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## **SUSTAINABLE DEVELOPMENT**

- ❖ Human beings live in both natural and social world.
- ❖ Our technological development has strong impacts on the natural as well as the social components
- ❖ Development does not mean an increase in GNP(Gross National Product) of a few different nations
- ❖ Until now development has been human oriented that too mainly for few rich nations
- ❖ They have touched the greatest heights of scientific and technological development but at what cost? The air we breathe, the water we drink, and the food we eat have all badly polluted
- ❖ Our natural resources are just dwindling due to over exploitation. If this growth continues in the same way we will be facing a doom's day as suggested by the world's famous report "The limits to growth"
- ❖ Development has to be visualized in a holistic manner, where it brings benefits to all, not only for the present generation but also for future generation
- ❖ There is an urgent need to interlink the social aspects with development and environment
- ❖ According to G.H.Brundtland (Norwegian Prime minister & Director of WHO)  
**Sustainable development is defined as "meeting the needs of the present without compromising the ability of future generation to meet their own needs"**

### **Key aspects for sustainable development:**

#### **1) Inter – generational equity:**

- We should minimize any adverse impacts on resources and environment for future generations
- We should handover a safe, healthy, and resourceful environment to our future generations
- This is possible only if we stop over exploitation of resources, reduce waste discharge and emissions and maintain ecological balance

#### **2) Intra – generational equity:**

- The development process should seek to minimize the wealth gaps within and between nations
- The technology should address to the problems of developing countries, producing drought tolerant varieties for uncertain climates, vaccines for infectious diseases, clean fuel for domestic and industrial use
- This will support the economic growth of poor countries, narrowing the wealth gap and lead to sustainability

### **Measures for Sustainable development:**

#### **1) Using appropriate technology:**

- Appropriate technology is the one which is locally adoptable, eco friendly, resource efficient, and culturally suitable (involves local resources and labor)
- Using indigenous technologies are more useful, cost effective, and sustainable
- The technology should use less resources and produce minimum waste

#### **2) Adopting 3R's (Reduce, Reuse, Recycle)**

- 3R approach reduces the pressure on resources and reduces waste generation and pollution

- **Minimizing the resource use:** Reduced demand for any metallic product will decrease the mining of their metal and cause less production of waste
  - **Using them again and again:** The refillable containers which are discarded after use can be reused Ex: discarded rubber tubes can be used as rubber bands
  - **Recycling the material:** recycling is the reprocessing of discarded materials into new useful products, Ex: recycling of paper
- 3) **Promoting environmental education & awareness:**
- This will help in changing the thinking and attitude of people towards our earth and the environment
  - Introducing the subject right from school stage will inculcate a feeling of belongingness to the earth in the small children
  - Earth thinking will help to transform our lifestyles to sustainable ones
- 4) **Resources utilization as per Carrying capacity:**
- Carrying capacity: Any system can sustain limited number of organisms on sustainable basis
  - If the carrying capacity of a system is crossed, environmental degradation starts.
  - Carrying capacity has the two basic components
  - **Supporting capacity:** the capacity to regenerate
  - **Assimilative capacity:** the capacity to tolerate different stresses
  - If the resources are utilized based on the above two properties then sustainability can be achieved

### **WATER CONSERVATION:**

Water being one of the most precious and indispensable resources needs to be conserved

The following strategies can be adopted for conservation for water

- 1) **Decreasing run off losses:** This can be achieved by
- **Contour cultivation** on small furrows and ridges across the slopes trap rainwater and allow more time for infiltration
  - **Conservation bench terracing** involves construction of a series of benches for catching the runoff water
  - **Water spreading** is done by channeling or lagoon travelling
    - Channeling means a series of diversions with vertical intervals
    - Lagoon travelling means small depressions are dug in the area so that there is temporary storage of water
  - **Chemical wetting agents or conditioners** like Gypsum when applied to sodic soils improves soil permeability and reduce runoff
  - **Surface crop residues** Tillage, mulch, animal residues
  - **Water storage structures** like farm ponds, dug wells
- 2) **Reducing evaporation losses:**
- Horizontal barrier of asphalt placed below the soil surface increases water availability
  - A co-polymer of starch and acrylonitrile called super slurper absorbs water 4000 times its weight
- 3) **Storing water in soil:**
- Soil should be wetted to field capacity

- Leaving the soil fallow for one season water can be made available for the next season for crop growth
- 4) **Reducing irrigation losses:**
  - Use of lined canals to reduce seepage
  - Irrigation in early morning or late evening
  - Sprinkling irrigation or drip irrigation
- 5) **Reuse of water:**
  - Treated waste water can be used for ferti-irrigation
  - Using grey water from washings, bath tubs for watering gardens washing cars
- 6) **Preventing wastage of water:**
  - Closing taps when not in use
  - Repairing any leakage from pipes
- 7) **Increasing block pricing:**
  - The consumer has to pay a proportionately higher bill with higher use of water

### **RAIN WATER HARVESTING:**

- ❖ In present age, concrete houses, well built roads, footpaths and well concreted courtyards have left few open grounds
- ❖ With the decrease in natural forest cover, increase in concrete jungles and decrease in exposed earth very little open ground is left for water to soak in and thereby increasing the ground water table
- ❖ So, artificial recharging of groundwater is extremely essential
- ❖ **Rainwater harvesting is a technique of increasing the recharge of ground water by capturing and storing water**
- ❖ This is done by constructing special water harvesting structures like dug wells, percolation pits, lagoons, check dams etc

### **Objectives**

- To reduce runoff loss
- To avoid flooding of roads
- To meet the increasing demands of water
- To raise the water table by recharging ground water

### **Rain water harvesting techniques:**

- ❖ **Traditional method:** Traditionally rainwater is collected from roof tops and stored in open storage bodies such as lakes, ponds, and tanks.
- ❖ It is still practiced in villages. In rural areas the harvested rain water is stored in underground tanks(called *tankas* in Rajasthan) or embankments(called *khadins* in Rajasthan)
- ❖ In foot hills, water flowing from springs are collected by embankment type water storage
- ❖ In Himalayan foot hills people use the hollow bamboo as pipeline to transport the water of natural springs
- ❖ **Modern method:**  
There are two main techniques for rain water harvesting
  - Storage of water on the surface for future use
  - Recharge of ground water

Storage of water on the surface for future use is a very old practice. Recharge of ground water is a recent concept and the structures used for the purpose are

- **Pits:** For recharging shallow aquifer, recharge pits are constructed. These are 1-2 m wide and 3m dept. This is backfilled with boulders, gravel, sand to aid filtration before percolation
- **Trenches:** About 0.5-1m wide, 1-1.5m deep and up to 20m long trenches are constructed where a permeable stream is available at shallow dept. The trench is also backfilled with filter material just as it is done in the case of pits
- **Dug wells:** Existing dug wells may be utilized as recharge structures. The excess water should pass through the filter media before percolation.
- **Spreading technique:** The water is allowed to spread in streams/nullahs, making check dams, nullah bunds, cement plugs or in a percolation pond

**In addition to these, the urban areas roof top and road top collection of rain water is also used to recharge aquifers**

**These days, the central ground water board along with the civic authorities is encouraging artificial recharge of ground water through rain water harvesting.**

### **WATERSHED MANAGEMENT:**

- 1) Water shed is a geographic unit (a piece of land) that collects, stores, and releases water.
- 2) Collected water comes from rain, snow melt & fog
- 3) The water is stored in lakes, ponds, sub-surface soil etc
- 4) The stored water is released through rivers, streams and ground water flow
- 5) **The water shed is defined as the land area from which water drains under gravity to a common drainage channel like streams, rivers, lake, estuary, and even the ocean.**
- 6) A water shed ranges from few square kilometers to few thousand square kilometers in size
- 7) The water shed comprises complex interactions of soil, land, vegetation, land use activities and water

#### **Causes of Watershed degradation:**

- Overgrazing
- Deforestation
- Mining
- Construction activities
- Industrialization
- Soil erosion
- Shifting cultivation

**Watershed management: Rational utilization of land and water resources for optimum production causing minimum damage to the natural resources is known as watershed management**

#### **Objectives of watershed management:**

- To promote sustainable economic development through optimum use of land, water and vegetation
- To restore ecological balance through sustainable development of natural resources
- Minimizing soil erosion and moisture retention
- To minimize the risk of floods, droughts, and landslides
- To manage watershed for the beneficial developmental activities like domestic water supply, irrigation, hydro power generation etc

**Watershed management Practices:****1) Water harvesting:**

- Proper storage of water is done for use in dry seasons in low rain fall areas.
- It also helps in moderation of floods
- This is carried out by construction of percolation tanks, dug wells, check dams etc at the base of hill/mountain such that the rain water will not run off and thus gets stored.
- Giving enough time for water to percolate in to sub-soil and enhance the ground water table

**2) Afforestation and Agro forestry:**

- In watershed development, afforestation and crop plantation play very important role
- They help to prevent soil erosion and retention of moisture
- In high rain fall areas woody trees are grown in between crops to reduce run off and loss of fertile soil
- In Dehradun, trees like Eucalyptus, grasses like Chrysopogan are grown along with maize or wheat
- Woody trees include Sheesham, Teak etc

**3) Mechanical measures to reduce run off loses and soil erosion:**

Several mechanical measures are followed to reduce run off loses and soil erosion

- Terracing
- Bunding
- Bench terracing
- No-till farming
- Contour cropping
- Strip cropping

Bunding has proved to be a very useful method in reducing run off , peak discharge and soil loss in Dehradun.

**4) Scientific mining and quarrying:**

Due to improper mining, the hills lose stability and get disturbed resulting in landslides, rapid erosion etc

- Contour trenching at an interval of 1m on overburden dump
- Planting some soil binding plants like Ipomeoea, Vitex
- Draining of water courses in the mined area are recommended for minimizing the destructive effects of mining

**5) Public participation:**

- People's involvement including the farmers and tribals is a key to success any watershed management programme, particularly the soil and water conservation
- The communities are to be motivated
  - for protecting a freshly planted area
  - Maintaining water harvesting structures implemented by govt. or NGO's
  - Properly education the people
- Successful watershed management has been done at Haryana state through active participation of the local people

**RESETTLEMENT AND REHABILITATION ISSUES:**

Various development projects often lead to displacement of native or tribal people who are poor and very often not educated. Their rehabilitation is a major socio economic issue.

**Problems and concerns:****Displacement 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 from their ancestral home and loss of their traditional profession or occupation.
- In India due to big dam construction, more than 20 million people are estimated to have been directly or indirectly affected by these dams
- The Hirakund dam has displaced more than 20,000 people residing about 250 villages.
- The Bhakra Nangal dam was constructed durind 1950's and till now it has not been possible to rehabilitate even half of the displaced persons.
- Tehri dam and Sardar sarovar dam also have same issues.

**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.
- Sometimes displacement of local people is due to accidents occurring in mined areas like subsidence of land that often leads to shifting of people.
- Jharia coal fields, Jharkhand have been posing big problems to the residents due to underground fires and they are asked to vacate the area.
- According to latest estimation, about Rs.18,000 crores will be spent for shifting the population while the cost of extinguishing the fire would be around 8,000 crore.

**Displacement due to creation of national parks:**

- When some forest area is covered under a national park, it is welcome step for conservation of natural resources.
- However it also has a social aspect associated with it.
- A major portion of the forest is declared as core area where the entry of local people is restricted.
- So they start destruction activities

**The major issues related to displacement and rehabilitation are**

- Tribals are usually most affected amongst the displaced who are already poor
- Break up of families and women are the worst affected.
- The tribals are not familiar with market policies and trends
- Kinship systems, marriages, social and cultural functions, their folk songs, dances and activities vanish with their displacement
- Loss of identity and loss of intimate link between the people

**ENVIRONMENTAL ETHICS**

There is an urgent need to inculcate sensitivity towards environmental degradation among people by fostering environmental ethical values. Environmental Ethics attempts to define what is right and what is wrong regardless of cultural differences. We human beings have a fundamental duty towards nature to respect and care for the Earth, protect life-support systems, biodiversity and ensure sustainable development.

The following are the environmental ethical values to be inculcated:

- Environmental consciousness
- Humility and reverence
- Responsibility and commitment
- Respect for all forms of life and landscape
- Global environmental citizenship
- Self-reliance
- Adoption of eco-friendly culture
- Preservation of diversity on the planet
- Sharing a common environment

The spectrum of environmental activities for inculcating environmental ethical values are:

- Using recycled paper for notes and circulars
- Diverting wastes from kitchen to the garden
- Switching off unnecessary lights
- Using bicycles or walking
- Using public transport systems
- Collecting rainwater
- Avoiding usage of freshwater for gardening
- Using cloth towels instead of paper towels
- Avoiding unnecessary outdoor lighting
- Organizing tree-plantation campaigns
- Reducing volume of radio and television to reasonable levels
- Listening to radio programs on environment and its problems
- Organizing eco-clubs
- Placing trash cans and dustbins around the college premises
- Observing Environment day on 5th June and Earth day on 22nd April
- Planting trees in and around the campus
- Encouraging healthy lifestyles through balanced nutrition, exercise and yoga
- Helping enforce environment protection laws
- Staging short plays on environmental crisis to create environmental awareness
- Conserving energy resources by avoiding unnecessary wastage of energy
- Cutting and displaying pictures and newspaper cuttings depicting environmental crisis

## WILD LIFE PROTECTION ACT, 1972

- 1) It came into existence in 1972
- 2) Wild life was transferred from state list to concurrent list in 1976, thus giving powers to central government
- 3) The Indian Board of Wildlife (IBWL) actively took up the task of setting up of National parks and wildlife sanctuaries
- 4) It defines wildlife related terminology
- 5) Appointment of wild life advisory board, wild life warden, their powers, duties etc
- 6) Setting up of Wildlife sanctuaries and National parks
- 7) Comprehensive listing of endangered wild life species
- 8) Prohibition of hunting of endangered species
- 9) Protection of wild life species like Blue vanda, ladies slipper Orchid etc
- 10) Trade and commerce in some wild life species with license for sale, possession, transfer etc
- 11) Ban on trade and commerce on scheduled animals
- 12) Legal powers to officers and punishment to offenders
- 13) Several conservation projects were launched to save endangered species such as lions, tigers, crocodiles etc

### Drawbacks

- 1) The penalties of offenders are not very harsh i.e just upto 3 years imprisonment or a fine of Rs.25,000 or both
- 2) Personal ownership certificates for animal articles

## THE WATER (PREVENTION & CONTROL OF POLLUTION) ACT 1974

- 1) It was initiated by Smt. Indira Gandhi after the 1974 Stockholm conference
- 2) It is an act to provide for the prevention and control of water pollution, maintaining and restoring wholesomeness of water
- 3) Water pollution is defined as *any alteration in physical, chemical or biological characteristics of water making it unsuitable for designated use in its natural state*
- 4) Provides for maintenance and restoration of water
- 5) Provides for the establishment of central and State pollution control boards
- 6) Assigning powers and functions to such boards
- 7) Procedures and various penalties for defaulters
- 8) The central boards
  - Will advise the govt. on matters concerning water pollution control
  - Provide guidance and advice to state boards
  - Will organize training and awareness programs
  - Will collect, compile and publish relevant technical data
  - May establish own laboratories for analysis of pollution
- 9) The state boards
  - Plan programs for pollution control
  - Advise the state govt.
  - Encourage research
  - Monitor effluent treatment plants
  - Prescribe or modify standards for release of pollutants
  - Maintain or modify sewage treatment and recycling plants



**Drawbacks**

- 1) The state boards are suffered with lack of adequate funds and expertise to pursue their objectives
- 2) The penalties are much less than the cost of treatment/pollution control equipments

**THE AIR (PREVENTION & CONTROL OF POLLUTION) ACT 1981**

- 1) The act provides for the prevention, control and abatement of air pollution
- 2) In the act air pollution has been defined as *the presence of any solid, liquid or gaseous substance (including noise) in the atmosphere which may be harmful to human beings or any other living creatures or plants or property*
- 3) Noise pollution has been inserted as pollution in the act in 1987
- 4) Pollution control boards at the central or state level have the regulatory authority
- 5) Provision for defining constitution, Powers, function, funds, audit, penalties and procedures
- 6) Boards have to check whether the industries are following standards or not(Under section 17)
- 7) Provision for ensuring emission standards from automobiles(Under section 20)
- 8) In consultation with state pollution control board, the state govt. may declare an area as '*air pollution control area*' and can prohibit use of any fuel other than approved fuel in the area causing air pollution(Under section 19)
- 9) A provision for appeals has been made i.e an Appellate authority(Under section31)

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**FOREST CONSERVATION ACT, 1980**

- 1) The act deals with the conservation of forests and related aspects
- 2) The state govt. has the powers to use forests only for forestry purposes.
- 3) If it wants to use it in any other way, it has to take prior approval from central govt.
- 4) Non forest activities include mining, replacing some naturally growing trees with economically important trees, clearing forest for cultivation etc
- 5) Some construction work in the forest for wild life or forest management are exempted from non forest activity(fencing, making water holes, pipelines etc)
- 6) Provision for conservation of all types of forests
- 7) Any illegal non forest activity within a forest area can be immediately stopped
- 8) In 1992, some amendments was made in the act which allows some non forest activities in forests like limited cutting of trees, seismic surveys etc
- 9) Wild life sanctuaries and national parks are totally prohibited for any non forest activity
- 10) Cultivation of tea, coffee, spices, oil yielding plants are non forest activities
- 11) Tusser cultivation (a type of silk yielding insect) in forest areas by tribals as a means of their livelihood is considered as forestry activity
- 12) Any proposal sent to central govt. for non forest activity must have cost benefit analysis and EIA

**Drawbacks**

- 1) The power has been centralized at the top
- 2) The local communities are completely kept out from decision making regarding nature of use of forest area
- 3) The tribal are stopped from taking any resources and start criminal activities