

## UNIT 2: NATURAL RESOURCES

Any component of the environment, which has intrinsic value of its own is called as resource. Any component which can be transferred in a way such that it becomes more valuable and useful is termed as resource.

**Renewable - Eg.** Clean air, clean water

Considered to be renewable with considerable lifespan -as long as they have the capacity to renew – unless they are affected by catastrophes or anthropogenic activity

**Non renewable - Eg.** Groundwater, minerals

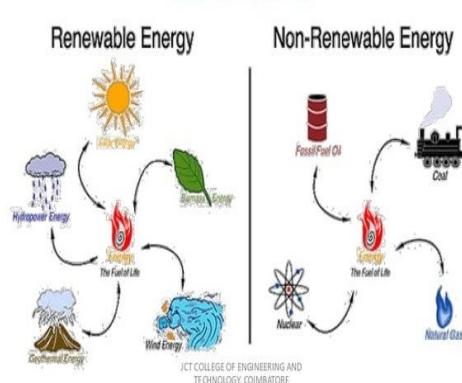
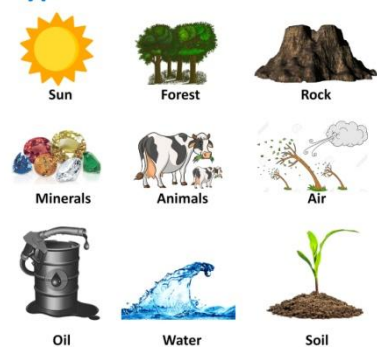
Available only infinite quantity their rate of renewal is so slow that they are considered as non-renewable

**Continuous – Eg.** Solar energy, wind energy

Considered to be available always

**Extrinsic – Eg. -** Human skills

### Types of Natural Resources



### FOREST RESOURCES:

Forests are one of the most important resources of the world. Apart from having high commercial importance they provide high environmental services also. They act as a blanket on the surface of the earth.

Around 1/3<sup>rd</sup> of world land area was found to be forests. 1/5<sup>th</sup> of world forests were found in Brazil and 6-7% was in Canada and USA. But the matter under high concern is the declination of forest cover year by year.

### USES OF FOREST

Commercial uses: Forests provide timber, fire wood, food material, resin, gum, non edible oils, drugs, medicine, rubber, fibers, bamboo and many other important items.

#### Ecological uses:

1. Production of Oxygen: Photosynthesis – earth's lungs
2. Reducing global warming – sink for carbon dioxide
3. Wild life habitat – 7 million species in tropical forests alone
4. Regulation of hydrological cycle – prevent surface runoff – giant sponges – 50-80% moisture
5. Soil conservation – hold solid particles tightly and prevent soil erosion – wind breaks
6. Pollution moderators: absorb toxic gases and purify air reduce noise pollution

## **OVER EXPLOITATION OF FORESTS:**

Human beings depend heavily on forests for food, shelter, wood, fuel and medicine with growing civilization etc. shooted up resulting in large scale mining, road building and clearing of forests.

Excessive use of charcoal, fuel wood, expansion of urban, agricultural and industrial areas and overgrazing have lead to over exploitation and rapid degradation of forests.

## **DEFORESTATION:**

The total forest area of the world in 1900 was 7000 million hectares - 1975 – 2900 mha – 2000 – 2300 mha.

Deforestation rate intemperate countries are relatively moderate. But it is alarming in tropical countries. It is estimated that in next 60 years we would lose more than 90% of our tropical forest.

## **INDIAN STATUS:**

Stabilized since 1982, with about 0.04% declaration per year between 1982- 90. During this period it is estimated that about 1.44 mha land was brought under afforestation. As per our NFP, we have a target of achieving 33% forest area. But we still have only 19.27% of our land area covered by forests (satellite data).

## **MAJOR CAUSES OF DEFORESTATION:**

1. Shifting of cultivation – 300 million people – 5 lakh hectares of forest for slash and burn culture
2. Fuel requirement
3. Raw materials for industrial use
4. Developmental projects
5. Growing food needs
6. Overgrazings

## **CONSEQUENCES OF DEFORESTATION**

1. Threatens many wild life species due to destruction of natural habitat
2. Biodiversity is lost along with that genetic diversity
3. Hilly regions are made prone to landslides
4. Soilerosion and loss of soil fertility
5. Hydrological cycle is affected (loss of rainfall, flood, drought etc)

## **TIMBER EXTRACTION AND MINING**

The major activities in forest area are 1. timber extraction 2. mining The important effects of timber extraction are

- i) thinning of forests
- ii) loss of biodiversity, particularly tree breeding species

- iii) soil erosion and loss of soil fertility
- iv) migration of tribal people from one place to another in search of new forest
- v) extinction of tribal people and their culture

## **MINING:**

Mining is a process of removing ores from area which is very much below the ground level. Mining is done for the extraction of several minerals of metals like Fe, Mn, Au, Ag, etc. The minerals are especially found in thick forests.

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**Mining** can be carried out in two ways

### **1. Surface mining**

### **2. Underground mining or sub-surface mining**

The effects of underground mining on forest reserves is comparatively less than that of surface mining

Relation between forest and climate change

Forests both influence and influenced by climate change. They play an important role in the carbon cycle and the way we manage forests could significantly affect global warming.

Forests hold more than 50 per cent of the carbon that is stored in terrestrial vegetation and soil organic matter. Hence, deforestation contributes significantly to net emissions of carbon di oxide into the atm.

If the predicted global warming occurs, the impact on forests is likely to be regionally varied, dramatic, and long-lasting. Even now, we can see how any extreme weather has great impact on forests. For example, the 1999 storms in Europe caused heavy damage to forests and also to trees outside forest areas.

The Kyoto Protocol on climate change may have a great impact on forest management. Under the Protocol, a country with forests earns emission credits, since its forests absorb carbon di oxide. These credits are tradable, that is, a developing country can sell its credits to an industrialized country that has exceeded its quota of emissions. The latter would invest in afforestation and reforestation projects in the developing country.

## **DAMS – BENEFITS AND PROBLEMS**

River valley projects with big dams are considered to play a key role in the development of a

country. India has large number of river valley projects

1. These dams are regarded as symbol of national development.
2. Provides large scale employment of tribal people and increase the std. of living of them
3. Contribute for economic uplift and growth
4. Help in checking flood
5. Generate electricity
6. Reduce power and water shortage
7. Provide irrigation water
8. Provide drinking water to remote areas
9. Promote navigation and fishery.



### **Environmental problems:**

The environmental problems can be at upstream as well as downstream Level

#### **Upstream problems**

1. Displacement of tribal people
2. Loss of flora and fauna
3. Siltation and sedimentation near reservoir
4. Stagnation and water logging near reservoir
5. Growth of aquatic weeds
6. Micro climatic changes
7. RIS causes earthquakes
8. Breeding of disease vectors

#### **Downstream problems**

1. Water logging and salinity due to over irrigation
2. Micro climatic changes
3. Salt water intrusion at river mouth
4. Loss of fertility due to sediment deposits
5. Out break of vector born diseases

### **WATER RESOURCES**

Water is an indispensable resource. Around 97% of world surface is covered with water. Most of the animals and plants have 60-65% of water in their body.

## **Unique features of water**

1. High specific heat
2. High latent heat of vaporization
3. Good solvent for oxygen, nutrients and pollutants
4. Anomalous expansion on freezing
5. High surface tension

Water is used for domestic, irrigation and also industrial purposes

Out of the total available water 75% is used for agriculture, 20% for industrial usage. In our country ~93% of water is used for agricultural purposes.

**Ground water:** 9.86% of fresh water is ground water and it is 35- 50% greater than surface water.

### **Aquifer:**

The layer of soil which is permeable has the ability to store water is called an aquifer. It is generally made up of gravel, sand etc.

**Unconfined aquifer:** it is covered by permeable layer. The recharge of this layer is by rainfall or snowmelt.

**Confined aquifer:** sandwiched between impermeable layers. The recharge is through unconfined aquifer layers.

**Over utilization of ground water:** Over utilization of water leads to rapid depletion of water resources, ground subsidence, lowering of water table and water logging.

**Reasons:** Economic development, rapid industrial growth and population explosion

The use of ground water and surface water rates which are higher than that of recharge ultimately leads to

- Declining of water levels
- Crops failure and reduction in agricultural production
- Over pumping of ground water create drought, famine and food shortage
- Over pumping of ground water sea water intrusion in coastal aquifers
- Land subsidence may due to over pumping of ground water
- River pollution due to industrial activities and dumping of waste into rivers, which in turn force to utilize the ground water, ultimately leads to over pumping

### **Effects of over utilization of ground water:**

- Water scarcity, water pollution/contamination
- Water logging
- Salination
- Alkalization

Clean water is universal right. It is the responsibility of everyone to ensure the purity of water. Water is a valuable commodity and it has to be conserved.



**Flood management:**

1. Dams and reservoirs can be constructed
2. Embankments and proper channel management
3. Flood way should not be encroached
4. Forecasting or flood warning
5. Decrease of run off by infiltration through afforestation or rain water harvesting etc

**Drought :**

Unpredictable delay in climatic condition occurring due to monsoon rain failure

**Types:**

**Meteorological:** in order of month or year, actual moisture supply at a given place consistently falls below critical level.

**Hydrological:** deficiency in surface and subsurface water supplies

**Agricultural:** inadequate soil moisture to meet the need of a particular crop at particular time or susceptibility of crops during different stages in its development

**Socioeconomic:** reduction in the availability of food and social securing of people

**Causes:**

- Deforestation and poor rainfall coupled with cutting of trees for timber leads to desertification.
- Over drafting of ground water, subsidence of soil, drying of wetlands
- Pollution of soil with solid waste, industrial effluents etc make land useless and dry
- Shifting cultivation

**Causes of drought**

1. When annual rainfall is below normal and less than evaporation drought is created
2. High population
3. Over exploitation of scarce water to get higher productivity
4. Deforestation leads to desertification

Example : In Maharashtra there has been no recovery from drought for last 30 years due to over-exploitation of water by sugarcane crop

**Effects of drought**

1. It causes hunger, malnutrition and scarcity of drinking water
2. It affects crop failures
3. It also accelerates degradation of natural resources
4. It leads to large migration of people



## Drought management

1. Rain water harvesting
2. Drip irrigation technology
3. Mixed cropping and dry farming
4. Construction of reservoirs to improve groundwater level

## Control measures

- ☐ Rain water harvesting
- ☐ Watershed management
- ☐ Prevent deforestation
- ☐ Encourage afforestation

## CONFLICTS OVER WATER

1. Conflicts through use: Unequal distribution of water led to inter-state or international disputes.

### a. International conflicts:

- India & Pakistan fight to water from the Indus
- Iran & Iraq fight for water from Shatt-al-Arab water
- India & Bangladesh fight for Bhramaputra river
- Mixico & USA fight over Colorado river

### b. National Conflicts:

Cavery problem between Karnataka & Tamilnadu Krishna problem between Karnataka & Andhra Pradesh Siruveni water problem between Tamilnadu & kerala

**2. Construction of Dams/Power stations:** For hydroelectric power generation, dams built across the rivers, initiates conflict between the states.

### 3. Conflict through pollution:

Rivers & Lakes are used for electricity, shipping & for industrial purpose.

Disposal of waste water & industrial waste decrease the quality of water & causes pollution.

## EXAMPLES OF WATER CONFLICTS:

Conflicts on Indian river:

**Damodar river** → It is the most polluted river, carrying 43 industries discharges/

**Yamuna river** → 19,000 cubic meters of Water containing DDT derivatives are dumped in the river.

**Ganga river** → 1000 cubic meters of polluted water from 68 industries are discharged in the river.

**Periyar river** → The River is dying due to mining of 4,37,000 tonnes of sand everyday & become salty due to intrusion of sea water

**Cavery water dispute:**

The Cauvery water dispute Tribunal set up on 2nd June 1990, directed Karnataka to ensure 205 TMC of water to Mettur dam every Year

Due to increase in population and decrease in water resources conflicts over water starts Conflicts over the water around world was classified as

## MINERAL RESOURCES

Minerals are naturally occurring substances having definite chemical composition and physical properties.



### Ores

Ores are minerals or combination of minerals from which useful substances, such as metals, can be profitably extracted and used for manufacture.

### Formation of mineral deposits

Concentration of minerals at a particular spot, gives rise to a mineral deposit. Formation of these deposits is a very slow biological process; even it takes millions of years to develop as a mineral deposit.

### Uses and exploitation of minerals

Minerals are used in a large number of ways in everyday in domestic, agricultural, industrial and commercial sectors.

Economy and political power of the country is determined from the number of reserves of minerals and technical know-how to extract the elements

### *The important uses of minerals are as follows.*

1. Development of industrial plants and machinery. Examples - Iron, aluminium, copper, etc.,
2. Construction, housing, settlements. Example - Iron, aluminium, nickel, etc.,
3. Generation of energy. Example – Coal, Lignite, Uranium etc
4. Designing of defence equipments, weapons, ornaments
5. Jewellery – Example - Gold, silver, platinum and diamond.
6. Making of alloys for various purposes. Examples - Phosphorites.
7. Communication purposes. Examples – Telephone wires, cables, electronic devices.
8. Medicinal purposes – particularly in ayurvedic system – Example – Sulphur pyrites

### Environmental effects (or) impacts of extracting and using mineral resources.

Most important environmental concern arises from the extraction and processing of minerals during mining, melting, roasting, etc

### Mining

Mining is the process of extraction of metals from a mineral deposit.



## Types of mining

**(a) Surface mining:** Surface mining is the process of extraction of raw materials from the near surface deposits.

**(b) Underground mining.** It is the process of extraction of raw materials below the earth's surface. It includes,

**(i) Open-pit mining:** Open-pit mining machines dig holes and remove the ores.

Example: Iron, copper, limestone, and marble etc.

## Environmental damage

Environmental damage, caused by mining activities, are as follows.

1. **Devegetation and defacing of landscape:** Large scale deforestation or devegetation leads to several ecological losses and also landscape gets badly affected.
2. **Groundwater contamination:** Mining disturbs and also pollutes the ground water. Some heavy metals also get leached into groundwater.
3. **Surface water pollution:** Drainage of acid mines often contaminates the nearby streams and lake water and kill many aquatic animals.
4. **Air pollution:** Smelting and roasting are done to purify the metals, which emits enormous amounts of air pollutants damaging the nearby vegetation and public suffer from several health problems.
5. **Subsidence of land:** It is mainly associated with underground mining. Subsidence of mining area results in cracks in houses, tilting of buildings, bending of rail tracks.



## FOOD RESOURCES

Food is an essential requirement for the human survival. Each person has a minimum food requirement.

The main components of food are carbohydrates, fats, proteins, minerals and vitamins.

## World Food problems

1. The problem of population explosion has made it worse. The world population increases and cultivable land area decreases. Therefore world food problem arises.
2. Environmental degradation like soil erosion, water logging, water pollution, salinity, affects agricultural lands.
3. Urbanisation is another problem in developing countries, which deteriorates the agricultural lands.
4. Since the food grains like rice, wheat, corn and the vegetable like potato are the major food for the people all over the world, the food problem raises.
5. A key problem is the human activity, which degrades most of the earth's net primary productivity which supports all life.

## **CHANGES CAUSED BY OVERGRAZING AND AGRICULTURE:**

### **Overgrazing:**

Process of eating away the vegetation along with its roots without giving a chance to regenerate



### **Effects (or) impacts of overgrazing**

#### **1. Land degradation**

Overgrazing removes the cover of vegetation over the soil and the exposed soil gets compacted. So the roots of plant cannot go much deep into the soil and the adequate soil moisture is not available.

Thus, overgrazing leads to organically poor, dry, compacted soil, this cannot be used for further cultivation.

#### **2. Soil erosion**

Due to overgrazing by livestock, the cover of vegetation gets removed from the soil. The roots of the grass are very good binders of the soil. When the grasses are removed, the soil becomes loose by the action of wind and rainfall.

#### **3. Loss of useful species**

### **Modern agriculture:**

The practice through which specific plant species are cared and managed so as to obtain maximum yield of consumable parts of plants – agriculture

Makes use of hybrid seeds and selected and single crop variety, high tech equipment and lots of energy subsidies in the form of fertilizers, pesticides and irrigation water e.g. green revolution

### **Effects (or) impacts of modern agriculture**

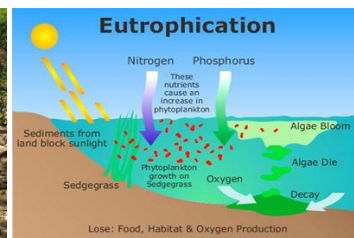
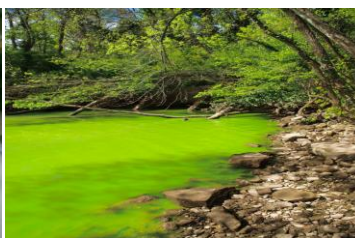
#### **(a) Micronutrient imbalance**

Most of the chemical fertilizers, used in modern agriculture, contain nitrogen, phosphorus and potassium (N, P, K), which are macronutrients. When excess of fertilizers are used in the fields, it causes micronutrient imbalance.

#### **(b) Blue Baby syndrome (Nitrate pollution)**

When Nitrogenous fertilizers are applied in the fields, they leach deep into the soil and contaminate the ground water. The nitrate concentration in the water gets increased.

When the nitrate concentration exceeds 25 mg / lit, they cause serious health problem called "Blue Baby syndrome". This disease affects infants and leads even to death.



### (c) Eutrophication.

A large proportion of N and P fertilizers, used in crop fields is washed off by the runoff water and reaches the water bodies causing over nourishment of the lake. This process is known as Eutrophication. Due to eutrophication, the lake gets attacked by algal bloom. Since the time of algal species is less, it dies quickly and pollutes the water, which in turn affects the aquatic life.

#### Problems associated with pesticide use:

- **Imbalance in the ecosystem**
- **Evolution in genetic resistance**
- **Creation of new pest/super pest**
- **Death of non target species**
- **Bio accumulation/ bio magnification**

### Water logging / salinisation:

Saturation of soil with irrigation water or excessive precipitation. So that the water table rises close to the surface.

Water logging results when soils are over irrigated without drainage. Occurs in clayey soil, the soil root zone becomes saturated with so much water blocking oxygen supply for growth and the soil becomes unsuitable. Carbon dioxide and ethylene accumulate around roots and affect plants.

#### Causes of water logging

1. Excessive water supply to the croplands.
2. Heavy rain.
3. Poor drainage.

#### Remedy

Preventing excessive irrigation, sub-surface draining technology and bio-drainage by trees like Eucalyptus tree are some methods of preventing water logging.

### Salinity

Soil salinity is the salt content in the soil; the process of increasing the salt content is known as salinization. Salts occur naturally within soils and water. Salinization can be caused by natural processes such as mineral weathering or by the gradual withdrawal of an ocean.

#### Problems in Salinity

Most of the water, used for irrigation, comes only from canal or ground, which unlike rainwater contains dissolved salts. Under dry climates, the water gets evaporated leaving behind the salt in the upper portion of the soil. Due to salinity, the soil becomes alkaline and crop yield decreases.

#### Remedy

The salt deposit is removed by flushing them out by applying more good quality water to such soils. Using a sub-surface drainage system, the salt water is flushed out slowly.

## ENERGY RESOURCES

### Growing energy needs:

Population explosion, Luxurious life, Industries, Agriculture, mining, transportation, lighting, cooling, heating, building all need energy. Fossil fuels like coal, oil, natural gas produce 95% of energy

### Sources of energy

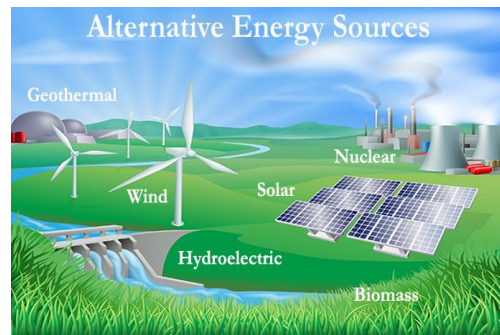
Primary- Renewable energy-resources which can be generated continuously in nature and are in exhaustible and can be used again endlessly. wood, Tidal, Solar, wind, hydropower, biomass, biofuel, geothermal, hydrogen

Non – renewable energy- Resources which have accumulated in nature over along span of time and cannot be quickly replenished when exhausted. coal, petroleum, natural gas

Secondary-petrol, electrical energy, coal burning

### Merits of renewable energy resources

1. Unlimited supply.
2. Provides energy security.
3. Fits into sustainable development concept.
4. Reliable and the devices are modular in size.



### Use of alternate energy sources:

Refers to energy sources which are not based on the burning of fossil fuels or the splitting of atoms.

### Solar energy:

Total energy from sun per year-35,000 times the energy used by man Used to run car, power plants and spaceships

### Energy harvesting devises:

Solar heat collectors  
Solar cells  
Solar cooker  
Solar water heater  
Solar furnace  
Solar power plants

### A) SOLAR ENERGY:

The Energy that we get directly from the sun is called solar energy

## **Methods of Harvesting Solar Energy**

### **1. Solar cells (or) photovoltaic cells (or) PV cells**

- Solar cells consist of a p-type semiconductor and n-type semi-conductor
- They are in close contact with each other.
- When the solar rays fall on the top layer of p-type semi-conductor, the electrons from the valence band get promoted to the conduction band and cross the p-n junction into n-type semi-conductor.
- Thus potential difference produced between two layers causes flow of electrons (ie., an electric current)

#### **Uses**

Used in calculators, electronic watches. Street lights, water pumps to run radios and TVs.

## **Solar Battery**

- Large number of solar cells is connected in series to form a solar battery.
- Solar battery produce more electricity which is enough to run water pump, to run street-light

### **2. Solar heat collectors**

- Solar heat collectors consist of natural materials like stones, bricks, (or) materials like glass.
- They can absorb heat during the day time and release it slowly at night.

#### **Uses**

Used in cold places, where houses are kept in hot condition using solar heat collectors.

### **3. Solar water heater**

It consists of

- An insulated box inside of which is painted with black paint.
- Provided with a glass lid to receive and store solar heat.
- Inside the box it has black painted copper coil, which heats the cold water.
- Then flows out into a storage tank.
- From the storage tank water is then supplied through pipes.

#### **Significance of Solar energy:**

- They are noise & pollution free
- Solar water heaters, cookers require no fuels
- Solar cells can be used in remote & isolated forest & hilly regions.

## **b) WIND ENERGY**

**Definition** - Moving air is called wind.

- Energy recovered from the force of the wind is called wind energy.
- The energy possessed by wind is because of its high speed.
- The wind energy is harnessed by making use of wind mills.

## **Methods of Harvesting wind energy**

### **1. Wind Mills**

- The strike of wind on the blades of the wind mill rotates it continuously.
- The rotational motion of the blade drives machines like water pump, flour mills, electric generators etc.



## 2. Wind farms

- Wind farm consists of large number of wind mills.
- The wind farms produce a large amount of electricity.

**Conditions** - The minimum speed required for satisfactory working of a wind generator is 15 km/hr.

**Advantages** - It does not cause any air pollution It is very cheap.

## c) OCEAN ENERGY

Ocean tides, produced by gravitational forces of sun and moon, contain enormous amount of energy.

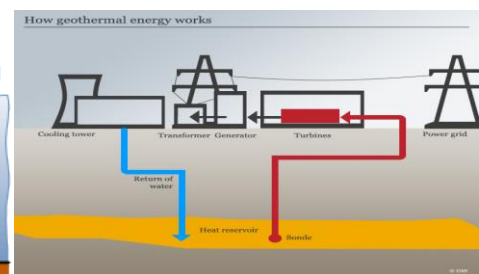
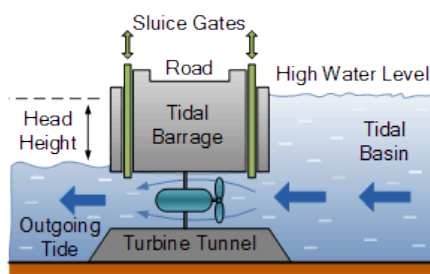
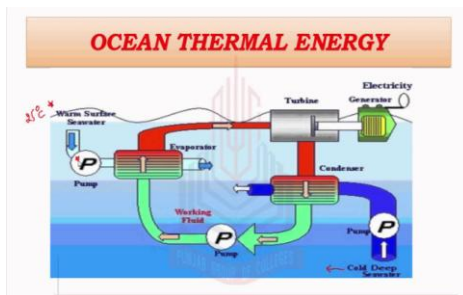
- The “high tide” and “low tide” refer to the rise and fall of water in the oceans.
- The tidal energy can be harnessed by constructing a tidal barrage.
- During high tide, the sea-water which flow into the reservoir of the barrage, rotates the turbine, which in turn produces electricity by rotating the generators

### Significance of tidal energy:

- Do not require large area
- Pollution free energy source
- No fuel is used & does not produce any wastes.

## 2. Ocean thermal energy (OTE)

The temperature difference between the surface level & deeper level of the oceans are used to generate electricity. A difference of 20<sup>0</sup> C or more is required for operating OTE power plants.



## 3. Geo-thermal Energy

The energy harnessed from high temperature & pressure present inside the earth is called geothermal energy.

### 1. Natural geysers

In some places, the hot water (or) steam comes from the ground through cracks naturally

### 2. Artificial geysers

In some places, we can drill a hole up to the hot region & make the hot water to rush out through the pipe with very high pressure.

Thus, the hot water (or) steam coming out from the natural (or) artificial geysers is allowed to rotate the turbine of a generator to produce electricity.

### Significance:

Power generation is higher than solar & wind energies, Can be brought online quickly,

Used for direct uses such as hot water bath, resorts, aquaculture, greenhouses.

#### d) BIOMASS ENERGY

Biomass is the organic matter, produced by plants or animals,

Eg: Wood, crop residues, seeds, cattle dung, sewage, agricultural wastes.

- Mixture of methane, carbondioxide, hydrogen sulphide, etc.
- It contains about 65% of methane gas as a major constituent
- Biogas is obtained by the anaerobic fermentation of animal dung or plant wastes in the presence of water.

2. **Bio fuels** - Biofuels are the fuels, obtained by the fermentation of biomass.

Examples:

(a)Ethanol = Easily produced from the sugarcane. Its calorific value is less than petrol,

(b)Methanol = obtained from ethanol or sugar-containing plants. calorific value is also too low than gasoline and diesel.

(c)Gasohol = Gasohol is a mixture of ethanol+gasoline

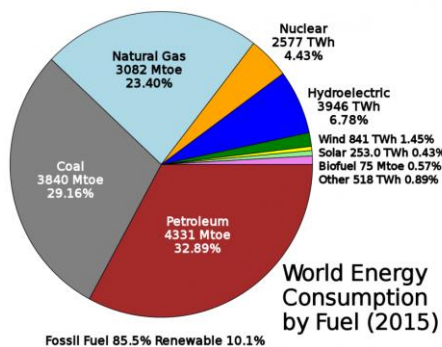
#### 3. Hydrogen Fuel

Hydrogen can be produced by thermal dissociation or photolysis or electrolysis of water.

Biomass energyIt possesses high calorific value.

It is non polluting, because the combustion product is water.

#### NON-RENEABLE ENERGY



##### 1. Coal

Coal is a solid fossil fuel formed in several stages & were subjected to intense heat and pressure over millions of years.

##### Disadvantages

1. When coal is burnt it produces CO<sub>2</sub> causes global warming
2. Coal contains impurities like S and N, it produces toxic gases during burning.

##### 2. Petroleum

Petroleum or crude oil = hydrocarbons +small amount S, O, N.

##### Occurrence

Petroleum was formed by the decomposition of dead animals and buried under high temperature and pressure for million years

### 3. LPG (Liquefied Petroleum Gas)

1. The petroleum gas, converted into liquid under high pressure is LPG
2. LPG is colorless and odorless gas.
3. During bottling some mercaptans is added, to detect leakage of LPG from the cylinder.

### 4. Natural Gas

1. Mixture of 50-90% methane and small amount of other hydrocarbons.
2. Its calorific value ranges from 12,000-14,000 k-cal/m<sup>3</sup>.

(i) **Dry gas** = the natural gas + lower hydrocarbons like methane and ethane, is called dry gas.

(ii) **Wet gas** = natural gas + higher hydrocarbons like propane, butane along with methane is called wet gas.

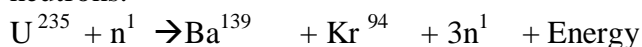
### 5. Nuclear Energy

#### Nuclear Fission

Heavier nucleus is split into lighter nuclei, on bombardment by fast moving neutrons, and a large amount of energy is released.

Eg: Fission of U<sup>235</sup>

When U<sup>235</sup> nucleus is hit by a thermal neutron, it undergoes the following reaction with the release of 3 neutrons.

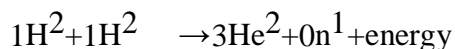


- Each of the above 3 neutrons strikes another U<sup>235</sup> nucleus causing (3x3) 9 subsequent reactions.
- These 9 reactions further give rise to (3x9) 27 reactions.
- This process of propagation of the reaction by multiplication in threes at each fission is called chain reaction.

#### Nuclear Fusion

Lighter nucleuses are combined together at extremely high temperatures to form heavier nucleus and a large amount of energy is released.

Eg: Fusion of Two hydrogen-2 (Deuterium) atoms may fuse to form helium at 1 billion °C with the release of large amount of energy



Nuclear power of India

- Tarapur (Maharashtra),
- Ranapratap Sagar (Rajasthan)
- Kalpakkam (Tamilnadu)
- Narora (U.P).

### LAND RESOURCE

Land is critically important national resource which supports all living organisms including plants and animals. The soil profile of land determines its ability to serve socio-economic needs.

It has been estimated that more than 5000 million tonnes of top soil is eroded annually along with 5

million tones of nutrients. About 1/3 of this is lost in sea while the rest in reservoirs and rivers leading to flood.

About 38% of the area in India suffers from moderate to high degree of water based erosion. The per capita availability of land in the country has declined from 1.37 hectare in 1901 to 0.33 hectare in 2000. All these lands cannot be utilized for agricultural purpose. Some land would be required for other activities (to maintain urban area).

Effective steps have to be taken for preventing diversion of land suitable for sustainable farming to non-farm uses. Simultaneously, degraded lands and waste lands have to be improved by ecological restoration. The Department of Land Resources was setup in April 1999 by ministry of Rural Development to act as nodal agency for land resource management.

### **Land Degradation:**

Land degradation is defined as the reduction in soil capacity to produce in terms of quality, quantity goods and services. The definition is also based on

1. Sustainability or ability to produce continuously and indefinitely.
2. Quality of land resource that makes it sustainable or resistant to degradation
3. Carrying capacity or the number of people and animals the land can normally support without significant stress.

Landscapes generally undergo degradation but are usually compensated by nature's inherent recovering ability. Whenever degradation occur exceeding nature's restorative capacity, the result will be a disaster.

### **Man induced landslides:**

The hill slopes are prone to landslides, landslips, rockslides etc. These hazardous features have reduced the overall progress of the region as they obstruct the roads, communication media and water flow.



There are two types of slides

1. Slides due to natural factors
2. Slides induced by man and his activities

Some of the human activities that cause land sliding are

### **Soil erosion:**

Soil erosion is the process of removal of superficial layer of the soil from one place to another. Soil erosion also removes the soil components and surface litter.

### **Types of soil erosion**

1. **Normal erosion:** It is caused by the gradual removal of top soil by the natural processes. The rate of erosion is slower.



## 2. Accelerated erosion:

It is mainly caused by man-made activities. The rate of erosion is much faster than the rate of formation of soil.

### Causes of Soil erosion

Run off, rain water flow, wind, overgrazing, mining, massive deforestation, road construction, unscientific quarrying, erratic agricultural practice etc

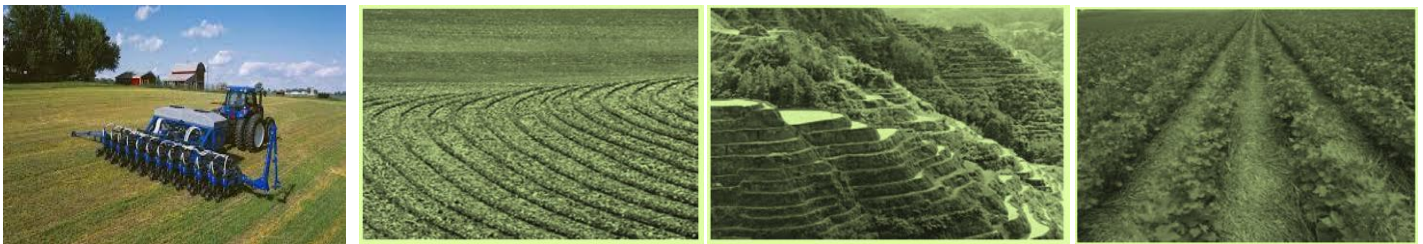
### Effects of soil erosion

1. Soil fertility is lost because of loss of top soil layer.
2. Loss of its ability to hold water and sediment.
3. Sediment runoff can pollute water and kill aquatic life.



### Control of soil erosion or conservation practices

1. **Terracing:** Terracing reduces soil erosion on steep slopes by concerting the land into a series of broad, level terraces. This retains water for crops at each level and reduces soil erosion by water run off.
2. **Contour Farming:** This method is adopted for gently sloped land. This involves planting crops in rows across the contour of gently sloped land.
3. **Alley Cropping or Agro forestry:** In this method crops are planted together in strips or alleys between trees and shrubs that can provide fruits and fuel wood. The trees and shrubs provide shade which reduce water loss by evaporation and preserve soil moisture.
4. **Wind Breaks or Shelter Belts:** Wind breaks and shelter belts or trees are established to reduce wind erosion and also for retaining soil moisture.



## Desertification

- Desertification is a progressive destruction or degradation of arid or semiarid lands to desert.
- It is also a form of land degradation.
- Desertification leads to the conversion of range lands or irrigated croplands to desert like conditions in which agricultural productivity falls.
- Desertification is characterised by devegetation, depletion of ground water, salination and soil erosion.

### Harmful effects of desertification

1. Around 80% of the productive land in the arid and semi-arid regions are converted into desert.



2. Around 600 million people are threatened by desertification.

### **Causes of Desertification (or) reasons for desertification**

1. **Deforestation:** The process of denuding and degrading a forest land initiates a desert. This also increases, soil erosion, loss of fertility.
2. **Over grazing:** The increase in cattle population heavily graze the grass land or forests and as a result denude the land area.
3. **Mining and quarrying :** These activities are also responsible for loss of vegetal cover and denudation of extensive land area leading to desertification.
4. **Climate change:** Formation of deserts may also take place due to climate change, ie., failure of monsoon, frequent droughts.
5. **Pollution:** Excessive use of fertilizers and pesticides and disposal of toxic water into the land also leads to desertification

### **ROLE OF INDIVIDUAL IN CONSERVATION OF NATURAL RESOURCES**

Natural resources-forest, water, soil, food, mineral and energy Overuse of these resources cause problems

### **ROLE OF INDIVIDUAL IN CONSERVATION OF NATURAL RESOURCES:**

#### **1. Conservation of energy**

- Turn off lights, fans and other appliances when not in use.
- Dry the clothes in sun instead of drier
- Use solar cooker for cooking food on sunny days and will cut down LPG expenses.
- Grow trees and climbers near the houses and get a cool breeze and shade. This will cut off electricity charges on coolers and A/C
- Ride bicycle or just walk instead of using your car or scooter.
- Always use pressure cooker.

#### **2. Conservation of water:**

- Use minimum water for all domestic purpose
- Check for water leaks in pipes & toilets & repair them properly
- Reuse the soapy water after washing clothes for washing courtyards, drive ways etc.
- Use drip irrigation to improve irrigation efficiency & reduce evaporation
- The waste water from kitchen, bath tub can be used for watering the plants
- Build rainwater harvesting system in your home

#### **3. Conservation of soil:**

- Grow plants, trees & grass which bind the soil & prevent its erosion
- Don't irrigate the plants using strong flow of water, as it will wash off the top soil
- Soil erosion can be prevented by the use of sprinkling irrigation
- Use green manure in the garden, which will protect the soil
- Use mixed cropping, so that specific soil nutrients will not get depleted

- While constructing the house don't uproot the trees

#### **4. Conservation of food resources:**

- Eat minimum amount of food, avoid over eating.
- Don't waste the food, instead give it to someone before getting spoiled.
- Cook only required amount of food
- Don't cook food unnecessarily
- Don't store large amounts of food grains & protect them from insects.

#### **5. Conservation of forest:**

- Use non-timber products
- Plant more trees & protect them
- Grassing, fishing must be controlled
- Minimize the use of papers & fuel wood
- Avoid developmental work like dam, road, construction in forest areas.

### **EQUITABLE USE OF RESOURCES FOR SUSTAINABLE LIFE STYLE**

#### **Sustainable development**

Sustainable development is the development of healthy environment without damaging the natural resources. All the natural resources must be used in such a way that it must be available for the future generation also.

#### **Unsustainable development**

Unsustainable development is the degradation of the environment due to over utilization and over exploitation of the natural resources.

#### **Life style in different countries**

The life style in world can be explained in two ways.

1. Most developed countries (MDCs)
2. Less developed countries (LDCs)

##### **1. Life style in most developed countries**

- The most developed countries have only 22% of world's population, but they are using 88% of its natural resources. Their income is nearly 85% of total global income.
- As the rich countries are developing more, they are consuming more natural resources and polluting the environment more. The sustainability of the earth's life supporting system is under threat.

##### **Life style in less developed countries**

- The less developed countries have 78% of the world's population and are using only about 12% of its natural resources.
- Their income is only 15% of total global income. They have very low industrial growth.
- They are still struggling hard with their large population and poverty problems.
- They are consuming too low natural resources leading to unsustainability.

#### **Causes of unsustainability**

The main cause is due to the difference between the less developed and more developed countries. i.e.,

- (i) Over population in poor countries, consume too low resources with low income.

(ii) Rich countries consume more resources with more income.

**Conditions for sustainable life style**

In order to achieve sustainable life styles,

1. It is essential to achieve a more balanced and equitable distribution of land resources and income to meet everyone's basic needs.
2. The rich countries should lower down their consumption levels, while the minimum needs of the poor should be fulfilled by providing them resources.

Thus more balanced and equitable use of resources will reduce the differences between the most developed countries and less developed countries and will lead to sustainable development.