

UNIT-II NATURAL RESOURCES

NATURAL RESOURCES: They occur naturally within environment and exist relatively undisturbed by mankind in a natural form. Some of them are essential for our survival while most are used for satisfying our needs.

- * A natural resource may exist as a separate entity such as fresh water and air as well as living organism e.g. fish or it may exist in an alternate form which must be processed to obtain the resource e.g. metal ores, oil and most forms of energy.
- * Natural resources are materials, which living organisms can take from nature for sustaining their life or any components of the natural environment that can be utilized by man to promote his welfare is considered as natural resource.

CLASSIFICATION: →

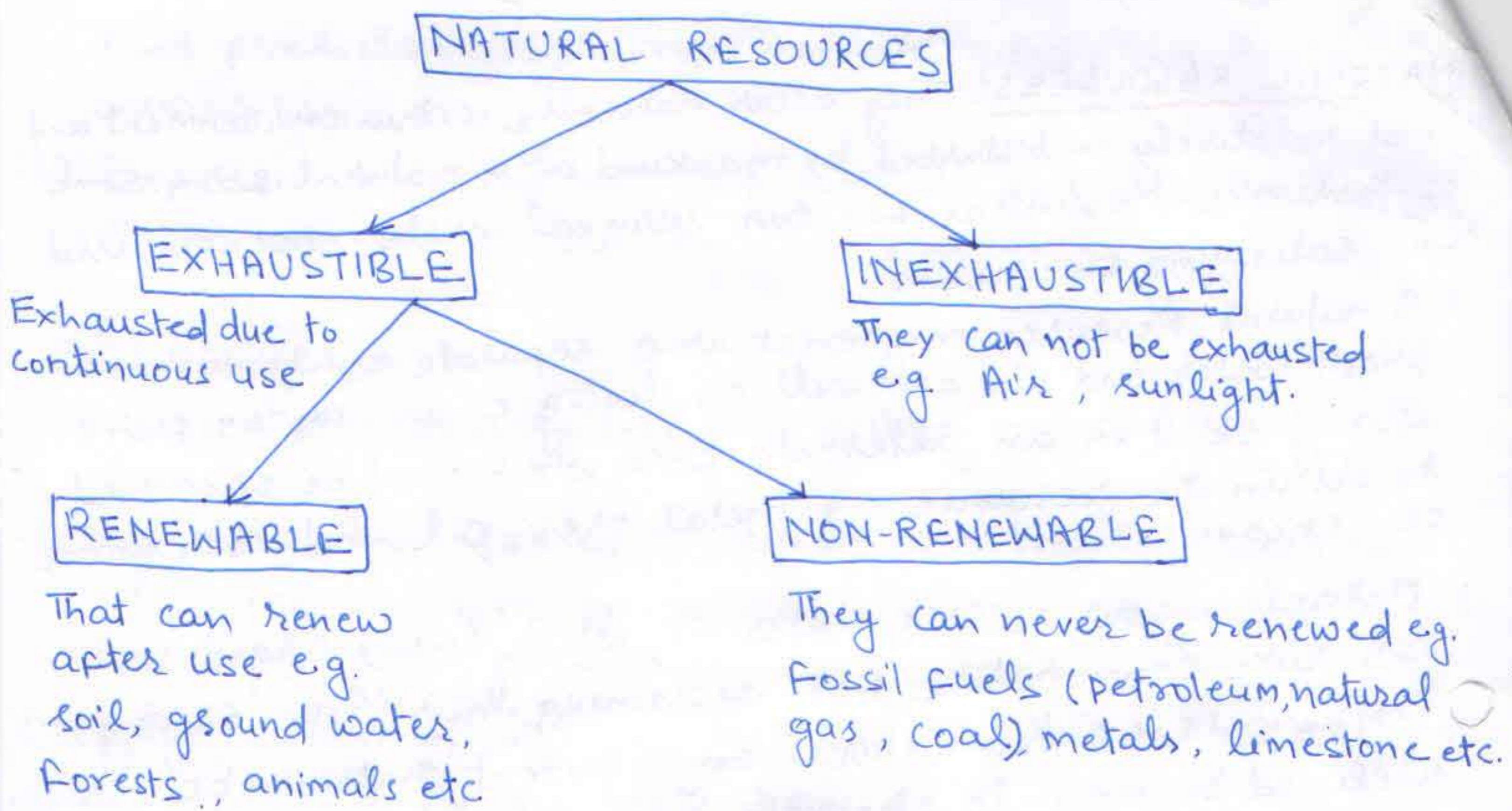
(a) On the basis of Origin: →

(1) Biotic: → They are obtained from biosphere (living and organic material) e.g. forests, animals, birds, and fish and the materials that can be obtained from them. Fossil fuels e.g. coal and petroleum also comes under this category because they are formed from decayed organic matter.

(2) Abiotic: → They come from non-living, non-organic material e.g. land, fresh water, air and heavy metals including ores i.e. gold, iron, copper, silver etc.

(b) On the basis of Renewability: →

(1) Renewable Resource: - They can replenish naturally e.g. sunlight, air, wind (they are continuously available and their quantity is not noticeably affected by human consumption).



(b) ON THE BASIS OF RENEWABILITY:

(i) Exhaustible: → They have a finite quantity and can be depleted if used improperly.

* Renewable: They grow again or come back again after use. e.g. soils, forests, groundwater etc. They are replenished by natural cycles or manually but it may take long period and hard effort if they are consumed / depleted once. e.g.

* → O₂ in air replenished by photosynthesis.

* → Forests are maintained themselves / manually.

* Non-Renewable: They are not replenishable e.g. fossil fuels, we can not get them back during our life time, if they are once consumed completely. e.g. metals, stone, salts, fossil fuels etc.

(ii) In-exhaustible: → They can not be exhausted through continuous use e.g. solar radiation, geothermal energy, and air.

NATURAL RESOURCES AND ASSOCIATED PROBLEMS

Human population is growing continuously causing increasing demand on natural resources. Man started using natural resources at a much larger scale due to urbanization, industrialization and electricity need.

The non-renewable resources are limited. They may come to an end after some time. Hence, there is a need to ensure a balance between population growth and utilization of resources. Resource overutilization creates many problems. Thus there is a need for conservation of natural resources. Problems associated with different resources are:

(1) Forest Resources:

- (a) Use and over exploitation.
- (b) Deforestation
- (c) Timber extraction
- (d) Mining and its effects on forest.
- (e) Dams and their effects on forests and tribal people.

(2) Water Resources:

- (a) Use and overutilization
- (b) Flood and drought
- (c) Water conflicts.
- (d) Dams and problems.

(3) Mineral Resources:

- (a) Use and exploitation
- (b) Environmental effects of minerals extraction and use.

(4) Food Resources:

- (a) World Food problem
- (b) Agriculture and overgrazing
- (c) Fertilizer and Pesticide problem

(d) Water logging and salinity.

(5) Energy Resources:

(a) Growing energy need.

(6) Land Resources:

(a) Land degradation

(b) Man-induced land slides

(c) Soil erosion and desertification.

Human beings utilize various resources for their growth and development. Proper utilization of our natural resources is the need of today. Resources are valuable gift of nature.

In past man was not so advanced and was satisfied with what he received from nature due to his limited needs. But at present, due to misuse of natural resources and population explosion the situation is imbalanced.

Human activities i.e. deforestation, hunting of animals, and pollution are creating severe problems for environment and natural resources. e.g.

- Lowering of water table
- Extinction of wild life
- Soil erosion,
- Siltation of rivers
- Floods
- Climate change
- Water cycle disturbance
- Ozone layer depletion
- Global warming
- Acid rain
- Green house effect
- Food shortage

- * Conservation of natural resources should be priority of every citizen. Natural resource management methods should be followed.
- * Awareness programmes, seminar and public programmes organization should be done to protect and conserve natural resources.
- * Advanced technologies should be adopted.
- * Population should be controlled which is root cause of resource exploitation.

Environment:

- (1) Biotic and (4) Abiotic parts of nature } different habitats.

Food sources, indirectly - pollinators / soil animals

History of G. Environment:

10,000 yrs ago hunter gatherer → agriculturalist
 began to change environment → natural ecosystems → agricultural fields.

- Rivers, streams, well
- Fertilizers / pesticides
- Industrialization, urbanization, population growth

undecorable change.

Change in land use and Resource use:

100 yrs - better healthcare + improved nutrition → population growth - developing countries.

Forest, Grasslands, wetlands

Agricultural and industrial use → Altered land use & disappearance of natural ecosystems.

I) Atmosphere - O₂, troposphere, Green house effect, Global warming, climate change

II) Hydrosphere - drinking water (3/4th)
 Food resources
 hydroelectricity
 Deforestation - changes hydrosphere
 Pollution

III) Lithosphere: Soil for agriculture
 Minerals, sand, stone
 Micronutrients
 Flora/fauna
 Fossil fuels.

4.6 billion years - Lithosphere ORIGIN
 3.2 billion years - Life on Earth

iv) Biosphere:

Food crops & domestic animals

Food for all - food chain

Biomass energy

Timber.

Nutrient Cycles

All Connected

- * forests have a tremendous importance to humans. They constitute important components of our environment. forests are important renewable natural resource. forest ecosystem is dominated by trees, the species varying in different parts of the world. forests are intimately linked with our culture and civilization. They contribute significantly to the economic development of our country.
- * Play an important role in geochemical cycles of H_2O , C , O_2 , N , P etc.
- * Provide broad genetic base from which future strains of species could be developed.
- * Help in development of regions, states and nations.
- * Forest and Environment are interrelated in such a way that we can not separate them.
- * $10^\circ N - 10^\circ S$ of Equator: Tropical rain forest.
 $53^\circ N - 67^\circ N$ Latitudes: Boreal Forest
- Angiosperms (broad leaf forests) - More biodiversity
- Gymnosperms (Conifer, montane/needle leaf forests) - Less biodiversity.

FOREST RESOURCES

The word forest is derived from a Latin word "Forus" means outside. Forests are one of the most important natural resources of the earth. Approximately $\frac{1}{3}$ rd of the earth's total ^{land} area is covered by forests. Also called as wood or woods. An area with high density of trees.

Indian Scenario:

Forest cover \rightarrow 19.39% of total geographic area.
Dense forest \rightarrow 11.48%
Open forest \rightarrow 7.76%
Mangroves \rightarrow 0.15% of Total area
Total Forest cover: \rightarrow 6,37,293 Km².

* 9.4% of Earth's surface
* 20% of Land area

Forest Functions: - can be classified into following categories:

- (1) Protective Function
- (2) Productive function
- (3) Regulative Function
- (4) Accessory function

Forests are central to all human life because they provide a diverse range of resources: they store carbon, aid in regulating global climate, purify water and mitigate natural hazards e.g. floods.

Protective Functions:

* Provide protection against soil erosion, droughts, floods, noise, radiations

Productive Functions: provide various products e.g. gum, resins, medicines, Katha, honey, pulp, bamboo, timber, and fruits.

Regulative Functions: regulate level of O₂ and CO₂ in atmosphere. The forests also regulate temperature conditions.

Accessory function: - provide aesthetics, habitat to flora and fauna, also have recreational value.

Ecological Importance: \rightarrow

① Regulation of Global Climate and Temperature: \rightarrow

* Forest cover absorb solar radiation that would otherwise be reflected back into the atmosphere by surface of earth.
* Transpiration by plants increases the atmospheric humidity which affect rainfall, cools the atmosphere and thus regulate hydrological cycle.

(2) Reduction of Global Warming: → The main green house gas CO_2 is used by forests for photosynthesis thus reduce green house effect.

(3) O_2 - Production: → During photosynthesis forest releases O_2 a very important gas for human survival. Hence called as lungs of earth.

(4) Conservation of Soil: → They prevent soil erosion by binding the soil particles tightly in their roots. They also reduce velocity of wind and rain which are chief agents causing erosion.

(5) Improvement in Soil Fertility: → Soil fertility increases due to humus formed by the decay of forest litter.

(6) Control of Water Flow: → They act as giant sponge. Thus they slow down runoff, absorb and hold water that recharges springs, streams, and ground water.

(7) Habitat for Wildlife: → e.g. lion, tiger, tortoise, donkey etc.

(8) Noise Absorption: → noise pollution reduction.

(9) Air pollutants absorption: → Forests absorb many toxic gases and air pollutants and thus help in keeping air pure.

ECONOMICAL IMPORTANCE:

(i) Timber for furniture, boats, bridges etc.

(ii) Fuel wood: poor people use wood as fuel for cooking.

(iii) Raw material for wood based industries e.g. pulp and paper, sports goods, furniture, match boxes etc.

(iv) Food: Fruits, roots, leaves of plants and trees along with meat of forest animals provide food to tribal people.

(v) Miscellaneous products: resin, gums, oils, medicines, Katha, honey.

DEFORESTATION

Forests are exploited since early times for humans to meet human needs. The permanent destruction of forest is called deforestation.

CAUSES:

- ① Population Explosion: This is the root cause for all environmental problems. Large area of forests is cleared for human settlement.
- ② Shifting Cultivation: It is a traditional agroforestry system widely practiced in north-eastern region of country in which felling and burning of forests followed by cultivation of crop for few years and abandon of cultivation allow forests for re-growth cause extreme damage to forest.
- ③ Growing Food Demand: To meet the food demand for rapidly growing population more and more forests are cleared off for agricultural purpose.
- ④ Fire Wood: Increasing demand of wood for fuel increases pressure on forests.
- ⑤ Raw Material for Wood Based Industries: Furniture, plywood, match box etc.
- ⑥ Infrastructure development: big dams, highways construction projects cause massive destruction of forests.
- ⑦ Forest Fires: Natural / man made
- ⑧ Over grazing: by cattle result in soil erosion, desertification.
- ⑨ Natural Forces: Floods, storms, heavy winds, snow, lightning.

EFFECTS OF DEFORESTATION

Deforestation adversely affects and damages the environment:

- ① Soil Erosion: The soil gets washed away with rain water on slopy areas in the absence of trees leading to soil erosion.
- ② Expansion of deserts: Due to strong winds laden by rock dust, land mass gradually gets converted into deserts.
- ③ Decrease in rainfall: In the absence of forest, rainfall declines considerably because forest bring rains due to high rate of transpiration. It maintains humidity in atmosphere.
- ④ Loss of Fertile land: Less rainfall results in loss of fertile land due to less natural vegetation growth.
- ⑤ Effect on Climate: Deforestation induces global climate change. Climate becomes warmer due to lack of humidity in deforested areas and also pattern of rainfall changes.
- ⑥ Lowering of Water Table: Due to lack of recharge of underground reservoir.
- ⑦ Economic losses: Loss of industrial timber and non-timber products.
- ⑧ Loss of Biodiversity: Loss of flora and fauna results into loss of biodiversity leading to disturbance in ecological balance world wide.
- ⑨ Environmental changes: Increase in CO_2 concentration and other pollutants which results in Global warming.

Forests can be classified in different ways i.e.: →

- (i) On the basis of biome i.e. Tropical, Temperate, Montane etc.
- (ii) Longevity of dominant species i.e. evergreen/deciduous.
- (iii) Depending on predominant vegetation: i.e.
 - * broad leaf trees
 - * Coniferous (needle leaved) trees
 - * Mixed.

(a) Boreal Forests → occupy subarctic zone and are generally evergreen and coniferous.

(b) Temperate Zones → support both i.e.

- * broadleaf deciduous forests: Temp. deciduous forest
- * evergreen coniferous forests: Temp. coniferous forests and Temperate rainforests.

(c) Tropical and Subtropical Forests →

- * Tropical and subtropical moist forests
- * Tropical and subtropical dry forests
- * Tropical and subtropical coniferous forest.

AFFORESTATION

The conservation measure against the deforestation is called afforestation. The development of forest by planting trees on waste land is called afforestation.

Main Objectives:-

- ① To control deforestation
- ② To prevent soil erosion
- ③ To regulate rainfall and maintain temperature.
- ④ To control atmospheric condition by keeping it clean.
- ⑤ To promote planned use of wasteland.
- ⑥ To protect forest ecosystem and to get benefits of forest products.
- ⑦ To preserve biological diversity.
- ⑧ To achieve sustainable development.

MEASURES TO CONSERVE FORESTS:-

- (i) If trees are cut down, plant new trees.
- (ii) Discourage use of wood and wood charcoal as fuel. Biogas can be used.
- (iii) Modern forest management methods should be employed.
- (iv) Rate of afforestation should be more than rate of deforestation.
- (v) Social forestry programme of 1976 should be undertaken on a large scale.
- (vi) Agroforestry programmes should be undertaken.
(Farming + Animal Husbandary + Forests)
- (vii) Urban forestry programme: gardens & house compounds.

Forest Conservation Through Law:

- (i) National Forest Policy (1952): Forest cover should be 33% of total area (60% hills and 20% Plains) to maintain ecological balance. (NFP-1988)-Joint Forest Management.
- (ii) Forest Conservation Act (1980).

*Forest Plantations

CASE STUDIES: →

JOINT FOREST MANAGEMENT: (JFM)

The need to include local communities in forest management has become a growing concern. Local people will only support greening an area if they have some economic benefit from conservation.

An informal arrangement between local communities and forest department began in 1972, in the Midnapore District of West Bengal. JFM has now evolved into a formal agreement which identifies and respects the local community's rights and benefits that they need from forest resources. Under JFM schemes, Forest Protection Committees (FPCs) from local community members are formed. They participate in restoring the green cover and protect the area from being over-exploited.

THE CHIPKO MOVEMENT (1987):

In 1970's and 1980's, Indian villagers have sought to protect their livelihoods through a non-violence movement against forest felling. They resisted against destruction of forests throughout India by a well organised Chipko Movement.

- * First chipko action started spontaneously in 1973 and over next five years spread to many districts of Himalaya in Uttar Pradesh.
- * Name of movement originated from the word 'embrace': villagers hugged the trees and thus saved them by putting their bodies in the way of contractors axes.
- * Due to this in 1980, a 15 year ban resulted on felling of trees in Himalayan forests, by the then Prime Minister, Indira Gandhi.
- * The movement later on spread to Himachal Pradesh, Karnataka, Rajasthan, Bihar and Vindhya. Deforestation in Western Ghats and Vindhya was also came to an halt.
- * Its leaders and activists were primarily village women.
- * Sunderlal Bahuguna, a gandhian activist, joined the movement in 1980's and opposed construction of Tehri dam. In 1989 he launched Save Himalaya Movement.

TIMBER EXTRACTION, MINING, DAMS: THEIR EFFECTS ON FORESTS AND TRIBAL PEOPLE

- * Timber extraction, mining and dams are needs of developing countries. If timber is over harvested, the ecological functions of forest are lost.
- * Unfortunately, forests often are located in areas where there are rich mineral resources.
- * Forests ~~at~~ also covers the steep embankments of river valleys, which are ideally suited to develop hydel and irrigation projects.
- * Thus there is a constant conflict of interests between environment conservationists and mining and irrigation Departments. What needs to be understood is that long term ecological gains can not be sacrificed for short term economic gains that unfortunately lead to deforestation.

* These forests, where development projects are planned, can displace thousands of tribal people who lose their homes when these plans are executed. This leads to high levels of suffering for which there is rarely a satisfactory answer.

TIMBER EXTRACTION:-

Wood used for different purposes i.e. building houses, furniture etc. is called TIMBER. Since wood is an important structural component of any forest, its removal has immediate implications for forest health. Timber extraction causes fragmentation of remaining forest as well as decrease in biodiversity. Furthermore, the remaining valuable species are likely to be damaged during extraction of nearby trees. Types of timber extraction:

- (i) Clear felling System:- cause extensive modification of forest after commercial trees have been harvested.
- (ii) Selective logging: Large trees of a few commercially marketable species are harvested while other trees are left standing.
- (iii) Mechanized logging:- Operations may be of clear felling or selective logging in nature. This practice use heavy machinery for pulling, lifting and transporting logs.
- (iv) Hand-logging:- used in areas that are seasonally flooded or permanently water logged. Heavy machines cannot be used, hence operation is done by hand.

EFFECTS:-

- (1) Poor logging results in a degraded forest.
- (2) Floods may be intensified by cutting of trees.
- (3) Loss of biodiversity.
- (4) Climate change e.g. reduced precipitation.
- (5) New logging roads permit shifting cultivators to gain access to logged areas and fell remaining trees.
- (6) Forest habitat fragmentation.
- (7) Exploitation of tribal people by contractors.
- (8) Soil erosion on hill slopes specially.

MINING: - Mining is the act of extracting ores, coal etc. from the Earth. Mining on industrial scale can produce environmental damages from exploitation and development, even long after the mine is closed. Most mining work has been unscientific with non-environmental protection. There have been problems e.g.

- * Water and air pollution.
- * Land degradation and deforestation
- * Noise and ground vibration etc.

U.P., Bihar, M.P., Orissa and Andhra Pradesh have mining activities. These operations have affected forest and cultivated land areas.

EFFECTS:

- (1) Huge amount of waste is generated. Water dissolves these wastes to produce contaminated fluid that pollutes soil, rivers and groundwater.
- (2) Air pollution due to release of green house gases and other toxic gases e.g. CH_4 (methane) by coal mining.
- (3) Deforestation and loss of flora and fauna.
- (4) Noise pollution. Sound of big machinery and blasting may become unbearable to local people and wild life.
- (5) Migration of tribal people from mining areas to other areas in search of land and food.
- (6) Lowering of ground water table.

DAMS: - Dams have made significant contribution to human development and benefits derived have been considerable. Dams could be used for irrigation, hydroelectricity generation and water transport to deficit areas. As per World Commission on Dam Report - 2000, there are 45,000 large dams (140 countries) in the world.

Benefits: -

- (1) Flood control
- (2) Hydroelectricity generation
- (3) Dams ensure a year round water supply

- (4) Food production: 16% from land irrigated from dam reservoirs.
- (5) Ecosystem improvement: New wetlands and opportunities for fishing and recreation are generated.

EFFECTS:

- (1) Reduce water availability and destroy natural and human values.
- (2) Many dams have failed to achieve the technical, economic and social objectives for which they were designed. Most have been less profitable than expected.
- (3) Huge amount of water is lost by evaporation and seepage into porous rock beds, as compared to the amount made available.
- (4) Serious irrecoverable loss of species and ecosystems.
- (5) Salts left after evaporation increases salinity of river and make its water unusable for downstream cities.
- (6) Accumulating sediments in storage reservoirs not only make dams useless but also leads to loss of valuable nutrients for downstream agricultural lands.
- (7) Enormous weight of water could trigger seismic activity that might crack the dam and cause flood.
- (8) Submergence of large land/forest area, fertile fields and human settlements.
- (9) Resettlement and rehabilitation of displaced people.
- (10) Loss of free flowing river
- (11) Water born diseases: Schistosomiasis and Malaria, Breeding sites for disease causing agents.