# Renewable & Non-renewable Resources

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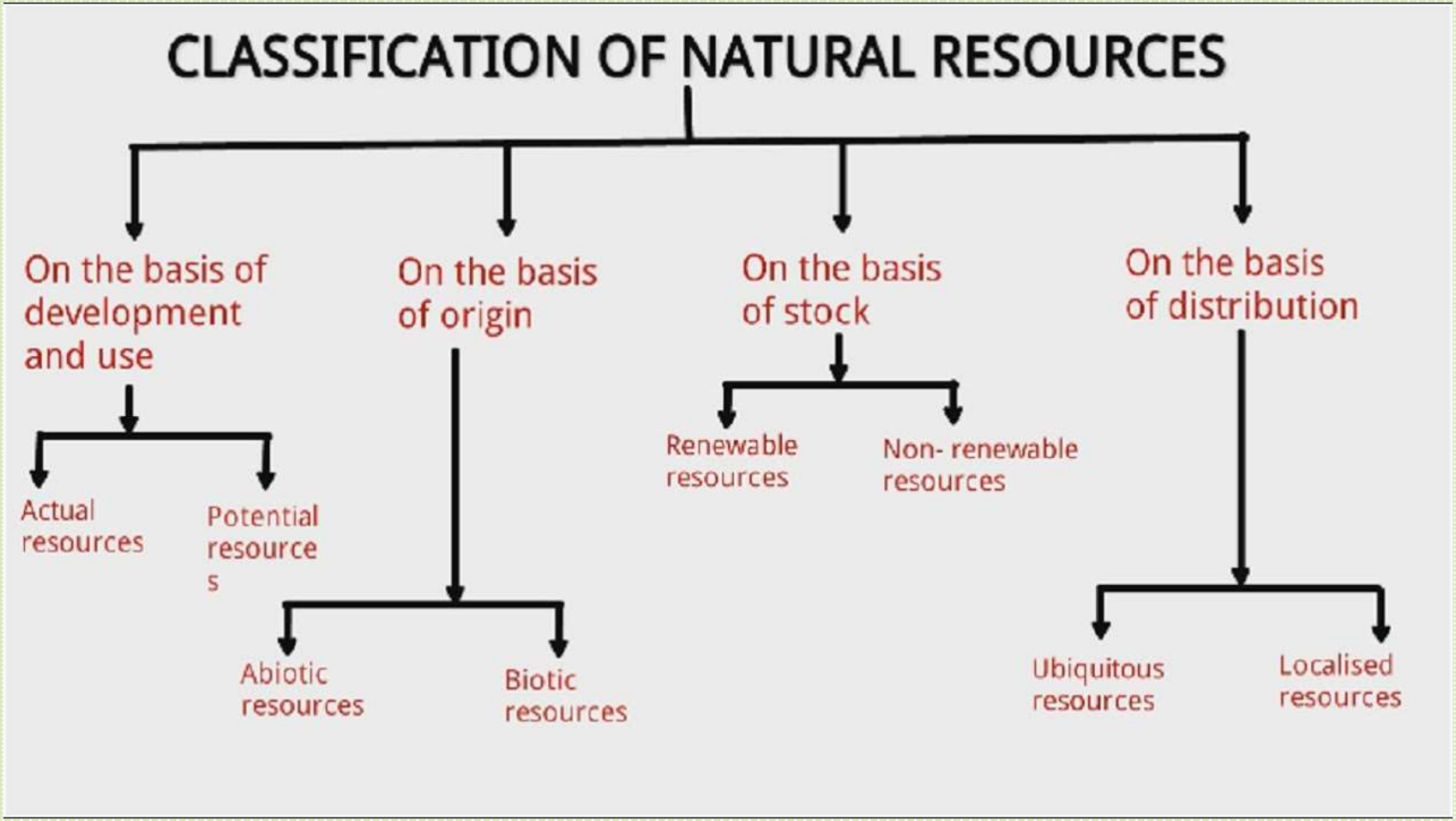
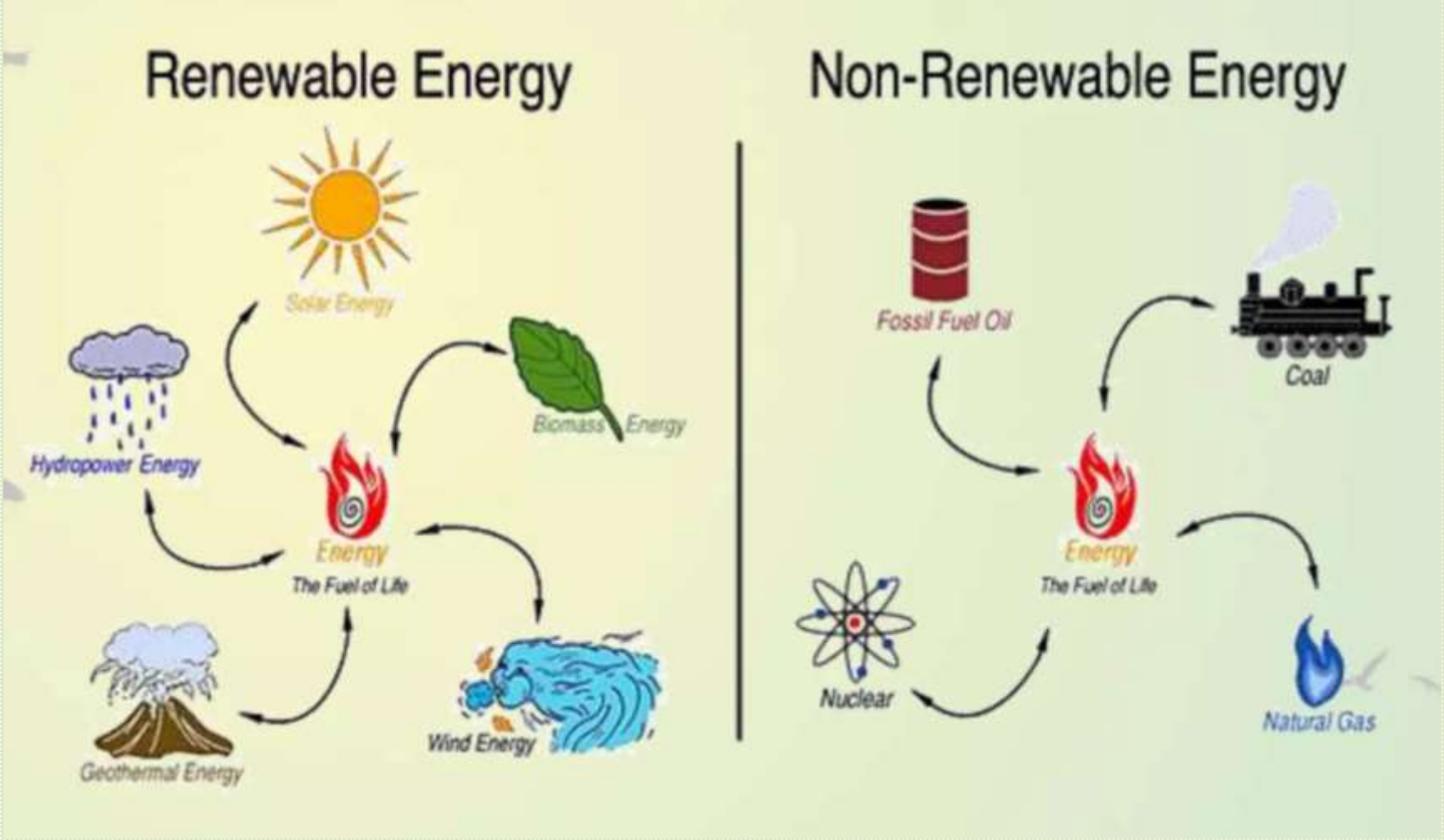
# Resources

- **Resources** refer to all the materials present in our environment which are used by living beings.
- **Natural resources** are known as materials that are found in nature and beneficial to every individual in a variety of ways.
- Examples- plants, soil, sunlight, minerals, coals, etc.

# Classification of natural resources



# Examples


Renewable Energy
Solar Energy
Hydropower Energy
Biomass Energy
Energy
The Fuel of Life
Geothermal Energy
Wind Energy
Non-Renewable Energy
Fossil Fuel Oil
Coal
Energy
The Fuel of Life
Nuclear
Natural Gas

# Non-renewable energy sources (Polluting source of energy)

- Natural resources that are limited in quantity are referred to as non-renewable resources.
- These resources cannot be supplied or regenerated in a short duration of time.
- These resources cannot be reused.
- Examples- Fossil Fuels, Coal, etc.

# Renewable energy sources (Non-polluting source of energy)

- Renewable energy sources are those that cannot be depleted (inexhaustive).
- They are always available and thus could be reused.
- Examples- solar energy, tidal energy, hydro power, wind energy, geothermal energy, biogas, etc.

# Solar energy

- The energy obtained from sunlight is solar energy.
- The sun is the ultimate natural resource for all living beings on the earth.
- Plants utilize solar energy and make their own food through photosynthesis.

# Solar energy harvesting devices

1. Solar heat collectors
2. Solar cells
3. Solar cooker
4. Solar water heater
5. Solar furnance
6. Solar power plants

# Advantages of solar energy

1. No emission of GHGs
2. Minimal impact on the environment
3. Free & requires no fuel
4. Produces no waste
5. Cost effective in long run
6. Convenient for low-power usages

# Disadvantages of solar energy

1. Can't be harvested at night
2. Large surface area is required
3. Variable based on location, time of day, year and weather conditions
4. Transmission is a barrier
5. Quite expensive to plant solar power stations

# Wind energy

- The energy that is obtained from wind is termed as wind energy.
- Wind is used to produce electricity by converting the kinetic energy of air in motion into electricity.
- Harvested by turbines (wind farms)

# Advantages of wind energy

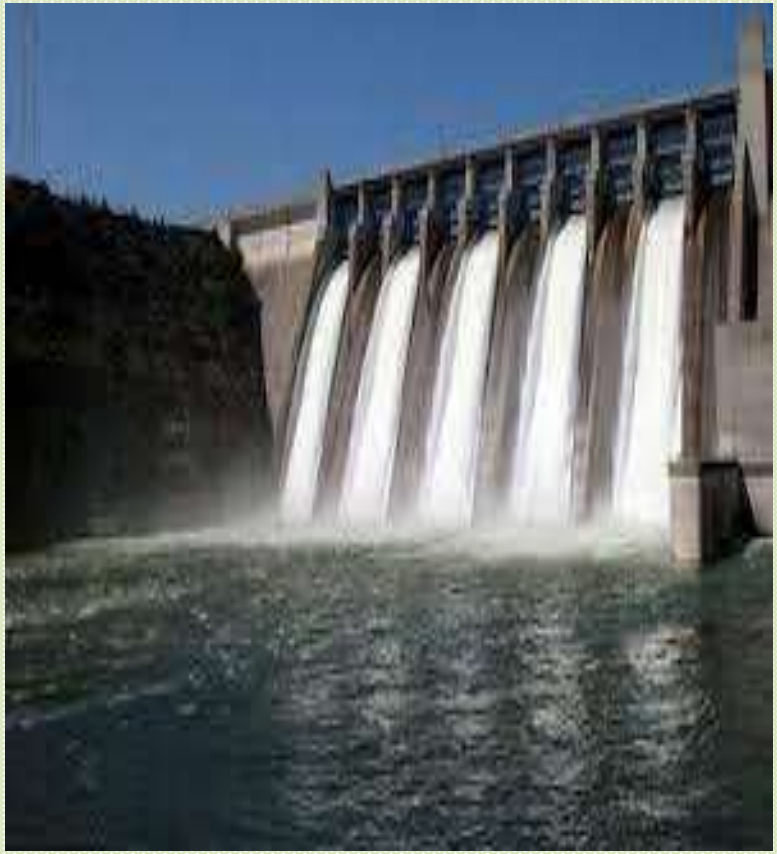
1. Free & requires no fuel
2. No emission of GHGs
3. Produces no waste
4. Decent method of supplying energy to remote areas
5. Land underneath may be used for farming

# Disadvantages of wind energy

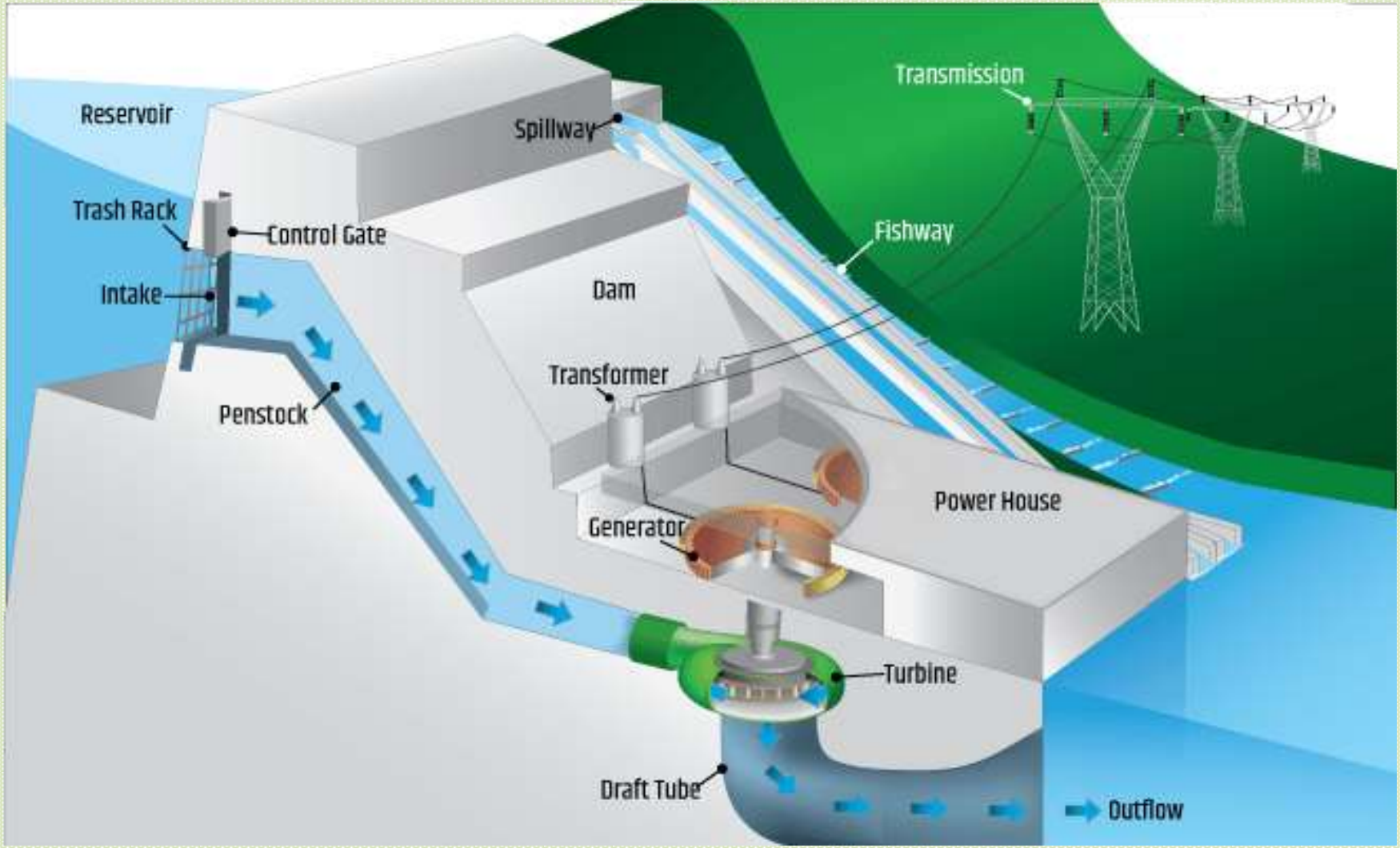
- Unpredictable & intermittent on some days
- Wind speed of less that 12-14 miles per hour is not effective
- Land for wind farms may be expensive
- Can affect tv reception, route of migratory flocks
- Can be noisy

# Hydro energy

- Hydro energy is generated by water flowing into a river or water held in a dam.
- Converting hydro energy into electrical energy is a simple way to utilize it.



# Hydro power plant



# Hydro power scenario in India

- In 1963, hydro power had 50.62 % share in total capacity of power production, which have been reduced to 22%. Some of the important hydroelectric power projects –

| Station | River | State |
|---|---|---|
| Nagarjunasagar | Krishna | Andhra Pradesh |
| Bhakra Dam | Sutlej | Punjab |
| Chandil | Subarnarekha | Jharkhand |
| Maithon | Damodar | Jharkhand |

# Advantages of hydro energy

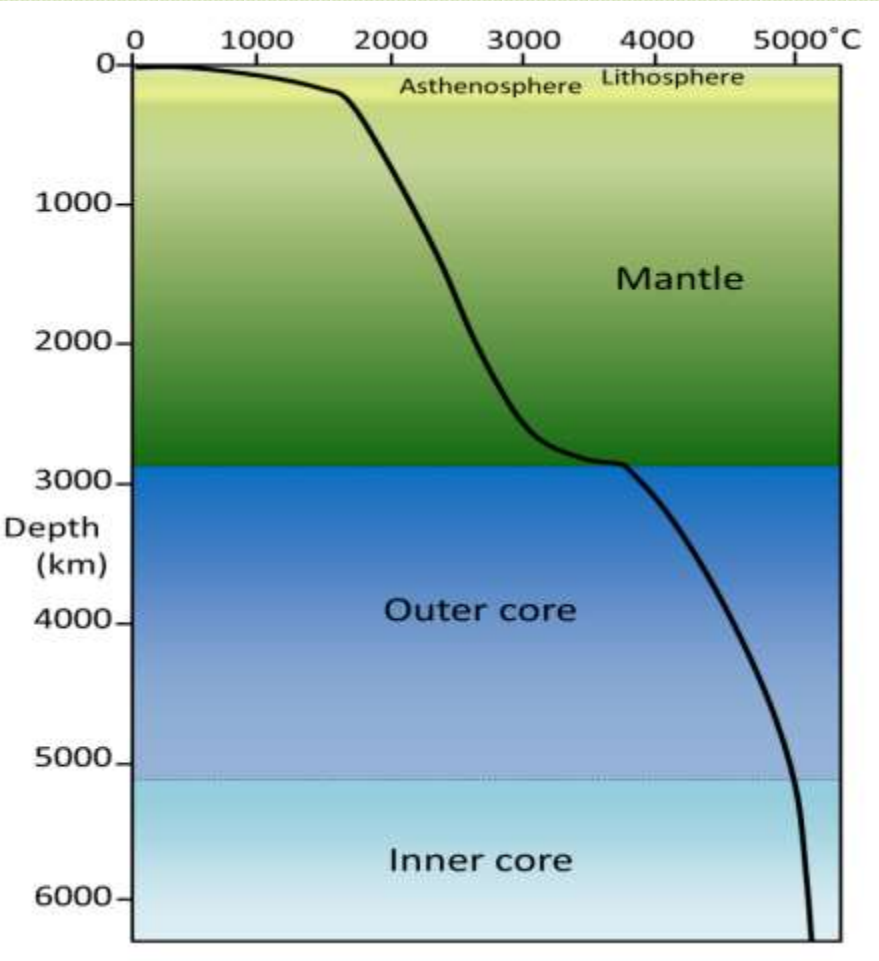
- Water is available throughout the year
- Operational and maintenance cost is lower than other power plants
- The cost of fuel is nil
- Hydro Plants are made for multiple purposes
- The requirement of working staff is less. The cost of expenses is lower as compared to other plants.

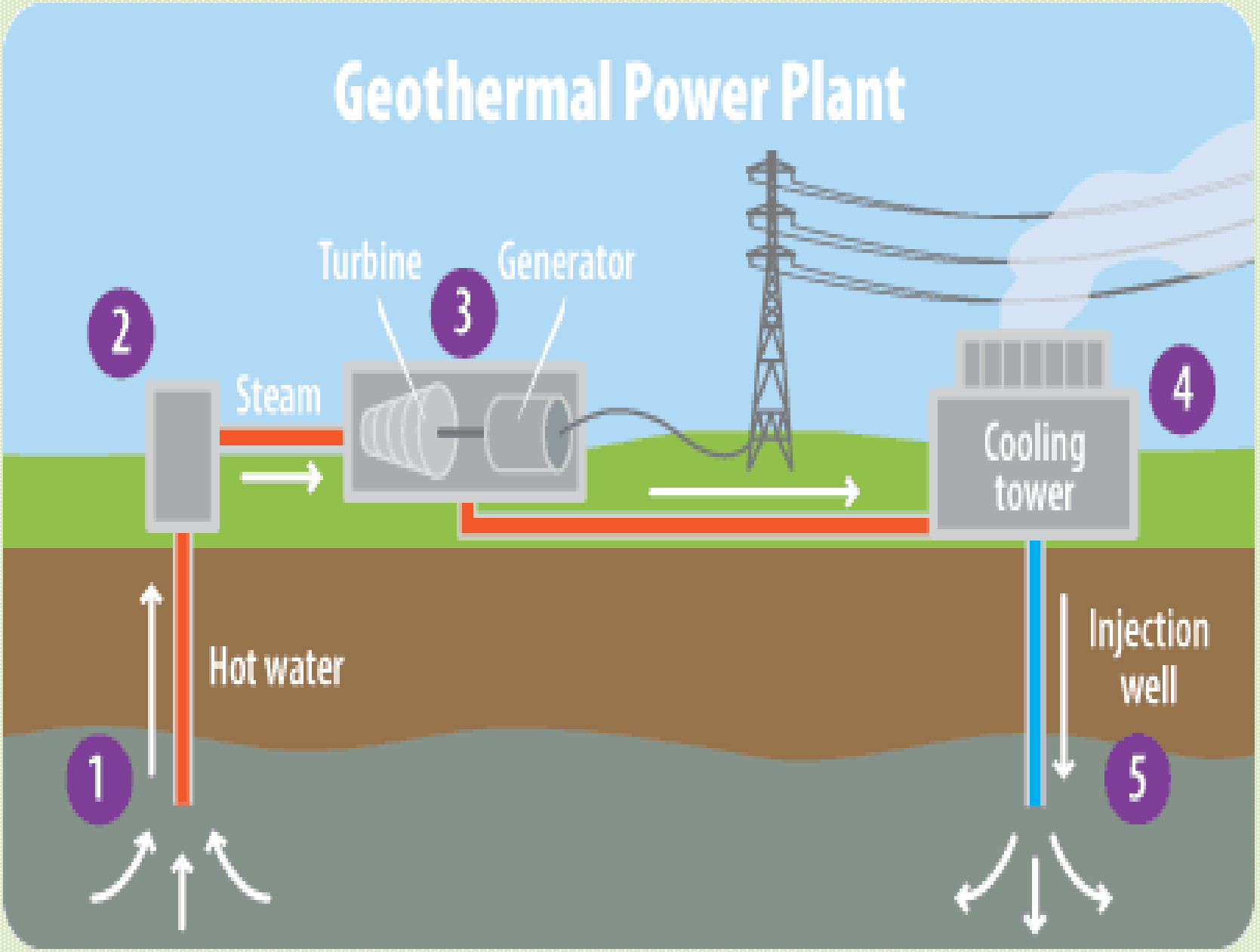
# Disadvantages of hydro energy

- Embankment construction cost is high
- The land space requirement for set up is large
- Water must be abundant to continue the process
- Aquatic life is affected
- Embankment areas need to be evacuated for flood plains.

# Geothermal energy

- Energy obtained from the heat stored inside earth's crust
- It can be harnessed for use as heat and electricity.




Geothermal Power Plant
Turbine
Generator
3
2
Steam
4
Cooling tower
Hot water
Injection well
1
5

# Geothermal energy scenario

- First-ever geothermal power Station- Italy
- In Iceland, geothermal, heat is used to heat houses and to generate electricity.
- The first geothermal power plant in India is to be set up at Tattapani, Chhattisgarh.
- Prospective sites in India- Puga Valley (Ladakh), Godavari basin Manikaran (Himachal Pradesh), Bakreshwar (West Bengal), Jalgaon (Maharashtra).

# Advantages of geothermal energy

1. Free & requires no fuel
2. No emission of GHGs
3. Produces no waste
4. Impact on the environment is negligible

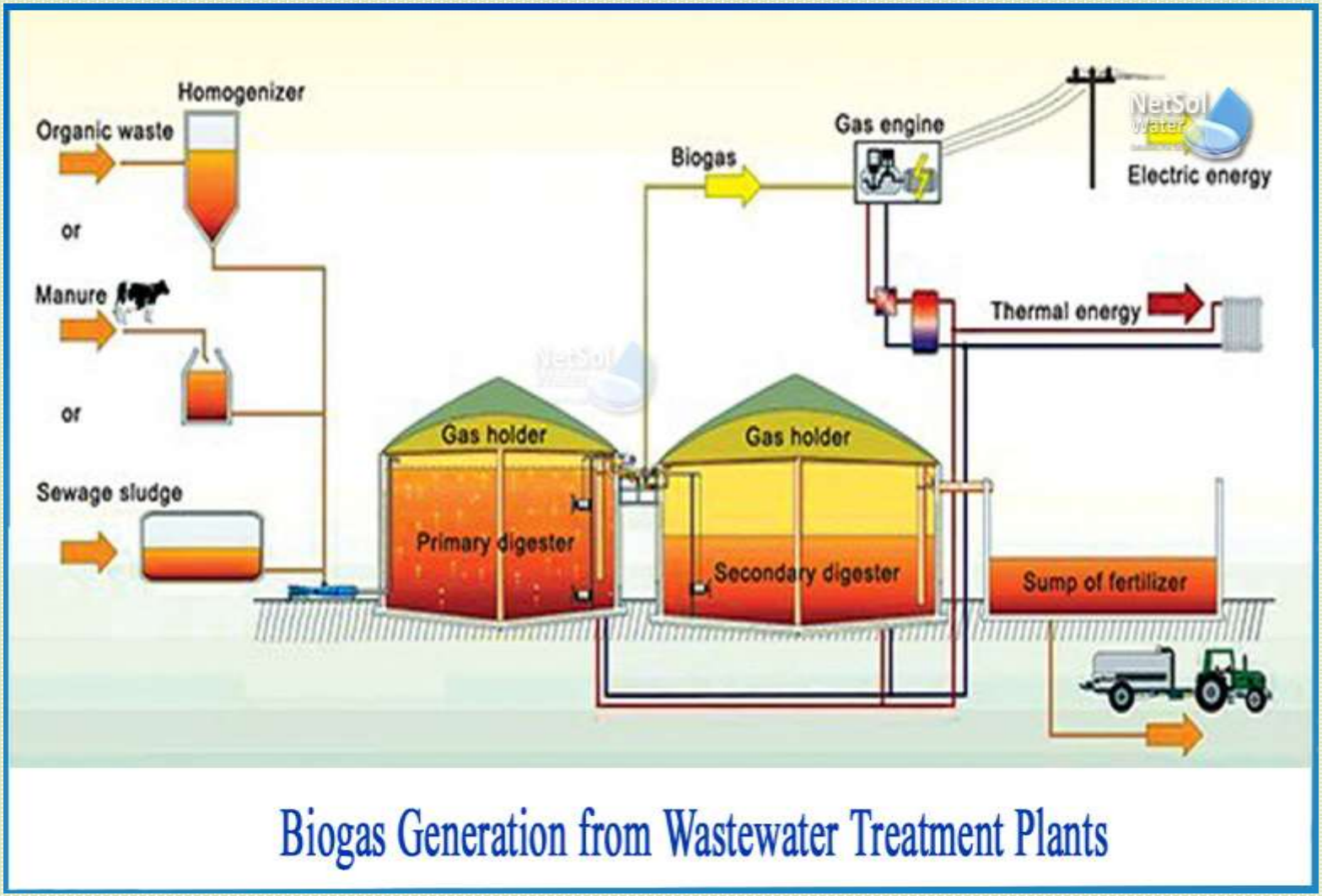
# Disadvantages of geothermal energy

1. Difficult to find prospective sites
2. Appropriate hot rocks at a depth to be drilled down should be found
3. Occasionally, such sites may run out of steam
4. Toxic gases and minerals may come out from underground along with steam which is difficult to handle

# Biogas

- Biogas is biofuel, and refers to the mixture of hydrogen & methane as a results of bacterial decomposition.
- The waste is digested in anaerobic condition (fermentation) at about 35-40 °C.
- This process is carried out in large tanks called digesters.
- Biogas can be utilized to generate heat and electricity.

# Biogas plant



# Biogas energy scenario in India

- India has the capacity to meet 10% of the energy requirements through biogas technology.
- 2012- around 4.30 million biogas units of domestic scale.
- Leading producers- Punjab, Andhra Pradesh, Maharashtra, West Bengal and Madhya Pradesh

# Advantages of Biogas

- Sensible to use waste materials
- The methane, a GHG can be used for electricity
- The fuel is cheaper.
- Low dependence on fossil fuels
- Some industry can meet their power demand from their own waste, such as leather, paper and pulp, sugar, poultry farming, etc.

# Disadvantages of Biogas

- It is not economically viable to use biogas on a large scale as it is difficult to enhance the efficiency of biogas.
- It contains many impurities that are difficult to control even after purification rounds.
- When methane comes in contact with oxygen, it reacts violently to produce carbon dioxide. The highly inflammable nature of methane makes it prone to explosions.

# Biofuels

- Any fuel that is derived from biomass—that is, plant or algae material or animal waste.
- Example- ethanol, biodiesel, etc.
- Brazil and the United States are among the leading producers of ethanol (which is made by fermenting starch or sugar).
- The second most common liquid biofuel is biodiesel, which is made primarily from oily plants (such as the soybean or oil palm).

# Biofuels in India

- Bioethanol is usually mixed with petrol, while biodiesel can be used as it is.
- Union cabinet have permitted a 'national policy on biofeuls' i.e., blending of 20% ethanol with petrol and 20% biodiesel with diesel by 2030.
- India- 4$^{th}$ largest producer of ethanol.
- In Kharagpur, WB- Jatropha trees on 200 ha.

# Advantages of Biofuel

- Reduces dependence on the fossil fuels.
- Carbon-neutral as compared to other fossil fuels
- No sulphur content, less particulate matter, carbon monoxide, hydrocarbons are released when compared to fossil fuels

# Disadvantages of Biofuel

- Requirement of larger area to grow crops for biofuels.
- Inconsistent supply of the materials
- Burning does produce carbon dioxide.
- Ethanol with high evaporative emissions from fuel tanks and dispensing apparatus is a limiting factor.

# References


- https://powermin.gov.in/en/content/power-sector-glance-all-india

# Thank You