ODM EDUCATIONAL GROUP
Changing your Tomorrow

GEOGRAPHY

SUBJECT : (Social Science)
CHAPTER NUMBER: 04
CHAPTER NAME : Mineral and Power Resources

Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: **1800 120 2316**
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

MINERAL & ENERGY RESOURCES

CONTENT:-

- Mineral Resources
- Types of Minerals
- Extraction of Minerals
- Distribution of Minerals (Asia, Europe, North America, South America, Africa, Australia, Antarctica)
- Distribution of Minerals in India and its Uses (Iron-Ore, Bauxite, Mica, Copper, Manganese, Limestone, Gold, Salt, Silicon)

MINERALS

- Mineral : A homogenous, naturally occurring substance with a definable internal structure.
- They are found in varied forms in nature.
- Rocks are combinations of minerals.
- A particular mineral that formed from a certain combination of elements depends upon the physical and chemical conditions under which the material forms.
- Because of this different minerals have different colour, hardness, crystal forms, lustre and density.

MINERAL RESOURCES

- **Minerals** are naturally occurring substances found in the Earth's crust.
- Minerals can be identified on the basis of their physical properties such as colour, hardness and chemical property such as solubility.
- Minerals are distributed in rocks and sea bed unevenly.
- Some common minerals are Silicates (feldspar and quartz built from silicon and oxygen) aluminum, iron, calcium, potassium, sodium and magnesium.
- Minerals are rarely found in the pure state. They are usually found in rocks, combined with other elements. Mostly they are found in low concentrations and in inaccessible places. Extraction becomes expensive.
- **Ore** is a rock which contains enough mineral to make its mining economically profitable. Ores are of two types:-

❖ High Grade Ores- the mineral content is high and impurities are less.

❖ Low Grade Ores- the mineral content is low and impurities are more.

Mineral	Ore
1. These are naturally occurring chemical substan-ces obtained from earth crust by mining.	1. Ores are those minerals from which metals can be extracted profitably and conveniently.
2. All minerals are not ores.	2. All ores are minerals.

Minerals and Energy Resources

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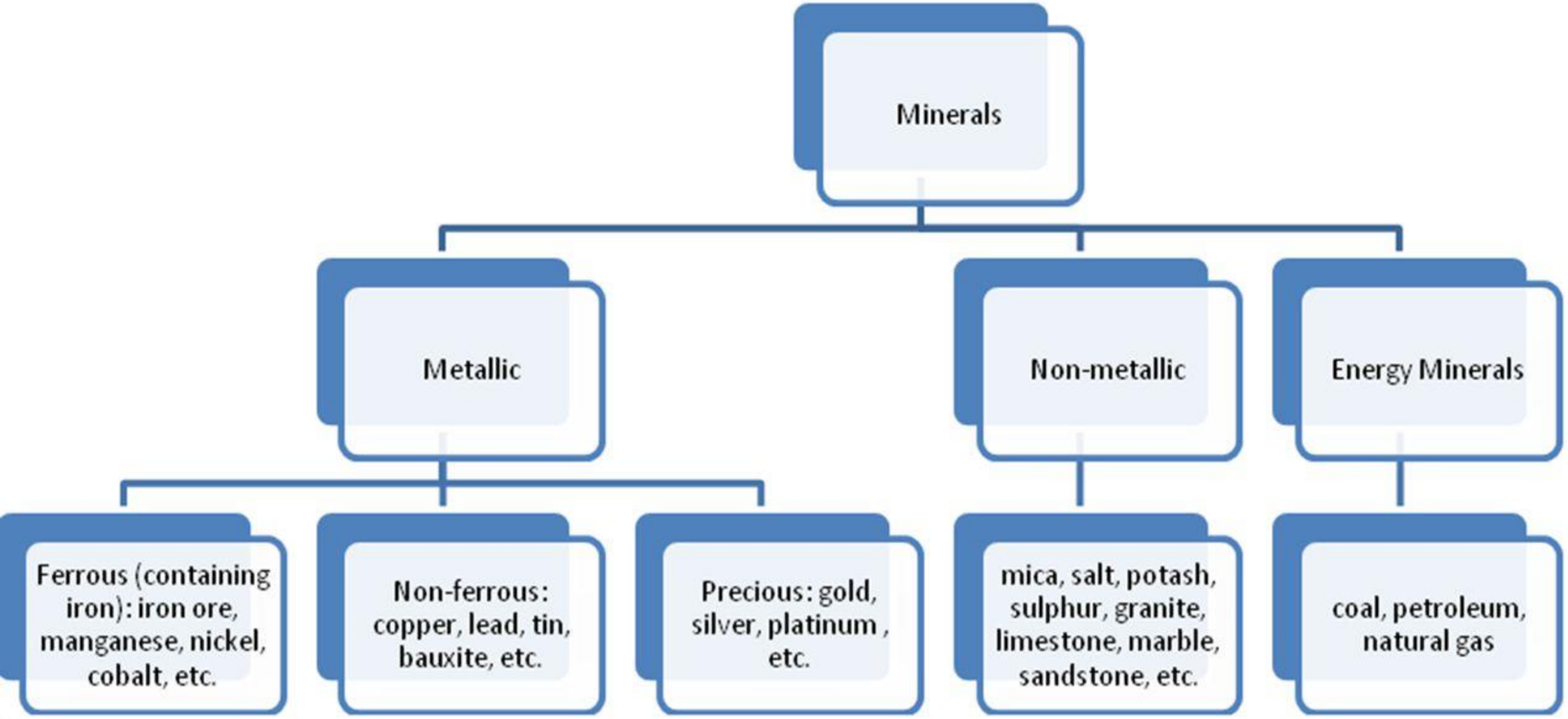
TYPES OF MINERALS

- On the basis of composition, minerals are classified into **metallic and non-metallic types**.
- Metallic, minerals contain metals in raw form.
- **Metals** are hard substances that conduct heat and electricity and have shine. For example, iron ore and bauxite.
- **Metallic minerals** are of two types: (a) Ferrous and (b) Non-ferrous.
- **Ferrous minerals** contain iron ore, manganese, and chromites. Most of the Iron and steel industries and heavy industries depends on this mineral.
- **Non-ferrous minerals** do not contain iron but may contain some other metals like gold, silver, copper or lead.
- **Non-metallic minerals** do not contain metals. They are either organic or inorganic by origin. Organic minerals contain carbon. For example, coal, petroleum and natural gas. Limestone, mica, graphite are examples of inorganic minerals.

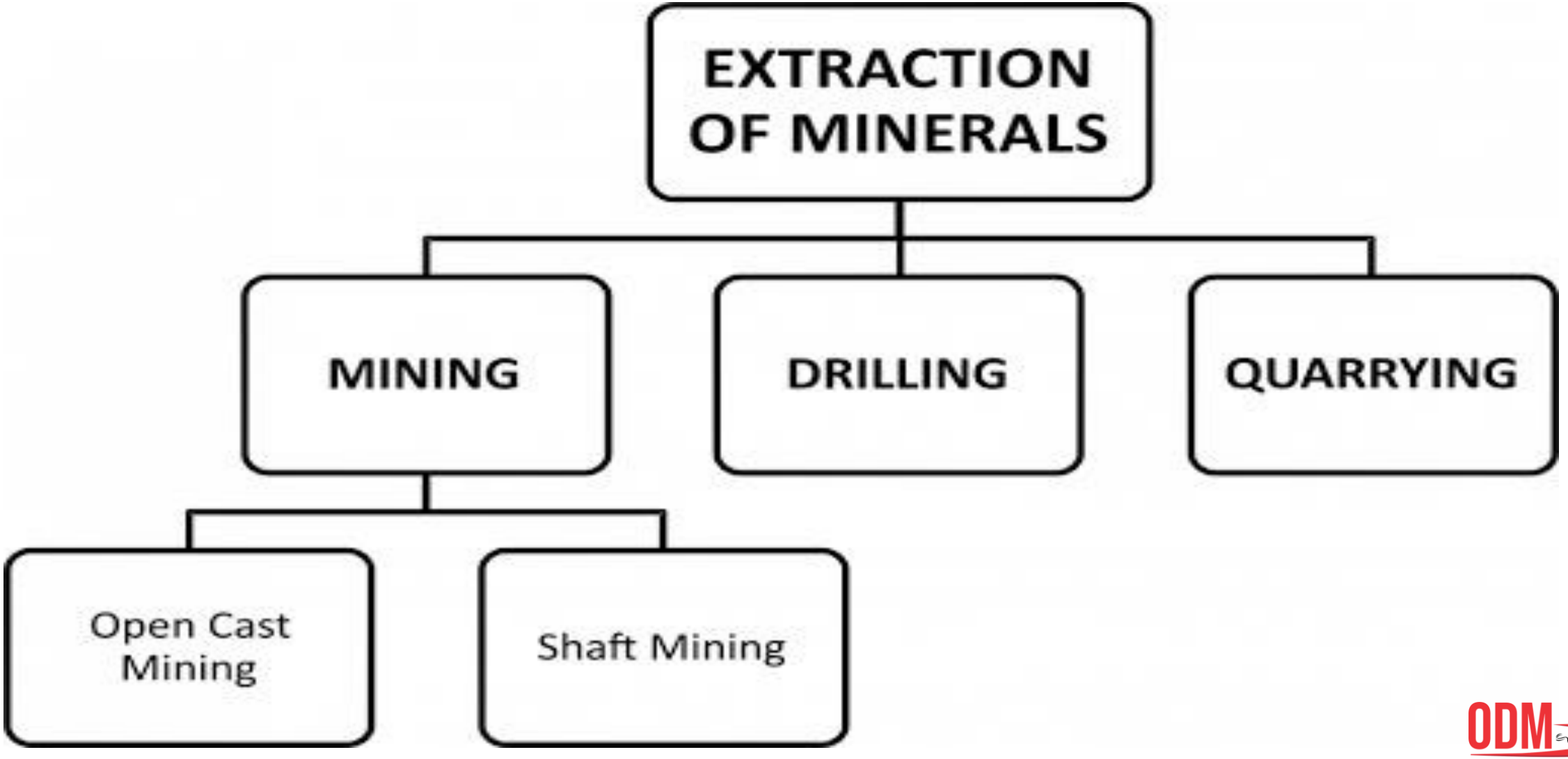
Types of Minerals	Rock Formations	Examples
Metallic minerals	Igneous and metamorphic rock formations	Iron-ore in north Sweden, copper and nickel deposits in Ontario, Canada; iron, nickel, chromites and platinum in South Africa are examples of minerals
Non-Metallic Minerals	Sedimentary rock formation	Limestone deposits of Caucasus region of France, manganese deposits of Georgia and Ukraine and phosphate beds of Algeria. Mineral fuels such as coal and petroleum are also found in the sedimentary strata

Types of Minerals



Metallic minerals	Non-metallic minerals
(*a*) Minerals from which metals are extracted are called metallic minerals.	(*a*) Minerals consisting of non-metals are called non-metallic minerals.
(*b*) These minerals are malleable and ductile.	(*b*) These minerals are neither malleable nor ductile.
(*c*) These minerals are associated with igneous and metamorphic rocks.	(*c*) Non-metallic minerals are associated with sedimentary rocks.
(*d*) They are usually hard and have shine or luster of their own.	(*d*) They are not so hard and have no shine or luster of their own.
(*e*) For example, iron, copper, bauxite, tin, manganese etc.	(*e*) For example, coal, salt, clay etc. (*any three*)

EXTRACTION OF MINERALS



METHODS OF MINING

- All minerals are extracted from rocks.
- Extraction is the process of taking out minerals from the rocks and is called mining.
- Methods of mining depends upon the depth at which the mineral is located.

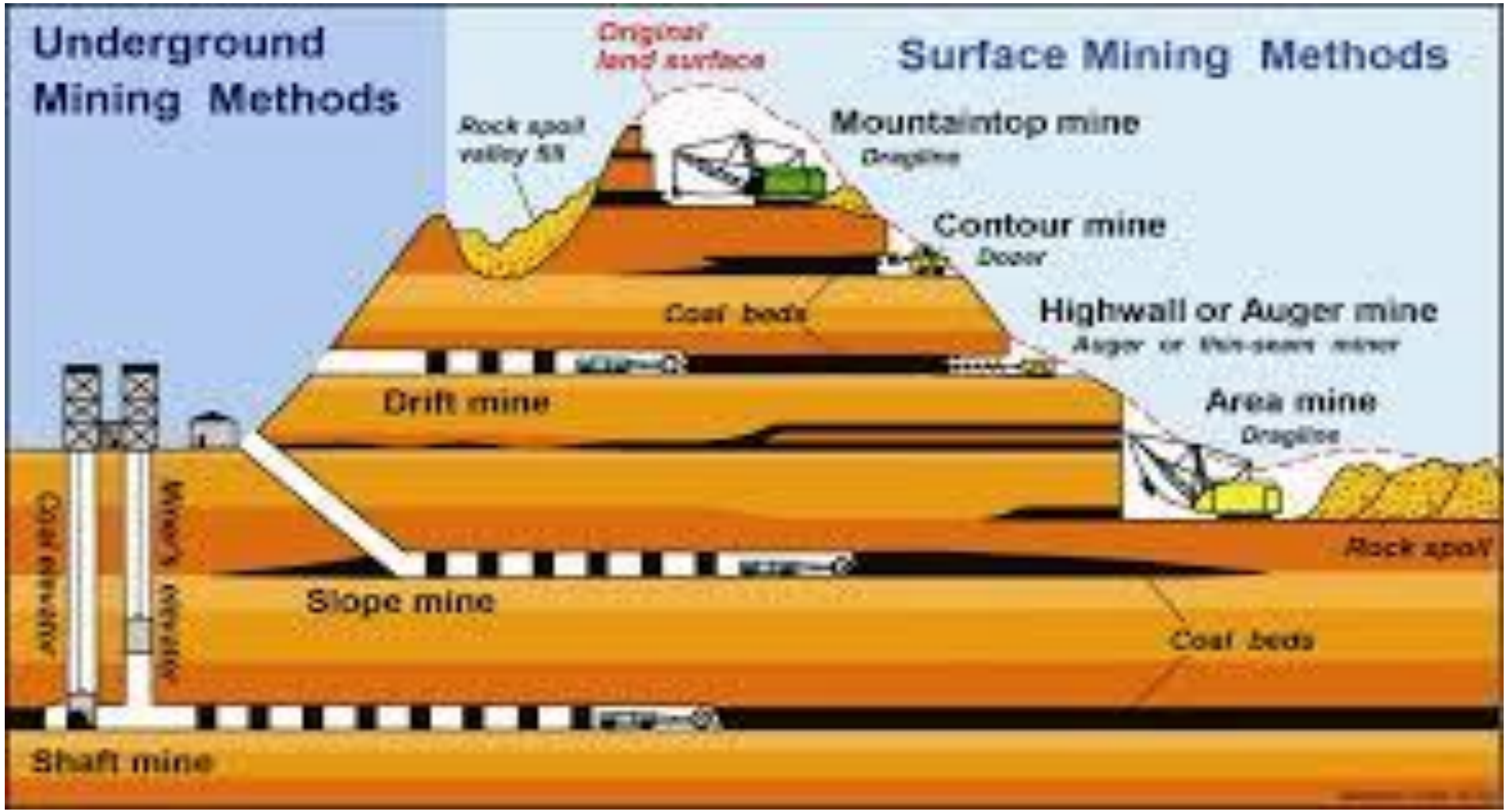
A. **Open-Cast Mining-** Minerals that lie near the surface are simply dug out of the ground through a process called open-cast mining. The opening formed is called an open-pit or quarry.

B. **Shaft Mining-** deep bores called shafts are made to reach mineral deposits that lie at great depths below the Earth's surface.

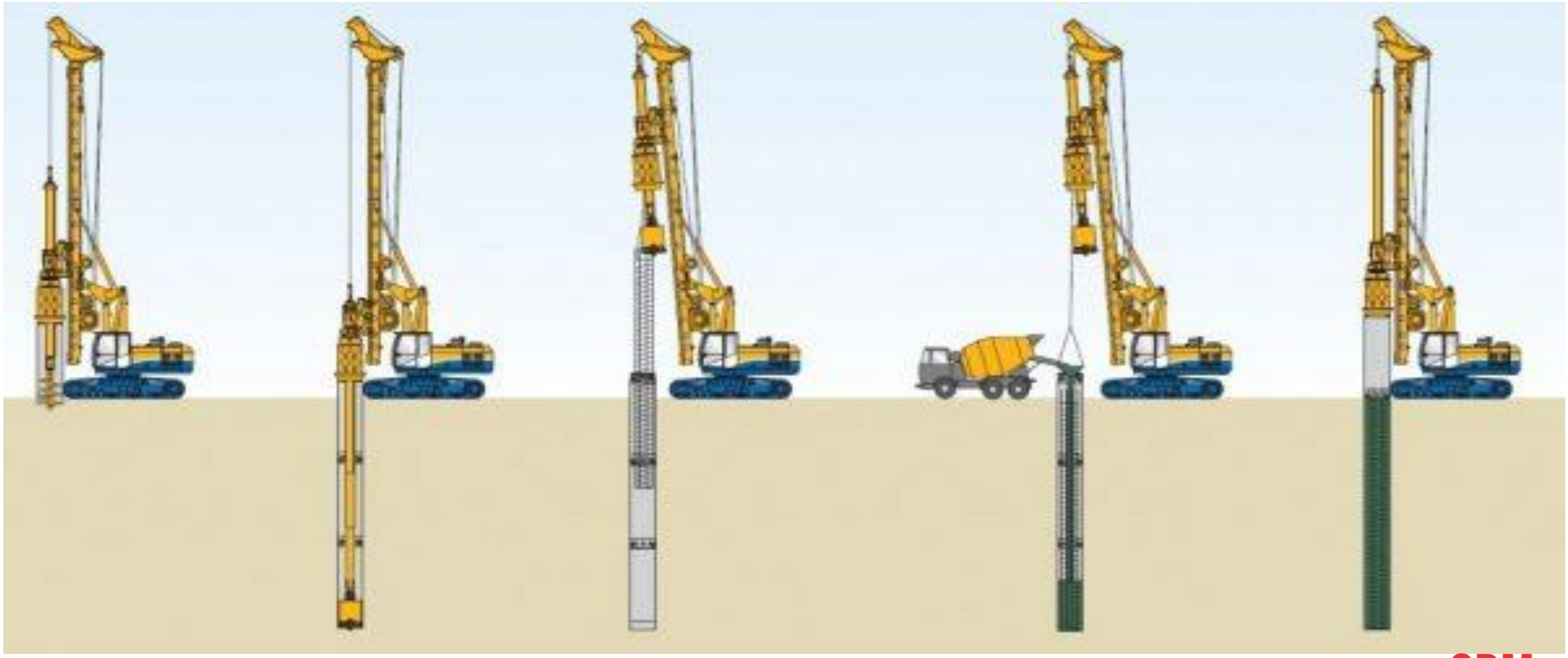
C. **Drilling**- Petroleum and natural gas is drilled out through drilling, far below the Earth's surface. Drilling can be done off-shore too.

OPEN-CAST MINING-

SHAFT MINING-



DRILLING



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DISTRIBUTION OF MINERALS

- Minerals are found in igneous rock, metamorphic rocks and sedimentary rocks.
- Metallic minerals are mostly found in igneous and metamorphic rocks. For example- Iron ore in Chotta Nagpur plateau in India, Iron ore in north Sweden. Iron-ore, nickel, platinum and chromites in South Africa are examples of minerals found both in igneous and metamorphic rocks.
- Sedimentary Rocks formed along the plains and young fold mountains have deposits of non-metallic minerals which may be organic or inorganic in origin. Limestone is found in sedimentary rocks of France, Manganese deposits in Ukraine and Georgia.

ASIA

- **Large iron ore deposits**-China & India
- **World's largest tin producer**-China, Malaysia and Indonesia
- **Production of lead, antimony and tungsten**-China leads
- **World's largest reserves of petroleum and natural gas**-Saudi Arabia, Iran, Iraq, Kuwait (Middle-East Countries)
- **Deposits of manganese, bauxite, nickel, zinc and copper**-Asia

EUROPE

- **Leading producer of iron ore in the world**– Europe
- **Countries with large deposits of iron ore**– Russia, Ukraine, Sweden and France
- **Minerals deposits of copper, lead, zinc, manganese and nickel**– Eastern Europe and European Russia.
- **Coal deposits, most populated industrial region-**The Ruhr Valley of Germany
- **Petroleum and Natural Gas found on the floors of the North Sea-** UK, Norway

NORTH AMERICA

- **Mineral deposits in North America are located in 3 zones**– the Canadian region north of the Great Lakes, the Appalachian region and the mountain ranges of the west
- **Iron ore, nickel, gold, uranium and copper**– mined in the Canadian Shield Region
- **Coal**– Appalachian Region
- **Vast deposits of copper, lead, zinc, gold and silver**– in Western Cordilleras
- World's Largest deposits of bituminous and soft coals- West Virginia, western Pennysylvania, bordering areas in Ohio

SOUTH AMERICA

- **The largest producer of high-grade iron ore in the World**– Brazil
- **Leading producers of copper**-Chile and Peru
- **World's largest producers of tin**-Brazil and Bolivia
- **Large deposits of gold, silver, zinc, chromium, manganese, bauxite, mica, platinum, asbestos and diamond**-South America
- **Mineral oil is found**-in Mexico,Venezuela, Argentina, Chile, Peru and Columbia

AFRICA

- **Rich in mineral resources-**World's largest producer of diamonds, gold and platinum
- **Produce a large portion of the world's gold**-South Africa, Zimbabwe and Zaire
- **World's main source of Gold-** Witwatersrand region of Johannesburg
- **Copper, iron ore, chromium, uranium, cobalt and bauxite**-other minerals found in Africa

AUSTRALIA

- The largest producer of bauxite in the world-leading producer of gold, diamond, iron ore, tin and nickel-rich in copper, lead, zinc and manganese
- **The largest mines of gold**– found in Kalgoorlie and Coolgardie areas of western Australia

ANTARCTICA

- Variety of mineral deposits are found, some probably large.
- **The significant size of deposits of coal-** the Trans-Antarctic Mountains
- **Deposits of Iron ore forecasted**-near the Prince Charles Mountains of East Antarctica
- **Iron ore, gold, silver and oil present** in commercial quantities.
- Mining for commercial reasons is banned here. Only researchers can do mining for scientific queries.

DISTRIBUTION OF MINERALS IN INDIA

IRON-ORE

- **Largest reserve of iron-ore in Asia-** India
- **Types of Iron-ore found in India-** Haematite and Magnetite
- **Areas of iron-ore mines-** Coals fields of Chhota Nagpur plateau (Jharkhand, Odisha, Chhattisgarh, MP)
- **Iron-ore is used to make steel, build ships and in the construction industry.**

BAUXITE

- **Ore of metal aluminium,** Aluminium is used to manufacture automobiles and aircrafts, constructions, furniture, fittings, kitchenware etc.
- **Largest producer of bauxite in India-** Odisha
- **Other areas are** Jharkhand, Chhattisgarh, MP, Gujarat, Maharastra, Tamil Nadu

MICA

- **Largest producer and exporter in the world-** India
- It is used in the electrical and electronic industries.
- **Areas-** Jharkhand, Bihar, Andhra Pradesh, Rajasthan

COPPER

- Good conductor of electricity, used for making wires, electric motors, transformers and generators.
- **Area of production-** Rajasthan, MP, Jharkhand, Karnataka

MANGANESE

- Raw-material for smelting of iron-ore
- Used in iron-steel industry as it adds strength to the steel.
- **Areas-** Maharashtra, MP, Chhattisgarh, Odisha, Karnataka, Telangana

LIMESTONE

- Raw material for the cement industry.
- **Areas-** Bihar, Jharkhand, Odisha, MP, Chhattisgarh, Rajasthan, Gujarat, Tamil Nadu.

GOLD

- Used for making jewellery.
- **Largest deposit areas in India and deepest mines in the world-** Kolar and Hutti in Karnataka

SALT

- Used by the food industry (preservatives) and chemical industries.
- Common salt (NaCl) is used to make food tasty.
- It is obtained from seas, lakes and rocks.
- World's leading producer and exporter of salt – India
- Areas- Gujarat and Tuticorin

SILICON

- Mineral used in the computer industry
- It is obtained from quartz.
- Quartz is found near Una in Himachal Pradesh, MP, UP

USES OF MINERALS

- Some minerals which are usually hard are used as gems for making jewelleries.
- Copper is used in almost everything from coins to pipes.
- Silicon is used in almost everything from coins to pipes.
- Silicon is used in the computer industry which is obtained from quartz.
- Aluminum is used in automobile, airplanes, bottling industry, building and in kitchen cookware.
- Mica is used to make electrical appliances and glassmaking industries.
- Iron and steel is used in every industry.

CONSERVATION OF MINERALS

- Minerals are the non-renewable resources.
- It is necessary to reduce wastage in process of mining.
- Recycling of metals is the way to conserve mineral resources.
- Over exploitation is harmful for environment as well.

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- Power Resources
- Conventional Sources of Energy (Firewood, Coal, Petroleum, Natural Gas)
- Non-Conventional Sources of Energy (Hydroelectric Power, Solar Energy, Wind Energy, Nuclear Power, Geothermal Energy, Tidal Energy, Biogas)
- Need for using Non-Conventional Sources of Energy
- Conservation of Energy

POWER RESOURCES

- Power resources are of two types:
- (a) Conventional Resources
- (b) Non-conventional Resources
- We need power resources for industry, domestic use, agriculture, transport, communication and defense.

CONVENTIONAL SOURCES OF ENERGY

- The energy resources which have been in common use for a long time are known as conventional sources.
- Firewood and fossil fuels are two main conventional energy sources.
- Fossil fuels comprises of Coal(known as buried sunshine), Petroleum (known as black gold), Natural Gas and Hydroelectricity.

FIREWOOD

- Widely used for cooking and heating – 50% of the energy used by villagers comes from firewood.

COAL

- Abundantly found fossil fuel- used as a domestic fuel, in industries such as iron and steel, steam engines- to generate electricity.
- Electricity from coal is called thermal power.
- The coal was formed millions of years ago when giant ferns and swamps got buried under the layers of earth.
- The leading coal producers of the world are China, USA, Germany, Russia, South Africa and France.
- The coal producing areas of India are Raniganj, Jharia, Dhanbad and Bokaro in Jharkhand, West Bengal, Odisha, Chhattisgarh, Telangana, Maharastra.

PETROLEUM

- The world ‘petroleum’ is derived from the Latin words *petra* meaning rock and *oleum* meaning oil.
- Petroleum is found as crude oil trapped in between layers of sedimentary rocks. It is thick black liquid found between the layers of rocks- drilled from oil fields located in off-shore and coastal areas.
- It is a source of energy for all internal combustion engines in automobiles, railways and aircrafts.
- Crude oil is sent to refineries where it is processed and numerous by-products like diesel, petrol, kerosene, wax, plastics and lubricants.
- Petroleum and its derivatives are called Black Gold, as it is very valuable.
- **Chief petroleum producing countries-** Iran, Iraq, Saudi Arabia and Qatar, other major producers are USA, Russia, Venezuela, and Algeria.
- **Leading producers in India**-Digboi in Assam, Bombay High in Mumbai and the deltas of Krishna and Godavari rivers.

NATURAL GAS

- Found with petroleum deposits-released when crude oil is brought to the surface-used as a domestic and industrial fuel.
- Major producers of natural gas-Russia, Norway, UK and the Netherlands – In India Jaisalmer, Krishna Godavari delta, Tripura and some areas offshore in Mumbai have natural gas resources.
- In India, GAIL (Gas Authority of India Limited) was set up in 1984 as a Public Sector undertaking to locate new reserves and to transport and market natural gas.
- CNC (Compressed Natural Gas) is eco-friendly automobile fuel.

CONVENTIONAL SOURCES OF ENERGY

Oil

Advantages	Disadvantages
• Easier to transport (tankers) • Basis of petro-chemical industry	• Depletion of oxygen due to oil spillage and gas leakage • Pollutants released caused acid rain • Exploration of new fuel is not easy

Natural Gas

Advantages
• Easier to transport (Pipelines) • Cleaner than oil and coal • Cheaper than oil

Fire Wood

Advantages	Disadvantages
• Easy access • Provides energy to a large number of people	• Collection is time consuming • Polluting • Promoting green house effect • Deforestation

Coal

Advantages	Disadvantages
• Extensively available • Efficient conversion to electricity	• Polluting source • Bulky to transport

Hydel Power

Advantages	Disadvantages
• Non-polluting • Promotes irrigation and fishing • Cheap	• Displacement of local community • Inundates low • Expensive to setup

NON-CONVENTIONAL SOURCES OF ENERGY

- Non-conventional sources of energy are renewable in nature.
- Solar energy, wind energy, tidal energy, etc. are the examples of non-conventional sources of energy.
- They are more expensive as it needs technological upgradation.
- India has a great potential for Solar energy.
- Increasing use of fossil fuels leads to shortage- if the present rate of consumption continues, the reserves of these fuels will get exhausted- their use also causes environmental pollution- Therefore, there is need for using nonconventional sources such as solar energy, wind energy, tidal energy, which are renewable.
- Unchecked burning of fossil fuel is like an unchecked dripping tap which will eventually run dry. This has led to the tapping of various nonconventional sources of energy that are cleaner alternatives to fossil fuels.

Sources of Energy

Conventional Sources

Fossil Fuels

Examples: Coal & petroleum

+ Industrial revolution → Better quality of life

−
- Non-renewable energy
- Air pollution
- acid rain
- Greenhouse effect

+ Thermal power plant

Transmission of electricity better than transporting coal or petroleum

Wind Energy

+ Renewable energy

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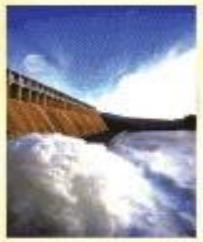
- High maintenance
- Needs high wind speeds

Bio Gas Plant

- Excellent energy (75% methane)
- Smokeless
- Scurry is used as manure

Hydro Power Plant



+ Renewable energy

−
- Limited Dams
- Ecosystems are destroyed
- Submerged vegetation produces methane gas → greenhouse effect

Kinetic energy of flowing water
or
Potential energy of water
↓
Converted to Electrical energy

Lifetime of Energy

Environmental Consequences

Good Sources

- Easy storing & transportation
- Easy access
- Large amount of work per unit volume or mass
- Economical

HYDEL POWER

- Rain water or river water stored in dams. The falling water flows through pipes inside the dam over turbine blades placed at the bottom of the dam. The moving blades then turn the generator to produce electricity. This is called hydro electricity. Water discharged after the generation of electricity is used for irrigation. 1/4th of the world's electricity is produced by hydel power.
- **Leading producers of hydel power in the world**-Paraguay, Norway, Brazil, and China.
- **Important hydel power stations in India**-Bhakra Nangal, Gandhi Sagar, Nagarjunsagar and Damodar valley projects.

SOLAR ENERGY

- Solar energy trapped from the sun-used in solar cells to produce electricity.
- Two effective processes to tap solar energy are photovoltaic cells and solar thermal technology.
- Many of these cells are joined into solar panels to generate power for heating and lighting purposes. Solar energy is used in solar heaters, solar cookers, solar dryers besides being used for community lighting and traffic signals.
- Gujarat and Rajasthan in India has great potential for solar energy development.

WIND ENERGY

- Inexhaustible source of energy- Windmills are used for grinding grain and lifting water-high speed winds rotate the windmill which is connected to a generator to produce electricity.
- Wind Farms are found in Netherlands, Germany, Denmark, UK, USA and Spain.
- The wind power plant at Lamba in Gujarat is the largest in Asia.

NUCLEAR POWER

- Obtained from energy stored in the nuclei of atoms of naturally occurring radioactive elements like uranium and plutonium- undergo nuclear fission in nuclear reactors and emit power.
- **Greatest producers of nuclear power**– USA and France
- **Large deposits of Uranium in India**-Rajasthan and Jharkhand
- **Thorium found in large quantities-** in the Monazite sands of Kerala
- **Nuclear power stations in India**-located in Kalpakkam in Tamilnadu, Tarapur in Maharashtra, Ranapratap Sagar near Kota in Rajasthan, Narora in Uttar Pradesh and Kaiga in Karnataka.

GEO-THERMAL ENERGY

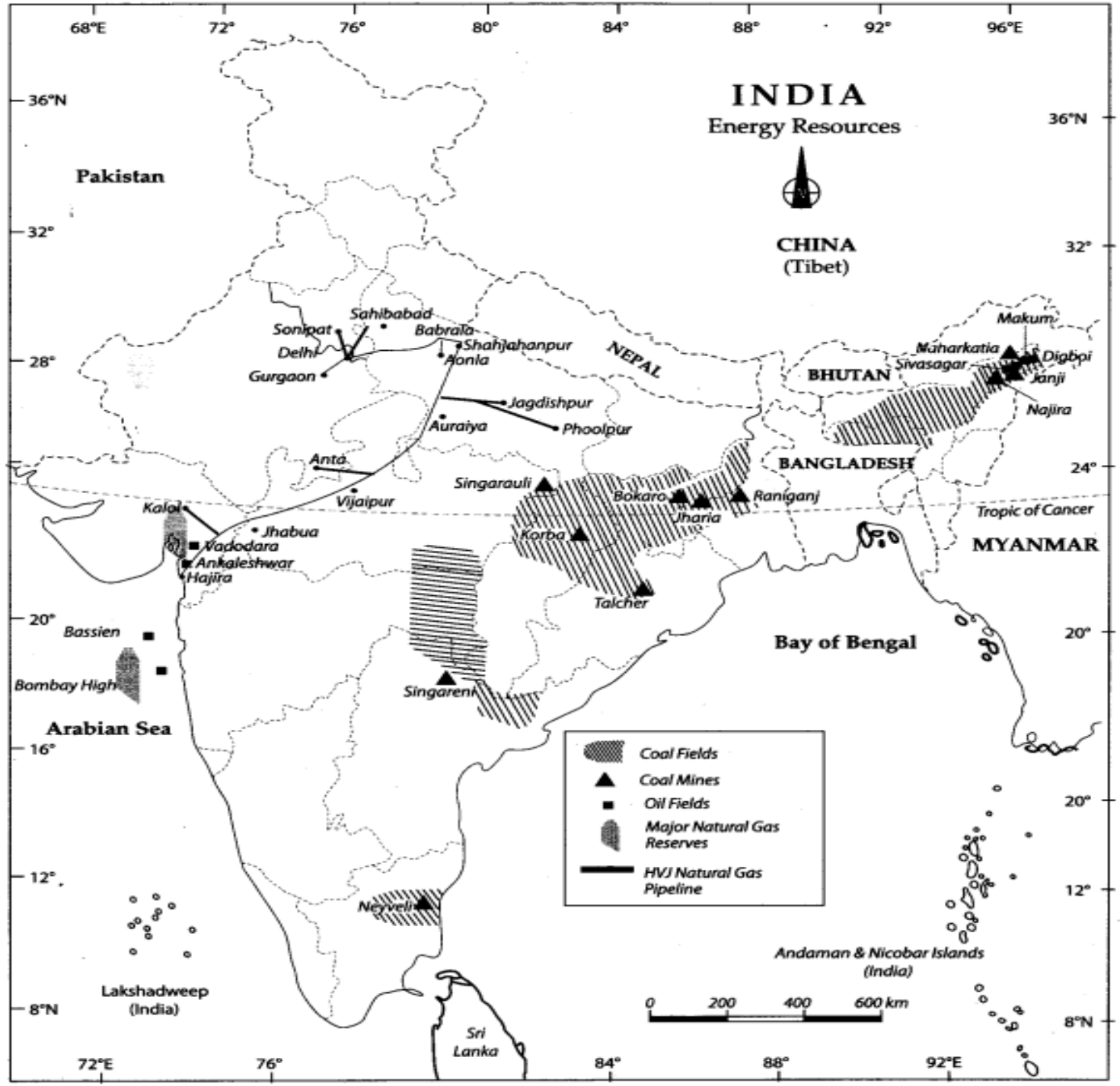
- Heat energy obtained from the earth- temperature in the interior of the earth rises steadily with depth- heat energy may surface itself in the form of hot springs- this energy is used to generate power and in the form of hot springs, it has been used for cooking, heating and bathing.
- **World's largest geothermal power plants**– in US, followed by New Zealand, Iceland, Philippines and Central America
- **Geothermal plants in India**-located in Manikaran in Himachal Pradesh and Puga Valley in Ladakh

TIDAL ENERGY

- Energy generated from tides – can be harnessed by building dams at narrow openings of the sea- During high tide, energy of the tides is used to turn the turbine installed in the dam to produce electricity.
- **Huge tidal mill farms-**Russia, France and the Gulf of Kachchh in India

BIOGAS

- Organic waste (dead plant and animal material, animal dung and kitchen waste) can be converted into a gaseous fuel called biogas.
- Organic waste is decomposed by bacteria in biogas digesters- will emit biogas (a mixture of methane and carbon dioxide)
- It is an excellent fuel for cooking and lighting and produces huge amounts of organic manure each year.



CONSERVATION OF ENERGY

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ENERGY SAVING CLIMATE CHANGE TIPS FOR YOUR SCHOOL

WATER HEATING
- CONSIDER GOING SOLAR FOR WATER HEATING SYSTEMS
- PUT TIMERS ON URNS OR USE A KETTLE

CANTEEN
- CHOOSE FRIDGE WITH A GOOD ENERGY STAR RATING
- USE LOCALLY GROWN PRODUCE
- MEATLESS MONDAY!
- HAVE ONE DAY A WEEK THAT IS VEGETARIAN DAY

TRANSPORT
- WALK
- RIDE A BIKE
- TAKE THE BUS TO SCHOOL

WASTE
- REDUCE LUNCH TIME RUBBISH
- COMPOST
- RECYCLE
- WWW.WASTEWISE.WA.GOV.AU

LIGHTING
- AT RECESS/ LUNCH
  - TURN OFF LIGHTS
  - USE ENERGY EFFICIENT LIGHTS

HEATING AIR CONDITIONING
- ONLY USE HEATERS WHEN THE SPACE IS OCCUPIED
- KEEP DOORS AND WINDOWS CLOSED WHEN HEATING OR USING REFRIGERATIVE AIRCONDITIONING
- INSULATE BUILDINGS
- SET THERMOSTAT TO 18°C - 20°C IN WINTER AND 26°C IN SUMMER

OFFICE EQUIPMENT
- CHOOSING EQUIPMENT
  - LOOK FOR A GOOD ENERGY STAR RATING
- TURN OFF
  - TURN COMPUTER OFF AT POWERPOINT WHEN NOT IN USE
- TURN OFF
  - TURN OFF AT POWERPOINT PHOTOCOPIERS, COMPUTER PRINTERS OUTSIDE SCHOOL HOURS

NOTE: SCREENSAVERS DO NOT SAVE ENERGY

ORGANISATIONS THAT CAN HELP
- WWW.SUSTAINABLESCHOOLS.WA.EDU.AU
- AUSSI
- SOLAR SCHOOLS PROGRAM ($12,500 GRANT)
- WWW.SEDO.ENERGY.WA.GOV.AU

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