

UNIT – I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Points to be covered in this topic

INTRODUCTION

NATURAL RESOURCES

RENEWABLE AND NON-RENEWABLE RESOURCES

NATURAL RESOURCES AND ASSOCIATED PROBLEMS

a. FOREST RESOURCES

b. WATER RESOURCES

c. MINERAL RESOURCES

d. FOOD RESOURCES

e. ENERGY RESOURCES

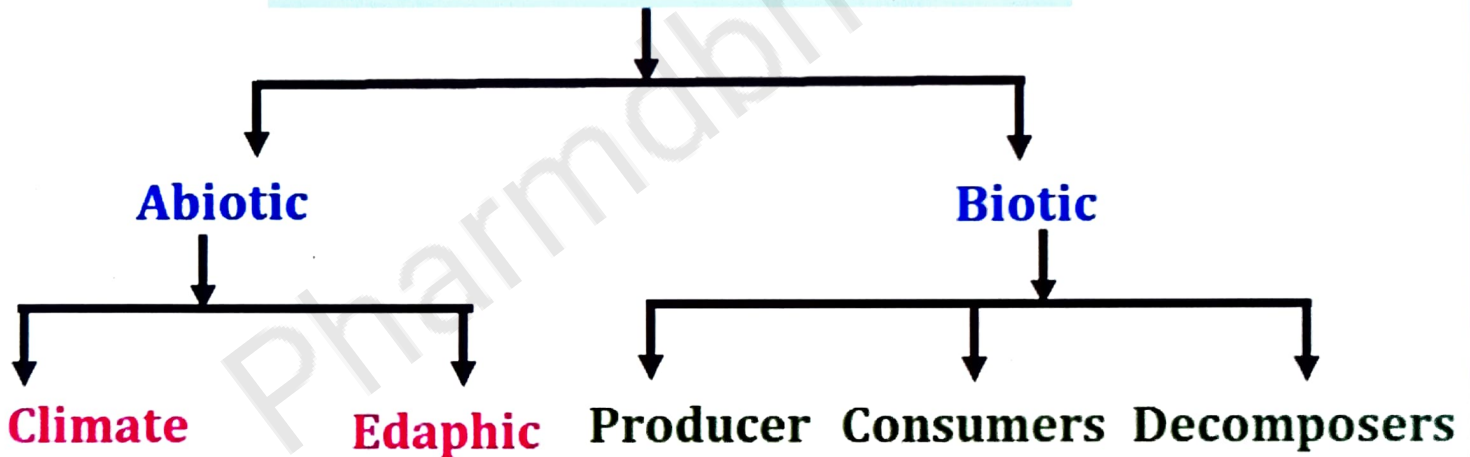
f. LAND RESOURCES :- Role of an individual in conservation of nature resources

INTRODUCTION

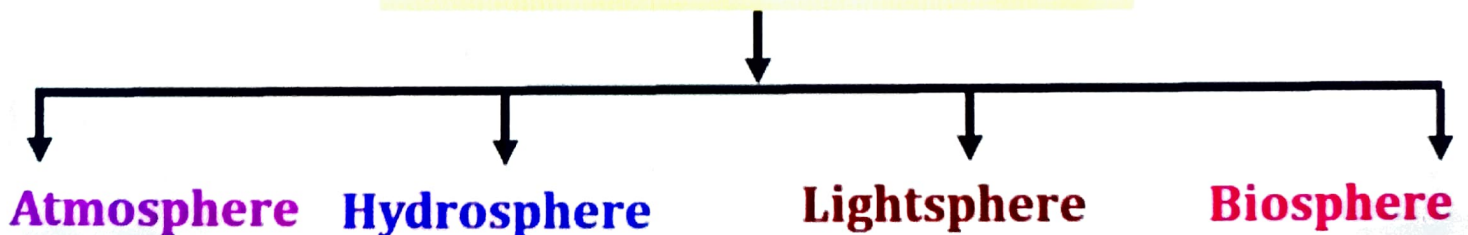
- The **term environment** is derived from French word '**ENVIRON**' which means encircle.
- So in other words everything that affects **living organism** is called as environment.
- **Environmental science** is called as **Multidisciplinary** as it brings about an interaction between our **natural world** (air, water, soil, and material) and **living organism**.
- Environmental study is an **interdisciplinary study** that utilizes information from **physical science** and **social science**.



COMPONENT OF ENVIRONMENT



SEGMENTS OF ENVIRONMENT



➤ SCOPE OF ENVIRONMENTAL SCIENCE

- Conservation of **nature and natural resources**.
- Conservation/ protection of **biological diversity**.
- Control of **environmental** and **human pollution**.
- **Social issues** in relation to development and environment.
- Development of **non- polluting renewable energy** system and provide new dimension to **nature's security**.

➤ MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- The **Environment studies** is a **multi-disciplinary science** because it comprises various **branches of studies** like chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc.
- It is the science of **physical phenomena** in the environment. It studies about the sources, reactions, transport, effect and fate of **physical and biological species** in the air, water, soil and the effect of from **human activity** upon these.
- As the **environment is complex** and actually made up of many different environments like **natural, constructed** and **cultural environments**, environmental studies is inter **disciplinary in nature** including the study of biology, geology, politics, policy studies, law, religion engineering, chemistry and economics to understand the **humanity's effects** on the natural world.
- This subject **educates the students** to appreciate the complexity of **environmental issues** and **citizens and experts** in many fields.
- By studying **environmental science**, students may develop a breadth of the **interdisciplinary** and **methodological knowledge** in the environmental fields that enables them to facilitate the definition and solution of **environmental problems**.



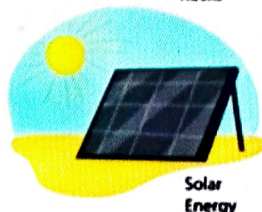
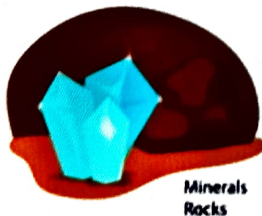
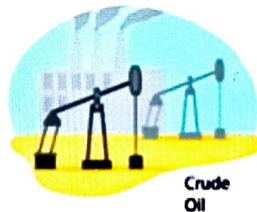
➤ IMPORTANCE OF ENVIRONMENTAL STUDIES

- The importance of **environmental studies** is that, the current trend of **environmental degradation** can be reversed if people of educated communities are organized, empowered and experts are involved in **sustainable development**.
- Environmental factors **greatly influence** every organism and their activities.
- At present a great number of **environmental issues**, have grown in size and **complexity** day by day, threatening the survival of mankind on earth. These issues are studied besides giving **effective suggestions** in the **environment studies**.
- The **environment studies** enlighten us, about the importance of **protection and conservation** of our natural resources, indiscriminate release of pollution into the **environment etc.**

NATURAL RESOURCES

➤ INTRODUCTION

- **Natural resources** can be defined as 'variety of goods and services provided by **nature** which are necessary for our **day-to-day lives**'.
- Eg : **Plants, animals and microbes** (living or biotic part), Air, water, soil, minerals, **climate and solar energy** (non- living or abiotic part).



- They are of two types of resources namely

1. **Renewable**

2. **Non-Renewable Resources.**

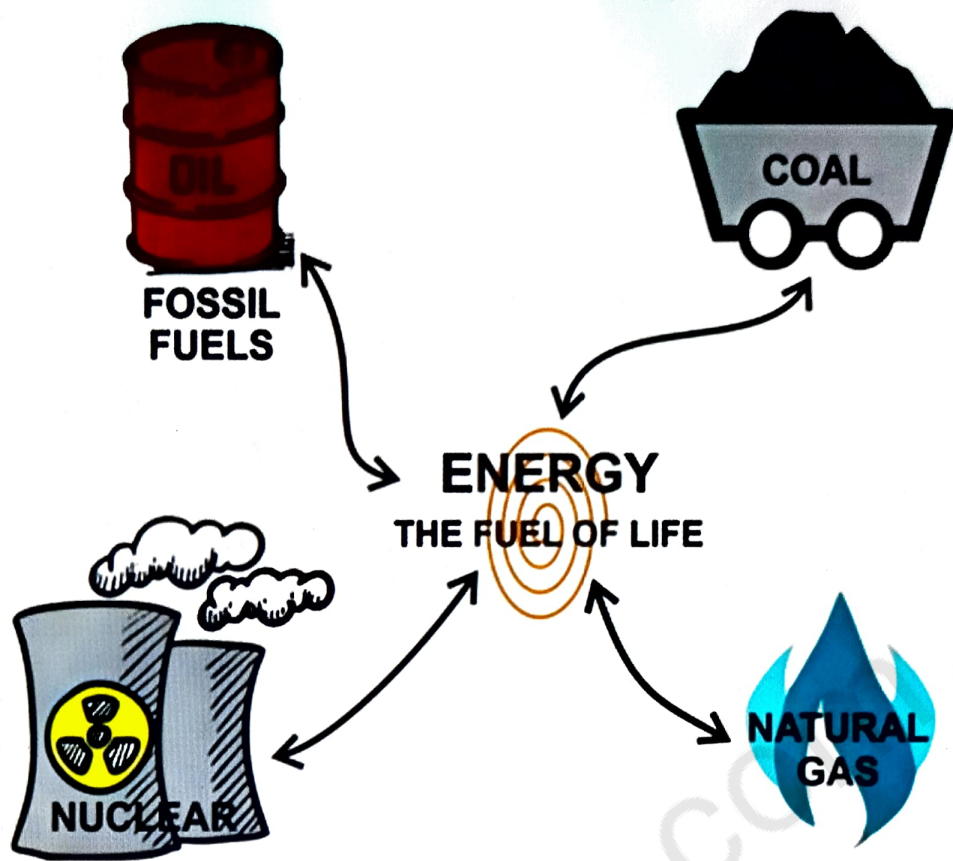
1. RENEWABLE RESOURCES

- The resources that can be **replenished** through rapid **natural cycles** are known as **renewable resource**.
- These resources are able to **increase their abundance** through **reproduction and utilization** of simple substances.
- Ex: **Plants, (crops and forests)** and **animals**.



2. NON RENEWABLE RESOURCES

- The resources that **cannot be replenished** through **natural processes** are known as **non-renewable resources**.
- These are available in **limited amounts**, which **cannot be increased**.
- These resources include **fossil fuels** (petrol, coal etc.), **metals** (iron, copper, gold, silver, lead, zinc etc.), **minerals and salts** (carbonates, phosphates, nitrates etc.)
- Once a **non-renewable resource** is consumed, it is gone forever.

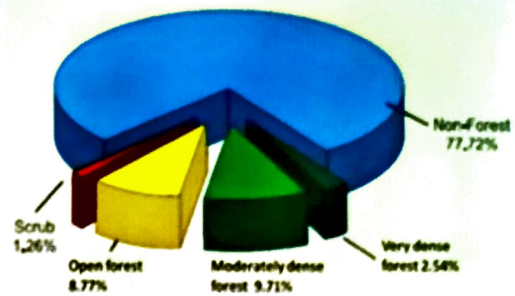


➤ NATURAL RESOURCES AND ASSOCIATED PROBLEMS

- The main problem associated with natural resources is **unequal consumption**.
- A major part of natural resources are consumed in the '**developed world**'. The 'developing nations' also over use many resources because of their **greater human population**.
- However, the **consumption of resources** per capita (per individual) of the developed countries is up to **50 times greater** than in most developing countries.
- **Advanced countries** produce over **75% of global industrial waste** and greenhouse gases.
- Energy from **fossil fuels** consumed in relatively much greater quantities in developed countries. Their per **capita consumption** of food too is much greater as well as their **waste**.

FOREST RESOURCES

- A forest can be defined as a **biotic community** predominant of trees, shrubs or any other **woody vegetation** usually in a **closed canopy**.
- It is derived from **latin** word '**foris**' means '**outside**'.
- India's **Forest Cover is 6,76,000 sq.km** (20.55% of geographic area).
- Scientists estimate that India should ideally have **33%** of its land under forests.
- Today we only have about **12%** thus we need not only to **protect our existing forests** but also to increase our **forest cover**.



❖ FUNCTIONS OF FOREST

1. It performs very important function both to **human and to nature**.
2. They are **habitats to millions** of plants, animals and wild life.
3. They **recycle rain water**.
4. They **remove pollutant** from air.
5. They control **water quality**.
6. They **moderate temperature** and weather.
7. They influence soil condition and **prevent soil erosion**.

❖ USES OF FOREST

1. **Commercial uses**
2. **Ecological uses**

1. **Commercial uses**

- i. Wood – used as a **fuel**
- ii. **Supply wood** for various industries – **Raw materials** as pulp, paper, furniture timber etc.
- iii. Minor forest products – **gum, dyes, resins**
- iv. Many plants – **Medicines**
- v. Supply variety of **animal products** – honey, Ivory, **hormones** etc.
- vi. Many forest lands are used for - **Mining, grazing, for dams and recreation**.

2. Ecological uses: Forest provides number of **environmental services**.

- i. Production of oxygen:** Photosynthesis produces large amount of oxygen which is essential for life.
- ii. Reducing global warming:** Carbon dioxide is one of the main green house gas. It is absorbed by plants for photosynthesis. Therefore the problem of global warming caused by CO₂ is reduced.
- iii. Soil conservation:** Roots of trees bind the soil tightly and prevent soil erosion. They also act as wind breaks.
- iv. Regulation of hydrological cycle:** Watershed in forest act like giant sponges and slowly release the water for recharge of spring.
- v. Pollution moderators:** Forest can absorb many toxic gases and noises and help in preventing air and noise pollution.
- vi. Wild life habitat:** Forest is the home of millions of wild animals and plants.

❖ OVER EXPLOITATION OF FOREST

- Due to **over population**, there is an **increased demand** for **medicine, shelter, wood and fuel**.
- Hence exploitation of **forest materials** is going on increasing cause of **over exploitation**:
 1. Increasing **agricultural production**
 2. Increasing **agricultural activities**
 3. Increase in **demand of wood resources**



❖ **DEFORESTATION:** It is process of **removal of forest resources** due to natural or **manmade activities** (i.e.) destruction of forests.

✓ **Causes of deforestation:**

1. Developmental projects:

Developmental projects causes deforestation through two ways.

- Through **submergence of forest area.**
- Destruction of forest area. Ex: **big dams, hydro electric projects, road construction etc.**



2. **Mining operations:** It reduces forest areas. Ex: Mica, coal, Manganese and lime stone.

3. **Raw materials for industries:** Wood is an important raw material for various purposes. Ex: Making boxes, furniture and paper etc.

4. **Fuel requirement:** Wood is the important fuel for rural and tribal population.

WATER RESOURCES

- Water claims to be an **important resource.**
- An **important use of water** in our country is for **irrigation.**
- Besides, water is also required in **large amounts** for industrial and **domestic consumption.**



❖ **USES**

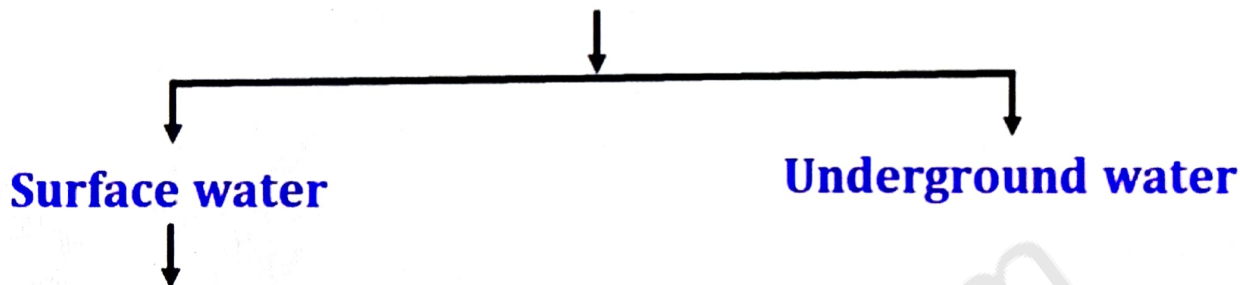
- Many uses of water include **agricultural, industrial, household, recreational** and **environmental activities.** Virtually, all of these human uses, require fresh water.
- **No plant or animal species** can survive without water. If water in our **body drops** by 1% we feel thirst, if it drops by **10% we face death.**

❖ HYDROLOGICAL CYCLE

- **Water** from various **water bodies** Evaporated by **solar energy** Enters in to the **atmosphere** as **clouds** Falls again on earth as rain or snow ultimately returns to the **ocean**.

❖ DISTRIBUTION OF WATER RESOURCES

FRESH WATER RESOURCES



- **Standing water bodies**
- **Flowing water bodies**

❖ UNDERGROUND WATER

- **Aquifer** Layers of **highly permeable** rock that can store water is called an **aquifer**. Layer of **sand** and **gravels** are **good aquifers**. **clay** and **crystalline rocks** are not good aquifers.



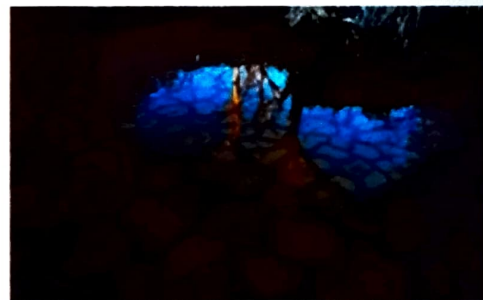
- Effects of **over utilization of water**

1. **Decrease of ground water**

i. **Increased usage decreases** the ground water.

ii. **Insufficient rain fall**

iii. **Building construction activities** sealing the permeability of the soil.



2. **Ground subsidence**

- If ground **water withdrawal** is greater than it's recharge rate, then the sediments in the **aquifers get compacted**.



- As a **result shrinkage** of **land surface** takes place.

- Problems:

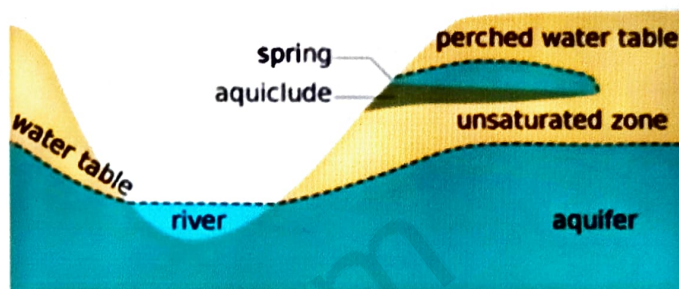
- a. **Structural damages** to the buildings

- b. **Fracture in pipes**

- c. Reversing the **flow of canals**

3. Lowering of water table

- **Over utilization** of **ground water** in arid and semi arid regions for **agriculture disturbs** the state of equilibrium of the **hydrological cycle**.



- Problem:

- ✓ **Lowering** of water table

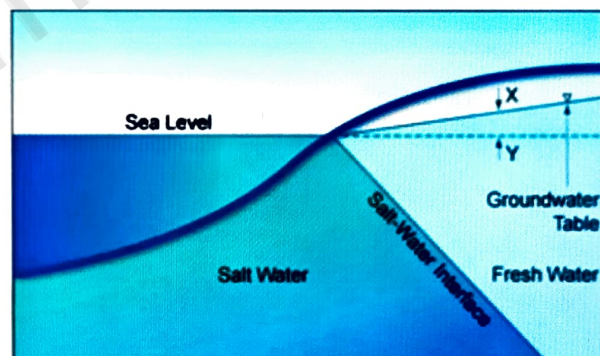
- ✓ Decrease the **number of aquifers**

- ✓ Change the **speed and direction of water**.

4. Intrusion of salt water

- In **coastal area** over **exploitation of ground water** leads to the intrusion of **salt water from sea**.

- Therefore that water cannot be used for **drinking and agriculture**.



5. **Drying up of wells:** Due to over utilization, ground water level decreases much faster than can be **regenerated**. It leads to drying up of **dug well and bore wells**.



6. **Pollution of water:** Near the **agricultural land** ground water decreases therefore water containing **nitrogen** enters into the ground and pollute the **ground water**.

- ✓ **Problem:** Water which contains **excess nitrate content** is not suitable for drinking.



MINERAL RESOURCES

- Naturally occurring **inorganic crystalline solids** with uniform **chemical composition** are called as **minerals**.



❖ USES AND EXPLOITATION OF MINERALS

1. Development of **industrial plants** and **machinery**. - Fe, Al & Cu
2. Construction work - Fe, Al & Ni
3. Generation of energy - **coal, lignite, uranium**
4. Designing defense equipments like **weapons and ornaments**
5. Agricultural purposes - **fertilizers and fungicides** - Zn & Mn
6. Jewellery - **Au, Ag & Pt**
7. **Making alloys** for various purposes
8. Medicinal purposes, particularly in **ayurvedic system**

❖ ENVIRONMENTAL DAMAGES CAUSED BY MINING

ACTIVITIES

1. Devegetation

- **Topsoil and vegetation** get removed
- **Deforestation** leads to several ecological losses
- **Land scape** gets badly affected

2. Ground water contamination

- **Mining pollutes** ground water; sulphur is converted into **sulphuric acid** which enters into the soil.

3. Surface water pollution

- **Radioactive wastes** and other **acidic impurities** affect the surface water, which kills many **aquatic animals**.

4. Air pollution

- **Smelting and roasting** are done to purify the metal which emits **air pollutants** and damage the nearby vegetation. It causes many **health problems**.

5. Subsidence of land

- Mainly underground **mining results** in cracks in **houses**, tilting of buildings and **bending of rail tracks**.

FOOD RESOURCES

- Food is an **essential requirement** for **survival of life**.
- Main components are **carbohydrates, fats, proteins, minerals** and **vitamins**.



➤ TYPES OF FOOD SUPPLY

1. CROP PLANTS: Grains mostly constitute about **76%** of the world's food. Ex: **Rice, Wheat and Maize**



2. Range lands: Produces **17%** of world's food from trees and grazing animals. Ex: **Fruits, milk and meat**



3. Ocean: **Fisheries** **7%** of world's food

➤ TYPES OF NUTRITION

1. NUTRITIOUS NUTRITION: To maintain **good health** and **disease resistance**, we need large amount of **carbohydrate, proteins, fats** and **smaller amount** of **micronutrients** such as vitamins and minerals such as Fe, Ca and iodine.

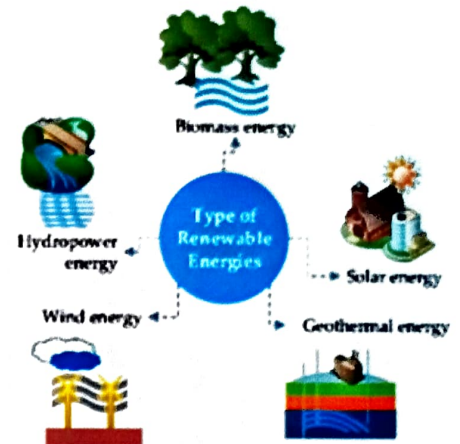
2. UNDER NUTRITION: People who cannot buy **enough food** to meet their basic **energy needs** suffer from under nutrition. They receive less than **90%** of this minimum **dietary calorie**. Effect of under nutrition: Suffer from **mental retardation** and infectious diseases.

3. MAL NUTRITION: Besides **minimum calorie** intake we also need **proteins, minerals, vitamins, iron** and iodine. Deficiency leads to malnutrition resulting in **several diseases**.

ENERGY RESOURCES

✓ Energy distribution in the world

- Developed countries like **USA and Canada** **constitute** only 5% of the world's population but **consume 25%** of the world's available energy.
- **Energy consumed** by a person in a developed country for a single day is equal to **energy consumed** by a single person in a **poor country** for one year.



- Developed country **GNP increases** and energy consumption increases. In the **poor country GNP** and **energy consumption** are less.

➤ TYPES OF ENERGY RESOURCES

1. **Renewable energy resource** (or) Non conventional energy resources
2. **Non renewable energy resources** (or) Conventional energy resources

❖ RENEWABLE ENERGY SOURCES

- Energy which can be **regenerated**.
- **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**.
 5. **Decentralized energy** production.

▪ Types of renewable energy resources

- **Solar energy**
- **Wind energy**
- **Ocean energy**

❖ NON RENEWABLE ENERGY SOURCES

- Energy which **cannot be regenerated** is called as **non-renewable**.

1. **Coal:** It is a **solid fossil fuel**.

✓ **Disadvantages:**

- When **coal is burnt** large **amount of CO₂** is released which causes **global warming**.
- S, N produces **toxic gases** during burning.

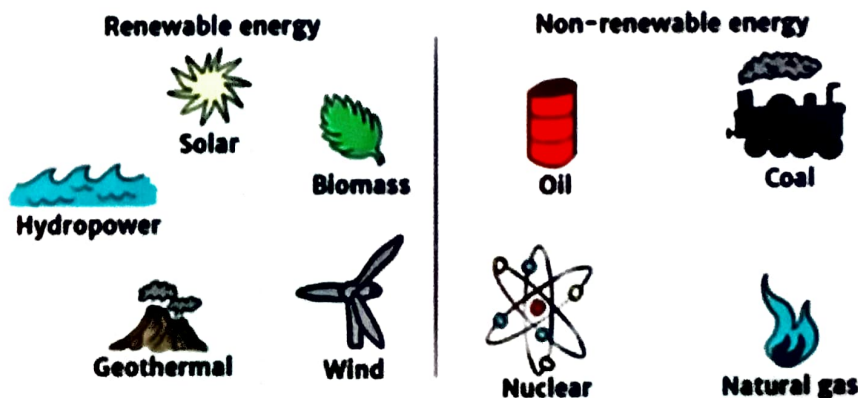
2. **Petroleum:** **Crude oil** is a **liquid consists** of more than hundreds of **hydrocarbons** and **small amount of impurities**. The petroleum can be refined by **fractional distillation**. In the world **level 25%** of **oil reserves** are in **Saudi Arabia**. At present rate of usage, the world **crude oil reserves** are expected to get exhausted in just **40 years**.

3. **Liquefied petroleum gas (LPG):** **Petroleum gases** obtained during **FD and cracking** can be easily converted into liquid under **high pressure** as LPG. It is **colorless and odorless gas**, but during cylindering mercaptans are added to detect leakage.

4. **Natural gas:** These are found above **oil in oil wells**. It is a mixture of **methane** and other **hydrocarbons**. Calorific value is **high**. There are two types. Dry gas and wet gas.

5. **Nuclear energy:** It **produces 2%** of India's electricity. Nuclear energy can be produced by two types of reactions. **Nuclear fission** and **nuclear fusion**.

Renewable and Non-Renewable Energy Sources



LAND RESOURCES

- **Land** is regarded as the greatest among the **natural resources**.
- It is one of the **important component** of life support system.



➤ IMPORTANCE OF LAND

- It sustains many of the **living beings**
- **Agricultural activities, animal husbandry**
- It supports **forests and grasslands**
- **Human settlement** and wildlife depends on land.
- **Industrialization, urbanization**
- **Construction of roads and railway lines** is possible due to availability of land.

❖ LANDSLIDES

- Landslides refer to any **down ward** movement of **mass of bed rock** under the influence of gravity.



✓ TYPES OF LAND SLIDES

1. **Nature induced land slide**

- These are caused by **natural factors**
- These are caused by natural factors such as heavy or **prolonged rains, high temperature, Earthquakes, winds, snow fall** etc.

2. **Man induced land slide**

- These are caused due to **human activities**.

✓ CAUSES FOR MAN INDUCED LAND SLIDES

- **Mining activities** in mountains or hills.
- **Removal of vegetation** in mountains or hilly regions.
- **Construction of dams** or reservoirs for hydro electric power.
- **Cutting of slopes** or mountains for construction purposes.
- **Agricultural activities** on **hilly regions**.
- **Over grazing** on hill slopes.
- Make **tunnels on mountains** for road, railway lines etc.

❖ SOIL EROSION

- Soil is the **loose material** lying on the **surface of the earth**.
- Soil is formed by the **disintegration and decaying** of rocks by the weathering process.

✓ **IMPORTANCE OF SOIL RESOURCES**

- Supports **all forms of life**.
- Plants absorb **all nutrients from soil**.
- **Soil determines** the animal life industry.
- It also **influences the population**
- **Provides raw materials** for industries.
- Influences the agricultural growth, population.

✓ **TYPES OF SOIL EROSION**

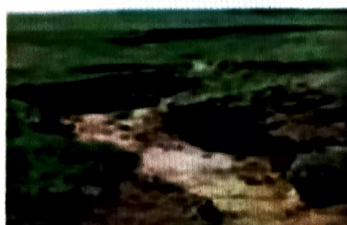
- 1. Normal Soil Erosion:** It is a **natural phenomenon** or process. It is a **slow process** and helps in soil formation.
- 2. Sheet erosion :** Sheet erosion is refers to **uniform Removal of soil** Over a **large area** from the surface of **Sloping lands** by Rain water.
- 3. Rill Erosion:** Refers to **eroding of the soil** in core use by rain water **running** along the slopes in the form of channel
- 4. Gully Erosion:** Refers to the **eroding of soil** in its course by rain water running along the slopes in the Form of rills or valleys.
- 5. Wind soil Erosion:** which is caused by **wind, more effective** in arid and semi arid regions.



Rill Erosion



sheet Erosion



gully Erosion



wind Erosion

✓ EFFECTS OF SOIL EROSION

- **Reducing soil fertility**
- **Causing floods**
- Making unfit cultivated land
- Resulting desertification
- **Due to silt storage capacity** of tanks are reduced

❖ **DESERTIFICATION**

- It is a process which involves **loss of regenerative capacity** of soil due to **depletion or absence** of plant supporting factors.

✓ CAUSES FOR DESERTIFICATION

- **Deforestation**
- **Over exploitation** of soil cover
- **Strong winds**
- Improper **agricultural practices**
- **Over grazing.**
- **Faulty land use.**



✓ CONTROL MEASURE

- Regulation of **cutting trees**
- **Control** of over grazing
- **Growing of ecologically** suitable plants in affected areas
- **Public awareness** Proper farming practices
- **Proper use** of available ground water