



- ENVIRONMENT  
Part 1

## Environment & Sustainable Development

- Economic development achieved so far is at a huge cost of environmental quality. We need to choose a path of sustainable development.
- FUNCTIONS OF ENVIRONMENT:
  - Supplies of resources
  - it assimilates waste
  - it sustains life by providing genetic and biodiversity
  - it also provides aesthetic services like scenery etc.
- The environment is able to perform these functions without any interruption as long as the demand on these functions is within its carrying capacity. But our resource extraction is higher than the rate of regeneration of resources and we are into environmental crisis.

## Environment

- Many resources have become extinct and the wastes generated are beyond the absorptive capacity of the environment. Absorptive capacity means the ability of the environment to absorb degradation.
- We are compelled to spend huge amounts on technology and research to explore new resources.
- There is also a huge health costs of degraded environmental quality- decline in air and water quality have resulted in increased incidence of respiratory and water-borne diseases.
- Global warming and ozone depletion also contribute to increased financial commitments for the government.

## Environment

- India has abundant natural resources in terms of rich quality of soil, hundreds of rivers and tributaries, lush green forests, plenty of mineral deposits beneath the land surface, vast stretch of the Indian Ocean, ranges of mountains, etc. The black cotton soil of the Deccan Plateau is particularly suitable for cultivation of cotton, leading to concentration of textile industries in this region. The Indo-Gangetic plains-spread from the Arabian Sea to the Bay of Bengal-are one of the most fertile, intensively cultivated and densely populated regions in the world.
- India alone accounts for nearly 20% of the world's total iron-ore reserves

## Global Warming

- Global warming is a gradual increase in the average temperature of the earth's lower atmosphere as a result of the increase in greenhouse gases since the Industrial Revolution. Much of the recent observed and projected global warming is human-induced. It is caused by man-made increases in carbon dioxide and other greenhouse gases through the burning of fossil fuels and deforestation.
- The atmospheric concentrations of carbon dioxide and Methane have increased by 31 per cent and 149 per cent respectively above pre-industrial levels since 1750. During the past century, the atmospheric temperature has risen by 0.6°C and sea level has risen several inches.

## Global Warming

- Some of the longer-term results of global warming are melting of polar ice with a resulting rise in sea level and coastal flooding, disruption of drinking water supplies dependent on snow melts, extinction of species as ecological niches disappear; more frequent tropical storms; and an increased incidence of tropical diseases. Among factors that may be contributing to global warming are the burning of coal and petroleum products: sources of carbon dioxide, methane, nitrous oxide, ozone; deforestation: which increases the amount of carbon dioxide in the atmosphere, methane gas released in animal waste, and increased cattle production, which contributes to deforestation, methane production and use of fossil fuels.

## Global Warming

- A UN conference on climate change held in Kyoto Japan, in 1997, resulted in an international agreement to fight global warming which called for reductions in emissions of greenhouse gases by industrialized nations.

## Ozone Depletion

- Ozone depletion refers to the phenomenon of reduction in the amount of ozone in the stratosphere. The problem of ozone depletion is caused by high levels of chlorine and bromine compounds in the stratosphere. The origin of these compounds are chlorofluorocarbons (CFC) used as cooling substances in air- conditioners and refrigerators, or as aerosol propellants, and bromofluorocarbons (Halons) used in fire extinguishers. As a result of depletion of the ozone layer, more ultraviolet (UV) radiation comes to Earth and causes damage to living organisms. UV radiations seems responsible for skin cancer in humans, it also lowers production of phytoplankton and thus affects other aquatic organisms. It can also influence the growth of terrestrial plants.



## Ozone Depletion

- A reduction of approximately 5% in the ozone layer was detected from 1979 to 1990.

Since the ozone layer prevents most harmful wavelengths of ultraviolet light from passing through the Earth's atmosphere, observed and projected decreases in ozone have generated worldwide concern. This led to the adoption of the Montreal Protocol banning the use of chlorofluorocarbon (CFC) compounds, as well as other ozone depleting chemicals such as carbon tetrachloride, trichloroethane also known as methyl chloroform and bromine compounds known as halons.

## Pollution Control Boards

- The GOI set up the Central Pollution Control Board (CPCB) in 1974 to address two major environmental concerns in India viz. water and air pollution.

The states also established the Boards to address all environmental concerns.

They investigate, collect and disseminate information relating to water, air and land pollution, lay down standards for sewage/trade effluent and emissions. These boards provide technical assistance to governments in promoting cleanliness of streams and wells by prevention, control and abatement of water pollution, and improve the quality of air and to prevent, control or abate air pollution in the country.

The PCBs prepare manuals, codes and guidelines relating to treatment and disposal of sewage and trade effluents.

## Pollution Control Boards

- State Boards periodically inspect every industry under their jurisdiction to assess the adequacy of treatment measures provided to treat the effluents and gaseous emissions. It also provides air quality data needed for industrial siting and town planning.

The pollution control boards collect, collate and disseminate technical and statistical data relating to water pollution. They monitor the quality of water in 125 rivers including tributaries, wells, lakes, creeks, ponds, tanks, drains and canals.

## Sustainable Development

- Environment and economy are interdependent. We need sustainable development. Sustainable development will allow future generations to have a potential average quality of life that is at least as high as that which is being enjoyed by the current generation. United Nations Conference on Environment and Development (UNCED) which defined it as- 'Development that meets the need of the present generation without compromising the ability of the future generation to meet their own needs'

## Sustainable Development

- Sustainable development aims at decreasing the absolute poverty of the poor by providing lasting and secure livelihoods that minimize resource depletion, environmental degradation, cultural disruption and social instability. Sustainable development is a development that meets the basic needs of all particularly the poor majority, for employment, food, energy, water, housing, and ensures growth of agriculture, manufacturing, power and services to meet these needs.

## Brundtland Commission

- The Brundtland Commission emphasizes on protecting the future generation. We have a moral obligation to hand over the planet earth in good order to the future generation. We should have development ensuring:
  - conservation of natural assets
  - preservation of the regenerative capacity of the world's natural ecological system
  - avoiding the imposition of added costs or risks on future generations

## Brundtland Commission

- According to Herman Daly, a leading environmental economist, to achieve sustainable development, the following needs to be done:
  1. Limiting the human population to a level within the carrying capacity of the environment. The carrying capacity of the environment is like a 'plimsoll line' of the ship which is its load limit mark. In the absence of the plimsoll line for the economy, human scale grows beyond the carrying capacity of the earth and deviates from sustainable development
  2. technological progress should be input efficient and not input consuming
  3. renewable resources should be extracted on a sustainable basis, that is, rate of extraction should not exceed rate of regeneration
  4. for non-renewable resources rate of depletion should not exceed the rate of creation of renewable substitutes and
  5. inefficiencies arising from pollution should be corrected.

## Strategies for Sustainable Development

- 1. Use of non-conventional Sources of energy. India hugely dependent on thermal and hydro powers. Thermal power plants emit large quantities of carbon dioxide which is a green house gas. It also produces fly ash which if not used properly can cause pollution of water bodies, land and other components of the environment.

Hydroelectric projects inundate forests and interfere with the natural flow of water in catchment area and the river basins.

Wind power and solar rays are good examples of cleaner and greener energy sources but it is not used extensively.



## Strategies for Sustainable Development

- 2. LPG, Gobar Gas in Rural Areas: Households in rural areas generally use wood, dung cake or other biomass as fuel. This practice has many adverse implications like deforestation, reduction in green cover, air pollution. Subsidised LPG is provided. Gobar gas plants are being provided. LPG is clean fuel. It reduces household pollution to a large extent. Cattle dung is used in gobar gas plant. Gas produced is used as fuel. Left over slurry is used as organic fertilisers and soil conditioner.
- 3. CNG in urban areas: CNG is used in public transport system. It has helped in controlling pollution in major cities.

## Strategies for Sustainable Development

- 4. Wind power: In areas of wind blowing at high speed wind mills can provide electricity without impacting environment.
- 5. Solar Power: With the help of photovoltaic cells solar energy can be converted into electricity.  
Mini-hydel plants: In mountainous regions, streams are running across. Many streams are perennial. Mini-hydel plants can be used to produce electricity. Enough power can be generated for local use.
- 6. India is privileged to have about 15,000 species of plants which have medicinal properties.
- 7. Bio-composting: Earthworms can convert organic matter into compost faster than the normal composting processes.
- 8. Bio pest control: use of pesticides based on plant products can be useful in controlling pollution. Neem is proving to be very useful.

## Biodiversity

- Biodiversity refers to the variety and variability of life on Earth.
- Biodiversity typically measures variation at genetic, species, and ecosystem level.
- Terrestrial biodiversity is usually greater near the equator. This is because of the warm climate and high primary productivity.
- Biodiversity is not evenly distributed on Earth.
- It is richest in the tropics.
- Tropical forest ecosystems cover less than 10% of earth's surface and contain about 90% of the world's species.

## Biodiversity Hot Spots

- A biodiversity hotspot is a biogeographic region with significant levels of biodiversity that is threatened with destruction.

For example forests are considered as biodiversity hotspots. Criteria: It must contain at least 0.5% or 1500 species of vascular plants as endemics, and it has to have lost at least 70% of its primary vegetation.

- India: Western Ghats, The Himalayas, Indo-Burma region and the Sunderland (Includes Nicobar group of Islands)

## Algal bloom

- An algal bloom is a rapid increase or accumulation in the population of algae in freshwater or marine water systems.
- It is recognized by the discoloration in the water from their pigments
- Blooms which can injure animals or the ecology are called 'harmful algal blooms' can lead to fish die-offs. It can cut off water supply to residents of a city.
- Bloom can block out the sunlight from other organisms
- Blooms can deplete oxygen levels in the water.
- Some algae can secrete poisons into water

## Algal bloom

- Freshwater algal blooms are the result of an excess of nutrients, particularly some phosphates.
- The excess of nutrients may originate from fertilizers that we use in agricultural fields
- These nutrients can enter watersheds through water runoff.
- Excess carbon and nitrogen are also found responsible for algal bloom
- Algae tend to grow very quickly under high nutrient availability.

## Shifting Cultivation

- A form of agriculture, in which an area of ground is cleared of vegetation and cultivated for a few years and then abandoned for a new area until its fertility has been naturally restored.
- It is practiced by tribal also known as Burn and Slash cultivation.
- It is known as Jhoom in Assam, Onam in Kerala, Podu in Andhra Pradesh and Odisha, Bewar in Madhya Pradesh
- The earlier 15-20 years cycle of shifting cultivation on a particular land has reduced to 2-3 years now. This has resulted in large-scale deforestation, soil and nutrient loss and invasion by weeds and other species.

## Green Urea

- Green Urea fertilizer contains a new formulation of urease inhibitor.

This delays the conversion of urea to ammonium by suppressing urease activity.

While urease activity is on hold, the fertilizer is protected against volatilization, giving time for it to be moved into the soil with rain, irrigation or cultivation. Once in the soil, it is much less susceptible to volatilization losses. Ammonia volatilization is a chemical process that occurs at the soil surface when ammonium from urea fertilizer is converted to ammonia gas at high pH. It is very high in waterlogged conditions.



## Neem Coated Urea

- With 46% N content, Urea is the most Popular Nitrogenous fertilizer. When Urea is applied to soil it is broken down into Ammonia and Nitrate in the presence of water. This process is called nitrification. This process make nitrogen available to plants. But if the process of nitrification is too rapid nitrogen will escape to atmosphere. And there is a concentration of nitrates in the soil. Excess nitrates reaches underground water. Excess nitrate in groundwater when used causes diseases such as blue baby syndrome.
- Coating urea with Neem inhibits the fast nitrification. GOI has made it mandatory to produce at least 75% of domestic urea as Neem coated urea only.

## Genetic Crops

- Genetically modified crops (GM Crops) are plants used in agriculture, the DNA of which has been modified using genetic engineering methods. In most cases, the aim is to introduce a new trait to the plant which does not occur naturally in the species.

GMO crops in India:

GM Soybean GM Maize GM Cotton

## Biotechnology

- Biotechnology deals with techniques of using live organisms or enzymes from organisms to produce products and processes useful to human.
- In vitro fertilization leading to a 'test-tube' baby, synthesizing a gene and using it, developing a DNA vaccine or correcting a defective gene are all part of biotechnology
- Genetic engineering- Techniques to alter the chemistry of genetic material (DNA RNA) to introduce these in to host organisms and thus change the phenotype of the host organism.

- Thank you