

UNIT 2

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NATURAL RESOURCES

(i) The basic ecological variables namely energy, matter, space, time & diversity are commonly called natural resources.

A natural resource is defined as sum of all physical, chemical, biological & social factors which compose the surroundings of man. Each element of these surroundings constitutes a resource from which man derives in order to develop a better life.

CLASSIFICATION

The material resources from the environment shall be classified as

(a) Based on ability

(i) Continuous resources

Eg: Sun light, wind, tides

These are directly obtained from the environment without any interference. They can be renewed continuously.

(ii) Renewable resources (inexhaustible)

Eg: Fresh air, water, fertile soil.

These are which regenerates through natural processes as long as it is not used faster than it is replaced.

(iii) Non-renewable resources (exhaustible)

Eg: fossil fuels, metallic resources, non metallic (gold, iron, etc) (sand, clay, etc)

These are fixed qty in the earth's crust

(b) Based on origin

i) Biotic (organic) resources

Eg: forest, agriculture, birds, fish, etc.

ii) Abiotic (inorganic)

Eg: water, land, minerals, etc.

WATER RESOURCES

* GLOBAL WATER DISTRIBUTION

0.01% potable water

Water on the earth occurs in 3 forms - solid, liquid & gaseous (vapour). The world's total qty. of water is estimated to be about 1.36×10^{18} ^{million} _{lakh}. About 97.2% of this water is in the oceans as salt water. Only about 2.8% is available as fresh water on the earth. Out of 2.8% of fresh water about 2.2% is available as surface water & rest 0.6% is available as ground water. Out of 2.2%, of fresh water around 2.15% is in gaseous glasses and ice caps. Out of the remaining 0.05% of freshwater, only 0.01% is available in lakes, streams & the remaining 0.04% is in the other forms. In the 0.6% of ground water, only about 0.25% can be extracted economically with the available drilling technology & the remaining is at greater depth of the earth's crust. The smallest qty. 0.01% of fresh water is previous and has to be preserved for future generation.

FOREST RESOURCES

- (i) Forests are major renewable natural resources. A forest is a biotic community mainly shrubs & other woody vegetation with a closed canopy.
 - (ii) Forests play a great role in the economic development of a country.
 - (iii) About $\frac{1}{3}$ rd of the total land area of the earth is covered by forests.
- Main functions are -

(i) Production

The production of timber, bamboo's, wood, fruit, resins, essential oils, latex, alkaloids, pharmaceuticals etc. is the production function of forests.

(ii) Regulation

They regulate the release of O_2 & absorption of CO_2 through the process called photosynthesis. They regulate floods, droughts & bio-geochemical cycles (material cycles). This function improves atmospheric & temperature conditions in addition to rainfall.

(iii) Protection

They play an imp. role in the conservation of soil as well as water. They protect us against cold, heat radiations &inating winds. They enhance agricultural products & prevent droughts.

The foll. are some imp. advantages of forests

(i) Food

(ii) Fuel - wood

(iii) Timber - building of houses, etc.

(iv) Paper - Diff. kinds of papers such as stationery paper

Newspaper, packing paper & sanitary papers are obtained from bamboos & eucalyptus tree.

v) Commercial products - Useful products such as essential oil for cosmetics, dye, resin, silk, honey, ivory, drugs.

vi) Production of O₂

vii) Environmental maintenance

viii) Glutin.

ix) Soil conservation - by preventing soil erosion

x) Soil fertility

xii) Control of hydrologic cycle

xii) Pollution moderation

xiii) Reducing global warming.

MINERAL RESOURCE

Mining - extraction of ore from earth

coal mine

[surface mining
underground mining]

- global warming by clearing vegetation

- solid removal disfiguring

- water table → degrades quality of water

- landslides

- machinery, tanks & blasting operations

- dust & noise.

- acid mine drainage (AMD)

- degrades habitat of aquatic life.

- land damage - lowers the surface

- siltation of the land.

- cracks of road surface, buildings, railway tracks, river beds

- environmental pollution

- residue, refuse piles

Health : - Pneumonia (black lung disease)

- cancers, explosions

Food RESOURCE

Impacts on environment due to modern agriculture

* Green revolution

- Hybrid seeds, Irrigation (drip irrigation or sprinkler irrigation)
↓ water logging, salinity, salinization
- Fertilizers
- Pesticides, agro chemicals
- Radiation shelf life of grain

Direct impacts on the environment by modern agriculture mainly due to human activities are as follows.

(i) Deforestation

(ii) Fertilizers (NPK)

(iii) Pesticides

(iv) Dams, reservoirs & canals

(v) ~~Modern~~ Modern agricultural system need organic fertilizer due to amount of fertilizers. unused by the crops remain in soil in dissolved state affecting quality of underground & surface water.

(vi) Water projects like dams bring water to farms in any dry seasons. As a result, the natural flow of river water upsets the natural balance of streams, lakes, coastal waters & terrestrial ecosystem. The rivers at their downstream get dried up due to diversion of the water in the middle course. the hydrology of the region is seriously affected due to excessive irrigation large area of fertile land becomes saline & water logged

(v) Agrochemicals

A variety of chemicals such as herbicides, round killers, sterilizers etc are utilized for agricultural purposes they pollute surface & sub surface water sources.

(vi) Depletion of ground water table

Excessive extraction of ground water for agricultural causes depletion in the ground water table.

(vii) Ground water degradation

Many agricultural activities involve use of chemical fertilizers, pesticides etc. The runoff from agricultural field has contaminated the ground water drastically.

(viii) Global warming

Paddy fields release methane which contributes to global warming.
Laptops also contributes to this.

(ix) Activities such as food processing, preparation, distribution, use of fossil fuel fuels, fuel wood, refrigerants & other inputs.

(x) Organic farming

Medium agricultural systems and require large amount of fossil fuel to run machinery & irrigation pump.

ALTERNATIVE AGRICULTURE METHODS TO REDUCE IMPACTS

- (i) Various forms of low IP lead & rotational cropping such as zero fallow afforations, trickle or drip irrigation, has to be used.
- (ii) Integrated pest management
- (iii) Perennial grain crops
- (iv) High yield crops, aquaculture
 - Trickle irrigation reduces evaporation & water loss help to prevent salinization and can also save energy using lifting delivering water

WATER LOSSES

It is phenomenon of ground water table rising in root zone of plants.

It could be due to

- (i) over irrigation of land
- (ii) Seepage loss
- (iii) Surface spreading of waste water
- (iv) Excessive rainfall
- (v) Poor land drainage
- (vi) Poor permeability of soil

Effects:

- (i) Land cannot sustain useful plant life
- (ii) Evaporation leaves salinity in soil
- (iii) inhibiting vegetation growth
- (iv) Anaerobic decomposition of organic matter leads to bad odour & ground water pollution

REMEDIAL MEASURES

- (i) Excessive watering of crops should be avoided.
- (ii) Irrigation canals have to be lined.
- (iii) Surface water drainage should be properly designed.
- (iv) Evapotranspiration should be increased with suitable plantations.

SALINISATION

By irrigating the land, the water that is not absorbed into the soil evaporates during leaving behind a thin crust of dissolved salts in the top soil. This accumulation of salts is called salinisation.

Effects:

- (i) It leads to slow growth.
- (ii) It leads to low crop yield.
- (iii) Sometimes the plants are destroyed.
- (iv) In most cases the land becomes unproductive & no crop can be cultivated.

PREVENTION

- (i) Reduced irrigation.
- (ii) Switch over to salt tolerant crops like cotton, sugarcane.
- (iii) Recharge the soil with fertile soil.
- (iv) Not to grow any crops for 2-3 yrs.
- (v) Installing underground drainage system.

FERTILIZERS

To encourage plant growth & increase yield
 N, P, K cause eutrophication
 Any substance that is applied to land
 to encourage plant growth & produce higher
 crop yield is called fertilizer.
 Fertilizer can be made from organic
 material including recycled waste, animal manure,
 compost or chemically manufactured.
 Most fertilizers contain varying amt. of
 nitrogen, phosphorus, potash & inorganic
 nutrients that plants need to grow.

Impacts on environment

- (i) It has been estimated that 25% of fertilizers is carried away as a run off.
- (ii) Fertilizer run off has contaminated ground water & surface water near & around the lands.
- (iii) Increase of nitrate concentration in drinking water has been reported in countries that practice intensive farming.
- (iv) Accumulation of nitrogen & P in water bodies from chemical fertilizers has also contributed to the eutrophication of lakes & ponds.
- (v) Ammonia released from decay of fertilizer causes minor irritation to respiratory system.

Measures

- (i) We cannot totally ban the use of chemical fertilizers but use them in efficient ways reducing their impact on environment.
- (ii) Proper planning shall reduce fertilizer application. This can be carried out by application in

(iii) small doses using drip irrigation or animal waste, crop residue or grass clippings which unlikely to encourage the growth of weeds.

PESTICIDES

These are chemicals that are used to kill insects, weeds & other organisms to control plant diseases in field of modern agriculture.

They can be classified into many types like

- (a) Fungicides - protect plant from fungal pathogens
- (b) Herbicides - kill weedy plants
- (c) Nematicides - kill nematodes which can destroy roots of plants.

HARMFUL

EFFECTS OF PESTICIDES

- (i) The considerable effects of pesticides are partly offset by some environmental damages.
- (ii) More serious problems is the spread of environmental contamination by persistent residues including presence of chemical residues in wildlife, in soil, water, etc.
- (iii) Ecological poisoning of wildlife and the disruption of ecological processes such as productivity of nutrient cycling.

S. No.	PESTICIDE	AFFECTED MEDIUM	PRY. HEALTH EFFECTS
1.	DDT	water, food chain	nervous disorders, decreased WBC count.
2.	Aroclor	water, food chain	Damage to kidney, liver, nervous system, possibly carcinogenic

ALTERNATIVES

- (i) Using rotation crop & mechanical cultivation & planting mixed poly cultures rather than mono culturing.
- (ii) Consumers should prefer organically grown fruits & vegetables.
- (iii) Biological control such as mixed predators, pathogens are natural persons specific particular pest can help to reduce chemical use.
- (iv) Genetic breeding and biotechnology can produce pest resistant crops.
- (v) The agricultural pest problem can be solved to some extent by integrated pest management.

LAND RESOURCE

Land is its soil content are considered as imp. resource as they provide medium for development of agriculture, forestry & vegetation. In India, 2/3 land is agricultural land. The pattern of land distribution is as follows.

(i) Agricultural land - 43.6%
(ii) permanent pasture & meadow - 14.6%

(iii) Culturable waste land - 12.2%	-
(iv) Forests - 10.7%	-
(v) Barren & uncultivable land - 8.4%	-
(vi) Other land - 5.3%	-
(vii) No information available - 5.2%	-

SOIL

It is a mixture of minerals, organic material when living organisms, air, water. Soil fertility is determined by inorganic matter, organic matter, water & air (word) spans in soil.

IMP. FUNCTIONS OF SOIL

- (i) It provides mechanical support to flora
- (ii) Its porosity & water holding capacity serve as reservoir of water & supplies water
- (iii) Ensures the supply of micro-nutrients and macro-nutrients for the growth of plant
- (iv) Prevents excessive leaching of nutrients
- (v) It contains wide variety of bacteria which helps in decomposition & mineralization of organic matter.

SOIL EROSION

- (i) It is a continuous process but when it occurs on a large scale due to water & wind erosion, it not only degrades environment but it is also responsible for the expansion of waste land due to gullies & ravines.
- (ii) It is a common phenomenon in arid & semi-arid regions causing desertification & desert expansion.

IMPACTS OF SOIL EROSION

- (i) Formation of gullies & ravines making area unsuitable for cultivation
- (ii) Wash out of upper layer of soil which

consists of turbulent

- (iii) Uprooting of plants leading to deposition
- (iv) Loss of soil fertility
- (v) Loss of pasture
- (vi) Increased frequency of floods & droughts

LAND SLIDES

- (i) It is a land hazard defined as any downward movement of mass of dead rock under the influence of gravity.
- (ii) It is a rapid sliding of large rock masses beginning a descent as unit of loss without internal flowage.
- (iii) In India, landslides occur in J&K, MP, Uttarakhand & NE states.
- (iv) Activities like hydroelectric projects, dams, reservoirs, construction of roads & buildings, mining, deforestation, etc. are responsible for inducing landslides.
- (v) During construction, portions of fragile mountain are destroyed by dynamite & thrown into valleys & streams.
- (vi) These land masses become the fragile mountain slopes causing landslides.
- (vii) Landslides also causes soil erosion & water pollution of streams.
- (viii) Natural factors responsible for landslides are responsible for heavy & prolonged rainfall, wind, damp, humidity, steep slopes & soil texture, ordinary matter content, earthquake, etc.
- (ix) Anthropogenic structures such as removal of vegetation on the slope, deep excavation on slopes for building, road, mining, etc.

DESERTIFICATION

It is a process of formation of dust either due to natural phenomena linked to exploitation of climate change or due to excessive land used.

FACTORS RESPONSIBLE FOR DESERTIFICATION

- (i) Water erosion
- (ii) Soil erosion
- (iii) Wind erosion
- (iv) Depletion of soil fertility
- (v) Overgrazing by livestock
- (vi) Loss of biodiversity
- (vii) Water logging & salinity
- (viii) Drought & flooding

∴ Desertification is a systematic phenomenon involving deterioration of ecosystems. It is a process through which fertile land will be converted into infertile land.

CONTROL MEASURES

- (i) Ban on cutting dust vegetation
- (ii) Plantation of ecologically suitable plants in affected areas
- (iii) Development of grasslands
- (iv) Control of overgrazing
- (v) Proper use of available ground water resources and farming practices
- (vi) Management of land use and diversified
- (vii) National watershed programme has to be intensified
- (viii) Public awareness has to be generated