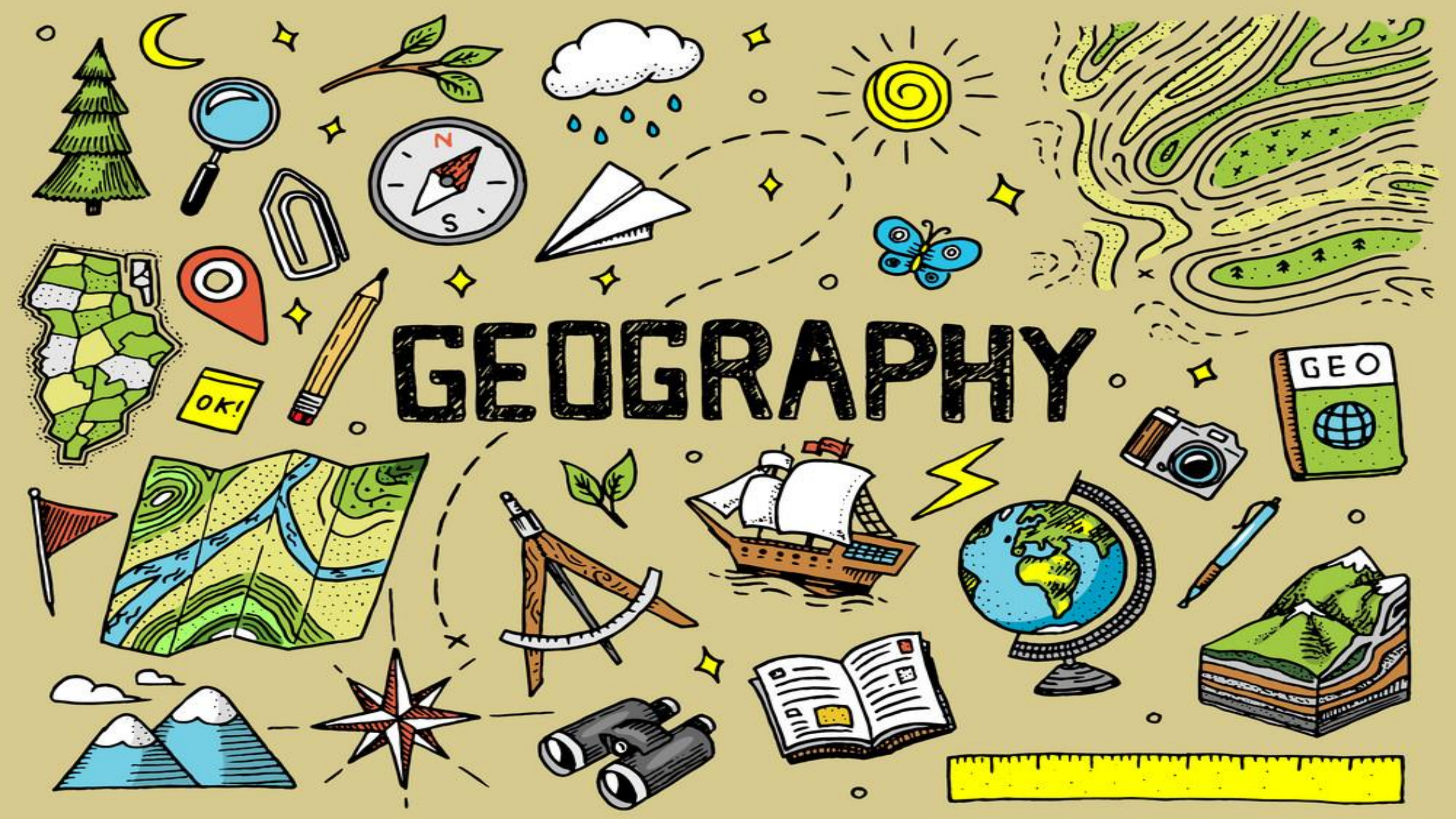
ODM EDUCATIONAL GROUP

Changing your Tomorrow

ODM LEARNING


GEOGRAPHY
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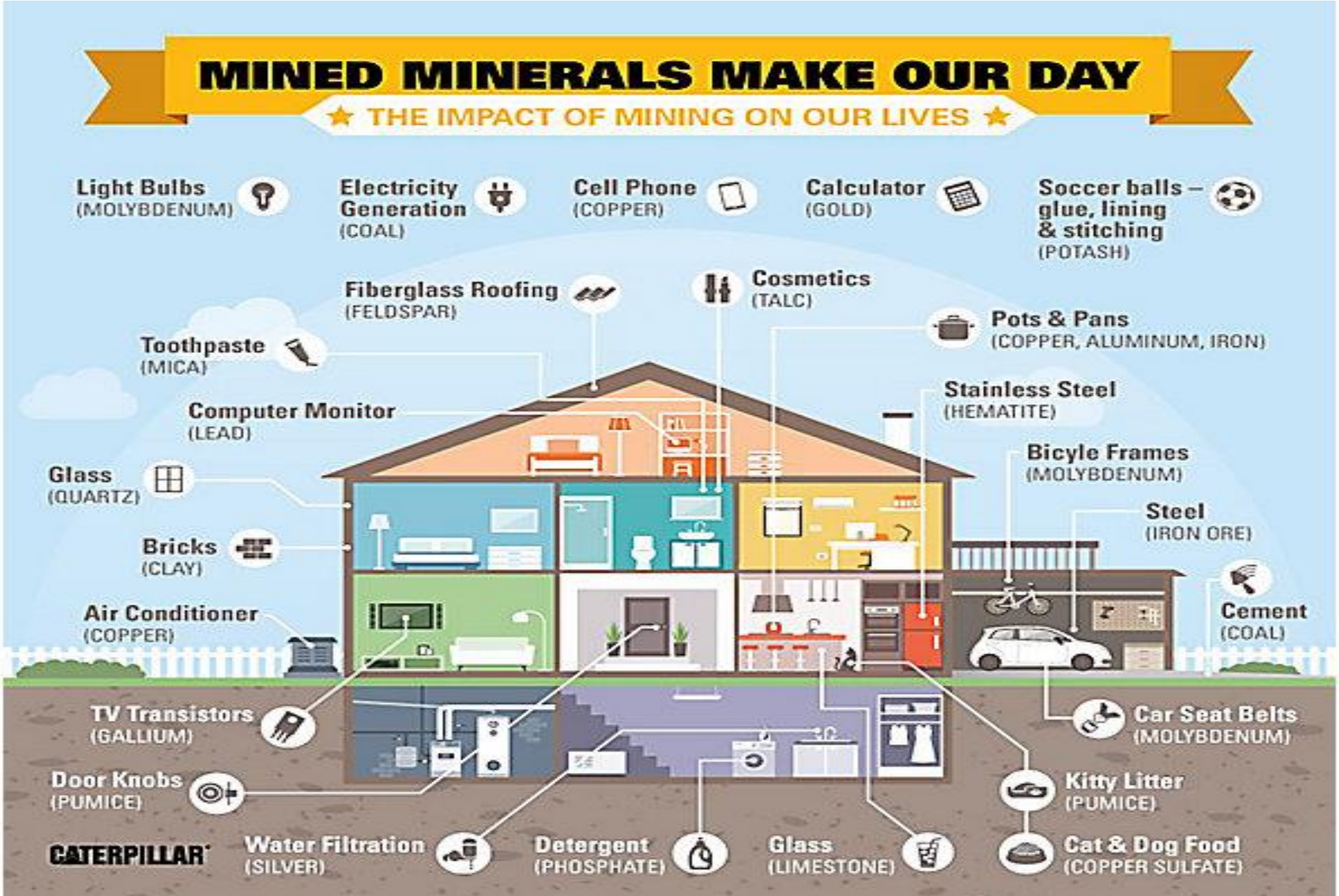
MINERAL & ENERGY RESOURCES

CONTENT:-

- Mineral Resources
- Occurrence of Minerals
- 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)

MINED MINERALS MAKE OUR DAY

★ THE IMPACT OF MINING ON OUR LIVES ★



CATERPILLAR

water pipe

bronze sledge dog statuette

watch

bag of plaster

kitchen foil

brass lock

pencil

table salt

car battery

high speed drill bits

toothpaste

stainless steel knife

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.

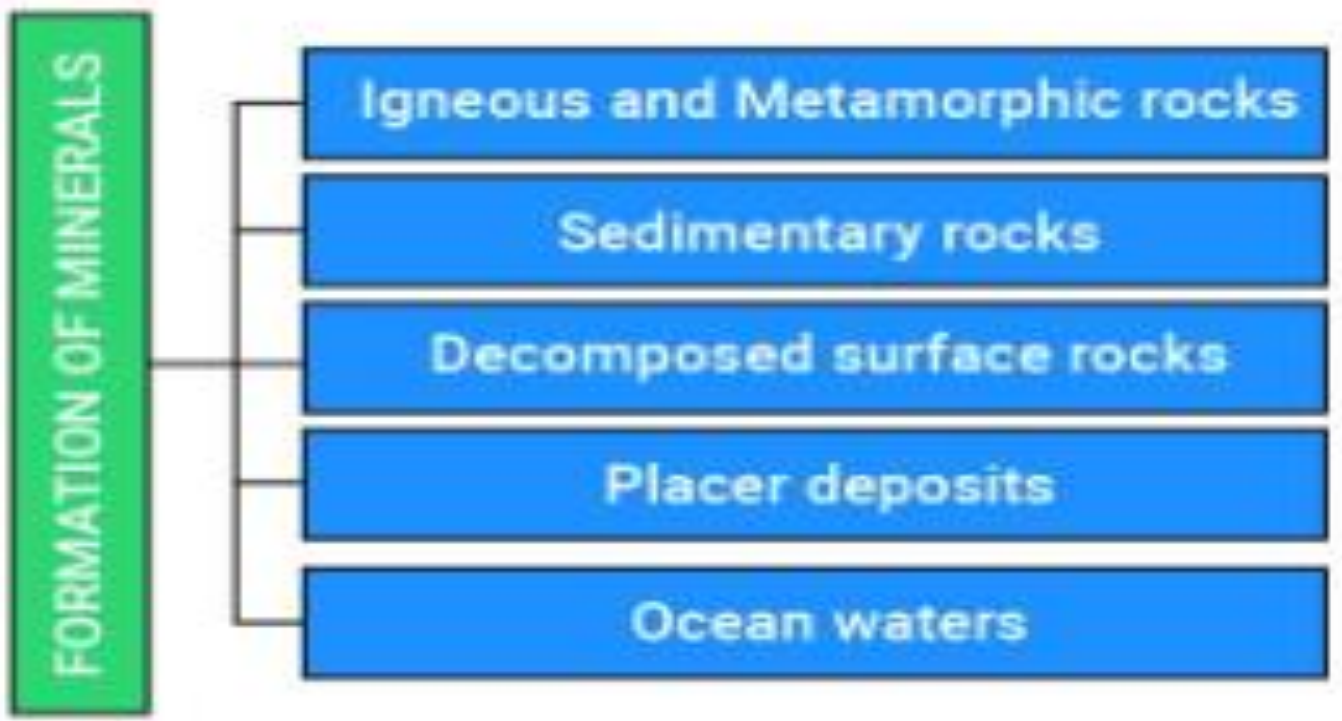
MINERALS

- 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.

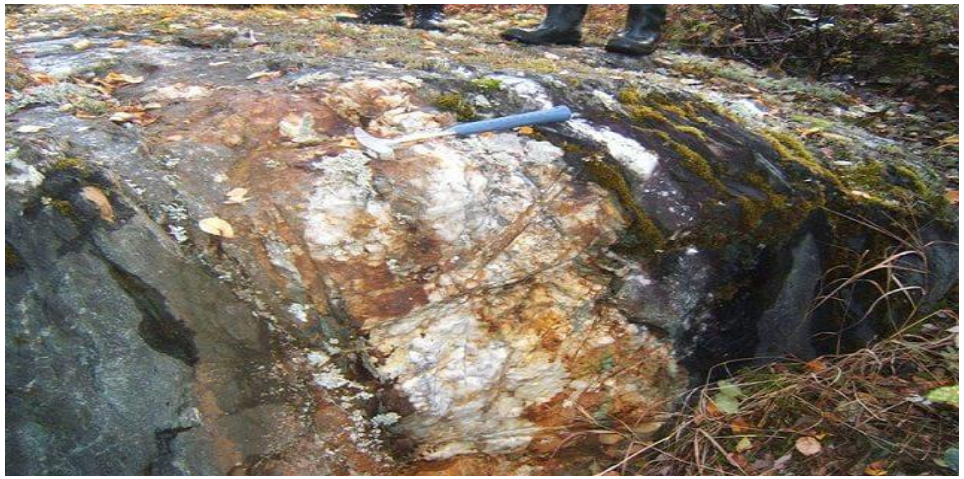
Mineral	Ore
1. These are naturally occurring chemical substan-ces obtained from earth crust by mining.	1. Ores are those minerals from which metals can be extracted profitably and conveniently.
2. All minerals are not ores.	2. All ores are minerals.

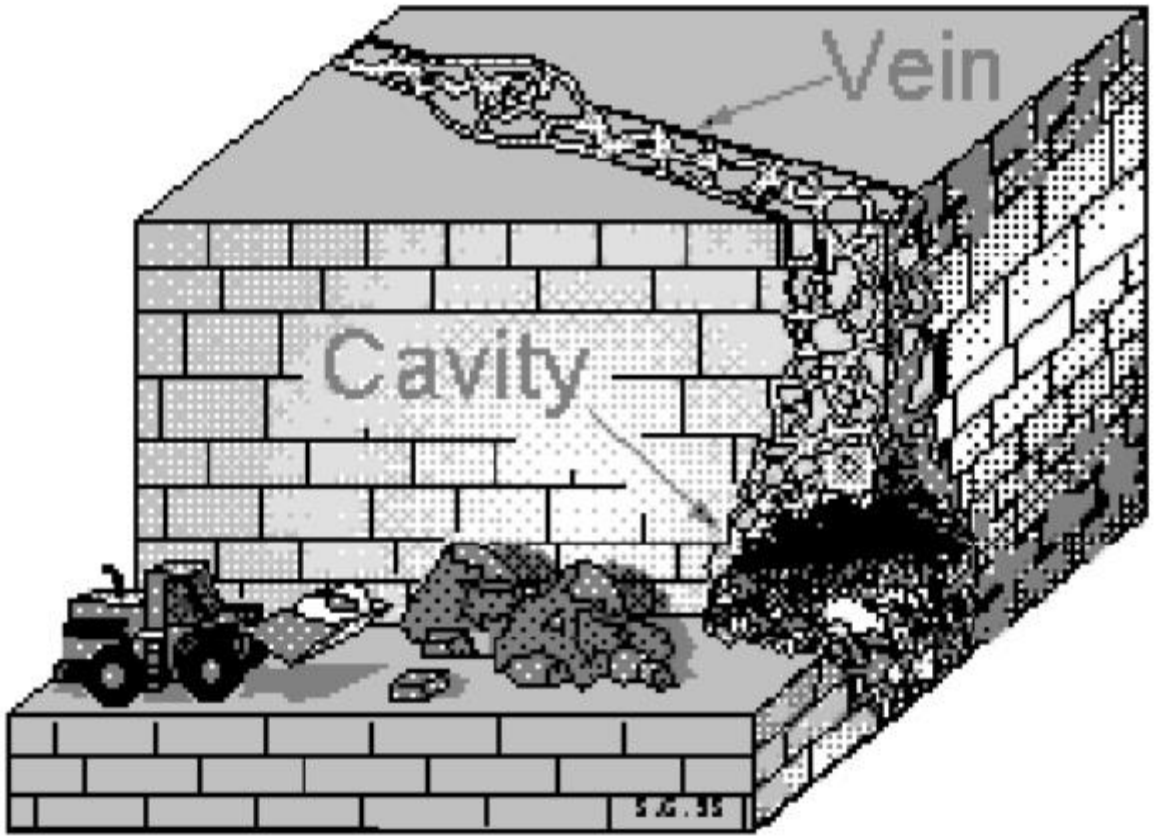
Minerals and Energy Resources

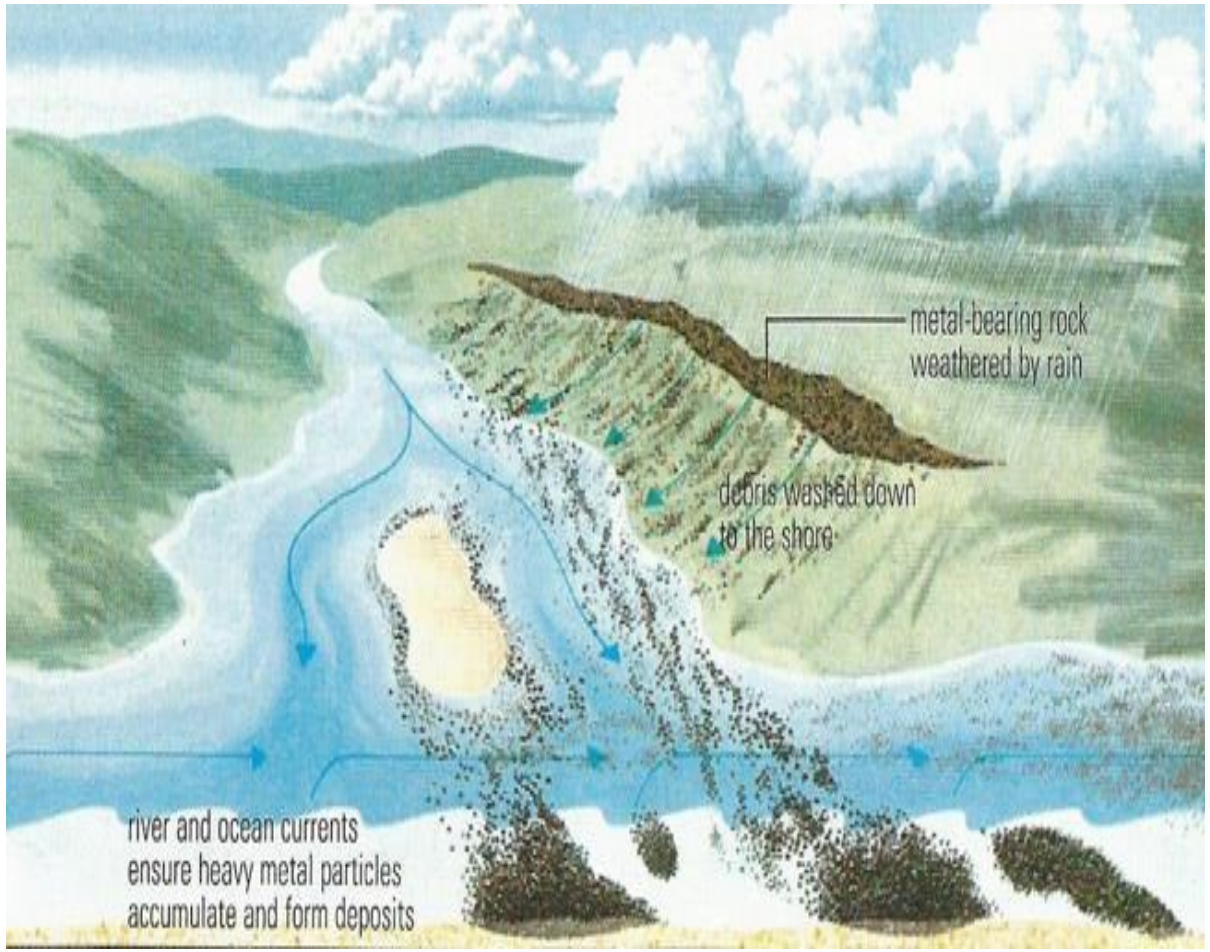
MODE OF OCCURRENCE OF MINERALS

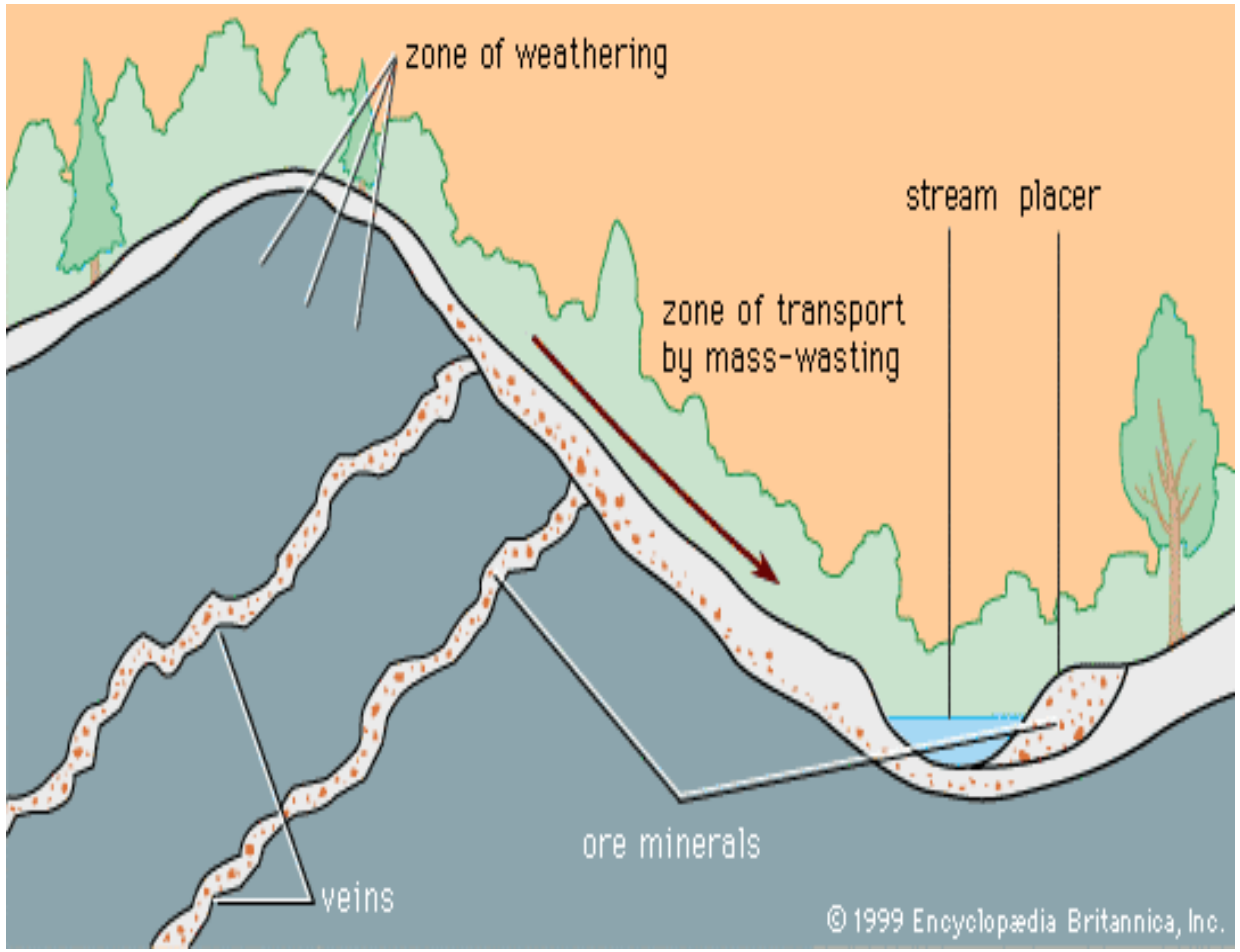


(i)In **IGNEOUS AND METAMORPHIC ROCKS** minerals may occur in the cracks, crevices, faults or joints. The smaller occurrences are called veins and the larger are called lodes. In most cases, they are formed when minerals in liquid/ molten and gaseous forms are forced upward through cavities towards the earth's surface. They cool and solidify as they rise. Major metallic minerals like tin, copper, zinc and lead etc. are obtained from veins and lodes.






metal-bearing rock
weathered by rain
debris washed down
to the shore
river and ocean currents
ensure heavy metal particles
accumulate and form deposits


zone of weathering
stream placer
zone of transport
by mass-wasting
ore minerals
veins
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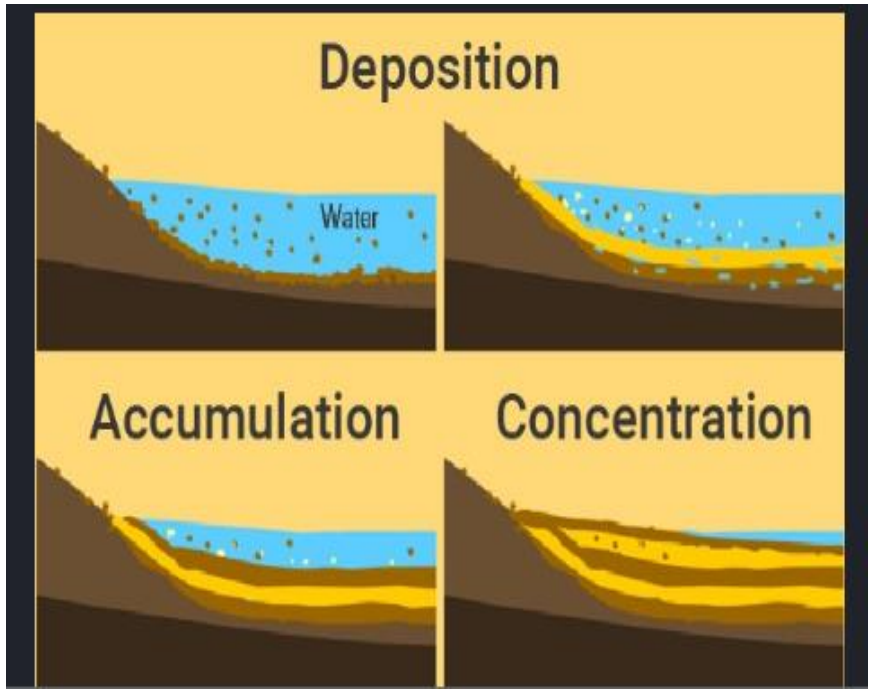
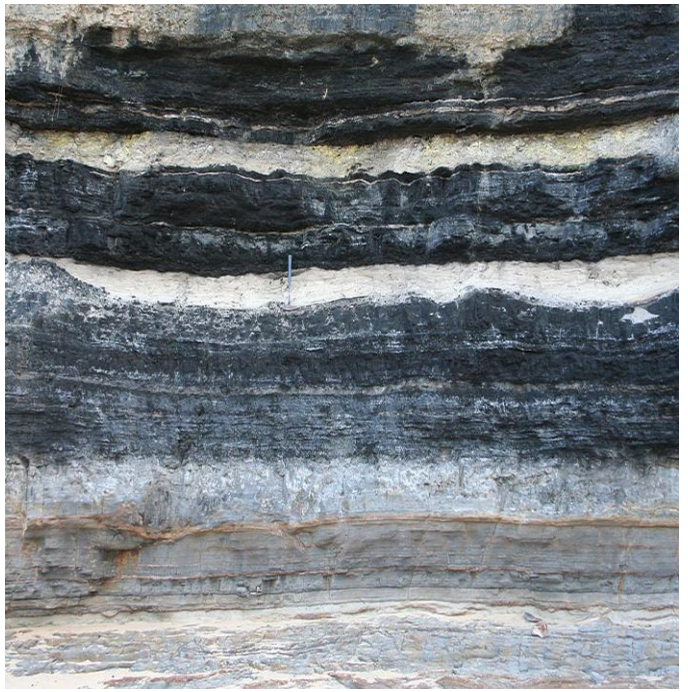
(ii) In **SEDIMENTARY ROCKS** a number of minerals occur in beds or layers. They have been formed as a result of deposition, accumulation and concentration in horizontal strata. Coal and some forms of iron ore have been concentrated as a result of long periods under great heat and pressure. Another group of sedimentary minerals include gypsum, potash salt and sodium salt. These are formed as a result of evaporation especially in arid regions.





(iii) Another mode of formation involves the decomposition of surface rocks, and the removal of soluble constituents, leaving a residual mass of weathered material containing ores. Bauxite is formed this way.

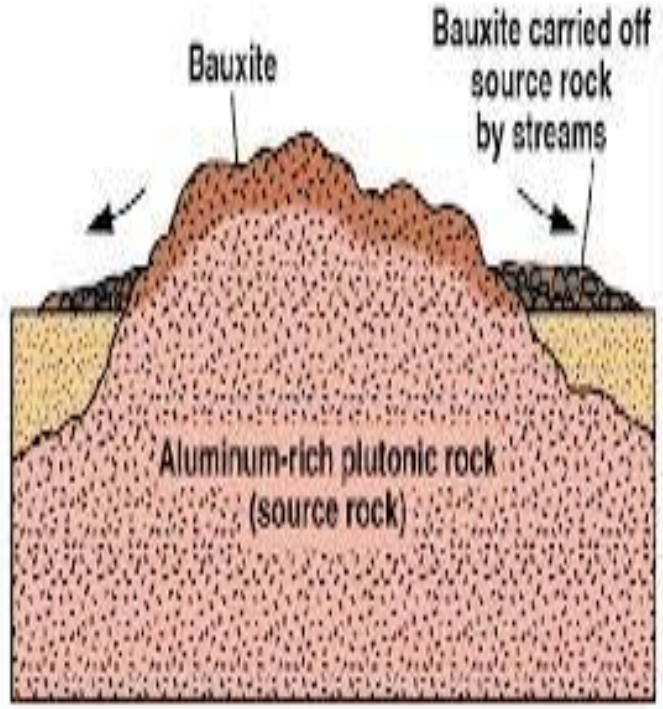
❖DECOMPOSITION OF SURFACE ROCKS

- Upper part of the rocks are removed due to decomposition and weathering.
- Removal of soluble constituents of rocks leaves residue of weathered materials containing ores.
- Example- Bauxite

Weathering

- What is weathering?
  - Weathering is the disintegration and decomposition of rock at or near the surface of the earth.

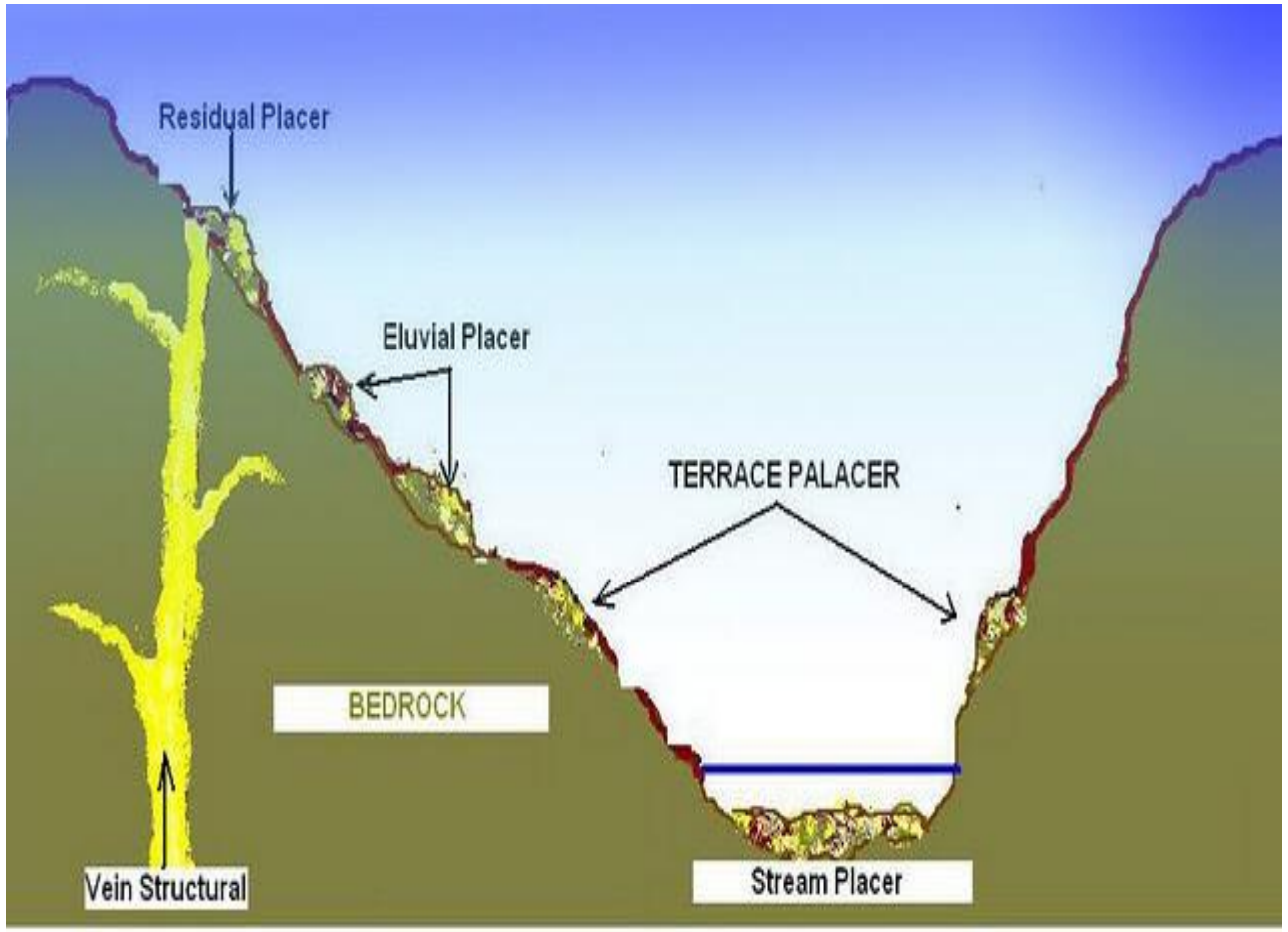
Bauxite Due to Tropical Weathering



Weathering

- Processes that break up rock to create sediment.
  - Physical - Mechanical breakage and disintegration.
  - Chemical - Decomposition by reaction with water.
- Weathering processes occur at Earth's surface.
  - Rocks react with hydrosphere, atmosphere, and biosphere.
  - Low temperature and pressure.

(iv) Certain minerals may occur as alluvial deposits in sands of valley floors and the base of hills. These deposits are called ‘placer deposits’ and generally contain minerals, which are not corroded by water. Gold, silver, tin and platinum are most important among such minerals.



PLACER DEPOSITS

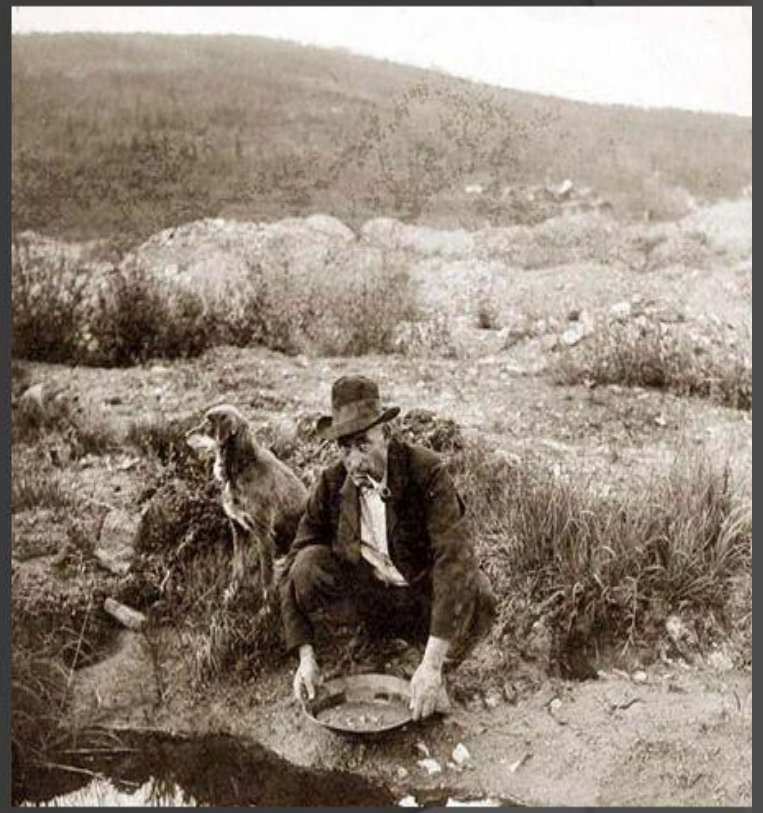
Alluvial Deposits

- Alluvial deposits refer to sediments carried by and deposited in fresh water.
- Flooding events carry rocks and minerals, which are deposited in bands.

http://cee.engr.ucdavis.edu/faculty/boulanger/geo_photo_album

Placer Deposits

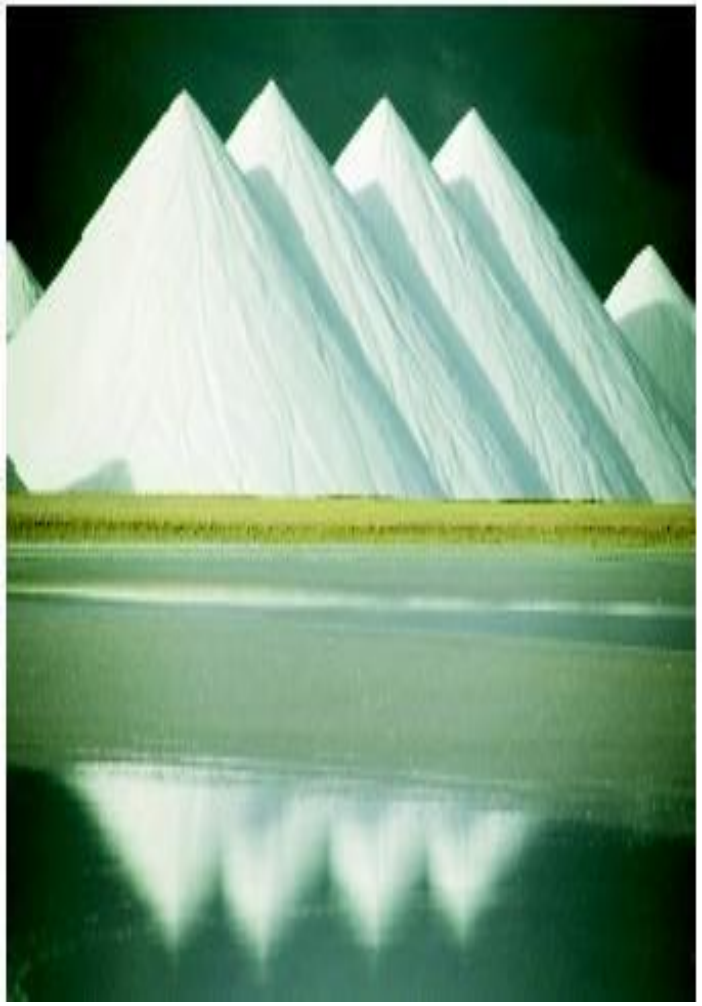
- Placer deposits are formed when eroded heavy minerals settle quickly from moving water while less dense particles remain suspended and continue to move.
- Common sites of accumulation include the inside of the bends in streams, as well as cracks, depressions, and other streambed irregularities
- Gold is the best know placer deposit

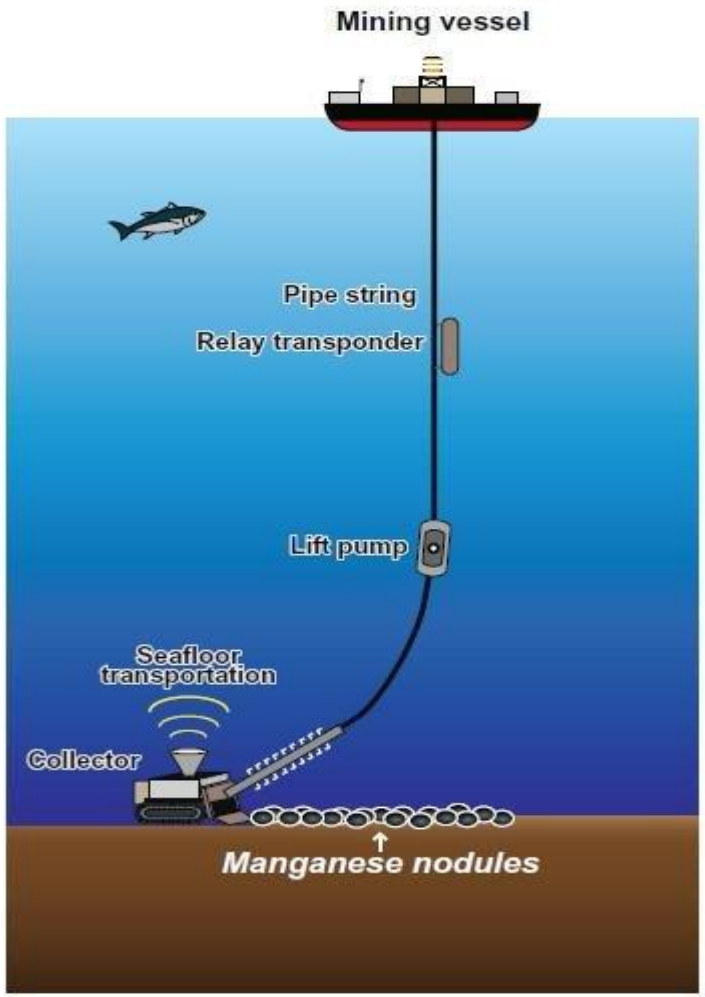


Placer deposits

- Loose, gravel and alluvial deposits
- Mineral nodule
- Gold, Titanium, rutile, zircon, garnet
- Sand and gravel

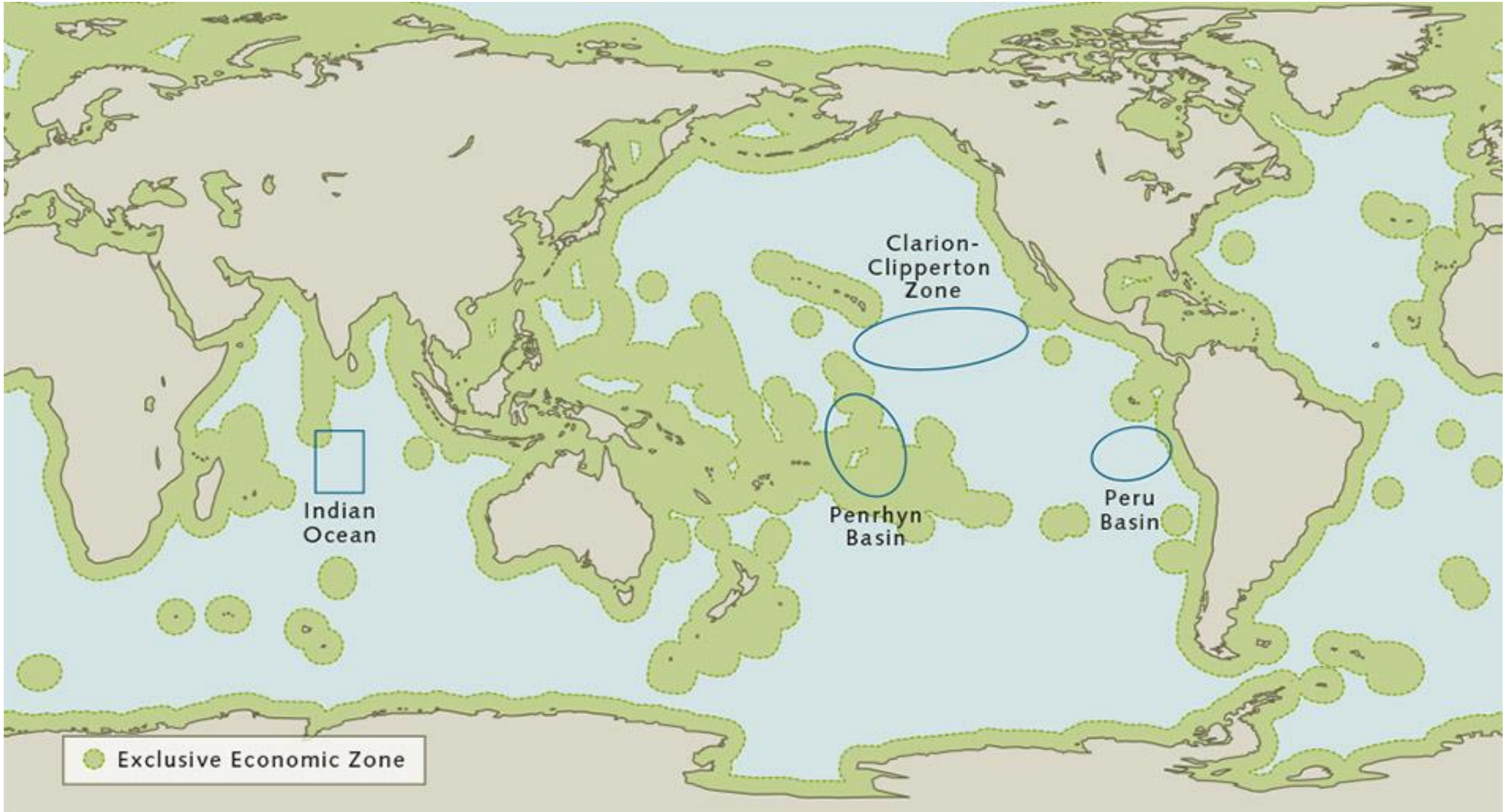
(v) The ocean waters contain vast quantities of minerals, but most of these are too widely diffused to be of economic significance. However, common salt, magnesium and bromine are largely derived from ocean waters. The ocean beds, too, are rich in manganese nodules.





Occurrences

- Most commonly found on the ocean floors
- Can form on lake bottoms
- Highest concentrations found on vast abyssal plains in the deep ocean
- 4,000 and 6,000 meters
- Estimated that approximately two billion metric tons of manganese nodules lie on the ocean floors around the world
- Manganese nodules occur in many different environment including freshwater lakes , continental shelves , seamount on abyssal plains.


Clarion-
Clipperton
Zone
Indian
Ocean
Penrhyn
Basin
Peru
Basin
Exclusive Economic Zone

❖ALLUVIAL DEPOSITS

- In sands of valley floors and base of hills.

These deposits are called 'placer deposits'

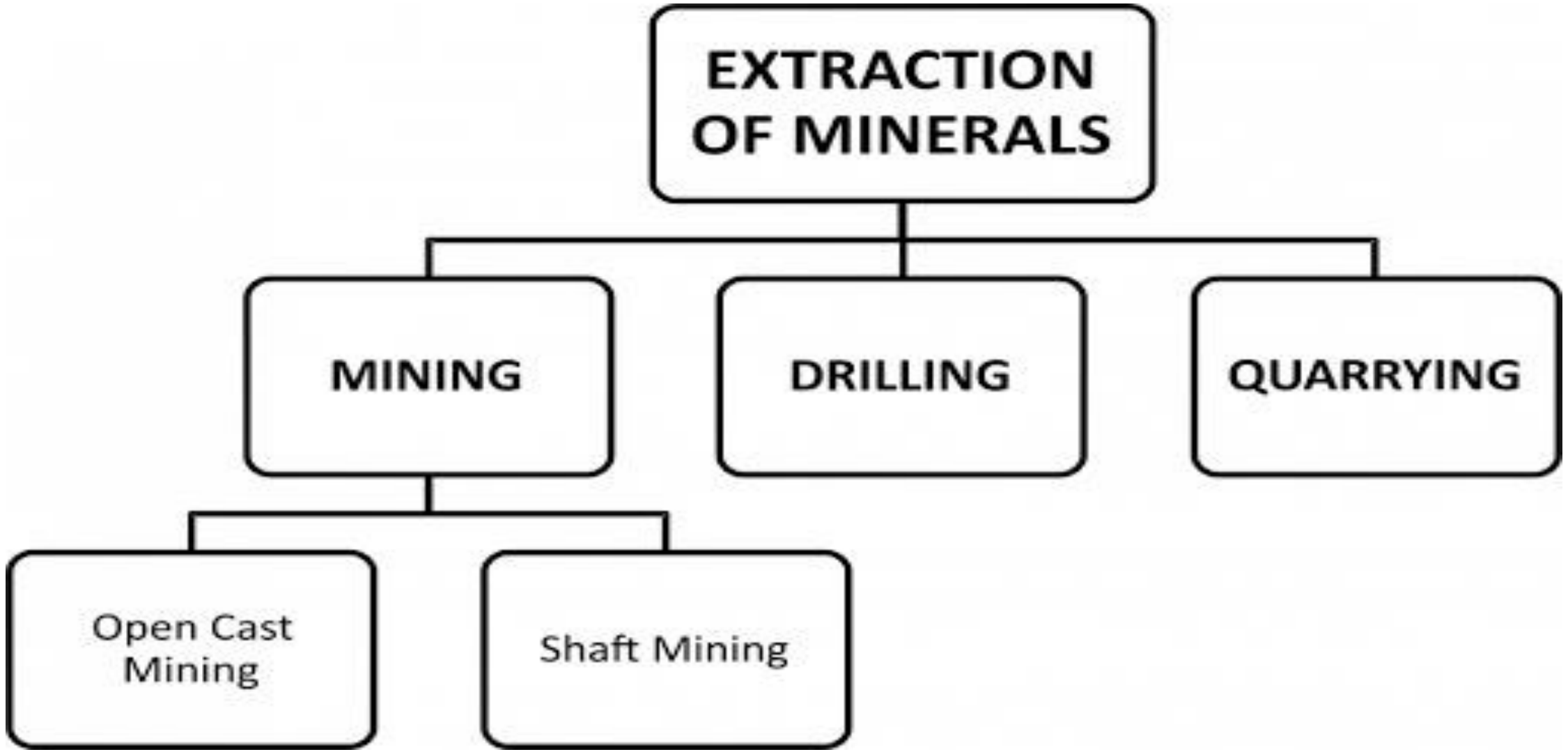
contains minerals, which are not corroded by water.

- Examples-Gold, silver, tin and platinum

❖ OCEAN

- Dissolved and defused in ocean water
- Examples- Common Salt, Magnesium , Bromine.
- Found in ocean beds- Manganese ore

EXTRACTION OF MINERALS

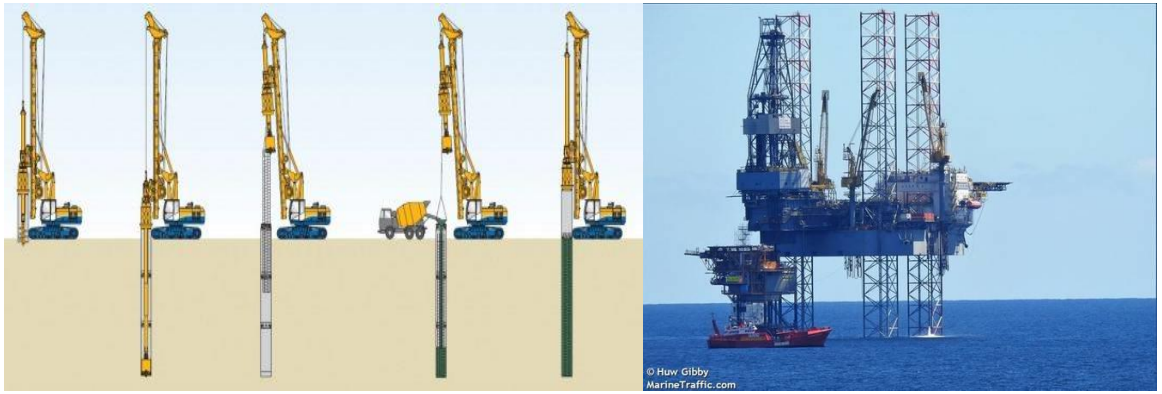


- All minerals are extracted from rocks.
- Extraction is the process of taking out minerals from the rocks and is called mining.
- Methods of mining depends upon the depth at which the mineral is located.

A. **<u>Open-Cast Mining-</u>** 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. **<u>Shaft Mining-</u>** deep bores called shafts are made to reach mineral deposits that lie at great depths below the Earth's surface.

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

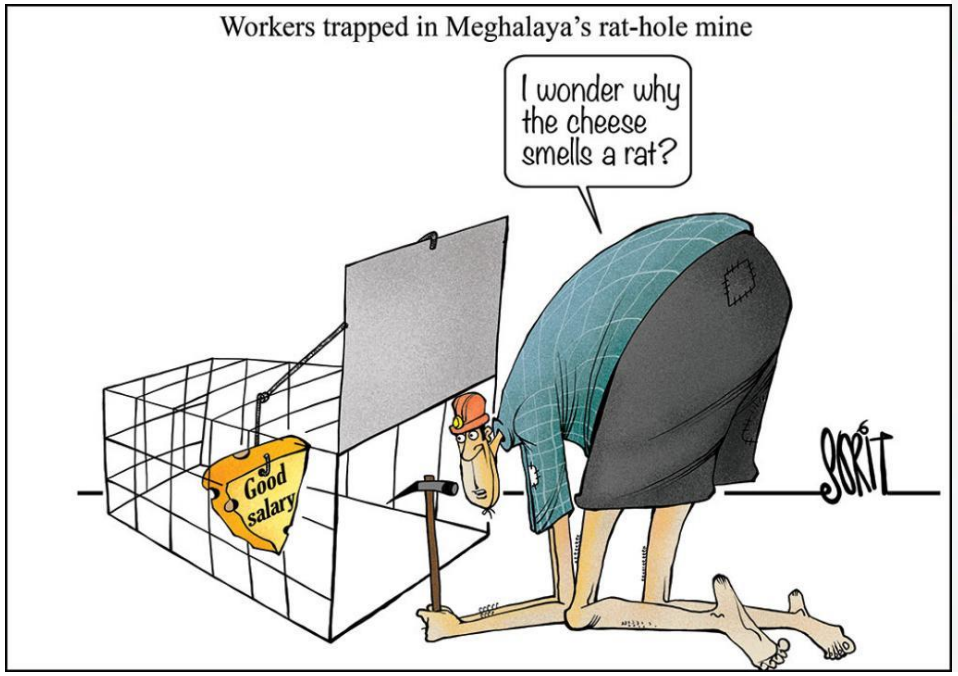


RAT-HOLE MINING

Most of the minerals in India are nationalized and their extraction is possible only after obtaining due permission from the government. But in most of the tribal areas of the north-east India, minerals are owned by individuals or communities.

In Meghalaya, there are large deposits of coal, iron ore, limestone and dolomite etc.

Coal mining in Jowai and Cherapunjee is done by family member in the form of a long narrow tunnel, known as ‘Rat hole’ mining.

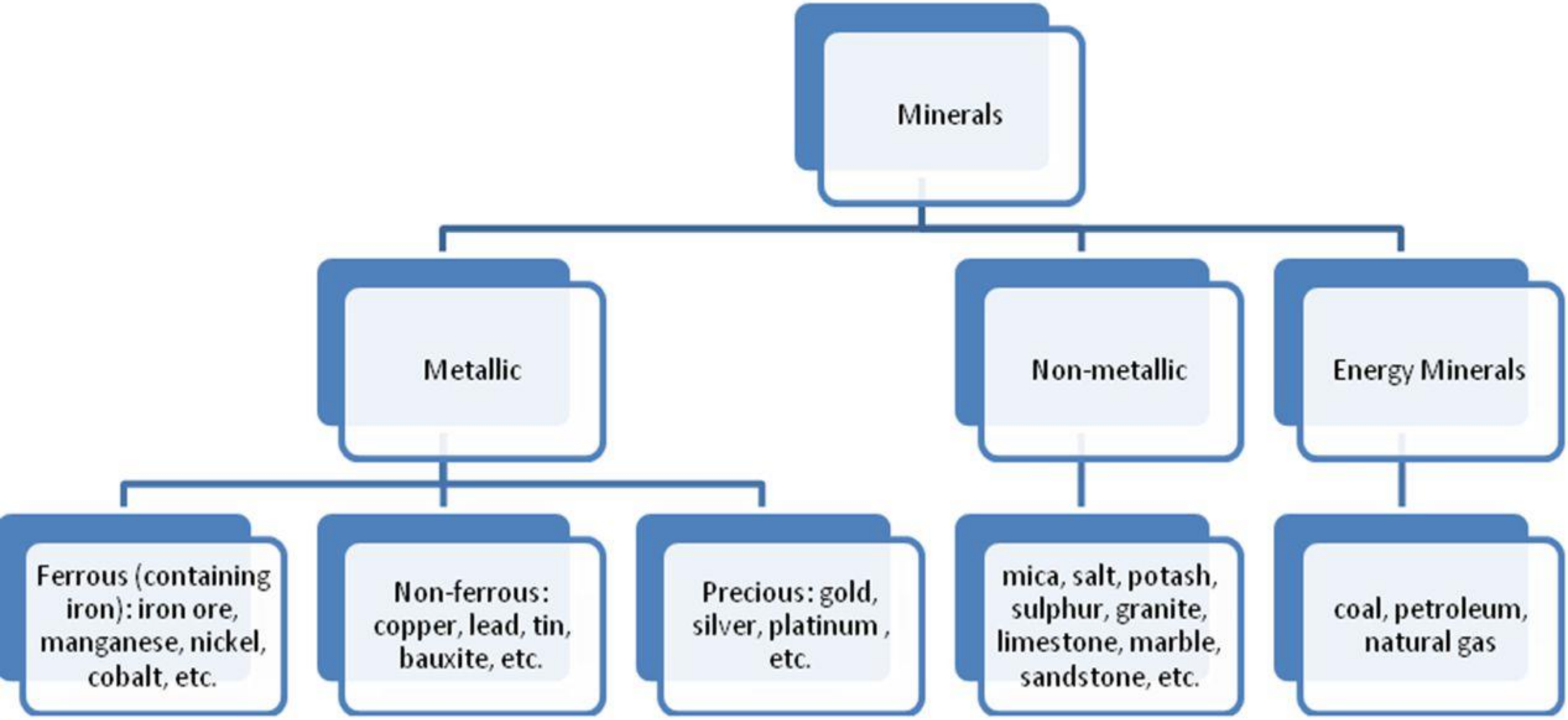


TYPES OF MINERALS

- 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



Classification of minerals

Metallic

Ferrous
(contain iron)
e.g. iron ore ,
manganese.

Non-ferrous
e.g. copper ,
lead & tin.

Precious
e.g. gold ,
platinum ,
& silver.

Non-metallic

e.g. mica , salt ,
Granite , limestone .




Energy minerals

Coal petroleum
Natural gas .

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*)

Ferrous minerals	Non-ferrous minerals
(*a*) Ferrous minerals have iron content.	(*a*) Non-ferrous minerals do not have iron content.
(*b*) These minerals have little resistance to corrosion.	(*b*) They have more resistance to corrosion.
(*c*) Iron ore and manganese are the examples of ferrous minerals.	(*c*) Copper, lead, zinc, gold and bauxite are the examples of non-ferrous minerals.

DISTRIBUTION OF MINERALS IN INDIA

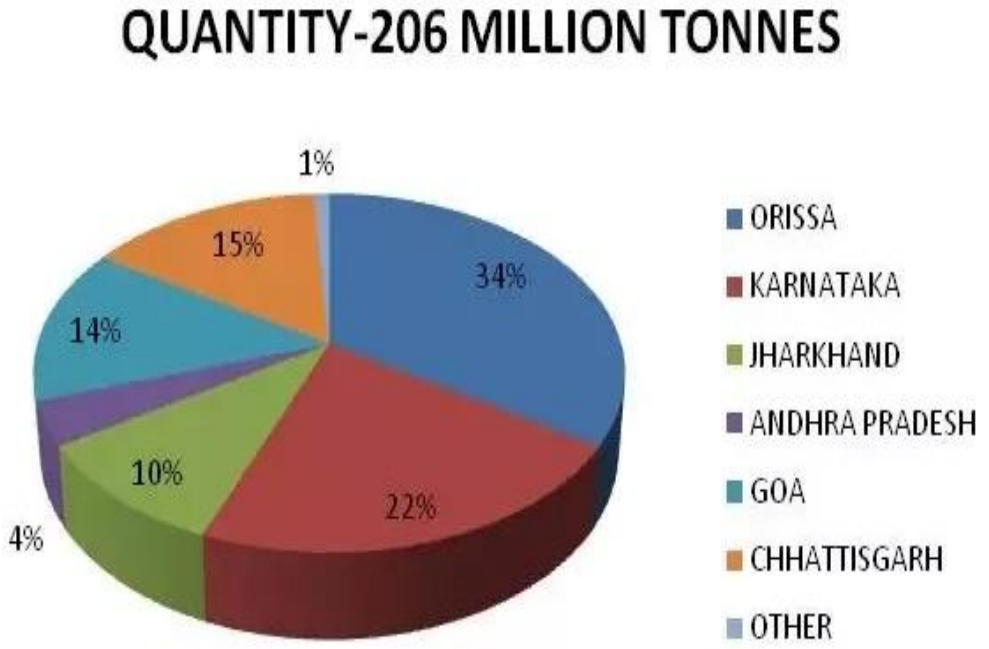
FERROUS MINERALS:-

They provide base for the development of metallurgical industries.

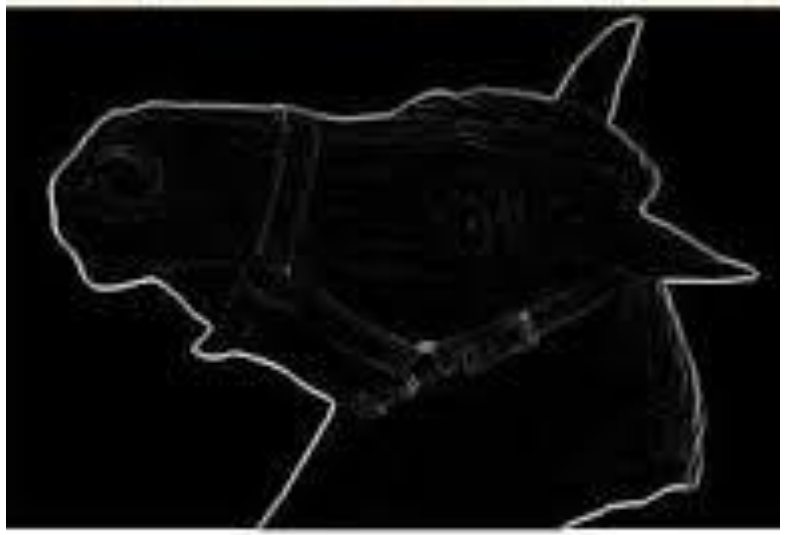
IRON-ORE (basic mineral and backbone of industries)

- **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.**

Mineral	Formula	% of Iron
Hematite	Fe_2O_3	70.0
Magnetite	Fe_3O_4	72.4
Limonite	$2Fe_2O_3.3H_2O$	59.8
Siderite	$FeCO_3$	48.2



Kudre in Kannada means horse.
The highest peak in the western ghats of Karnataka resembles the face of a horse.
The Bailadila hills look like the hump of an ox, and hence its name.

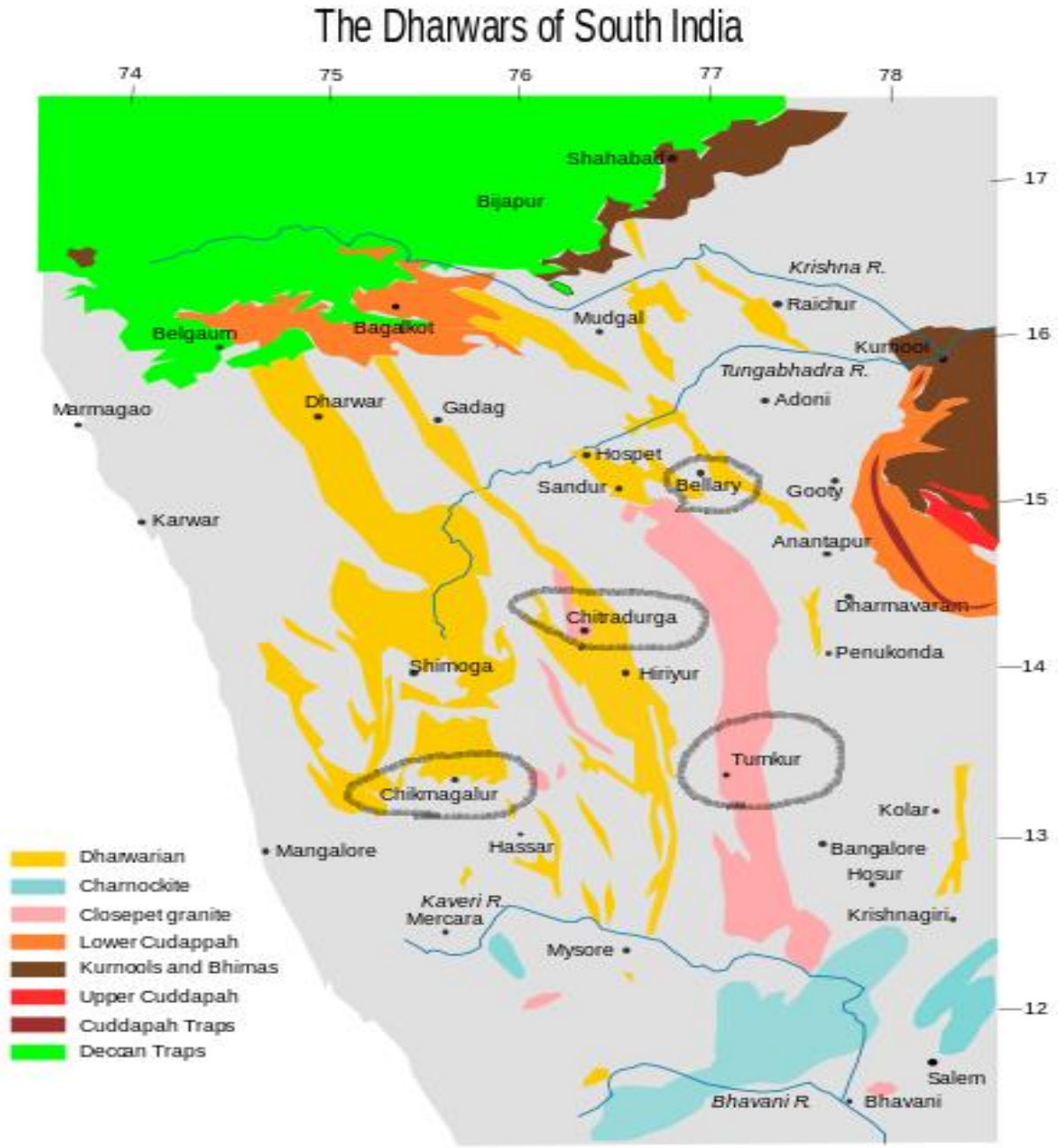


IRON ORE BELTS IN INDIA

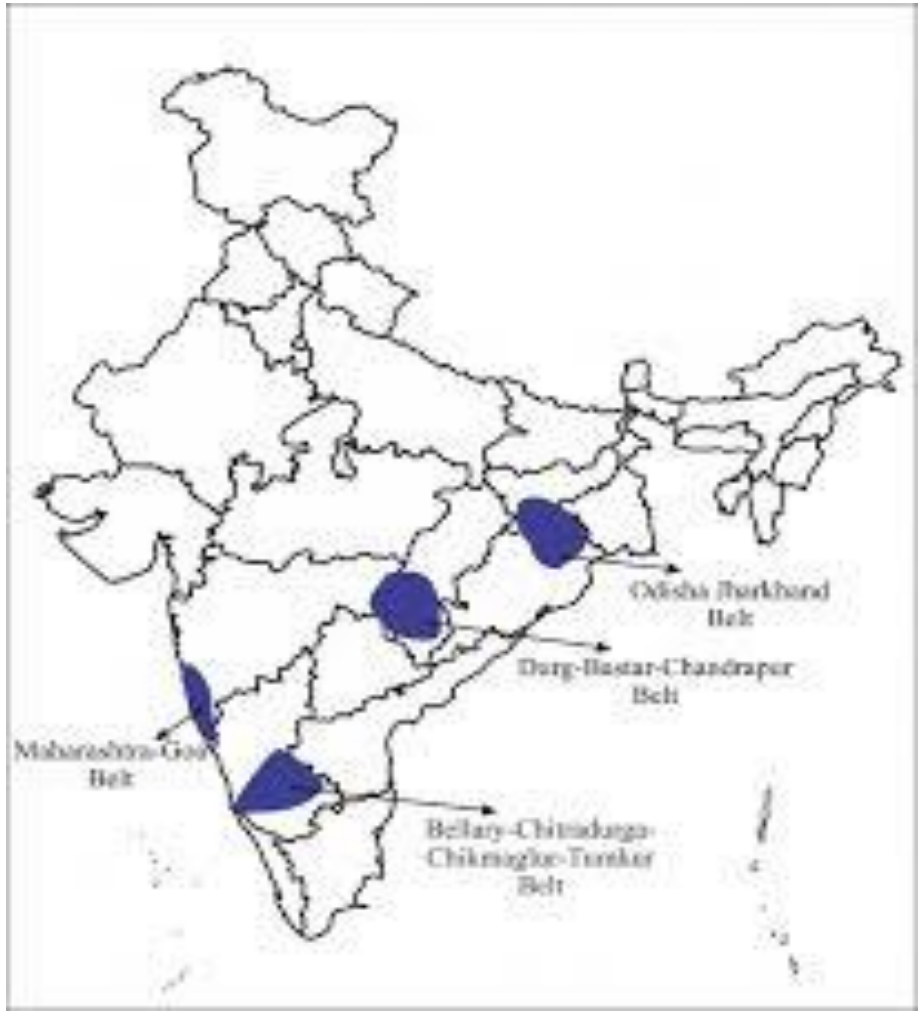
- **Odisha-Jharkhand belt**:
- Odisha -high grade hematite ore is found in Badampahar. mines in the Mayurbhanj and Kendujhar districts.
- Jharkhand- Hematite iron ore is mined in Gua and Noamundi in Singbhum district.

- **• Durg-Bastar-Chandrapur belt**
- lies in Chhattisgarh and Maharashtra.
- Very high grade hematite are found in the Bailadila range of hills in the Bastar district.
- Iron ore from these mines is exported to Japan and South Korea via Vishakhapatnam port.

BELLARY-CHITRADURGA-CHIKMAGLUR-TUMKUR BELT in Karnataka has large reserves of iron ore. The Kudermukh mines located in the Western Ghats of Karnataka are a 100 per cent export unit. Kudremukh deposits are known to be one of the largest in the world. The ore is transported as slurry through a pipeline to a port near Mangalore.

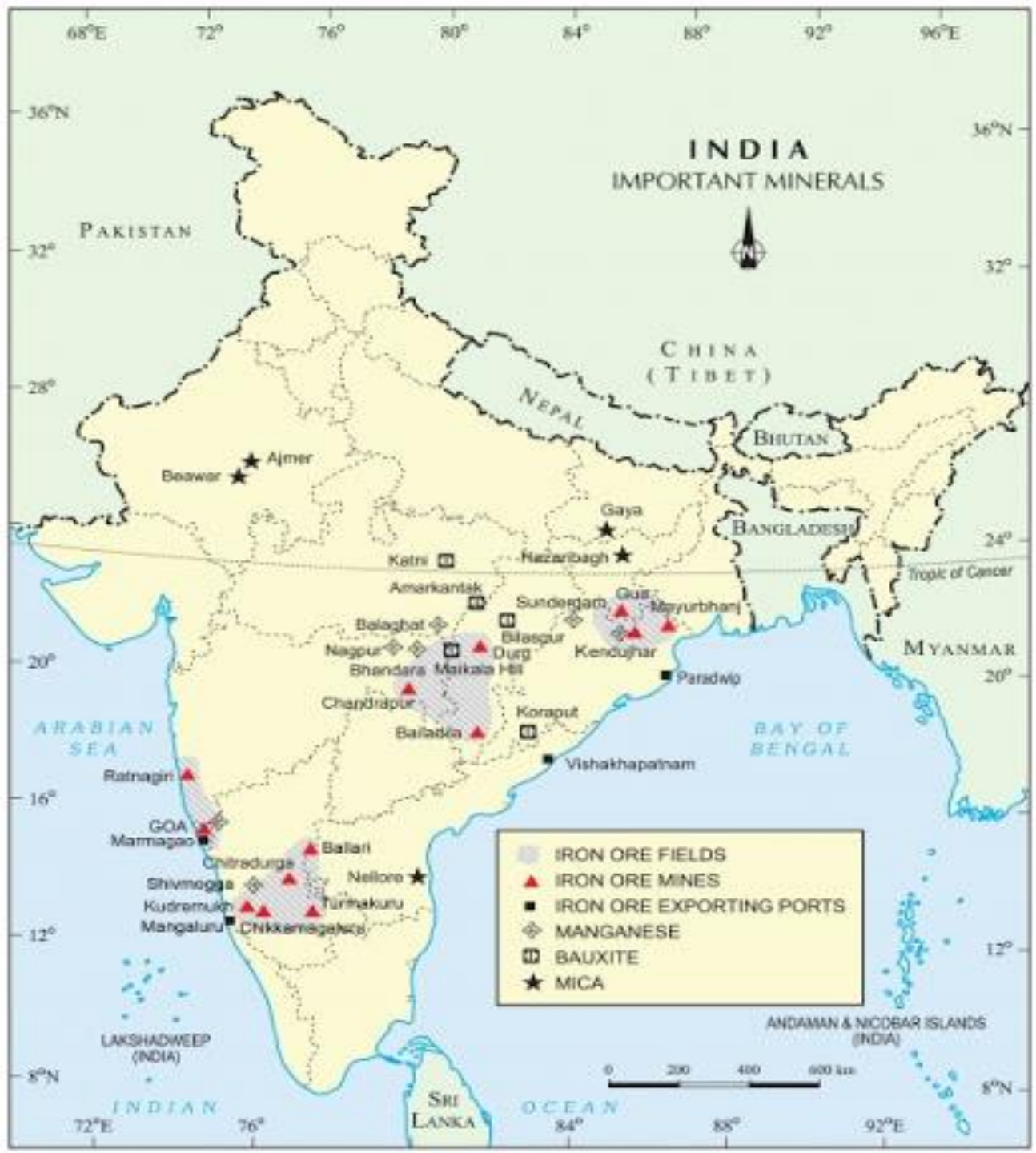


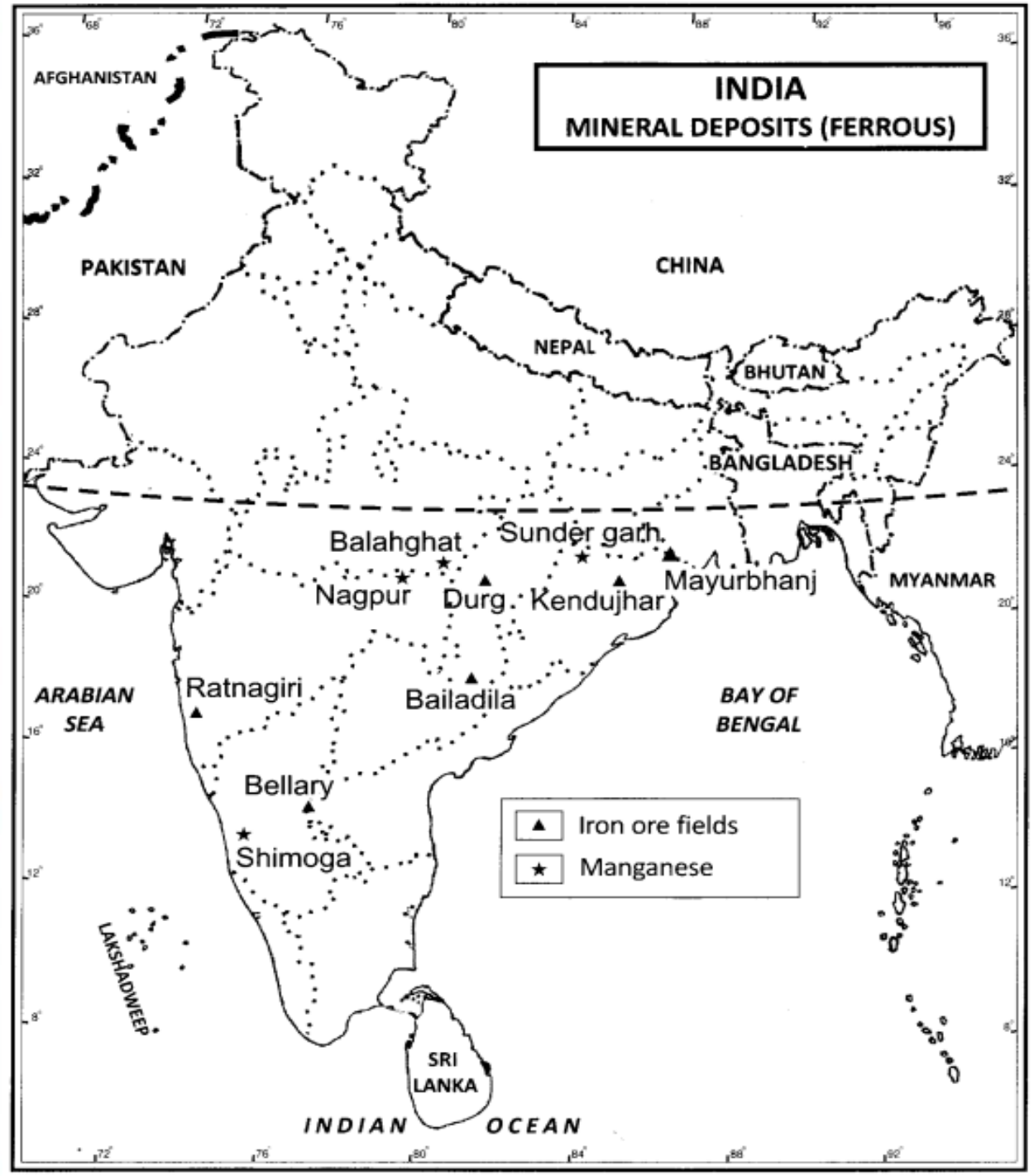
- **MAHARASHTRA-GOA BELT** includes the state of Goa and Ratnagiri district of Maharashtra. Though, the ores are not of very high quality, yet they are efficiently exploited. Iron ore is exported through Marmagao port.



MANGANESE

- Manganese is mainly used in the manufacturing of steel and Ferro-manganese alloy.
- Nearly 10 kg of manganese is required to manufacture one tonne of steel.
- It is also used in manufacturing bleaching powder, insecticides and paints .
- Orissa is the largest producer of manganese ores in India. It accounted for one-third of the country's total production in 2000-01.


INDIA
IMPORTANT MINERALS
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
Tropic of Cancer
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
SRI LANKA
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
Beawar
Ajmer
Gaya
Katni
Nazaribagh
Amarkantak
Sundergarh
Gua
Mayurbhanj
Balaghat
Bilaspur
Nagpur
Durg
Kendujhar
Bhandara
Maikala Hill
Chandrapur
Koraput
Baliadia
Paradwip
Vishakhapatnam
Ratnagiri
GOA
Marmagao
Ballari
Chitradurga
Shivmogga
Nellore
Kudremukh
Tumakuru
Mangaluru
Chikkamagalur
IRON ORE FIELDS
IRON ORE MINES
IRON ORE EXPORTING PORTS
MANGANESE
BAUXITE
MICA


INDIA
MINERAL DEPOSITS (FERROUS)
AFGHANISTAN
PAKISTAN
CHINA
NEPAL
BHUTAN
BANGLADESH
MYANMAR
Balahghat
Sunder garh
Nagpur
Durg
Kendujhar
Mayurbhanj
Ratnagiri
Bailadila
Bellary
Shimoga
ARABIAN SEA
BAY OF BENGAL
LAKSHADWEEP
SRI LANKA
INDIAN OCEAN
Iron ore fields
Manganese

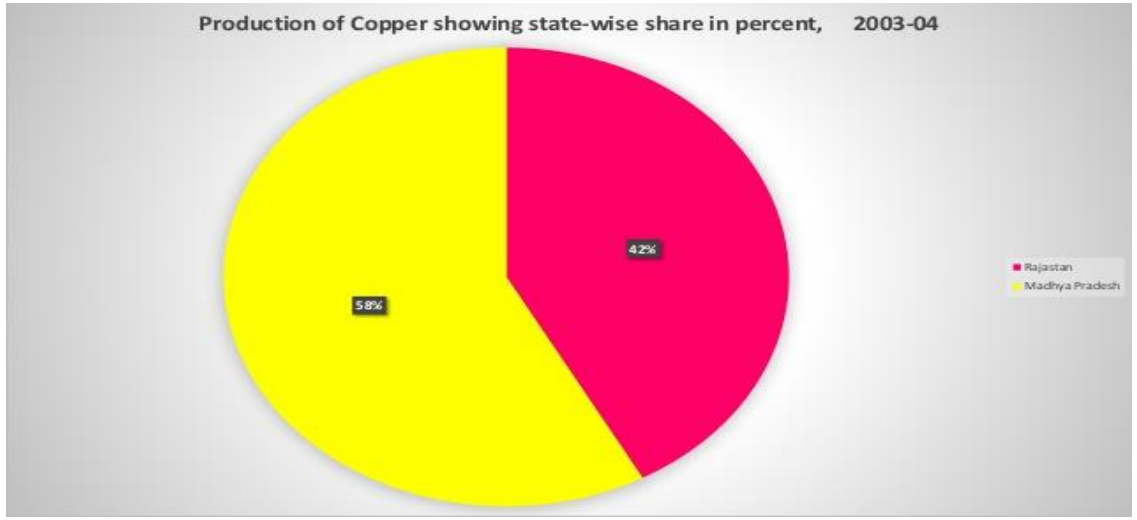
NON-FERROUS MINERALS:-

India’s reserves and production of non- ferrous minerals is not very satisfactory.

These minerals, which include copper, bauxite, lead, zinc and gold play a vital role in a number of metallurgical, engineering and electrical industries.

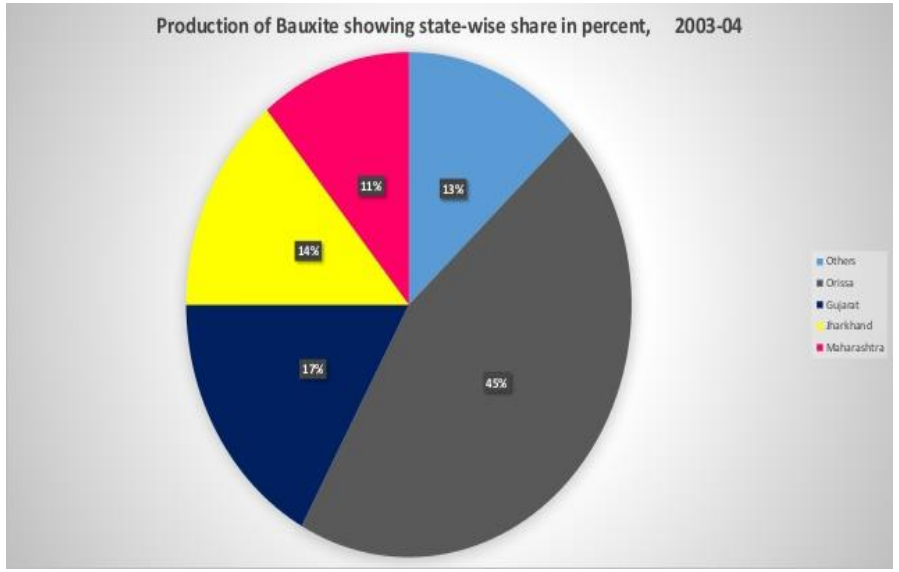
COPPER

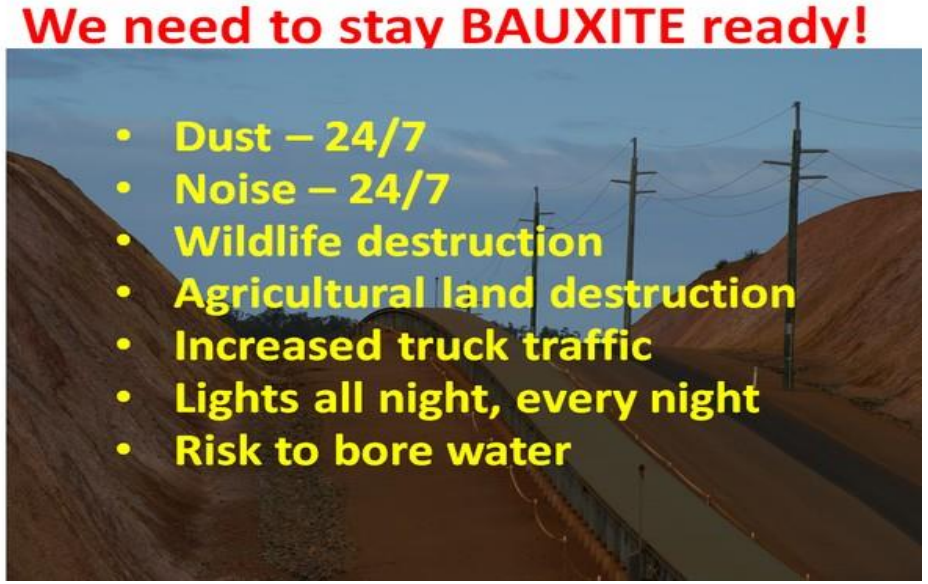
- Good conductor of electricity, used for making wires, electric motors, transformers and generators.
- **Area of production-** Rajasthan, MP, Jharkhand, Karnataka
- The Balaghat mines in Madhya Pradesh produce 52 per cent of India’s copper. The Singbhum district of Jharkhand is also a leading producer of copper. The Khetri mines in Rajasthan are also famous.



BAUXITE

- Though, several ores contain aluminium, it is from bauxite, a clay-like substance that alumina and later aluminium is obtained. Bauxite deposits are formed by the decomposition of a wide variety of rocks rich in aluminium silicates.
- Aluminium is used to manufacture automobiles and aircrafts, constructions, furniture, fittings, kitchenware etc because it combines the strength of metals such as iron, with extreme lightness and also with good conductivity and great malleability.
- **Largest producer of bauxite in India-** Odisha is the largest bauxite producing state in India with 45 per cent of the country's total production in 2000-01. Panchpatmali deposits in Koraput district are the most important bauxite deposits in the state.
- **Other areas are** Jharkhand, Chhattisgarh, MP, Gujarat, Maharastra, Tamil Nadu
- India's bauxite deposits are mainly found in the Amarkantak plateau, Maikal hills and the plateau region of Bilaspur- Katni.



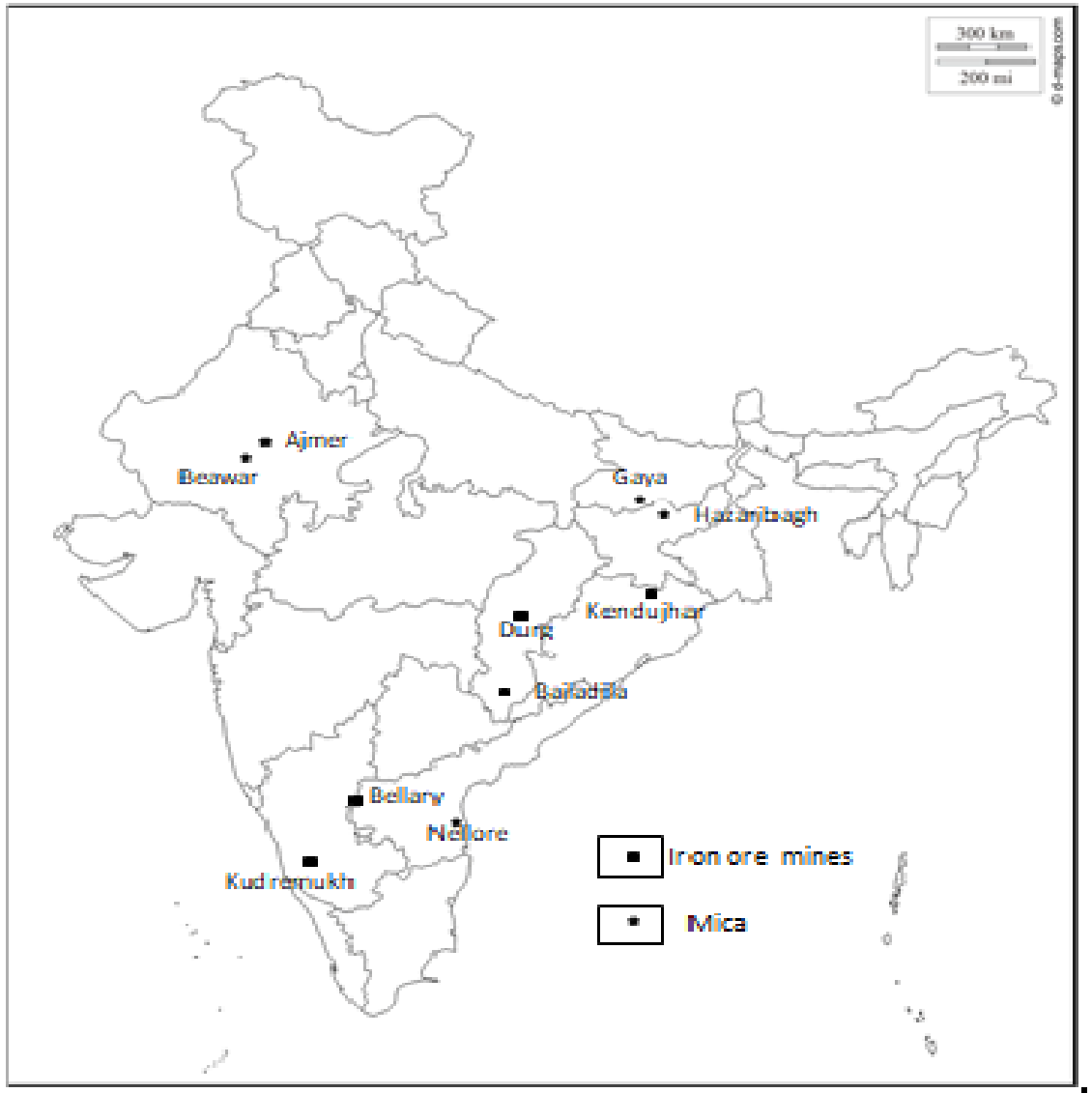


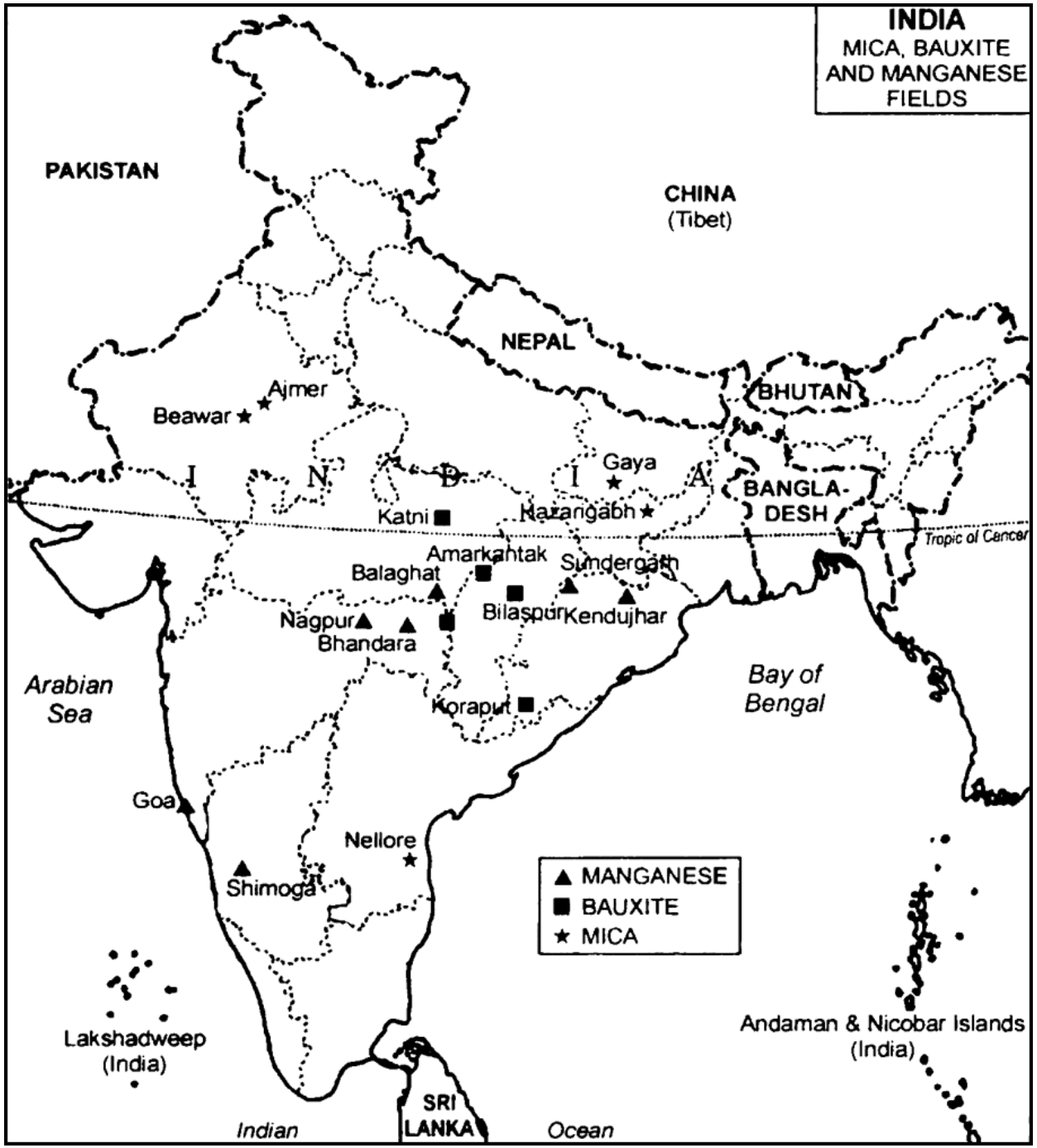
NON-METALLIC MINERALS:-

MICA

- **Largest producer and exporter in the world-** India
- Mica is a mineral made up of a series of plates or leaves. It splits easily into thin sheets. These sheets can be so thin that a thousand can be layered into a mica sheet of a few centimeters high.
- Mica can be clear, black, green, red yellow or brown. Due to its excellent di-electric strength, low power loss factor, insulating properties and resistance to high voltage, mica is one of the most indispensable minerals used in electric and electronic industries.
- Mica deposits are found in the northern edge of the Chota Nagpur plateau. Koderma Gaya – Hazaribagh belt of Jharkhand is the leading producer. In Rajasthan, the major mica producing area is around Ajmer. Nellore mica belt of Andhra Pradesh is also an important producer in the country.

INDIA: IRON ORE MINES AND MICA MINES





ROCK MINERALS

LIMESTONE

- **Areas-** Bihar, Jharkhand, Odisha, MP, Chhattisgarh, Rajasthan, Gujarat, Tamil Nadu.
- Limestone is found in association with rocks composed of calcium carbonates or calcium and magnesium carbonates. It is found in sedimentary rocks of most geological formations.
- Limestone is the basic raw material for the cement industry and essential for smelting iron ore in the blast furnace.

HAZARDS OF MINING (KILLER INDUSTRY)

Life as an Iron Miner

- Mining was hard work
- Early miners used pickaxes and shovels
- Horses and mules hauled ore out of the mine
- Work was dangerous
- Living conditions often unhealthy
- Bankruptcies were common

First mining camp near Mountain Iron in 1893

MINING WOES

- The Supreme Court had banned iron ore export from Karnataka in 2012
- The FIMI says the SC will be requested to relax the norms for ore miners of Karnataka
- Steel manufacturers in Karnataka are allowed to procure raw material from any other part of the country or import whereas, under current Supreme Court directives
- Iron ore procured from within Karnataka would cost steelmakers around ₹3,000 per tonne as against imported ore

- The dust and noxious fumes inhaled by miners make them vulnerable to pulmonary diseases.
- The risk of collapsing mine roofs, inundation and fires in coalmines are a constant threat to miners.
- The water sources in the region get contaminated due to mining.
- Dumping of waste and slurry leads to degradation of land, soil, and increase in stream and river pollution.

Stricter safety regulations and implementation of environmental laws are essential to prevent mining from becoming a “killer 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.

CONSERVATION OF MINERALS

- The total volume of workable mineral deposits is only 1% of the earth's crust.
- The geological processes of mineral replenishment are infinitely small in comparison to the present rates of consumption.
- Mineral resources are therefore non-renewable.
- Continued extraction of ores lead to increasing costs as mineral extraction comes from greater depths along with decrease in quality.
- A concerted effort has to be made in order to use our mineral resources in a planned and sustainable manner.
- Improved technologies need to be constantly evolved to allow use of low grade ores at low costs.
- Recycling of metals, using scrap metals and other substitutes are steps in conserving our mineral resources for the future.

RECAPITULATION:-

- Mineral Resources
- Mode of occurrence of minerals
- Types of Minerals
- Extraction of Minerals
- Distribution of Minerals in India and its Uses (Iron-Ore, Bauxite, Mica, Copper, Manganese, Limestone)
- Hazards of mining
- Conservation of minerals

CONTENT:-

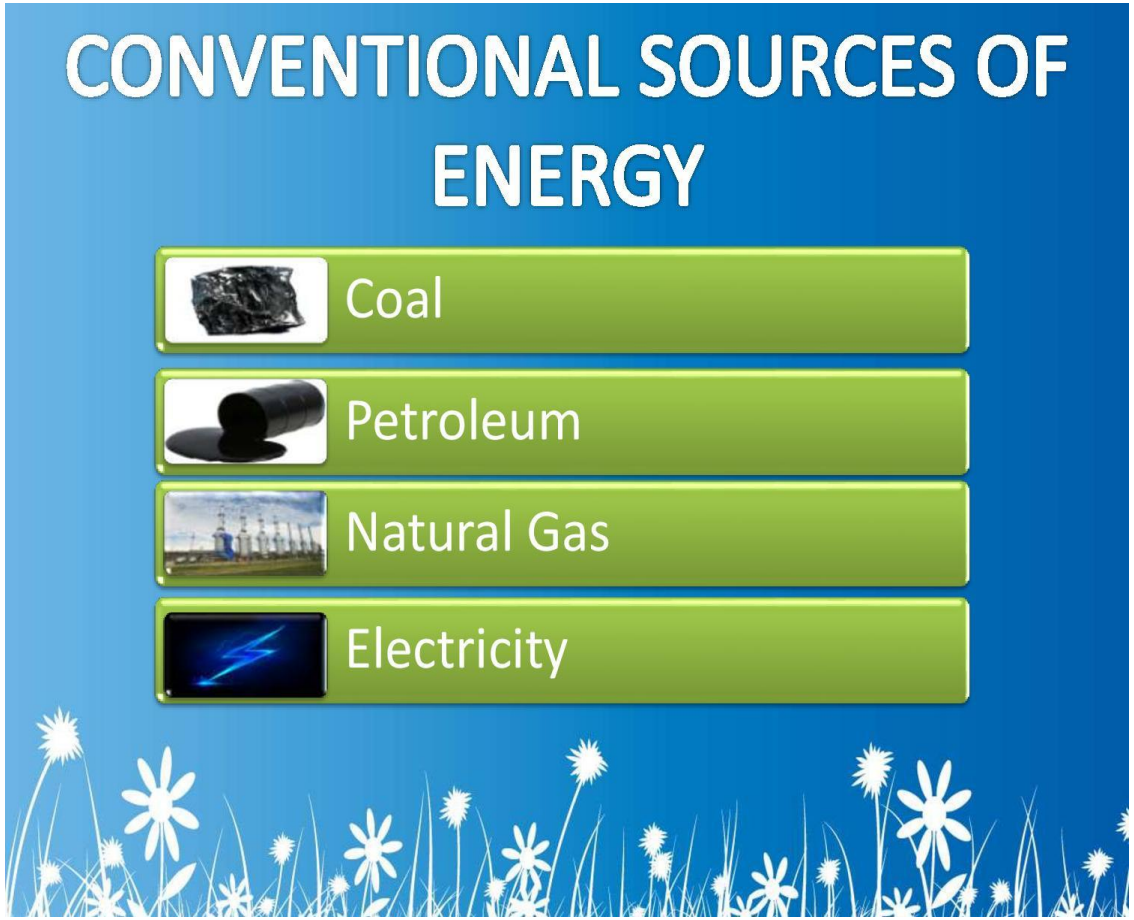
- Energy Resources
- Conventional Sources of Energy (Coal, Petroleum, Natural Gas, Electricity-Hydro and Thermal)
- Non-Conventional Sources of Energy (Hydroelectric Power, Solar Energy, Wind Energy, Nuclear Power, Geothermal Energy, Tidal Energy, Biogas)
- Need for using Non-Conventional Sources of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

ENERGY RESOURCES

- Energy is required for all activities. It is needed to cook, to provide light and heat, to propel vehicles and to drive machinery in industries.
- Energy can be generated from fuel minerals like coal, petroleum, natural gas, uranium and from electricity.
- Energy resources can be classified as **conventional** and **nonconventional** sources.
- Conventional sources include: firewood, cattle dung cake, coal, petroleum, natural gas and electricity (both hydel and thermal).
- Non-conventional sources include solar, wind, tidal, geothermal, biogas and atomic energy.
- Firewood and cattle dung cake are most common in rural India. According to one estimate more than 70 per cent energy requirement in rural households is met by these two ; continuation of these is increasingly becoming difficult due to decreasing forest area. Moreover, using dung cake too is being discouraged because it consumes most valuable manure which could be used in agriculture.

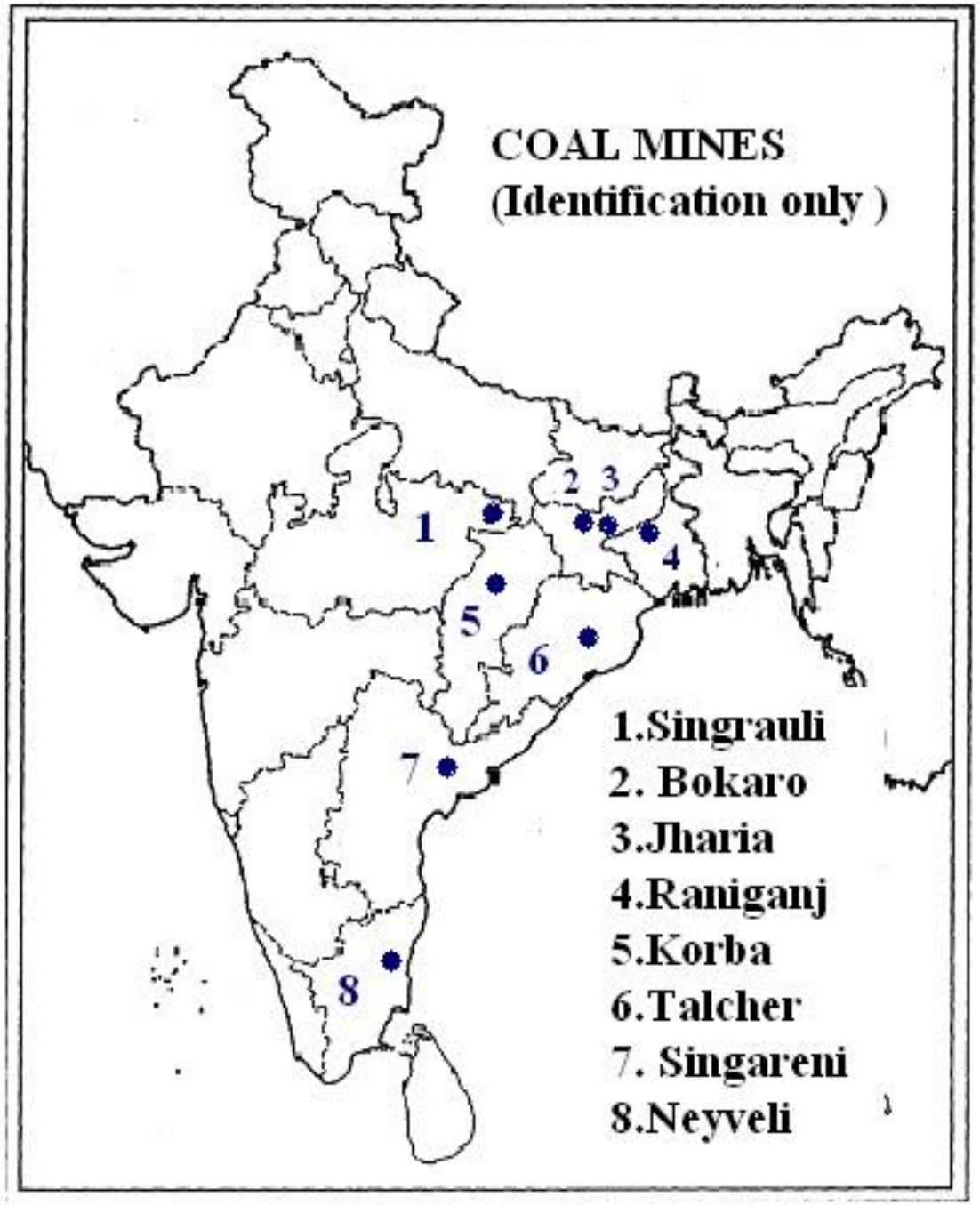
CONVENTIONAL SOURCES OF ENERGY

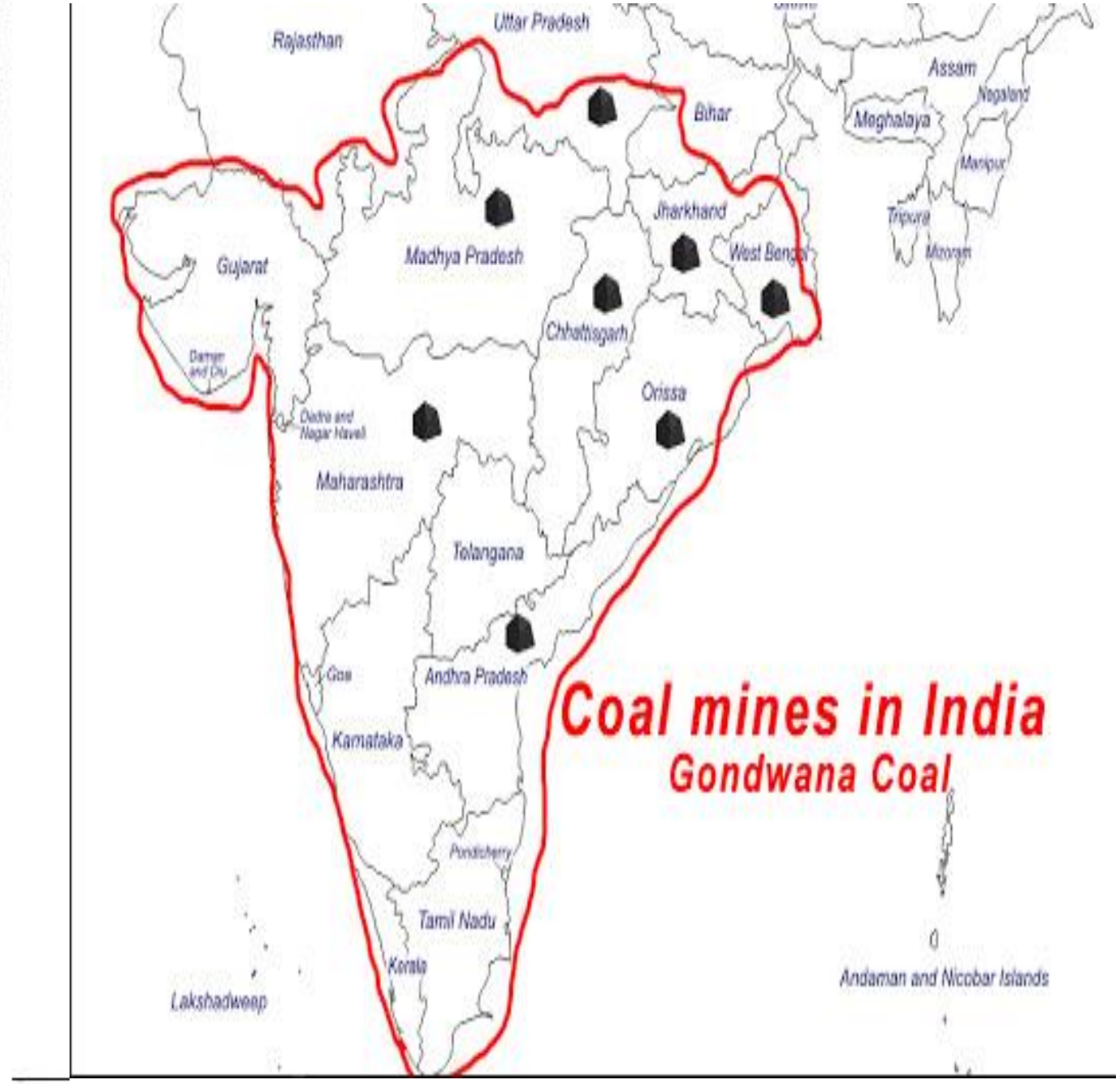
- The energy resources which have been in common use for a long time are known as conventional sources.
- Firewood and fossil fuels are two main conventional energy sources.
- Fossil fuels comprises of Coal(known as buried sunshine), Petroleum (known as black gold), Natural Gas and Hydroelectricity.



COAL

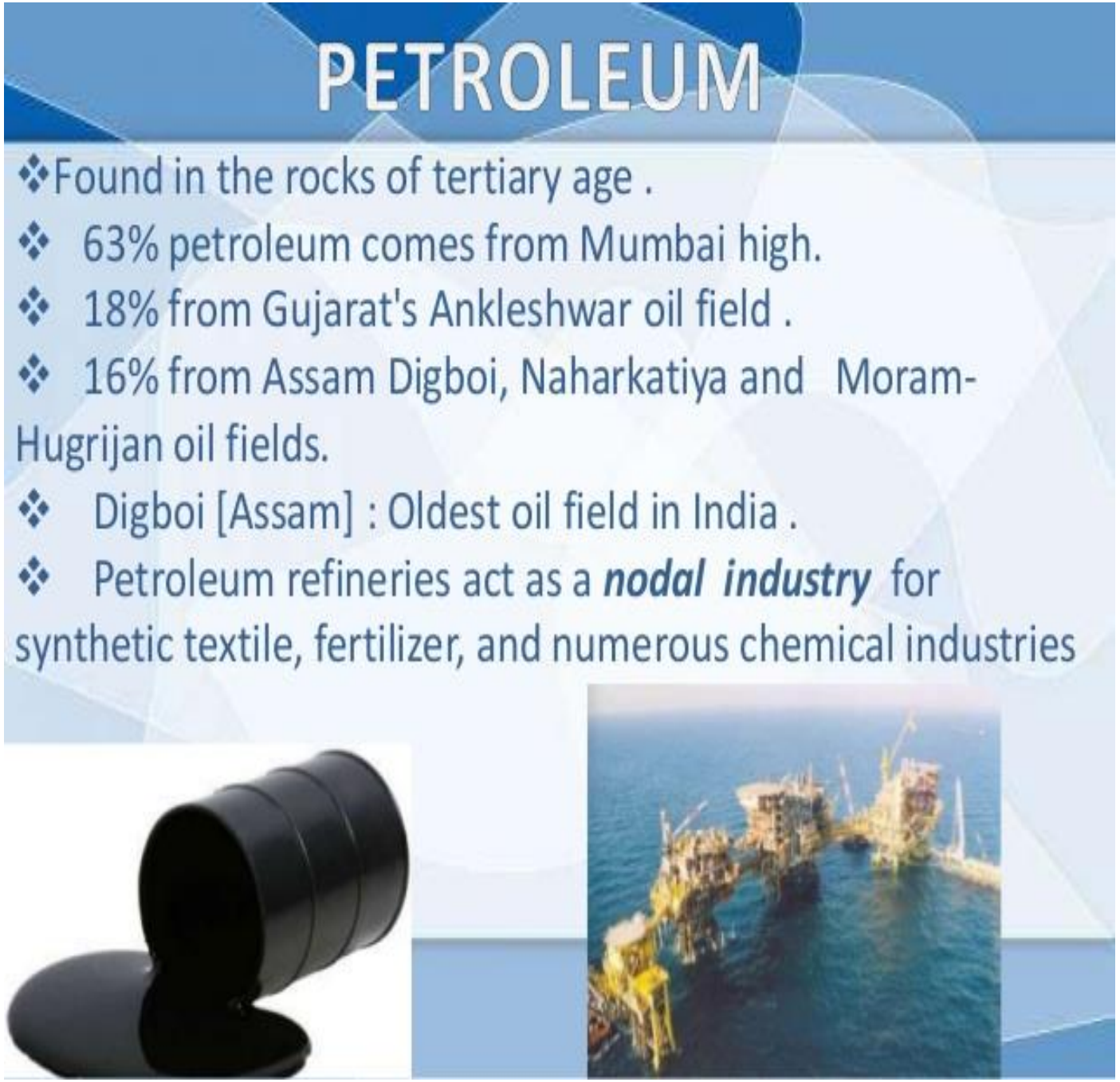
- Coal is formed due the compression of plant material over millions of years. Coal, therefore, is found in a variety of forms depending on the degrees of compression and the depth and time of burial.
- Decaying plants in swamps produce **PEAT** which has a low carbon and high moisture contents and low heating capacity.
- **LIGNITE** is a low grade brown coal, which is soft with high moisture content. The principal lignite reserves are in Neyveli in Tamil Nadu and are used for generation of electricity.
- Coal that has been buried deep and subjected to increased temperatures is **BITUMINOUS** coal. It is the most popular coal in commercial use. Metallurgical coal is high grade bituminous coal which has a special value for smelting iron in blast furnaces.
- **ANTHRACITE** is the highest quality hard coal.
- In India coal occurs in rock series of two main geological ages, namely Gondwana, a little over 200 million years in age and in tertiary deposits which are only about 55 million years old.
- The major resources of Gondwana coal, which are metallurgical coal, are located in Damodar valley (West Bengal-Jharkhand). Jharia, Raniganj, Bokaro are important coalfields. The Godavari, Mahanadi, Son and Wardha valleys also contain coal deposits.
- Tertiary coals occur in the north eastern states of Meghalaya, Assam, Arunachal Pradesh and Nagaland.
- Coal is a bulky material, which loses weight on use as it is reduced to ash. Hence, heavy industries and thermal power station are located on or near the coalfields.


COAL MINES
(Identification only)
1
2
3
4
5
6
7
8
1.Singrauli
2. Bokaro
3.Jharia
4.Raniganj
5.Korba
6.Talcher
7. Singareni
8.Neyveli

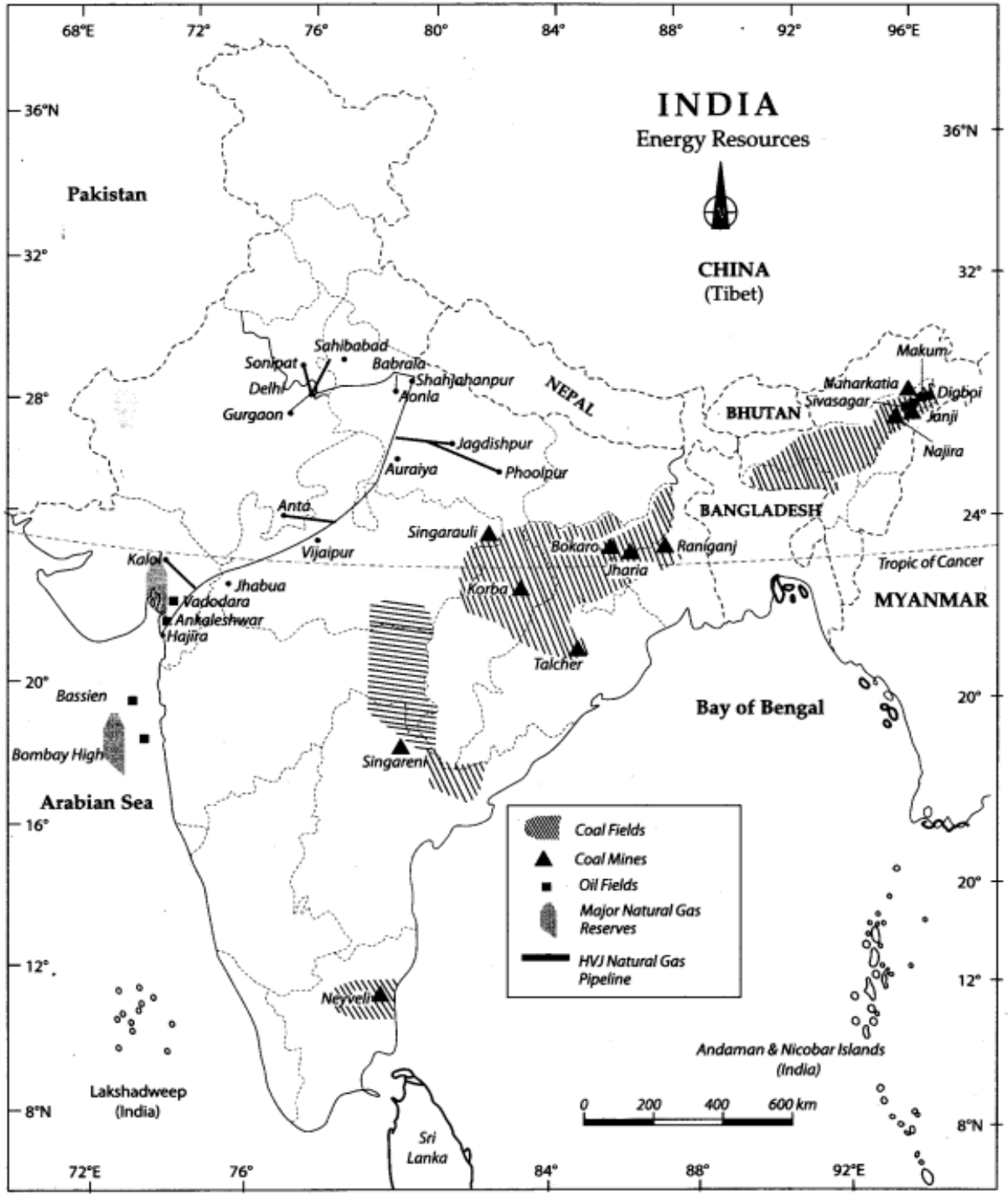

Rajasthan
Uttar Pradesh
Bihar
Assam
Nagaland
Meghalaya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Daman and Diu
Orissa
Dadra and Nagar Haveli
Maharashtra
Telangana
Goa
Andhra Pradesh
Karnataka
Puducherry
Tamil Nadu
Kerala
Lakshadweep
Andaman and Nicobar Islands
Coal mines in India
Gondwana Coal

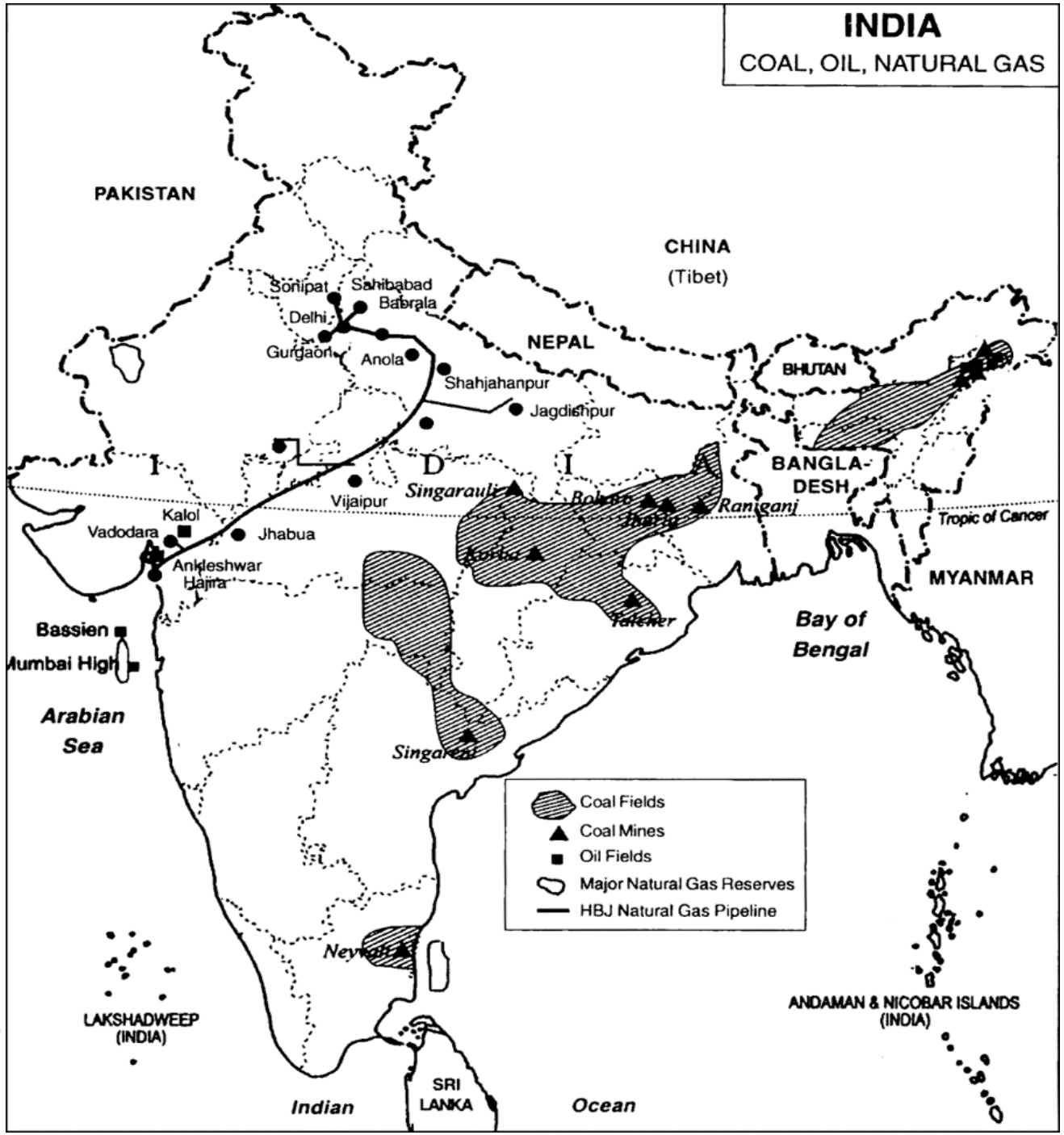
PETROLEUM

- 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.



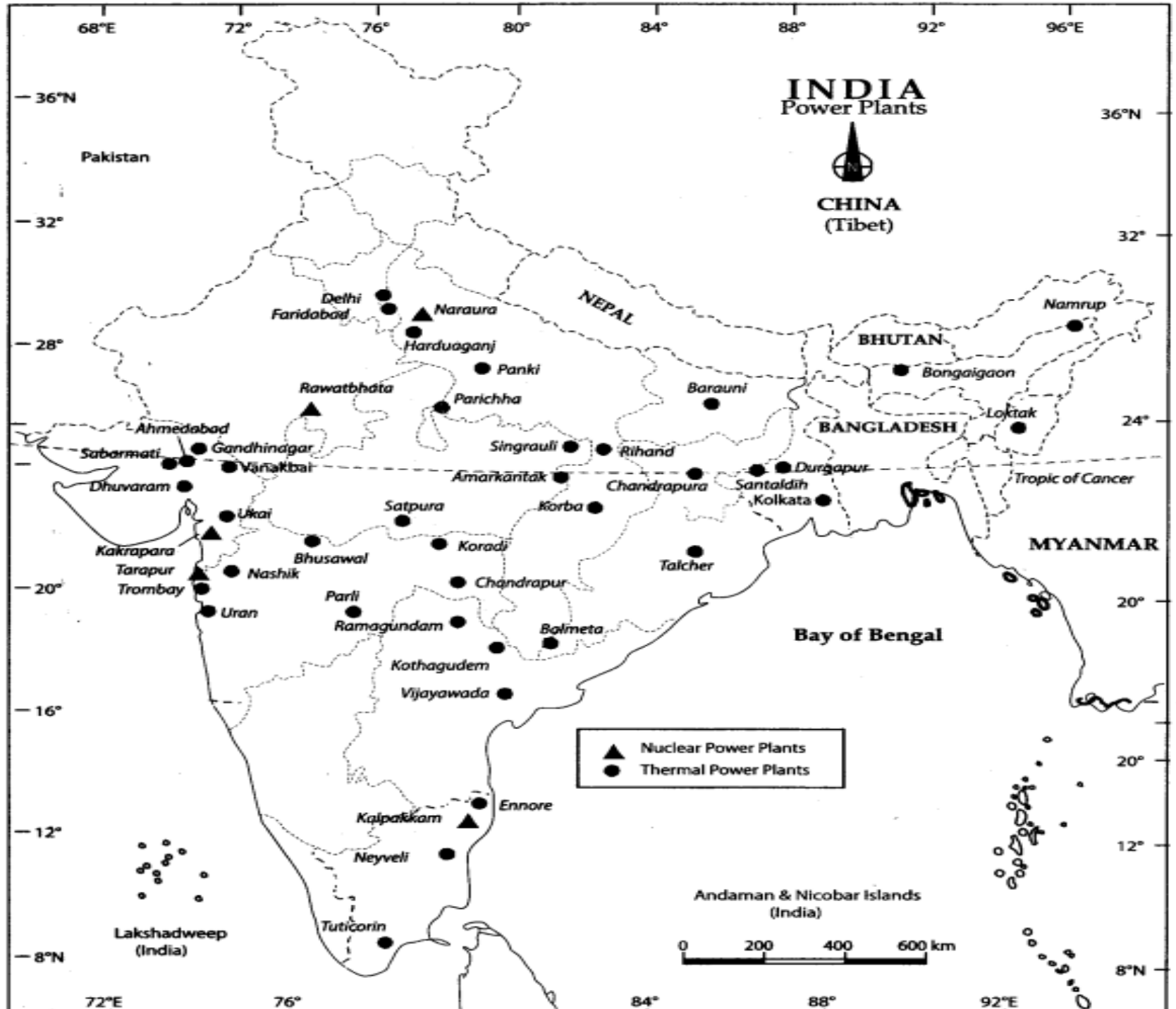
- **NATURAL GAS**
- Found with petroleum deposits-released when crude oil is brought to the surface-used as a domestic and industrial fuel.
- It is used as a source of energy as well as an industrial raw material in the petrochemical industry.
- Large reserves of natural gas have been discovered in the Krishna- Godavari basin. Along the west coast the reserves of the Mumbai High and allied fields are supplemented by finds in the Gulf of Cambay. Andaman and Nicobar islands are also important areas having large reserves of natural gas.
- The 1700 km long Hazira-BijaipurJagdishpur cross country gas pipeline links Mumbai High and Bassien with the fertilizer, power and industrial complexes in western and northern India. This artery has provided an impetus to India's gas production. The power and fertilizer industries are the key users of natural gas.
- 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 to replace liquid fuels, is gaining wide popularity in the country.


INDIA
Energy Resources
Pakistan
CHINA
(Tibet)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
Sonipat
Sahibabad
Babrala
Delhi
Gurgaon
Shahjahanpur
Aonla
Jagdishpur
Auraiya
Phoolpur
Anta
Vijaipur
Kalol
Vadodara
Jhabua
Ankaleshwar
Hajira
Bassien
Bombay High
Arabian Sea
Singarauli
Korba
Talcher
Bokaro
Jharia
Raniganj
Singareni
Neyveli
Bay of Bengal
Tropic of Cancer
Makum
Maharkatia
Sivasagar
Digboi
Janji
Najira
Andaman & Nicobar Islands
(India)
Lakshadweep
(India)
Sri
Lanka
Coal Fields
Coal Mines
Oil Fields
Major Natural Gas
Reserves
HVJ Natural Gas
Pipeline
0 200 400 600 km
68°E
72°
76°
80°
84°
88°
92°
96°E
36°N
32°
28°
24°
20°
16°
12°
8°N


INDIA
COAL, OIL, NATURAL GAS
PAKISTAN
CHINA
(Tibet)
NEPAL
BHUTAN
BANGLA-
DESH
MYANMAR
Sonipat
Sahibabad
Babrala
Delhi
Gurgaon
Anola
Shahjahanpur
Jagdishpur
Vijaipur
Singarauli
Kalol
Vadodara
Jhabua
Ankleshwar
Hajira
Bassien
Mumbai High
Arabian
Sea
Korba
Bokaro
Jharia
Raniganj
Talcher
Singareni
Neyveli
Bay of
Bengal
Tropic of Cancer
LAKSHADWEEP
(INDIA)
ANDAMAN & NICOBAR ISLANDS
(INDIA)
SRI
LANKA
Indian
Ocean
Coal Fields
Coal Mines
Oil Fields
Major Natural Gas Reserves
HBJ Natural Gas Pipeline

ELECTRICITY

- Electricity has such a wide range of applications in today's world that, its percapita consumption is considered as an index of development.
- Electricity is generated mainly in two ways: by running water which drives hydro turbines to generate hydro electricity; and by burning other fuels such as coal, petroleum and natural gas to drive turbines to produce thermal power. Once generated the electricity is exactly the same.
- **Hydro electricity** is generated by fast flowing water, which is a renewable resource. India has a number of multi-purpose projects like the Bhakra Nangal, Damodar Valley corporation, the Kopili Hydel Project etc. producing hydroelectric power.
- **Thermal electricity** is generated by using coal, petroleum and natural gas. The thermal power stations use non-renewable fossil fuels for generating electricity. There are over 310 thermal power plants in India.
- **Nuclear or Atomic Energy** is obtained by altering the structure of atoms. When such an alteration is made, much energy is released in the form of heat and this is used to generate electric power. Uranium and thorium, which are available in Jharkhand and the Aravalli ranges of Rajasthan are used for generating atomic or nuclear power. The Monazite sands of Kerala is also rich in thorium.


INDIA
Power Plants
CHINA
(Tibet)
Pakistan
NEPAL
BHUTAN
BANGLADESH
MYANMAR
Bay of Bengal
Delhi
Faridabad
Naraura
Harduaganj
Panki
Rawatbhata
Parichha
Barauni
Namrup
Bongaigaon
Loktak
Ahmedabad
Gandhinagar
Sabarmati
Vanakbai
Dhuvaram
Ukai
Kakrapara
Tarapur
Trombay
Uran
Nashik
Bhusawal
Satpura
Singrauli
Rihand
Amarkantak
Chandrapura
Korba
Santaldih
Durgapur
Kolkata
Tropic of Cancer
Koradi
Chandrapur
Parli
Ramagundam
Balmeta
Kothagudem
Vijayawada
Talcher
Ennore
Kalpakkam
Neyveli
Tuticorin
Lakshadweep
(India)
Andaman & Nicobar Islands
(India)
Nuclear Power Plants
Thermal Power Plants
0 200 400 600 km
68°E
72°
76°
80°
84°
88°
92°
96°E
36°N
32°
28°
24°
20°
16°
12°
8°N

NON-CONVENTIONAL SOURCES OF ENERGY

- Non-conventional sources of energy are renewable in nature. There is a pressing need to use renewable energy sources like solar energy, wind, tide, biomass and energy from waste material. These are called nonconventional energy sources. India is blessed with an abundance of sunlight, water, wind and biomass. It has the largest programs for the development of these renewable energy resources.
- 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.

Conventional Sources	Non-conventional Sources
Conventional sources of energy (e.g. coal, petroleum and natural gas) are non-renewable sources of energy.	Non-conventional sources of energy (e.g. solar and wind energy) are renewable sources of energy.
They have been in use since a long time. For example, firewood and coal have been in use since a long time.	These sources have recently developed and are still developing. For example, the technology of producing electricity from solar panels has recently developed.
Most of these energy sources (e.g. coal and firewood) cause pollution when used.	They do not cause any pollution (e.g. solar energy, geothermal energy etc.)
They are common and widely used sources (e.g. thermal power).	They are comparatively new sources of energy and hence are not widely used. For example, solar panels and wind mills are not widely used.

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.
- Photovoltaic technology converts sunlight directly into electricity. Solar energy is fast becoming popular in rural and remote areas.
- The largest solar plant of India is located at Madhapur, near Bhuj, where solar energy is used to sterlise milk cans. It is expected that use of solar energy will be able to minimise the dependence of rural households on firewood and dung cakes, which in turn will contribute to environmental conservation and adequate supply of manure in agriculture.
- 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.
- India now ranks as a “wind super power” in the world.
- The largest wind farm cluster is located in Tamil Nadu from Nagarcoil to Madurai. Apart from these, Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra and Lakshadweep have important wind farms. Nagarcoil and Jaisalmer are well known for effective use of wind energy in the country.

BIOGAS

- Shrubs, farm waste, animal and human waste are used to produce biogas for domestic consumption in rural areas. Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake and charcoal.
- Biogas plants are set up at municipal, cooperative and individual levels. The plants using cattle dung are know as ‘Gobar gas plants’ in rural India. These provide twin benefits to the farmer in the form of energy and improved quality of manure.
- Biogas is by far the most efficient use of cattle dung. It improves the quality of manure and also prevents the loss of trees and manure due to burning of fuel wood and cow dung cakes.

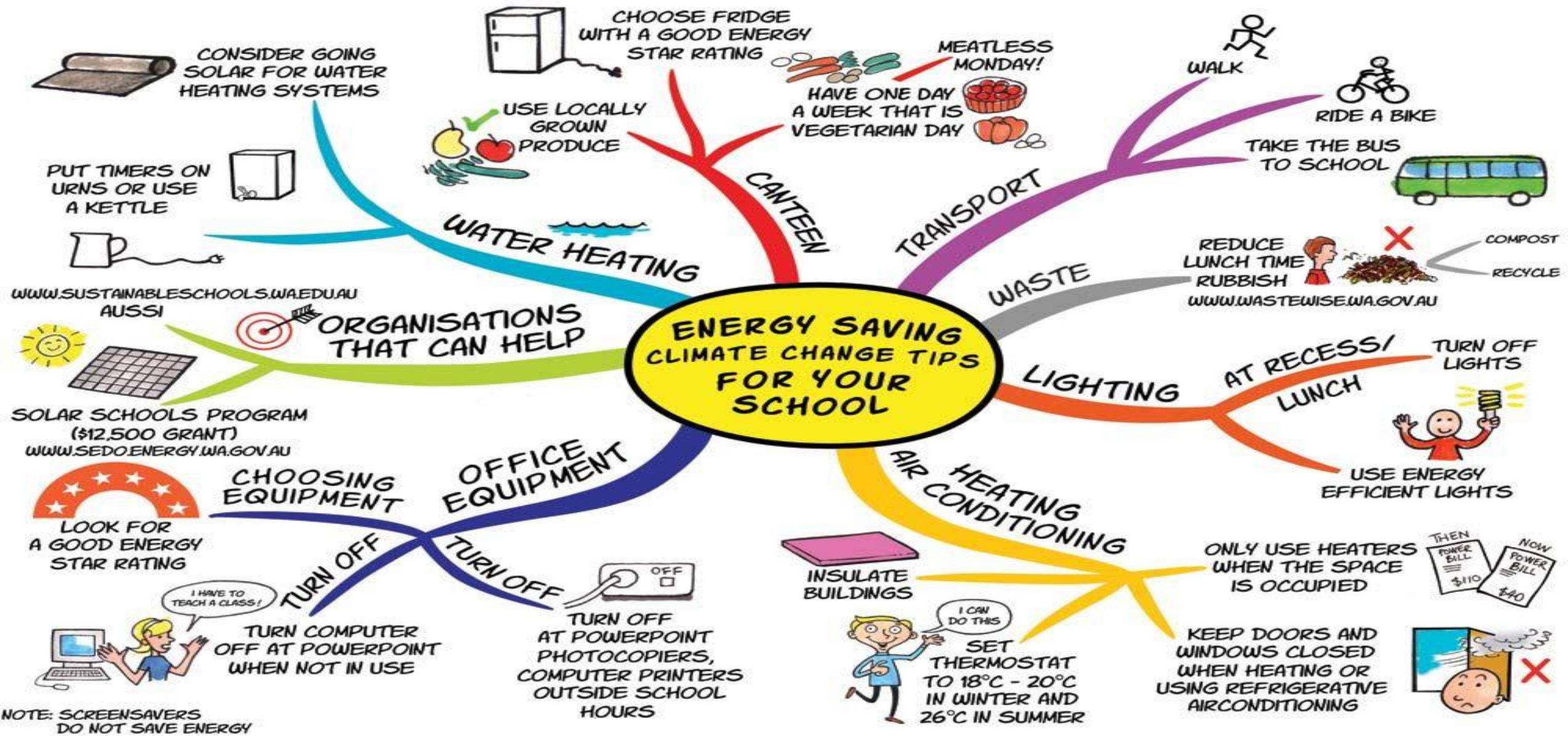
TIDAL ENERGY

- 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
- Oceanic tides can be used to generate electricity. Floodgate dams are built across inlets. During high tide water flows into the inlet and gets trapped when the gate is closed. After the tide falls outside the flood gate, the water retained by the floodgate flows back to the sea via a pipe that carries it through a power-generating turbine.
- In India, the Gulf of Kuchchh, provides ideal conditions for utilising tidal energy. A 900 mw tidal energy power plant is set up here by the National Hydropower Corporation.

GEO-THERMAL ENERGY

- Geothermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth. Geothermal energy exists because, the Earth grows progressively hotter with increasing depth. Where the geothermal gradient is high, high temperatures are found at shallow depths. Groundwater in such areas absorbs heat from the rocks and becomes hot. It is so hot that when it rises to the earth's surface, it turns into steam. This steam is used to drive turbines and generate electricity.
- There are several hundred hot springs in India, which could be used to generate electricity.
- Two experimental projects have been set up in India to harness geothermal energy. **Geothermal plants in India**-located in the Parvati valley near Manikaran in Himachal Pradesh and Puga Valley in Ladakh

CONSERVATION OF ENERGY



- Energy is a basic requirement for economic development. Every sector of the national economy – agriculture, industry, transport, commercial and domestic – needs inputs of energy. The economic development plans implemented since Independence necessarily required increasing amounts of energy to remain operational. As a result, consumption of energy in all forms has been steadily rising all over the country. In this background, there is an urgent need to develop a sustainable path of energy development.
- Promotion of energy conservation and increased use of renewable energy sources are the twin planks of sustainable energy.
- India is presently one of the least energy efficient countries in the world. We have to adopt a cautious approach for the judicious use of our limited energy resources. For example, as concerned citizens we can do our bit by using public transport systems instead of individual vehicles; switching off electricity when not in use, using power-saving devices and using non-conventional sources of energy.
- After all, **“energy saved is energy produced”.**

Thank You
&
Happy Learning!