sometimes called the “Chapman layer”. However, this theory has its limitations that in the reaction the loss of ozone given was too slow. It could not remove enough ozone to give the values seen in the real atmosphere. There had to be other reactions, faster reactions that were controlling the ozone concentration in the stratosphere.

OZONE DEPLETION

Loss of ozone in the lower stratosphere over Antarctica was first noticed in the 1970's. In 1985, the drop in ozone levels in the Stratosphere showed that the loss was rapid and of large scale over most of the Antarctica continent. There are also many new measurements and observations of the changes in ozone that occur over Antarctica. There has been a phenomenal decrease from 1975 onwards in the total ozone and it was recorded less than half its value during the year 1994. This dramatic fall in ozone was caused by the use of manmade chemicals known as halocarbons which include the well known CFC's commonly used in fridges. These CFC's had made their way into the upper atmosphere where the much stronger UV radiation from the sun had broken them down into their component molecules, releasing the potentially damaging chlorine (and bromine) atoms, which could destroy ozone. The loss of ozone was not restricted to Antarctic only but there had been an ozone decrease over the heavily populated northern mid-latitudes (30-60N).

ENVIRONMENTAL LAWS

SALIENT FEATURES OF “THE WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974”

This is an Act which is meant for the prevention and control of pollution in the environment and for the matters which are connected with the abatement of pollution. The Act was enacted by the Indian Parliament in the 25th year. This Act may be called The Water (Prevention and Control of Pollution) Act, 1974. It shall come into force as may be notified in the Official Gazette and it extends to whole of India.

DEFINITIONS:

Pollution means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or to aquatic organisms.

Central and State Boards for the Prevention and Control of water Pollution:

The Central Board for the Prevention and Control of water Pollution constituted under section 3 of the Water (Prevention and Control of Pollution) Act, 1974, shall, without prejudice to exercise and performance of its power and functions under that Act, exercise the power and perform the functions of the Central Board for the Prevention and Control of Air Pollution under this Act. In any state for the purpose of this Act, shall be deemed under Water (Prevention and Control of Pollution) Act.

Constitution of State Boards:

In any state in which the water (Prevention and Control of Pollution) Act, 1974, is not in force, that Act is in force but the state Government has not constituted a State Board for the Prevention and Control of Water Pollution) under that Act, the State Board shall with effect from such date as it may, by notification in the Official Gazette, appoint, constitute a State Board for the Prevention and Control of Air pollution under such name as may be specified in the notification, to exercise the power conferred on, and perform the functions assigned to, that Board under this Act.

Functions of Central Board:

Subject to provisions of this Act, the main functions of the Central Board shall be to improve the quality of water and to prevent, control or abate water pollution in the country.

Functions of State Board:

Subject to the provisions of this Act, and without prejudice to the performance of this functions, if any under the Water (Prevention and Control of Pollution) Act, 1974 the functions of a State Board shall be to plan a comprehensive programme for the prevention, control or abatement of pollution and to secure the execution thereof.

Power to take samples of effluents and products to be followed in connection therewith:

State Board or any officer empowered by it in this behalf shall have power to take for the purpose of analysis sample of water from any stream or well or sample of any sewage or trade effluents which is passing from any plant or vessel of from or over any place into any such stream or well.

Power of entry and inspection:

Subject to the provisions of this section, any person empowered by a State Board in this behalf shall have a right and any time to enter, with such assistance as he considers necessary, any place.

Prohibition on use of stream or well for disposal of polluting matter, etc:

No person shall knowingly cause or permit any poisonous, noxious or pollution mater determined in accordance with such standards as may be laid down by the State Board to enter (whether directly or indirectly) into any stream or well or sewer or on land.

Restrictions on new outlets and new discharges:

Subject to the provisions of this section, no person shall, without the previous consent of the State Board, establish or take any steps to establish any industry, operation or processes, or any treatment and disposal system or any extension or addition there to, which is likely to discharge sewage or trade effluent into a stream or well or sewer or on land (such discharge being hereafter in this section referred to as discharge of sewage).

Penalty for Contravention:

Whoever contravenes the provisions of section 25 or section 26 shall be punishable with imprisonment for a term which shall not be less than one year and six months but which may extend to six years and with fine.

Enhanced penalty after previous conviction: If any person who has been convicted of any is again found guilty of an offence involving a contravention of the same provisions, he shall, on the second and on every subsequent conviction be punishable with imprisonment for a term which shall not be less than two years but which may extend to seven section no cognizance shall be taken of any conviction made more than two years before the commission of the offence which is being punished.

Penalty for contravention of certain provisions of the Act:

Whoever contravenes any of the provisions of this Act or fails to comply with any order or direction given under this Act, for which no penalty has been elsewhere provided in this act, shall be punishable with imprisonment which may extend to three months or with fine which may extend to ten thousand rupees or with both and in the case of a continuing contravention or failure, with an additional fine which may extend to five thousand rupees for every day during which such contravention or failure continues after conviction for the first such contravention or failure.

Offences by companies:

Where an offence under this Act has been committed by a company, every person who at the time the offence was committed was in charge of, and was responsible to the company for the conduct of, the business of the company, as well as the company, shall be deemed to be guilty of the offences and shall be liable to be proceeded against and punished accordingly, provided that nothing contained in this subsection shall render any such person liable to any punishment provided in this Act if he proves that the offence was committed without his knowledge for that he exercised all due diligence to prevent the commission of such offence.

Power of State Government to make rules: The state Government may frame rules with the constitution of the State Board for the purpose of this Act in respect of matters not falling within the purview of different sections.

SALIENT FEATURES OF “THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981”.

This is an Act which is meant for the prevention and control of pollution in the environment and for the matters which are connected with the abatement of pollution. The Act was enacted by the Indian Parliament in the 32nd year. This Act may be called The Air (Prevention and Control of Pollution) Act, 1981. It shall come into force as may be notified in the Official Gazette and it extends to whole of India.

DEFINITION:

"Air pollutant" means any solid, liquid or gaseous substances (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

Central and State Boards for the Prevention and Control of Air Pollution:

The Central Board for the Prevention and Control of water Pollution constituted under section 3 of the Water (Prevention and Control of Pollution) Act, 1974, shall, without prejudice to exercise and performance of its power and functions under that Act, exercise the power and perform the functions of the Central Board for the Prevention and Control of Air Pollution under this Act. In any state for the purpose of this Act, shall be deemed under Water (Prevention and Control of Pollution) Act.

Constitution of State Boards:

In any state in which the water (Prevention and Control of Pollution) Act, 1974, is not in force, that Act is in force but the state Government has not constituted a State Board for the Prevention and Control of Water Pollution) under that Act, the State Board shall with effect from such date as it may, by notification in the Official Gazette, appoint, constitute a State Board for the Prevention and Control of Air pollution under such name as may be specified in the notification, to exercise the power conferred on, and perform the functions assigned to, that Board under this Act.

Functions of Central Board:

Subject to provisions of this Act, the main functions of the Central Board shall be to improve the quality of air and to prevent, control or abate air pollution in the country.

Functions of State Board:

Subject to the provisions of this Act, and without prejudice to the performances, the functions of a State Board shall be to plan a comprehensive programme for the prevention, control or abatement of air pollution and to secure the execution thereof.

Power to declare air pollution control areas:

The State Government may, after consultation with the State Board, by notification in the Official Gazette, declare in such manner as may be prescribed any area or areas within the State as air pollution control area or areas for the purposes of this Act.

Power to give instructions for ensuring standards for emission from automobiles:

With a view to ensuring that the standards for emission of air pollutants from automobiles laid down by the State Board under clause (g) of sub-section (1) of section 17 are complied with, the state Government shall, in consultation with the State Board, give such instructions as may be deemed necessary to the concerned authority in charge of registration of motor vehicles under the Motor Vehicles Act, 1939 and such authority shall, notwithstanding anything contained in that Act or the rules made there under be bound to comply such instructions.

Restrictions on use of certain Industrial plants:

Subject to the provisions of this section, no person shall, without the previous consent of the State Board, establish or operate any industrial plant in an air pollution control area.

Power of Board to make application to court for restraining persons from causing air pollution:

Where it is apprehended by a Board that emission of any air pollutant, in excess of the standards laid down by the state Board under clause of sub-section (1) of section 17, is likely to occur by reason of any person operating an industrial plant or otherwise in any air pollution control area, the Board may make an application to court, not inferior to that a metropolitan Magistrate or a Judicial Magistrate of the first class for restraining such persons from emitting such air pollutant.

Power of entry and inspection:

Subject to the provisions of this section, any person empowered by a State Board in this behalf shall have a right to enter, at all reasonable times with such assistance as he considers necessary any place for the purpose of performing any or the functions of the State Board entrusted to him.

Power to take samples of air:

A State Board or any officer empowered by it in this behalf shall have power to take, for the purpose of analysis samples, of air or emission from any chimney, flue or dust or any other outlet in such manner as may be prescribed.

Reports of result of analysis on samples taken under section:

Where a sample of emission has been sent for analysis to the laboratory established or recognized by the State, the Board analyst appointed under sub-section (2) of section 26 shall analyse the sample and submit a report in the prescribed form of such analysis in triplicate to the State Board.

Failure to comply with the provisions of certain sections:

Whoever fails to comply with provisions of certain sections shall in respect of each such failure, be punishable with imprisonment for a term which shall not be less than one year and six months but which may extend to six years and with fine, and in case the failure continues, with an additional fine which may extend to five thousand rupees for every day during which such failure continues after the conviction for the first such failure.

Penalty for contravention of certain provisions of the Act:

Whoever contravenes any of the provisions of this Act or any order or direction issued, there under, for which no penalty has been elsewhere provided in this act, shall be punishable with imprisonment for a term which may extend to three months or with fine which may extend to ten thousand rupees or with both, and in the case of continuing contravention, with an additional fine which may extend to five thousand rupees for every day during which such contravention continues after conviction for the first such contravention.

Offences by companies:

Where an offence under this Act has been committed by a company, every person who at the time the offence was committed was in charge of, and was responsible to the company for the conduct of, the business of the company, as well as the company, shall be deemed to be guilty of the offences and shall be liable to be proceeded against and punished accordingly, provided that nothing contained in this subsection shall render if he proves that the offence was committed without his knowledge for that he exercised all due diligence to prevent the commission of such offences.

THE ENVIRONMENT (PROTECTION) ACT, 1986

This is an Act which is meant for the protection and improvement of environment and for the matters which are connected with the abatement of pollution. The Act was enacted by the Indian Parliament in the 37th year. This Act may be called The Environment (Protection) Act, 1986. It shall come into force as may be notified in the Official Gazette and it extends to whole of India.

DEFINITION:

"Environment" includes water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

"Environmental pollution" means the presence in the environment of any environmental pollutant;

"Hazardous substance" means any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plant, micro-organism, property or the environment;

SALIENT FEATURES OF THE ACT

Power of Central government to take measures to protect and improve environment:

Subject to the provisions of this Act, the Central Government shall have the power to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution.

Appointment of officers and their powers and functions:

Without prejudice to the provisions, the Central Government may appoint officers with such designations as it thinks fit for the purpose of this act and may entrust to them such of the powers and functions under this Act as it may deem fit.

Power to give directions:

In exercise of the powers of this Act, Central Government may issue directions in writing to any person or authority and they shall be bound to comply with such directions.

Rules to regulate environment pollution:

The central Government in exercise of the powers of this Act may by notification in the Official Gazette make rules in respect of all or any of the matters referred to. Prevention, Control and Abatement of Environmental Pollution:

Prohibition on discharge of hazardous material

No person carrying on the industry shall be allowed to discharge, emit, and handle such hazardous materials in excess of such standards as may be prescribed which pose threat to the environment. The person responsible for emitting shall be responsible to mitigate the pollutant caused. He shall be bound to render assistance to the authorities.

Persons handling hazardous substances to comply with procedural safeguards:

No person shall handle or cause to be handled any hazardous substance except in accordance with such procedure and after complying with such safeguards as may be prescribed.

Power of entry and inspection:

Subject to the provisions of this section, any person empowered by the Central Government in this behalf shall have a right to enter, at all reasonable times with such assistances as he considers necessary any place.

Power to take sample and procedure:

The Central Government or any officer empowered by it in this behalf shall have power to take, for the purpose of analysis, samples of air, water soil or other substances from any factory, premises or other in such manner as may be prescribed.

Penalty for contravention:

The contravention of the provisions of the Act and the rules, orders and directions therein, whoever fails to comply with or contravenes any of the provisions of this Act, or the rules made or orders or directions issued there under, shall in respect of each such failure or contravention, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees, or with both, and in case the failure or contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention.

Offences by companies:

Where any offence under this Act has been committed by company, every person who at the time the offence was committed, was directly in-charge of and was responsible, to the company for the conduct of the business of the company shall be deemed to be responsible of the offence and shall be liable to be prosecuted and punished accordingly.

Protection of action taken in good faith:

No suit, prosecution or other legal proceeding shall lie against the Government or any other officer or other employee of the Government or any authority constituted under this Act or any member, officer or other employee of such authority in respect of anything which is done or intended to be done in good faith in pursuance of this Act or the rules made or orders or directions there under.

Cognizance of offence:

No court shall take cognizance of any offence under this Act except on a complaint made by officer in charge on behalf of the government.

Powers to make rules:

The Central Government from time to time may frame rules for the purpose of this Act. These rules may be called the Environment (Protection) Rules, 1986. In exercise of the powers conferred by sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the rules.

ENVIRONMENTAL EDUCATION

ENVIRONMENTAL EDUCATION: GOALS, OBJECTIVES AND NEED FOR PUBLIC AWARENESS

Environmental Education (EE) is a process in which individuals gain awareness of their environment and acquire knowledge, skills, values, experiences and also the determination, which will enable them to act - individually and collectively - to solve present and future environmental problems.

Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values.

Environmental education is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action. The world's first intergovernmental conference on environmental education was organized by the United Nations Education, Scientific, and Cultural Organization (UNESCO) in cooperation with the U.N. Environment Programme (UNEP) and was convened in Tbilisi, Georgia (USSR) from October 14-26, 1977.

GOALS AND OBJECTIVES:

The goals and objectives of environmental education were formulated to help social groups and individuals towards the following:

1. Awareness and sensitivity to the environment and environmental challenges
2. Knowledge and understanding of the environment and environmental challenges
3. Attitudes of concern for the environment and motivation to improve or maintain environmental quality
4. Skills to identify and help resolve environmental challenges
5. Participation in activities that lead to the resolution of environmental challenges
6. Evaluation abilities i.e evaluates environmental measures and educational programmes in terms of ecological, aesthetic, economical, social and educational factors.

GUIDING PRINCIPLES:

Environmental education should:

1. **Consider** the environment in its totality—natural and built, technological and social (economic, political, cultural-historical, ethical, aesthetic);
2. Be a continuous lifelong process, beginning at the preschool level and continuing through all formal and non-formal stages;
3. Be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
4. **Examine** major environmental issues from local, national, regional, and international points of view so that students receive insights into environmental conditions in other geographical areas;
5. **Focus** on current and potential environmental situations while taking into account the historical perspective;
6. **Promote** the value and necessity of local, national, and international cooperation in the prevention and solution of environmental problems;
7. **Explicitly** consider environmental aspects in plans for development and growth;
8. **Enable** learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;
9. **Relate** environmental sensitivity, knowledge, problem-solving skills, and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;
10. **Help** learners discover the symptoms and real causes of environmental problems;
11. **Emphasize** the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
12. **Utilize** diverse learning environments and a broad array of educational approaches to teaching, learning about and from the environment with due stress on practical activities and first-hand experience.

NEED FOR PUBLIC AWARENESS:

There is a need for environmental awareness and a concern to protect it. One must know the grave dangers that await all life on this planet if due care is not taken towards environmental conservation and protection. Further, the effect of environmental pollution often does not remain confined to one region. For instance, the effect of the increased levels of carbon dioxide in the atmosphere, depletion of ozone, acid rains etc. are a few to mention. At present we are facing with many environmental issues which have grown in size day by day. Still land and natural resources are being exploited without any ethics and the wastes produced are pumped into the environment freely. However, some realization has started developing that air, water and land have limited carrying capacities and that pollution control

measures must be instituted to safeguard the environment and the quality of human life. In developed countries, the cost of environmental policies has been estimated to range between 1 and 2 per cent of GNP. Most of this expenditure is for pollution abatement and natural resources protection. In the developing countries, the expenditure is much lower and is mainly directed towards drinking water supply and sanitation. However, the expenditures for pollution control vary from one developing country to another. In order to control pollution effectively, it is recommended that in developing countries at least 0.5 and 1% of the GNP must be kept for this purpose.

Large quantities of pollutants enter the environment as a result of human activities. For example, the cost of air pollution damages in the United States of America has been estimated to vary between US\$2 billion and US\$35 billion per year. Generally speaking, the economic cost of pollution damage in developed countries varies between 3 percent and 5 percent of the GNP; this cost has kept on growing every other day.

Reduction of air pollution will definitely lead to health benefits. The construction of drinking water or sewerage systems in third world countries could reduce the incidence of infectious diseases, such as typhoid, dysentery, and cholera. Such an improvement in human health would lead not only to an increase in productivity and time on the job but also to less expenditure on goods and services delivered by the medical sector. Environmental awareness and the introduction of strict environmental control measures have encouraged the development of alternative technologies, for example, recycling and low waste and non waste technologies. From an economical point of view, such technologies could lead to substantial savings. The improvements in environmental quality have generated significant benefits. The benefits of environmental policies have included reduced mortality and morbidity, improved productivity of labour, technological innovation and increased amenities.

ROLE OF MASS MEDIA AND ENVIRONMENTAL ORGANIZATIONS

Environmental awareness is a planned communication process to promote the knowledge of environment, keep people up to date about catastrophic impacts of human development and help them to know about sustainable development. For the sake of our world, clearly environmental awareness plays a critical role for creating interest in environment. This is the time which demands us to deliver the sensitivity of environmental issues to the masses particularly among youth and mass media has an important role to play .considering penetration, accessibility and acceptability of mass media at grass root level of society. Further the cost of airing information via mass media is nominal and the content effective.

ROLE OF ENVIRONMENTAL ORGANIZATIONS

A non-governmental organization (NGO) is an organization that is neither a part of a government nor a conventional for profit business. Usually set up by ordinary citizens, NGOs may be funded by governments, foundations, schools, businesses, or private people.

Today we come across various non-governmental organizations whose concerns are focused on various areas such as social issues, health issues, and environmental issues. These NGO's are involved in the

whole spectrum of developmental activities from creating environmental awareness to undertaking watershed development, from disaster management to sustainable livelihoods, from joint forest management to giving inputs to policies. They range from clubs which encourage nature camping to agencies which undertake research and monitoring.

There are large number of NGOs in India and other countries that are exclusively working for environmental protection, conservation and awareness. The number of these non-governmental organizations which are actively involved in environmental protection in our country is, in fact, more than in any of the developing country.

Some of the international environmental organizations are Greenpeace, Worldwide Fund for Nature' (WWF), Earth First, etc.

NGOs play important role in securing project funding and its implementation .NGOs also facilitate connection between government and societies at grass root.

ENVIRONMENTAL MOVEMENTS IN INDIA: CHIPKO MOVEMENT, SILENT VALLEY AND NARMADA ANDOLAN

There are certain people called activists who want that the natural resources should be conserved to prevent undue damage to the environment. Some of the examples where ordinary people turned activists have played a great role in conservation of resources are as under:

1. CHIPKO ANDOLAN:

The contribution of common people towards the conservation of forests is the Chipko Andolan (Hug the trees movement). The Chipko Andolan originated from an incident in a remote village called 'Reni' in Gharwal, high up in the northern Himalayas in the early 1970's. The word "chipko" refers "to stick" or "to hug". The name of the movement comes from a word meaning "embrace": where the villagers hug the trees, saving them by interposing their bodies between them and the contractors' axes. A logging contractor had been allowed to cut down trees in a forest close to a village. The people of the village did not want this forest to be cut down because it would have spoiled their healthy environment. One day, when the men folk of the village were out of work, the contractors workers came in the forest to cut down the trees. In the absence of men, the women of the village reached the forests quickly and clasped the tree trunks with their arms, preventing the workers from cutting down the trees. The forest trees were thus saved. The Chipko movement quickly spread across all the communities and helped in the conservation of forests. This gave a start to the "Chipko Movement". The main objective of this movement was to ensure an ecological balance and the survival of the tribal people whose economic activities revolved around these forests. Sunderlal Bahuguna, a renowned Gandhian, with a group of volunteers and women started the non-violent protest by clinging to the trees to save them from felling.

2. NARMADA ANDOLAN:

The Narmada Bachao Andolan (NBA) is the peoples, movement that mobilized itself against the development in the mid- and late-1980s. The movement first started as a protest for not providing

proper rehabilitation and resettlement for the people who have been displaced by the construction of Sardar Sarovar Dam. Later on, the movement turned its focus on the preservation of environment and the eco-systems of the valley. The arguments in favor of the construction of the dam say that it is intended to irrigate large tracts of land in Gujarat, provide drinking water to drought-prone villages and towns and generate electricity. The withdrawal of the World Bank from the project was considered to be a major victory for the anti-dam activists. In October 2000 the Supreme Court gave a judgment approving the construction of the Sardar Sarovar Dam. The court decided that the height of the dam be raised to 90 m. This height is much higher than the 88 m which anti-dam activists demanded, but it is definitely lower than the proposed height of 130 m.

After the Supreme Court judgment, the Gujarat Government has taken up the construction of the dam. As the World Bank withdrew its financing in 1993 the project is now largely financed by the state governments and market borrowings. Now the project is expected to be fully completed by 2025.

3. SILENT VALLEY

An NGO in Kerala namely Save Silent Valley (SSV) was a social movement aimed to protect Silent Valley which is an evergreen tropical forest area in the Palakkad district of Kerala, India. The Kuntipuzha river that flows through Silent Valley was surveyed and identified an ideal site for electric generation by the Kerala State Electricity Board in 1958. In 1973 the Save Silent Valley (SSV) took an initiative to save the Silent Valley Reserve Forest from being flooded by a hydroelectric project. The Kerala Shastra Sahitya Parishad (KSSP) was another NGO working for environmental awareness among masses from many years. It was the only organization in 1978 whose campaign turned out to be a public education programme in many respects. The movement in many ways helped to save the ecosystem of Silent Valley. The valley was declared as Silent Valley National Park in 1985.

ENVIRONMENTAL ETHICS

Ethos, the Greek word from where "ethic" is derived means the character. Environmental ethics can be described as the individual's character or ethic to become compatible with the environment or recognition of the need for the survival of human beings. This requires minimum manipulation of environmental components and judicious use of resources treating all of the earth as a sacred land so that its contents are neither diminished nor changed permanently. It is the basic idea of environmental ethics. Natural environment, man's most precious heritage, has been suffering a tremendous onslaught by reckless developmental activities. The tragic drama of human cruelty and savagery, death and destruction being played at the angelic land resources and it has crumbled the foundation of our old civilization and left nothing unaffected and unharmed. At a time when our environment is drastically deteriorating, it is ironical that man has admitted that there have been disorders and he started thinking of the future for survival. There are two different values/ethic systems:

- 1. Ego-centric:** The ego-centric world view states that man is the only species who is important and the planet earth has unlimited supply of resources. The ego-centric world view is based on assumption that

what is good for individual is good for the society. Ego centric development will eventually lead to self destruction and inequality.

2. Eco-centric: The eco-centric world view states the every life has the right to live and the earths resources are limited. It also states that all the species have equal rights over the resources. Future generation have also same rights to the environment as we do have. Eco-Centric ethic based development will lead to sustainable world where environment is equally cared for.