NATURAL RESOURCES

- Definition
- Types of Natural resources
- Growing energy needs
- Non-Renewable Resources
- Renewable resources – solar, Hydro power, tidal, Biogas, Biofuels
- Alternative sources of Energy

Life on this planet earth depends upon a large number of things and services provided by the nature, which are known as Natural resources.
Thus water, air, soil, minerals, coal, forests, crops and wild life are all examples of natural resources.

What are Natural Resources?

Natural resources can be defined as the resources independent of human actions.
These are the resources that are found in the environment and are developed without the intervention of humans.

Common examples of natural resources include air, sunlight, water, soil, stone, plants, animals and fossil fuels.

Types of Natural Resources

Based on the availability , there are two types of natural resources**:**

- **Renewable:** resources that are available in infinite quantity and can be used repeatedly are called renewable resources.
- They are available continuously and their quantity is not noticeably affected by human consumption. However, renewable resources do not have a rapid recovery rate and are susceptible to depletion if they are overused.

Example: Forest, wind, water, etc.

- **Non-Renewable [**exhaustible resources] **:** resources that are limited in abundance due to their non-renewable nature and whose availability may run out in the future are called non-renewable resources.
- These resources form extremely slow and do not naturally form in the environment.
- A resource is considered to be non-renewable when their rate of consumption exceeds the rate of recovery. Examples of nonrenewable natural resources are minerals and fossil fuels.

Examples include fossil fuels, minerals, etc.

Difference between Renewable and Non-Renewable Resources

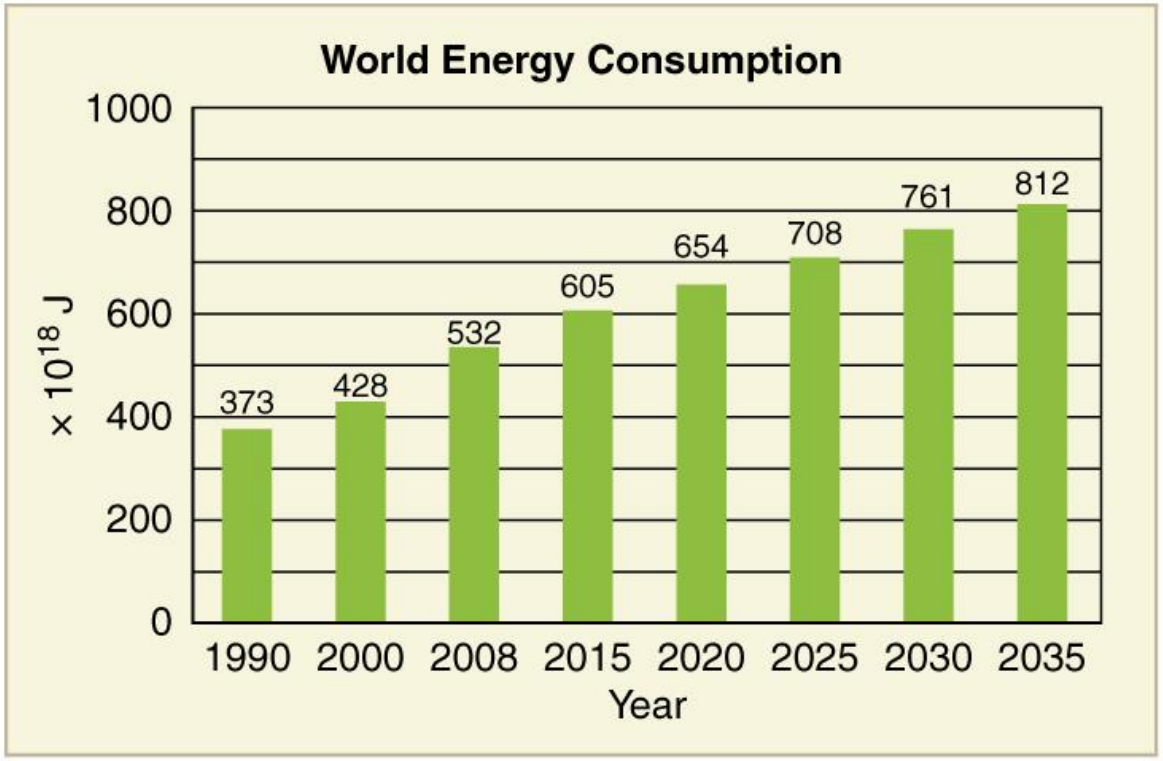
Renewable resource	Non-renewable resource
It can be renewed as it is available in infinite quantity	Once completely consumed, it cannot be renewed due to limited stock
Sustainable in nature	Exhaustible in nature
Low cost and environment-friendly	High cost and less environment-friendly
Replenish quickly	Replenish slowly or do not replenish naturally at all

GROWING ENERGY NEEDS

Development in different sectors relies largely upon energy. Agriculture, industry, mining, transportation, lighting, cooling and heating in buildings all need energy.

Developed countries like USA and Canada- 5% of world's population- consumes 1/4th ofglobal energy.

Avg person consumes – 300GJ /year (60 barrels of oil) where as in poor countries it consumes 1GJ/year


World Energy Consumption
1000
800
600
400
200
0
x 10^18 J
373
428
532
605
654
708
761
812
1990
2000
2008
2015
2020
2025
2030
2035
Year

Nonrenewable Resources

- A resource that exists in limited supply
- Nonrenewable resources are used up faster than they are able to be replaced
- Takes millions of years to form
- Able to be stored for use at a later time
- Certain nonrenewable resources can cause pollution when burned



Fossil Fuels

1. Coal
2. Petroleum
3. Natural Gas

- Coal and its types
- Anthracite (Hard coal)
- Bituminous (soft coal)
- Lignite (brown coal)

- Can lasts for next 200yrs , if its use increases by 2% then it can last for 65yrs only

Fossil Fuels

- Petroleum: 67%of global petroleum is with OPEC (organization of petroleum exporting countries)
- 1/4th of oil reserves are in Saudi Arabia
- Estimated to last long for another 40yrs only
- Prepared from Crude Oil by Fractional Distillation

- **LPG:** main component is **butane** followed by ethane and propane
- Colourless and odourless
- **Ethyl mercaptan** is added as additive - leakage awareness
- Oil fields in India are Assam, Gujarat,Mahanadi

Fossil Fuels

- **Natural Gas:** main component **methane** -95%
- Cleanest fossil fuel
- Transported through pipelines
- Uses: 1. used as a domestic and industrial fuel.
- Used as fuel in thermal power plants - electricity
- Used as a source of hydrogen gas – fertilizer industry
- As a source of carbon in tyre industry.

Compressed Natural Gas(CNG): alternate source to petrol and diesel

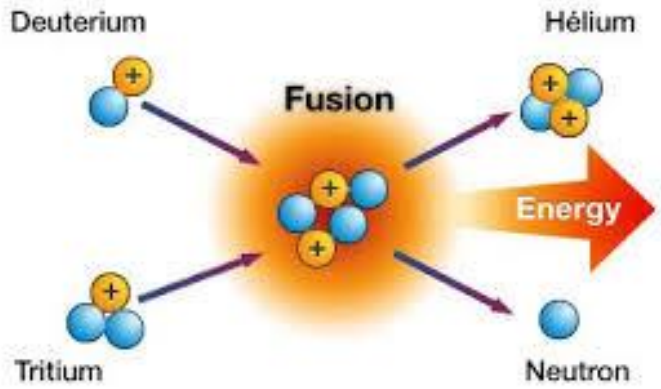
- Greatly reducing vehicular pollution.

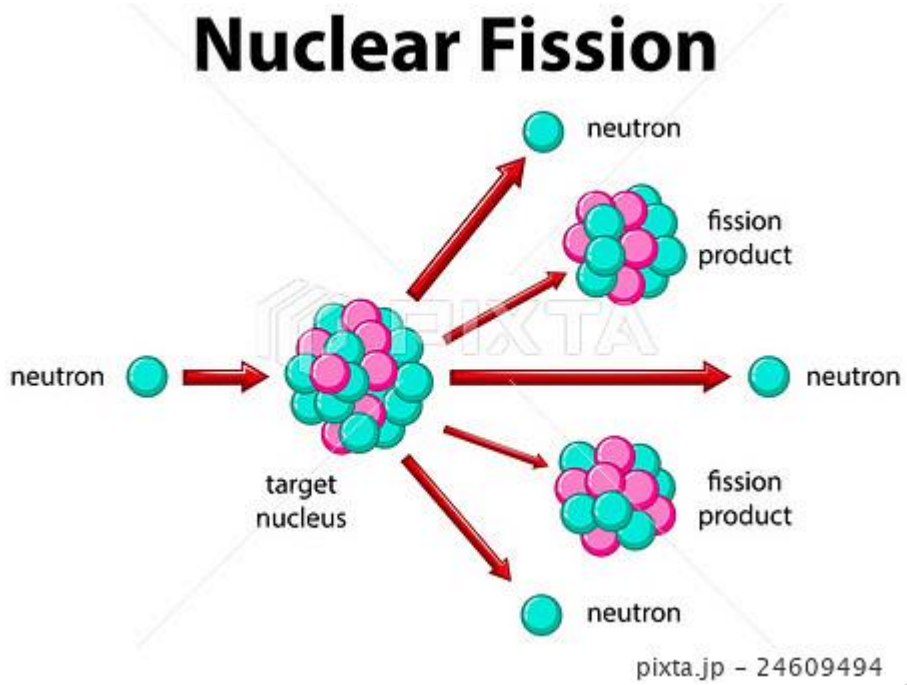
Synthetic Natural Gas (SNG): mixture of **CO and H_2** gas

- low grade of coal is the source to extract SNG by gasification followed by catalytic conversion of methane.

- **NUCLEAR ENERGY:** harnessed for providing commercial energy.

- **Nuclear energy** from 2 reactions: nuclear fusion and nuclear fission.





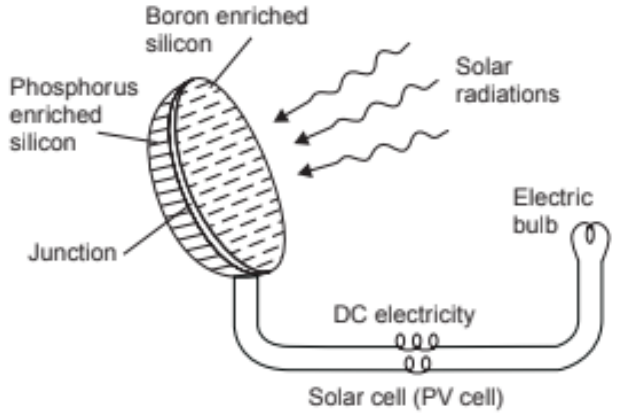
(a)Renewable Energy Resources

Solar energy: Sun is the ultimate source of energy, directly or indirectly for all other forms of energy. The nuclear fusion reactions occurring inside the sun release enormous quantities of energy in the form of heat and light.

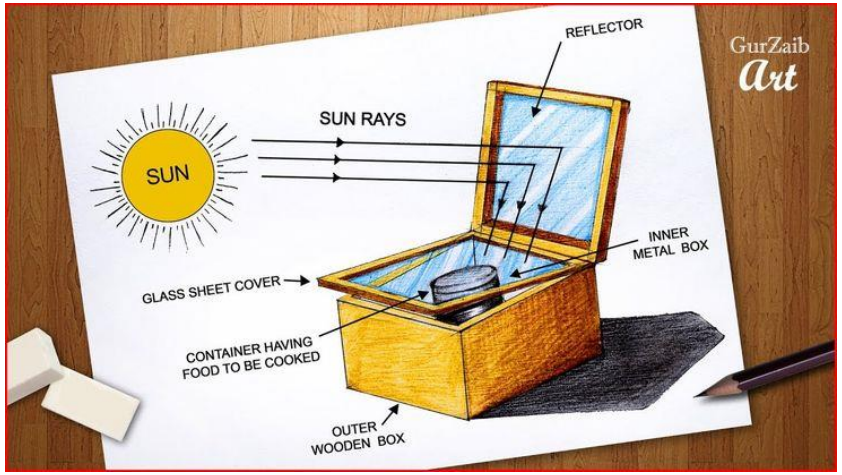
Solar cells:

- They are also known as photovoltaic cells or PV cells.
- semi conductor materials like silicon and gallium.
- When solar radiations fall on them, a potential difference is produced which causes flow of electrons and produces electricity.

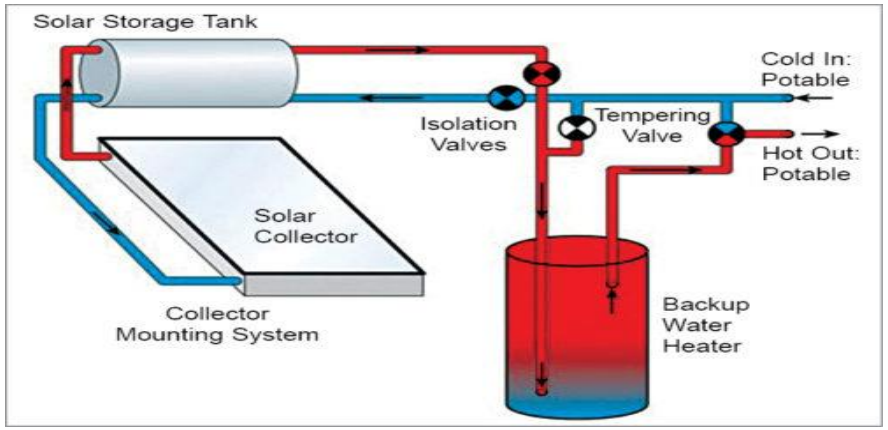
Solar cells are widely used in calculators, electronic watches, street lighting, traffic signals, water pumps etc.



Solar cooker: Solar cookers make use of solar heat by reflecting the solar radiations using a mirror directly on to a glass sheet which covers the black insulated box within which the raw food is kept.

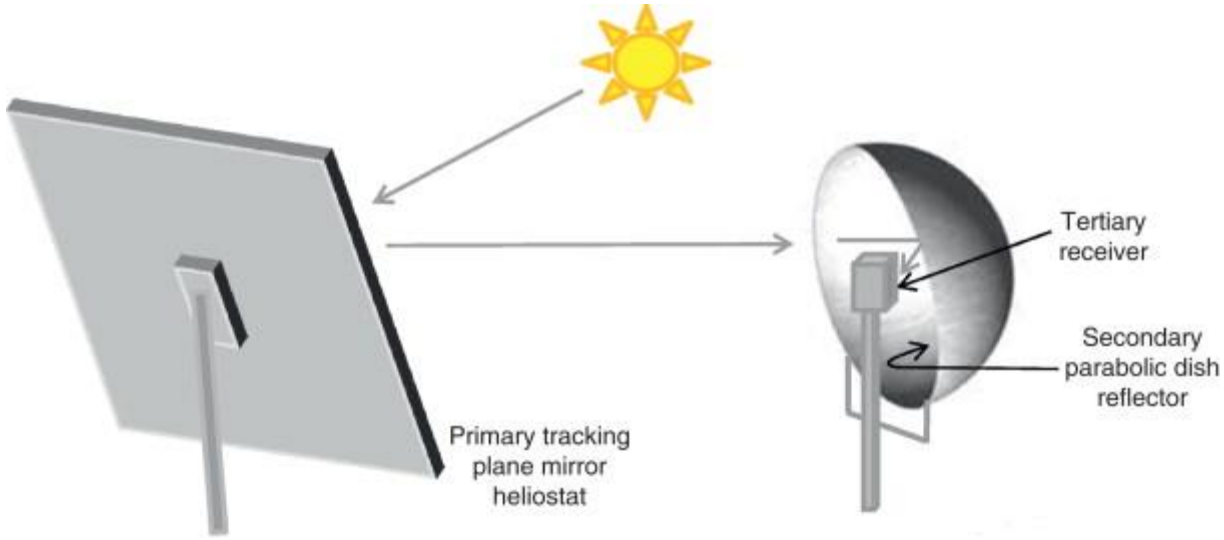


(**iv) Solar water heater: It consists of an insulated box painted black from inside and having a glass lid to receive and store solar heat. Inside the box it has black painted copper coil through which cold water is made to flow in, which gets heated and flows out into a storage tank. The hot water from the storage tank fitted on roof top is then supplied through pipes into buildings like hotels and hospitals.**



(v) Solar furnace: Here thousands of small plane mirrors are arranged in concave reflectors, all of which collect the solar heat and produce as high a temperature as 3000°C.

(vi) Solar power plant: Solar energy is harnessed on a large scale by using concave reflectors which cause boiling of water to produce steam. The steam turbine drives a generator to produce electricity



WIND ENERGY

- The high speed winds have a lot of energy in them as kinetic energy due to their motion.
- The driving force of the winds is the sun.
- **The wind energy is harnessed by making use of wind mills.**
- The minimum wind speed required for satisfactory working of a wind generator is **15 km/hr**.
- The wind power potential of our country is estimated to be about 20,000 MW

HYDROPOWER the minimum height of the water falls should be 10 metres. Hydropower does not cause any pollution, it is renewable and normally the hydro power projects are multi-purpose projects helping in controlling floods, use irrigation, navigation etc.

TIDAL ENERGY The tidal energy can be harnessed by constructing a tidal barr

- During high tide, the sea-water flows into the reservoir of the barrage and the turbine, which in turn produces electricity by rotating the generators.
- During low tide, when the sea-level is low, the sea water stored in the ba reservoir flows out into the sea and again turns the turbines.

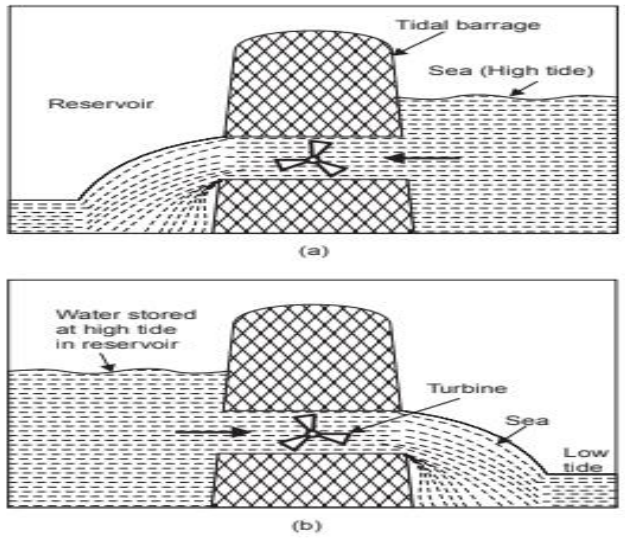


Fig. 2.5.4. Water flows into the reservoir to turn the turbine at high tide (*a*), and flows out from the reservoir to the sea, again turning the turbine at low tide (*b*).

- **Ocean Thermal Energy:** due to difference (of abt 20^0C) in temp at surface and at deeper levels. This temp is used to boil NH_3 into vapours, which in turn boils the water , generates steam – turbines – electricity.
- Further, the cold water pumped to cool the vapours into ammonia liquid and the process continues.
- **Geo thermal energy:** Natural geysers
- **Biomass Energy:** organic matter produced by plants and animals.
- 1. Energy plantation: eg potato, sugarcane, sweet potato
- 2. petro crops: latex containing plants, oil palms rich in hydrocarbons
- 3. agri wastes: bagasse, coconut shells,peanut hulls etc

- **BIOGAS:** mix of **methane**, CO_2, H_2, H_2S.
- Anaerobic degradation of animal wastes (by bacteria in absence of O_2.
- **Advantages:**
- Non- polluting , clean fuel
- Cheap in cost
- No storage prob(direct supply)

Biofuels: Biomass is fermented to alcohols- ethanol and methanol

Gasohol: mix of gasoline(petrol) and ethanol

- **Hydrogen as a fuel**: can be prepared by
- Thermal dissociation of water
- Electrolytic method
- Photolysis of water
- Disadvantages:
- 1. highly inflammable
- 2. difficult to store and transport.

BIO INTRODUCTION

- Biofuel is the fuel which is produced from organic products and wastes.
- The common commercially used biofuels are bioethanol, biodiesel and biomethane.

❑ Bioethanol is made from sugar, algae, wheat and sugar beet

❑ Biodiesel is made from vegetable oil, algal lipids, animal fats

❑ Biomethane can be produced from waste organic material, sewage, agriculture waste and domestic wastes.

USES OF BIOFUELS

- **Cars and Trucks:** Diesel cars and trucks can run on biodiesel.
- **Aircraft:** Recent testing has shown the viability of biofuel use in the aviation industry, and use of biofuels to power aircraft is expected to increase substantially in the next decade.
- **Off-Road Equipment:** A large percentage of off-road equipment -- such as vehicles used in agriculture, mining, forestry, construction, and power and heat production -- use diesel fuel, making this equipment suitable for biodiesel use
- **Small Engines:** Small engines, like those found in lawn mowers and chainsaws, can use ethanol blends up to 10 percent without problems

Biofuels and biodiesels

Biofuels are created from vegetable or animal based oils (Ex: canola or soybean oil, palm oil, grease, sewage or leftover trash) It is used and fuels for vehicles.

Biodiesel is also a type of fuel created by vegetable or animal oils but it is often blended with regular diesel. Biodiesel is a cleaner alternative to diesel. But not all vehicles can use diesel.


Thank You!