VIT UNIVERSITY
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Module -4

ENERGY RESOURCES
NON-RENEWABLE RESOURCES

By

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  - **geothermal energy.**
  - **Energy from biomass,**
  - **solar-Hydrogen revolution.**

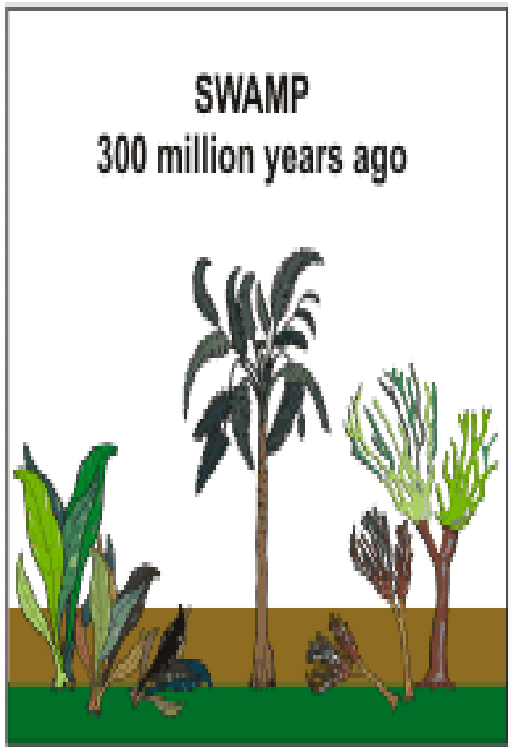
Natural resources – value to ecosystem

- Economic value
- Aesthetic value
- Legal value

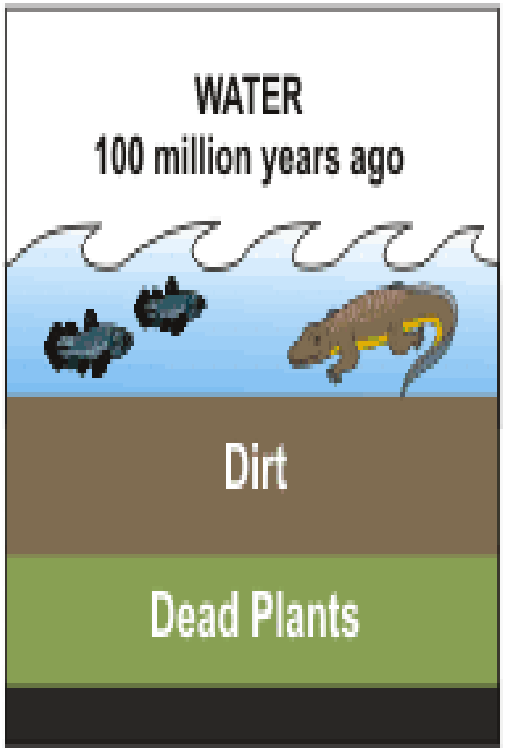
Non- renewable resources

- Non-renewable resources exist in a fixed quantity or stock in the earth's crust.
  - Eg: oil, coal and natural gas.
- Classified as metallic mineral (copper and aluminium) and non-metallic resources. (Salt and sand).
- Few non-renewable can be recycled and reused Eg. Aluminum cans

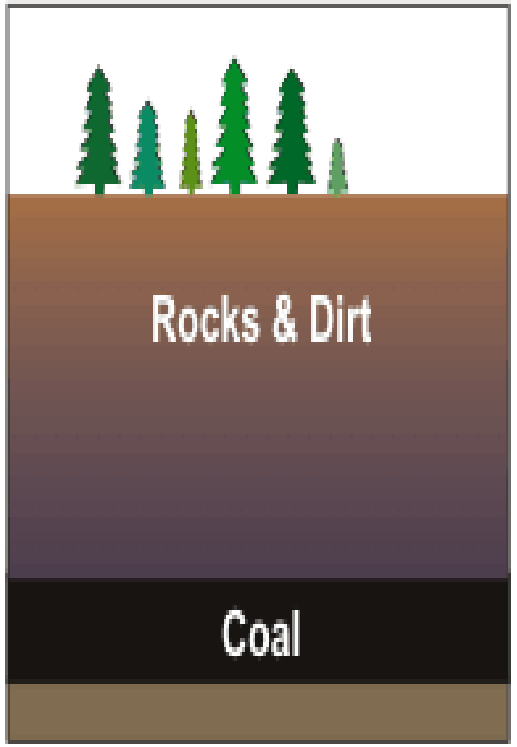
HOW IS COAL MADE ???



Before the dinosaurs, many giant plants died in swamps.



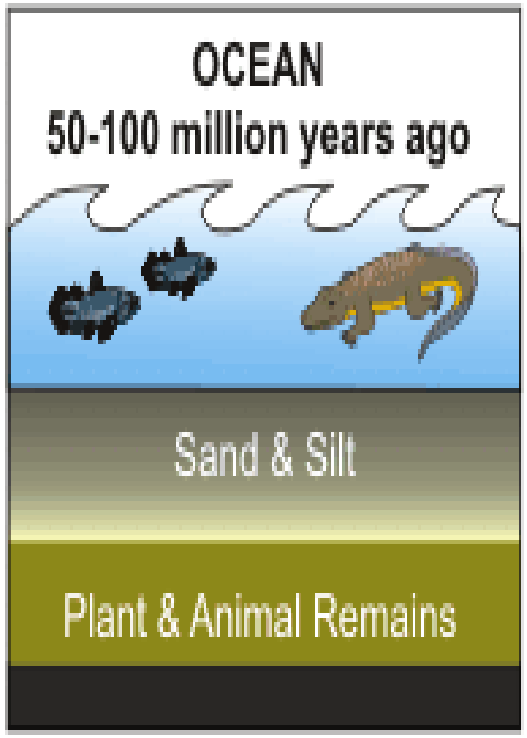
Over millions of years, the plants were buried under water and dirt.



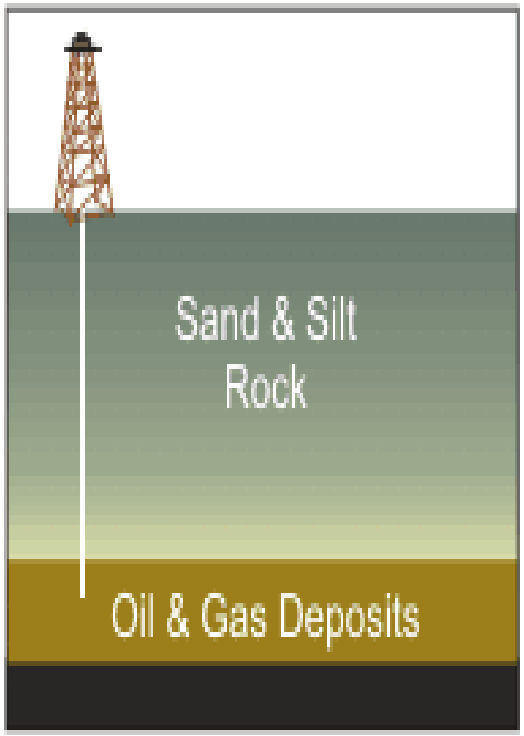
Heat and pressure turned the dead plants into coal.

HOW ARE OIL AND GAS MADE ???

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of silt and sand.



Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.



Today, we drill down through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits.

Impact on environment- non-renewable resources

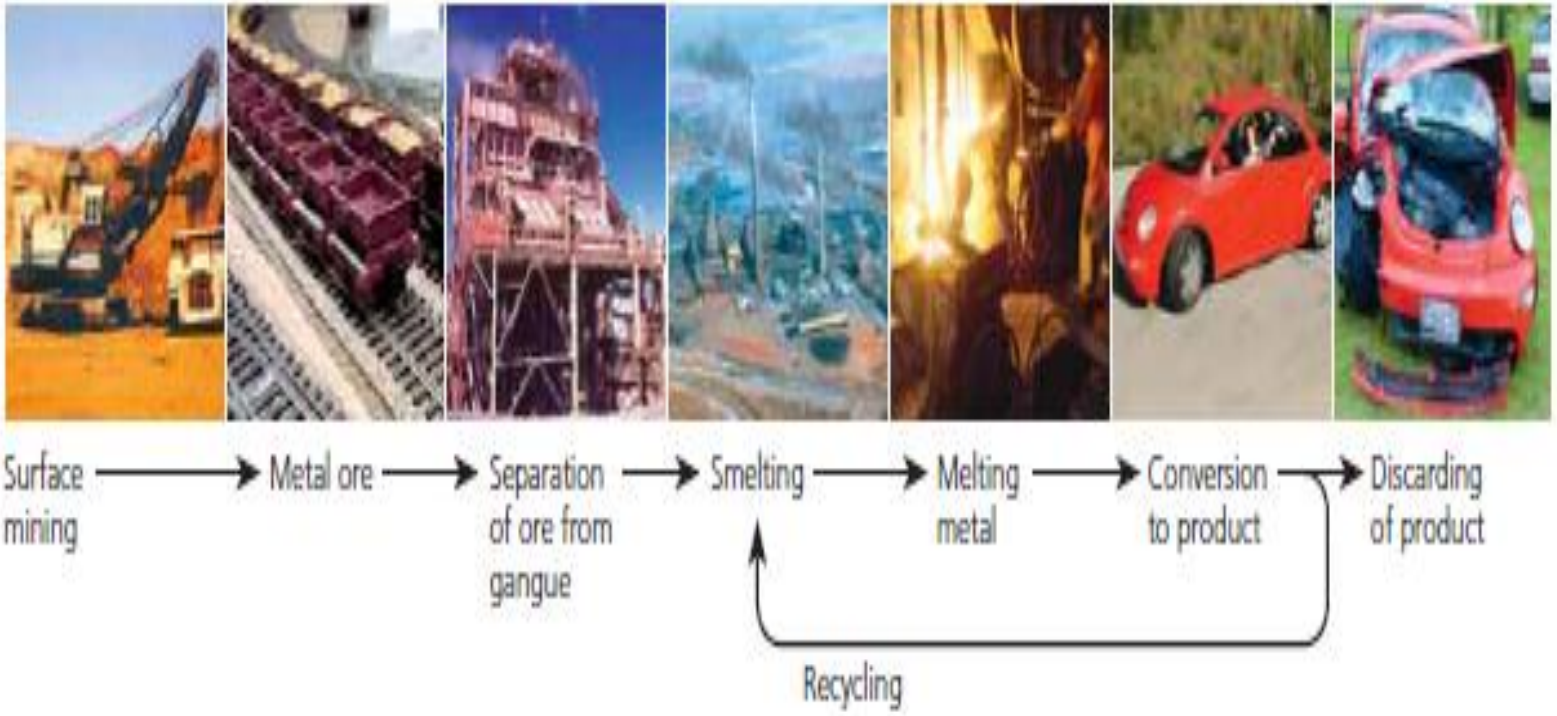


Figure 12-7
Life cycle of a metal resource. Each step in this process uses large amounts of energy and produces some pollution and waste.

Degradation of Non-renewable resources

Mining – leads to degradation of resources

1. Fossil fuels:

Coal, petroleum and natural gas are examples of fossil fuels.

These are formed in nature due to the decomposition of animals and plants, which have remained, embedded inside earth's crust due to geological changes.

2. Coal:

Coal is a complex mixture of compounds of carbon, hydrogen and oxygen and some free carbon.

Small amounts of nitrogen and sulphur compounds are also present in coal.

Types:

Anthracite – hard coal- Maximum carbon (90%) Calorific value 8700 KCal/Kg

Bituminous – Soft coal

Lignite – brown coal

Peat

(Contain 80, 70 and 60% carbon)

1. At present rate of usage – lost for 200 years
2. If its use increases by 2% per year – lost for another 65 years.

India

- 5% of worlds coal
- It is not too good in terms of heat capacity.
- Major coal fields are Raniganj, Jharia, Bokaro, Singrauli, and Godavari valley.
- Coal states are Jharkhand, Orissa, West Bengal, Madhya Pradesh, Andhra Pradesh and Maharashtra.
- Anthracite coal occurs only in J & K.

Disadvantages:

1. Very high environmental impact
2. Severe land disturbance, air and water pollution
3. Severe treat to human health.
4. High CO_2 emissions when burned.

Petroleum:

- ✓ **Petroleum (L. *petroleum*, from Greek *πετρέλαιον*, lit. *"rock oil"*) or crude oil is a naturally occurring, flammable liquid consisting of a complex mixture of hydrocarbons of various molecular weights, and other organic compounds, that is found in geologic formations beneath the earth's surface.**
- ✓ **It is a crude mixture so purified by fractional distillation.**
- ✓ **During purification process we get lot of products like petroleum gas, kerosene, petrol, diesel, fuel oil, lubricating oil, paraffin wax, asphalt, plastic.**
- ✓ **There are 13 countries in the world having 67% of the petroleum reserves.**
- ✓ **About ¼ th of the oil reserves are in Saudi Arabia.**
- ✓ **A present rate of usage estimates that it will be exhausted in another 40 years.**

Advantages:

1. **Compare to coal it burns completely and leaves no residue.**
2. **It is also easier to transport and use.**

Liquefied petroleum gas LPG

1. The main component of petroleum is butane, the other being propane and ethane.

2. The petroleum gas is easily converted to liquid form under pressure as LPG.

3. It is odorless, but the LPG in domestic gas cylinders gives a foul smell.

4. This foul smell is due to *ethyl mercaptan*, a foul smelling gas added to LPG so that any leakage of LPG from the cylinder can be detected instantaneously.

India:

Digboi (Assam), Gujarat and Mumbai, offshore areas in deltaic coasts of Godavari, Krishna, Kaveri and Mahanadi.

Natural Gas:

1. It is also called Marsh gas.

2. It is mainly composed of methane (95%) with small amount of propane and ethane.

3. It is a fossil fuel.

4. Russia has maximum reserves (40%) followed by Iran (14%) and USA (7%)

5. In India found in Tripura, Jaisalmer, offshore area of Mumbai and Krishna-Godavari Delta.

Dry gas:

If the natural gas contains lower hydrocarbons like methane and ethane called dry gas.

Wet Gas:

If the natural gas contains higher hydrocarbons like propane and butane along with methane it is called wet gas.

Compressed Natural Gas (CNG):

1. It is being used as alternate to petrol and diesel for transport of vehicles.
2. Delhi has switched over to CNG where buses and rickshaws run on this new fuel.
3. CNG greatly reduced vehicular pollution in the city.

Synthetic Natural Gas (SNG):

1. It is a mixture of carbon monoxide and hydrogen.
2. It is a connecting link between a fossil fuel and substituted natural gas.
3. Low grade coal is initially transformed into synthetic gas by gasification followed by catalytic conversion to methane.

Uses:

1. It is used as a domestic and industrial fuel.
2. It is used as a raw material for the manufacture of carbon black and hydrogen.
3. It is also used for the generation of electricity by using it in fuel cells.

NUCLEAR ENERGY

Nuclear fission uses uranium to create energy.

Nuclear energy is a nonrenewable resource because once the uranium is used, it is gone!

Substitute to minerals

- In 2005 builders began to construct houses made of stryofoam sprayed with ceramic spray called grancrete.
- This ceramic was affordable, will not leak.
- Light weight styrofoam locks are used to pave bridges.
- Plastics has replaced - copper, steel , and lead.
- High strength plastics and composite materials strengthened by lightweight carbon and glass fibres are beginning to transform the automobile and aerospace industries.

Solutions


SOLUTIONS
Sustainable Use of Nonrenewable Minerals
Do not waste mineral resources.
Recycle and reuse 60–80% of mineral resources.
Include the harmful environmental costs of mining and processing minerals in the prices of items (full-cost pricing).
Reduce mining subsidies.
Increase subsidies for recycling, reuse, and finding substitutes.
Redesign manufacturing processes to use less mineral resources and to produce less pollution and waste (cleaner production).
Use mineral resource wastes of one manufacturing process as raw materials for other processes.
Slow population growth.

Thank You