

SOCIAL ISSUES AND THE ENVIRONMENT

From Unsustainable to Sustainable Development:

- Mahatma Gandhi envisioned a reformed village community based on sound environmental management.
- He stressed the need for sanitation based on recycling human and animal manure and well ventilated cottages built of recyclable material.
- He envisioned clean roads that were free of dust.
- His main objective was to use village-made goods instead of industrial products.
- All these principles are now considered part of sound long term development.
- Gandhi had designed a sustainable lifestyle for himself when these concepts were not a part of general thinking.
- The idea of sustainable development grew from various environmental movements, however it was only clearly defined in 1987 by the World Commission on Environment and Development as: Development that meets the need of the present without compromising the ability of future generations to meet their own needs.

- This expresses the idea of environmental, economic and social equity within the limits of the world's natural resources.
- Sustainable development is based on improving the quality of life for all, especially the poor and deprived, within the carrying capacity of the supporting ecosystems.
- It is a process which leads to a better quality of life while reducing the impact on the environment.
- To ensure sustainable development, any activity that is expected to bring about economic growth must also consider its environment impact. So that it is more consistent with long term growth and development.
- Many development projects – such as dams, mines, roads, industries and tourism development – have severe environmental consequences in terms of their natural resources use, land use and their impact on biodiversity.
- All these impacts must be studied before any development is even begun.

Urban Problems Related to Energy:

- Cities are the main centers of economic growth, trade, education, innovations and employment.
- Until recently, a big majority of human population lived in rural areas and their economic activities centered around agriculture, cattle rearing, fishing, hunting or some cottage industry.
- Now about 50 percent of the world population lives in urban areas and there is increasing movement of rural folk to cities in search of employment.
- The urban growth is so fast that it is becoming difficult to accommodate all the industrial, commercial and residential facilities within a limited municipal boundary.
- The energy requirement of urban population are much higher than that of rural ones.
- This is because urban people have a higher standard of life and their life style demands more energy inputs in every sphere of life.

- **The energy demanding activities include:**
 - Residential and commercial lighting.
 - Transportation means including automobiles and public transport for moving from residence to workplace.
 - Industrial plants use big proportion of energy.
 - A large amount of waste generation which has to be disposed off properly using energy based techniques.
 - Control and prevention of air and water pollution which need energy dependent technologies.
 - Due to high population density and high energy demanding activities, the urban problems related to energy are much more magnified as compared to the rural population.

WATER CONSERVATION

- Water being one of the most precious and indispensable resources needs to be conserved.
- The following strategies can be adopted for conservation of water.
 - **Decreasing run-off losses:** Huge-water loss occurs due to run-off on most of the soils, which can be reduced by allowing most of the water to infiltrate into the soil.
 - This can be achieved by following methods:
 - a. **Contour cultivation** on small furrows and ridges across the slopes trap rainwater and allow more time for infiltration.
 - b. **Conservation bench terracing** involves construction of a series of benches for catching the run off water.
 - c. **Chemical wetting agents** increase the water intake rates when added to normal irrigated soils.
 - d. **Chemical conditioners** like gypsum when applied to sodic soils improve soil permeability and reduce run off

- **Reducing evaporation losses:** This is more relevant in humid regions.
 - **Storing water in soil:** storage of water takes place in the soil root zone in humid regions when the soil is wetted to field capacity.
- **Reducing irrigation losses:**
 - ✓ Use of lined or covered canals to reduce seepage.
 - ✓ Sprinkling irrigation and drip irrigation to conserve water by 30-50%
 - ✓ Growing hybrid crop varieties with less water requirements and tolerance to saline water help conserve water.
- **Re-use of water:**
 - ✓ Treated wastewater can be used for ferti-irrigation.
- **Preventing wastage of water:** this can be done in households, commercial buildings and public places.

RAINWATER HARVESTING

- Rainwater harvesting is a technique of increasing the recharge of groundwater by capturing and storing rainwater.
- This is done by conducting special water-harvesting structures like dug wells, percolation pits, lagoons, check dams etc.
- Rainwater, where it falls, is captured and pollution of this water is prevented.
- **Rainwater harvesting has the following objectives.**
 - To reduce run off loss
 - To avoid flooding of roads
 - To meet the increasing demands of water
 - To raise the water table by recharging ground water
 - To reduce groundwater contamination
- Rainwater can be mainly harvested by any one of the following methods:
 - ✓ By storing in tanks or reservoirs above or below ground.
 - ✓ By recharging the groundwater.
 - ✓ By constructing pits, dug-wells check-dams.

WATERSHED MANAGEMENT

- The management of a single unit of land with its water drainage system is called watershed management.
- This is a technique that has several components including soil and water management, and developing a vegetation cover.
- The natural drainage pattern of a watershed unit, if managed properly, can bring about improvement of quality of life in the area.
- Provides water throughout the year, health in the community improves as clean water becomes available.
- Watershed management enhances the growth of agricultural crops and it is possible to grow more than one crop in a year in dry areas.
- Watershed management begins by taking control of a degraded site through local participation.
- Once they are educated, the community begins to understand the project and people begin to work together to promote good watershed management.
- Technical steps to take appropriate soil conservation measures for a sound watershed management.

RESETTLEMENT AND REHABILITATION

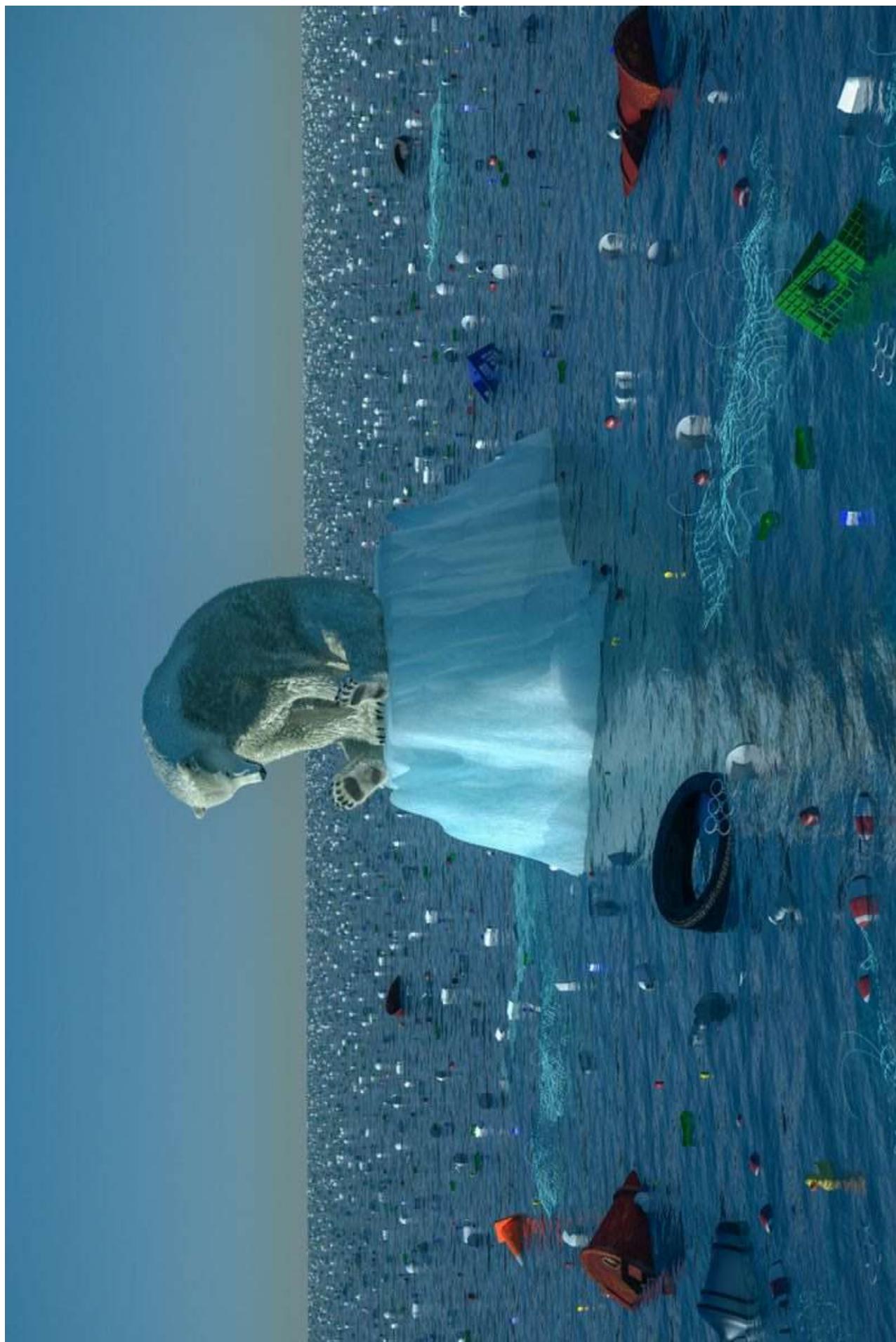
- Problems and Concerns:** Economic development raises the quality and standard of living of the people of a country.
 - ✓ Developmental projects are planned to bring benefits to the society. However, in the process of development, there is over exploitation of natural resources and degradation of the environment.
 - ✓ Besides this, quite often, the native people of the project site are directly affected.
 - ✓ These native people are generally the poorest of the poor, underprivileged tribal people.
 - ✓ Various types of projects result in the displacement of the native people who undergo tremendous economic and psychological distress, as the socio-economic and ecological base of the local community is disturbed.
- a. **Displacement of problems due to dams:** The big river valley projects have one of the most serious socio-economic impacts due to large scale displacement of local people.

- ✓ The Hirakund Dam has displaced more than 20,000 people residing in about 250 villages .
 - ✓ The Bhakra Nangal Dam was constructed during 1950's and till now it has not been possible to rehabilitate even half of the displaced persons.
 - ✓ The immediate impact of the Tehri Dam would be on the 10,000 residents of the Tehri town.
- b. Displacement due to Mining:** Mining is another developmental activity, which causes displacement of the native people.
- Several thousands of hectares of land area is covered in mining operation and the native people are displaced.
- c. Displacement due to creation of National Parks:** when some forest area is covered under a National Park, it is a welcome step for conservation of the natural resources. However, it also has a social aspect associated with it which is often neglected.
- A major portion of the forest is declared as core area, where the entry of local dwellers or tribals is prohibited.

CLIMATE CHANGE

- Climate is the average weather of an area. It is the general conditions, seasonal variations and extremes of weather in a region.
 - Such conditions which average over a long period of time(at least 30 years) is called climate.
 - There are today five key signs of climate change as suggested data from the National Oceanic and Atmospheric Administration(NOAA), USA
- **Increase in global concentration of carbon dioxide:**
- Carbon dioxide is an important greenhouse gas, which is released through human activities such as deforestation and burning fossil fuels, as well as natural process such as respiration and volcanic eruptions.
- **Increase in global surface temperature:**
- **Decline of the arctic sea ice:**
- The Arctic sea ice is now declining at a rate of 11.5% per decade, relative to the 1979 to 2000 average.
- **Decrease in land ice:** The continent of Antarctica has been losing more than 100 cubic kilometers of ice per year since 2002.





- **Sea level rise:** sea level rise is caused by the expansion of sea water as it warms up in response to climate change and the widespread melting of land ice.
- Human societies will be seriously affected by extremes in climate such as droughts and floods.
- A changing climate would bring about changes in the frequency and/or intensity of these extremes.
- This is also a fundamental concern for human health.
- To a large extent, public health depends on safe drinking water, sufficient food and good social conditions.
- Changes in climate may affect the distribution of vector species which in turn, will increase the spread of disease, such as malaria and filariasis, to new areas which lack a strong public health infrastructure.
- The seasonal transmission and distribution of many diseases that are transmitted by mosquitoes may spread due to climate change.



GLOBAL WARMING

- Troposphere, the lowermost layer of the atmosphere, traps heat by a natural process due to the presence of certain gases. This effect is called **Greenhouse Effect**.
- **Greenhouse Effects:** The phenomenon that worries the environmental scientists is that due to anthropogenic activities there is an increase in the concentration of greenhouse gases in the air that absorb infra-red light containing heat and results in the re-radiation, thereby increasing the average surface temperature beyond 15°C .
- Human activities during the last few decades of industrialization and population growth have polluted the atmosphere to the extent that it has begun to seriously affect the climate.
- The carbon dioxide in the atmosphere has increased by 31% since pre-industrial times, causing more heat to be trapped in the lower atmosphere.
- **Greenhouse gases:** Carbon dioxide, Chlorofluorocarbons, Methane, Nitrous Oxide and Sulphur Hexafluoride.
- **Impacts:** Global temperature increases, Rise in sea level, Effects on Human Health and Agriculture.

- **Measures to check Global Warming:**
 - Cut down the current rate of use of CFCs and fossil fuel
 - Use energy more efficiently
 - Shift to renewable energy resources
 - Shift from coal to natural gas
 - Trap and use methane as a fuel
 - Plant more trees.
 - Efficiently remove CO₂

The Greenhouse Effect

Sun's solar radiation passes through the atmosphere. Some of the infrared radiation emitted by the Earth is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Most radiation is absorbed by the Earth's surface and emitted by the Earth's surface.

Infrared

Earth's surface

Atmosphere

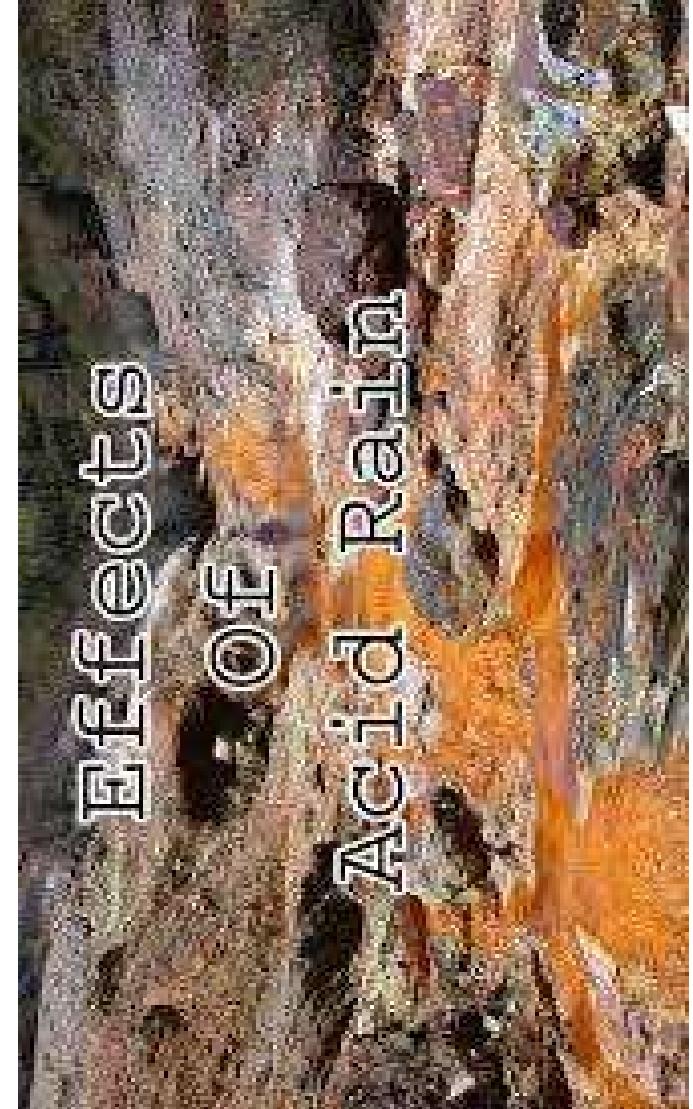


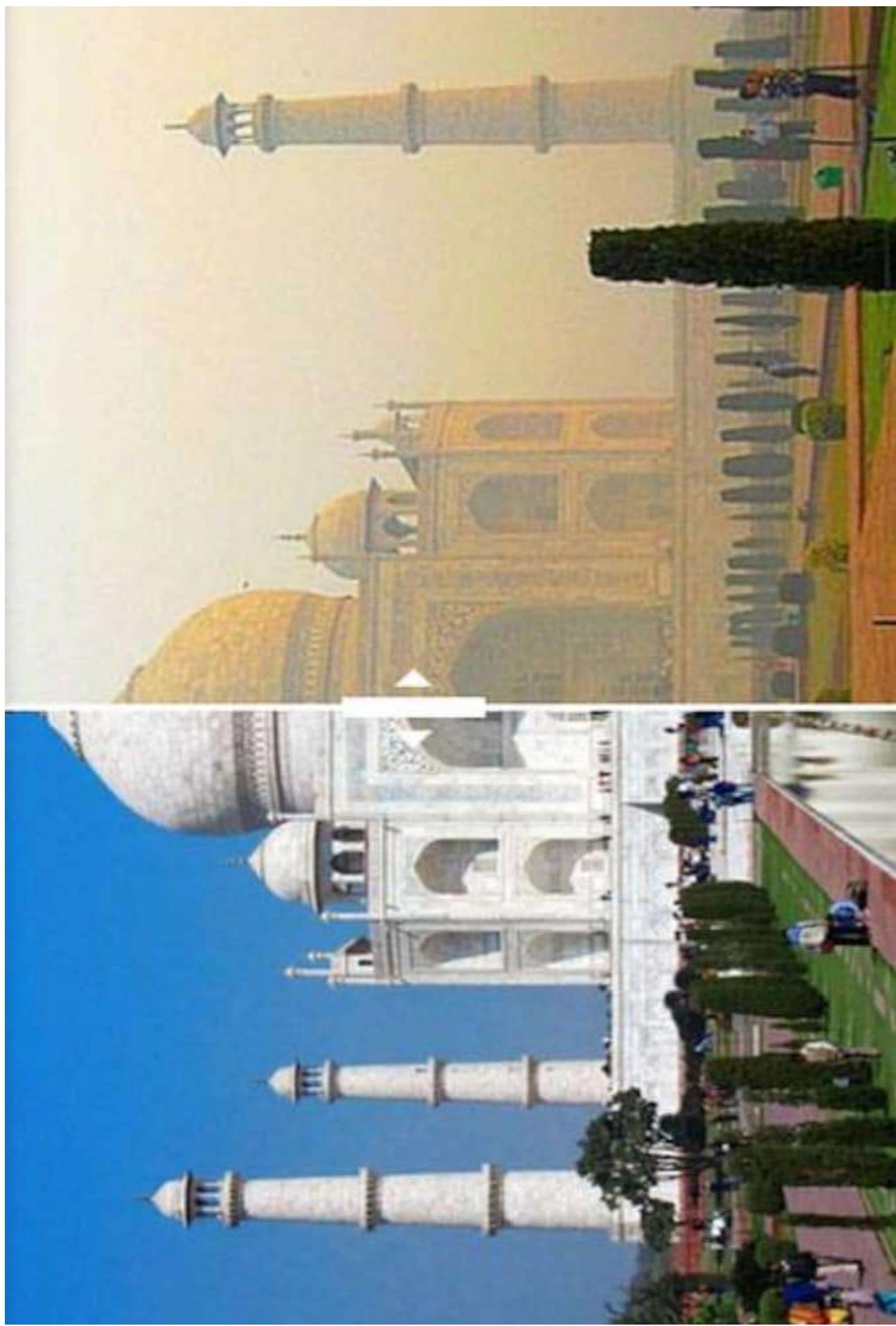
ACID RAIN

- Oxides of sulfur and nitrogen originating from industrial operations and fossil fuel combustion are the major sources of acid forming gases.
- In the atmosphere these gases are ultimately converted into sulfuric acid and nitric acids.
- Hydrogen chloride emissions forms hydrochloric acid. These acids cause acidic rain.
- Rain water is turned acidic when its pH falls below 5.6.
- In fact clean or natural rain water has a pH of 5.6 at 20°C because of formation of carbonic acid due to dissolution of CO₂ in water.
- **Effects of Acid Rain:**
- It causes of deterioration of buildings especially made of marbles. E.g. Monuments like Taj Mahal.
- It damages stone statues. Priceless stone statues in Greece and Italy have been partially dissolved by acid rain.
- It damages metals and car finishes.
- Aquatic life especially fish are badly affected by lake acidification.



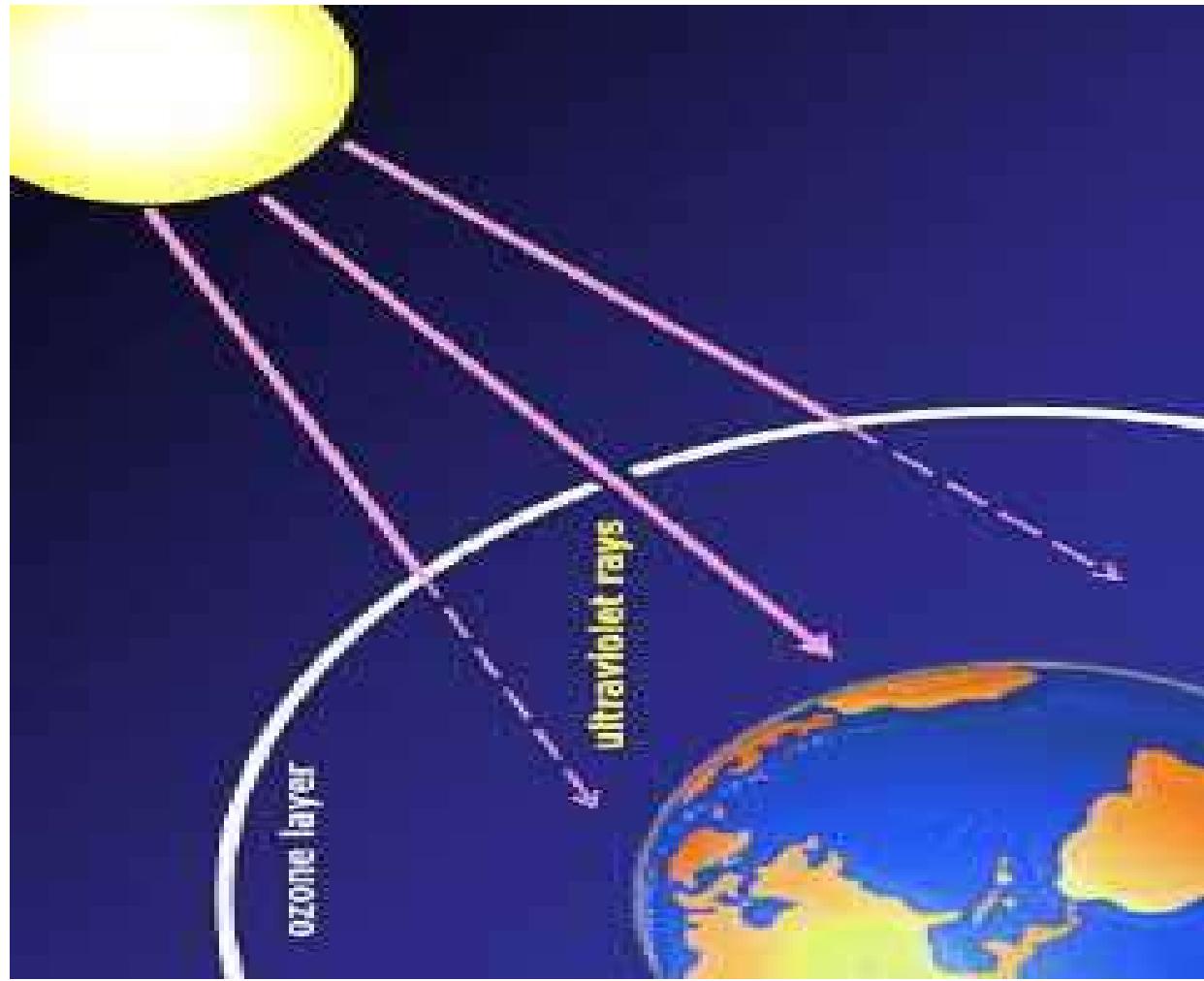
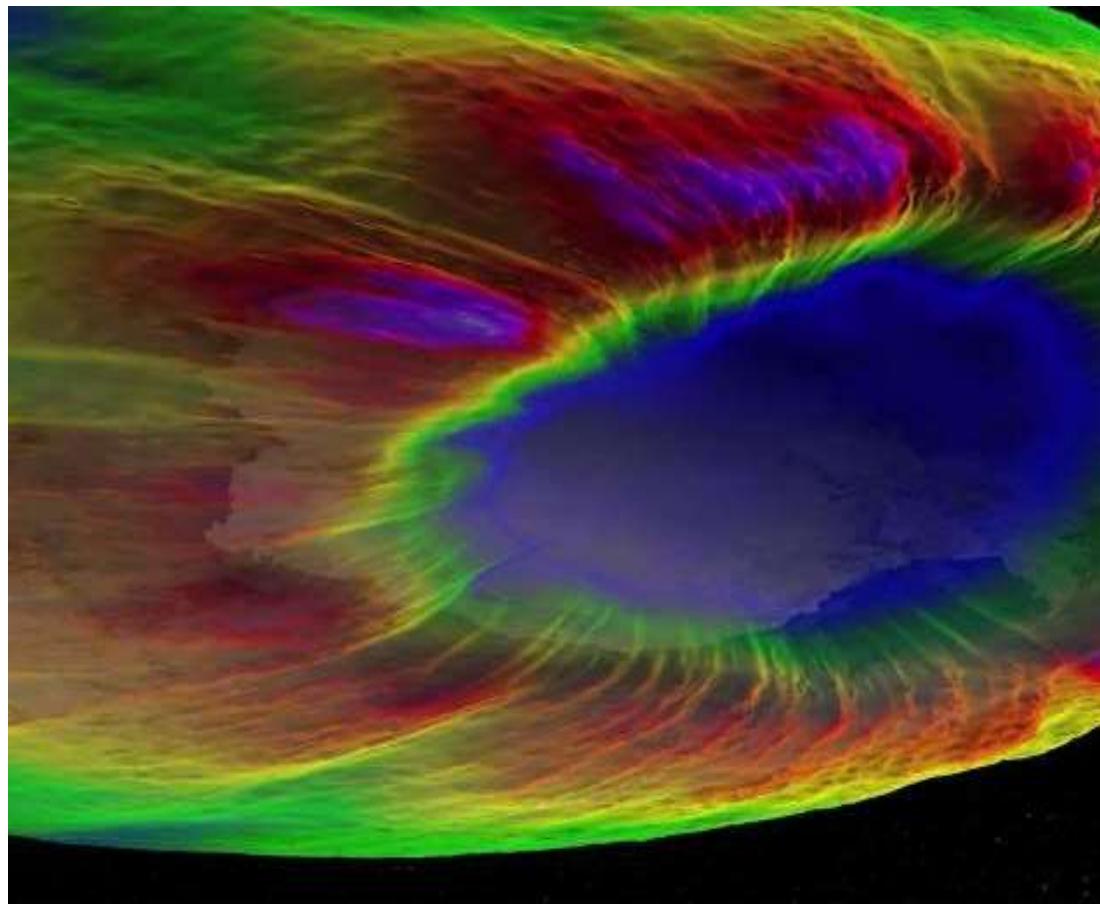
WHAT IS ACID RAIN





- Aquatic animals suffer from toxicity of metals such as aluminum, mercury, manganese, zinc, and lead which leak from the surrounding rocks due to acid rain. It results in reproductive failure and killing of fish.
- Many lakes of Sweden, Norway, Canada have become fishless due to acid rain.
- **Control of acid rains:**
- Emission of SO_2 and NO_2 from industries and power plants should be reduced by using pollution control equipments.
- Liming of lakes and soils should be done to correct the adverse effects of acid rain.
- A coating of protective layer of inert polymer should be given in the interior of water pipes for drinking water.

- **Ozone Layer Depletion:**
- Chlorofluorocarbons are mainly responsible for ozone depletion in the stratosphere.
 - CFCs are used as coolants in refrigerators and air conditioners, as propellants, cleaning solvents, sterilant and in Styrofoam etc.
 - CFCs are released in the troposphere reach the stratosphere and remain there for 65-110 years destroying O₃ molecules.
 - In 1974, Rowland and Molina warned that CFCs are lowering the concentration of ozone in the stratosphere and predicted severe consequences.
 - However, in 1985 that scientists for the first time discovered that 50% of upper stratospheric ozone over Antarctica was destroyed during the Antarctic spring and early summer.
- **Effects of Ozone Depletion:**
 - Ozone depletion in the stratosphere will result in more UV radiation reaching the earth.
 - The UV-B radiations affect DNA and the photosynthetic chemicals. Any change in DNA can result in mutation and cancer.



- Easy absorption of UV rays by the lens and cornea of eye will result in increase in incidents of cataract.
- Melanin producing cells of the epidermis will be destroyed by UV-rays resulting in immuno-suppression.
- Ozone depletion will result in decrease in their population thereby affecting the population of zooplankton, fish, marine animals.
- Yield of vital crops like corn, rice, soybean, cotton, bean, pea and wheat will decrease.
- Nitrous oxide emitted by supersonic aircrafts during combustion of fossil fuel, and use of nitrogen fertilizers breaks ozone molecules.
- Chlorine released from chlorofluorocarbons reacts with O_3 and forms chlorine monoxide (ClO), which combines with nitrogen dioxide (NO_2) to form chlorine nitrate ($ClONO_2$)
 - $Cl + O_3 \dashrightarrow ClO + O_2$
 - $ClO + NO_2 \dashrightarrow ClONO_2$

- Chlorine nitrate is relatively inactive.
- During Antarctic winter ice crystals in polar vortices react with chlorine nitrate to form Hypochlorous acid and nitric acid.
- $\text{H}_2\text{O} + \text{ClONO}_2 \longrightarrow \text{HOCl} + \text{HNO}_3$
- During August, Antarctic sun rises and liberates Cl from HOCl which along with (OH) starts destroying O_3 .
- $\text{HOCl} \longrightarrow \text{Cl} + \text{OH}$
- During Antarctic spring, O_3 destruction continues from 16 to 23 September each year.
- Thereafter, solar intensity increases and HNO_3 liberates NO_2 by photolysis, which combines with ClO to form relatively inactive chlorine nitrate and hence O_3 destruction stops till next Antarctic spring.

Nuclear Accidents and Nuclear Holocaust:

- Nuclear energy was researched and developed by man as an alternate source of clean and cheap energy compared to fossil fuels.
- In the short history of nuclear energy, there have been a number of accidents that have surpassed any natural calamities.
- A single nuclear accident causes loss of life, long-term illness and destruction of property on a large scale and for a long period of time.
- Radioactivity and its fallout lead to cancer, genetic disorders and death in the affected area for decades after the accident, thus affecting all forms of life for several generations. The use of nuclear energy in war has devastating effects on humans and on the earth.
- In the only use of nuclear power in war, the United States dropped two atomic bombs over the Japanese towards of Hiroshima and Nagasaki in 1945.
- These two atomic bombs killed thousands of people, left many more thousands injured and destroyed everything for miles around.
- The effects of the radiation from these nuclear bombs can still be seen today in the form of cancer and genetic mutations in the affected children and survivors of the incident.

