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MINERAL & ENERGY RESOURCES



MINERAL DEPOSIT

- Mineral Deposit: concentrated, natural occurrence of one or more minerals.
- Mineral deposits can form within any kind of rock and consist of any type of mineral.
- They are valuable economically because they contain high concentrations of metallic and nonmetallic elements or other valuable

- The concentration of a mineral in a mineral deposit is critically important in determining whether it can be mined profitably.
- For the mining of metals, concentration in a mineral deposit is measured in two ways.
- The grade depends on the percentage by weight of a metal in a mineral deposit.
- This percentage is measured by dividing the weight of the metal by the weight of the rock.
- The concentration factor (also called enrichment

- The concentration factor is measured by dividing a mineral deposit's grade by the average grade of crustal rocks for that metal.
- A concentration factor of ten, for example, means that a metal is ten times more abundant in a particular deposit than in the earth's crust.
- If a metal is to be mined profitably, it must have attained a minimum concentration factor

concentration factor of between 5 and 10.

- Gold and silver, however, require concentration factors in excess of 2,000.

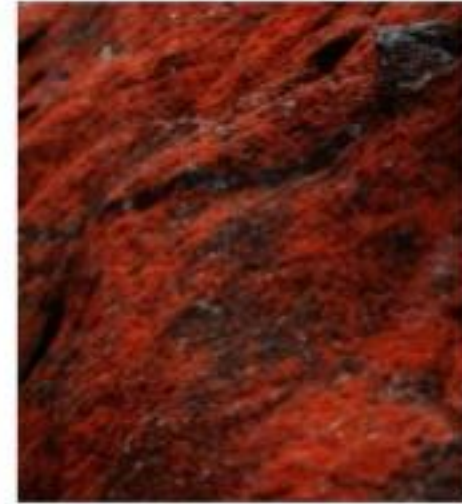
- The term **ore** describes rock that contains high enough concentrations of a metal to be mined profitably.



MICA



COAL



IRON



MANGANESE





Galena



Jasper



Marcasite



Gypsum
(Selenite)



Dolomite



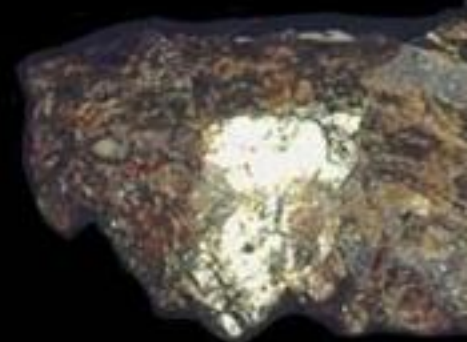
Calcite



Halite



Oolite



Sphalerite



- The accessibility of a mineral deposit also plays an important role in determining the cost-effectiveness of mining.
- In general, deposits that reside deeper in the crust are more difficult and more expensive to mine.
- Consequently, the minimum required concentration factor increases with the difficulty of extraction.

Graded Bedding

- The layers, or beds, in a sedimentary rock are called graded beds when the size of the grain particles vary within the thickness of the bed.
- Graded bedding usually has the coarsest material near its bottom because this material settles first, and the finest material near its top because this material settles last.
- The rock in the photograph is laying on its side, but it displays several beds consisting of darker, coarser

BED OR LAYER DEPOSIT



BED OR LAYER DEPOSIT



the formation of sediment layers at an angle to the underlying sediment bed.

- Sand dunes and ripples at the bottom of rivers are two areas where cross-bedding forms.
- The cross-bed layers always slope toward the down current direction of the wind or water current that produced them.
- Scientists use cross-bed slopes to determine the direction of flow of the current that deposited them.

Cross-bedding in Sandstone



Sedimentary Rock Beds

- Sedimentary rocks often consist of flat, thin, parallel bands, called beds.
- They are formed when sediments, laid down in flat, thin beds, are buried, compressed, and cemented together.
- Individual beds are easily identified because they exhibit slight differences from adjacent

Sedimentary Rock Beds



- Gold was discovered in California in 1848.
- Two main methods were used for gold mining:
 - lode and placer mining.
 - In lode mining, prospectors dug into the earth in an effort to reach pockets of minerals.
 - In placer mining, prospectors found gold in the gravels of existing and dried streams.

Placer Mining

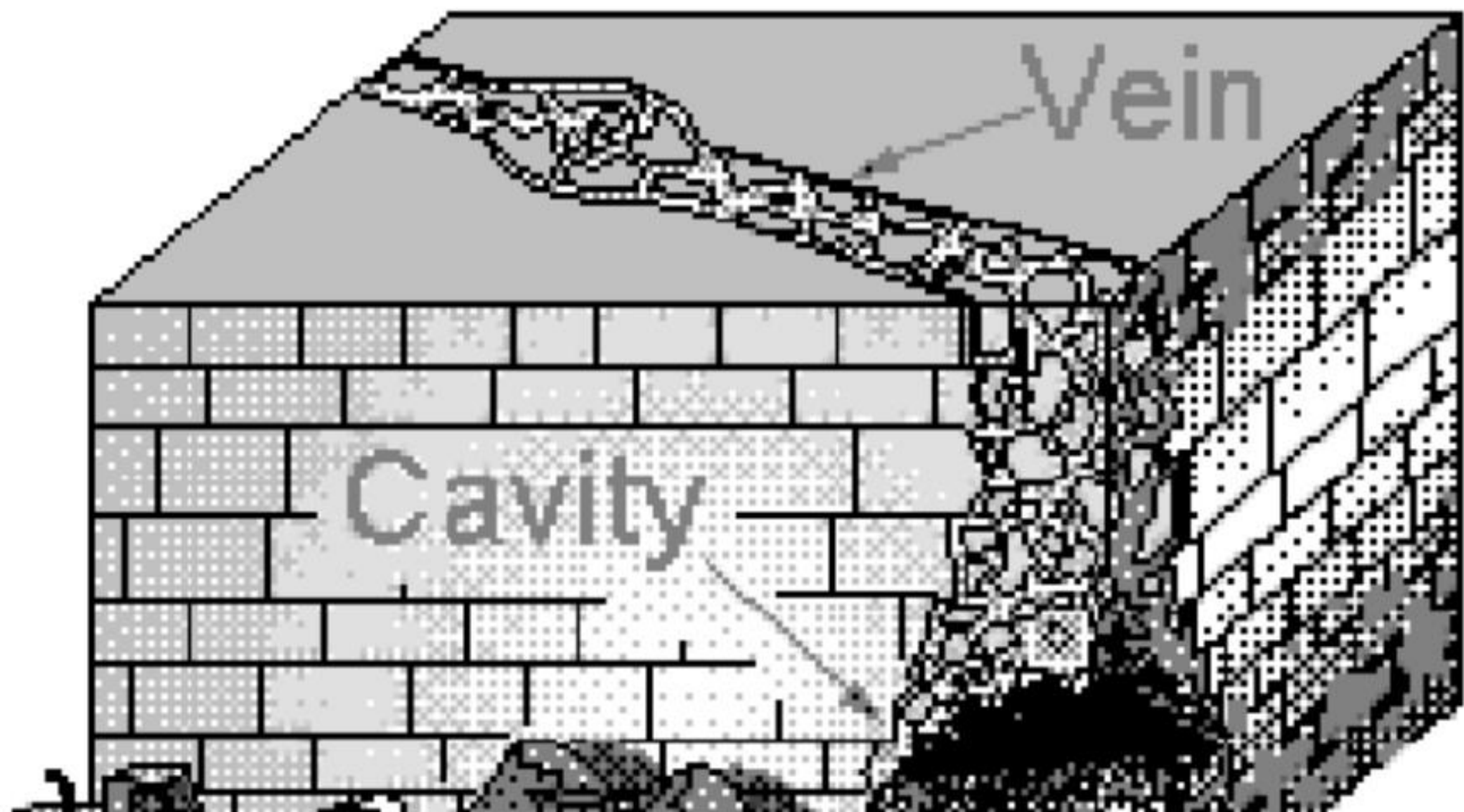


- Geological processes, such as melting and crystallizing of igneous rocks as well as erosion and deposition, sometimes separate and concentrate minerals.
- At other times, these processes mix and dilute them.
- Any process that separates and concentrates minerals is called a process of segregation.

- Vein in geology, is a tabular mass of mineral matter, deposited in the fissure, crack, or crevice of a body of rock, differing in composition from the substance in which it is embedded.
- Most veins are the result of the gradual precipitation of substances, which were carried by underground waters or gases after

- Veins vary in size from tiny streaks, which may be entirely contained in a small rock specimen, to masses thousands of feet in extent.

- Veins of quartz and other minerals may also form when magmatic fluids are injected into fissures opened by intrusion of large bodies of igneous rock.



- Many valuable metals and minerals occur in veins of igneous and sedimentary rock.
- Within a vein the ore may follow certain streaks known as shoots, or be restricted to pockets of extreme richness.
- The non valuable minerals associated with the ore in a vein are called gangue.
- A variety of metals are found in veins, usually in chemical combination as minerals, but also, in the case of gold and platinum, in their pure or native form.



Gold Vein in Quartz Rock

It is quite common to find precious minerals such as gold or platinum, deposited in their pure state in veins of igneous and sedimentary rocks.

- Evaporite, sedimentary rock formed over geologic time from the residues left as salty waters of ancient seas or lakes evaporated in arid locations.
- Limestone, dolomite, gypsum, halite, and other minerals are common constituents of evaporites, which occur on all continents and are often associated with deposits of gas and oil

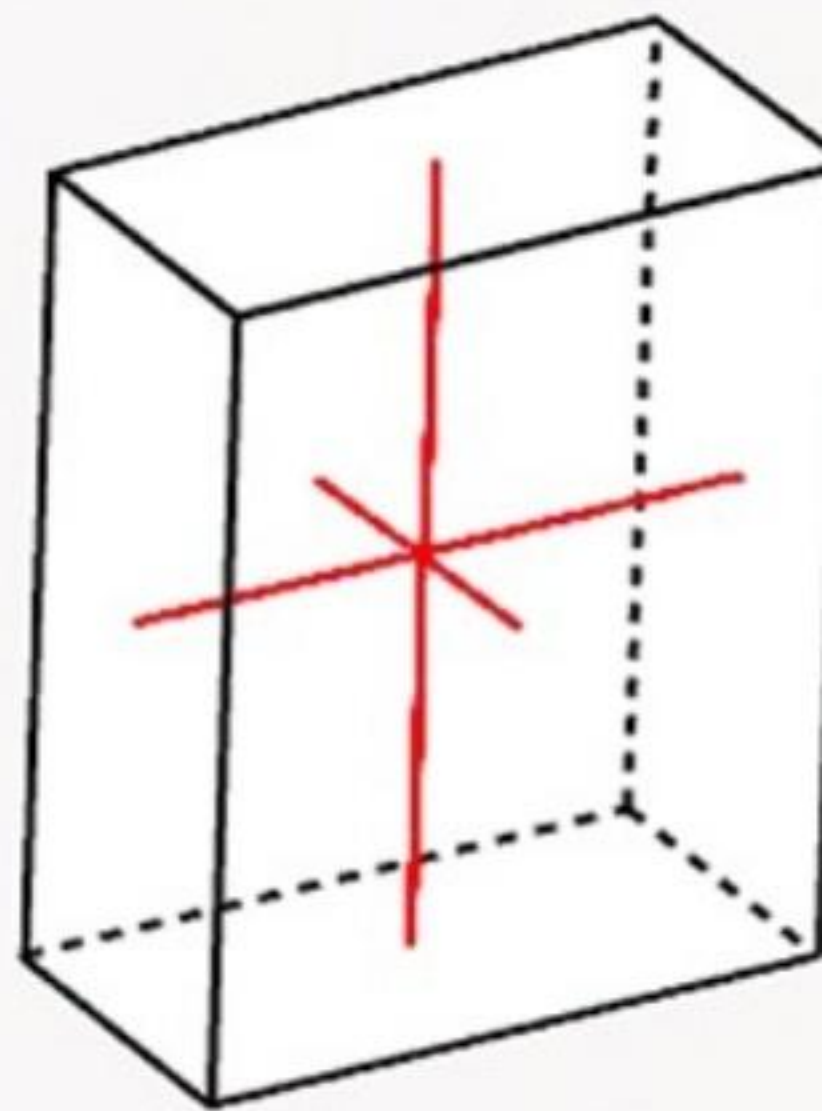
Limestone with Fossils

- Limestone is a sedimentary rock that forms either by the accumulation of shells, shell fragments, or coral fragments, or by the crystallization of the mineral calcite from water.
- The first kind, called fossiliferous limestone, can provide geologists with a record of the evolution of prehistoric animals. Geologists



enough to be scratched by a fingernail.

- The crystals are formed by the evaporation of saline waters.
- Therefore, rich deposits of gypsum are frequently found near the sea.
- Gypsum has a monoclinic crystal structure, which means it has three axes of unequal length, two of which are perpendicular to the third axis, but not to each other.



Monoclinic Crystal

Apatite Crystals

- Apatite includes a number of calcium phosphate minerals, including calcium phosphate fluoride, the material of teeth and bones.
- These yellow apatite crystals belong to the hexagonal crystal system, which means they have one axis of symmetry in the elongated direction of the crystal and three other symmetrical axes in a plane at right angles to



Dolomite

- Dolomite is a common mineral often found in rock masses as dolomitic limestone.
- Depending on the amount and type of impurities it contains, the mineral may be of any of the several colors.



Dolomite





Placer Mining

- Placer mining involves excavating loose, or alluvial, deposits such as sand, gravel, silt, or clay.
- Valuable minerals are separated from the alluvial materials through a system of screens, jigs, and sluices.
- Placer minerals include metals such as gold,

- Some mineral deposits form in river beds because running water tends to segregate dense minerals.
- Rivers deposit grains that are either larger or denser first and then carry grains that are either smaller or lighter farther downriver.
- Relatively dense minerals or metals, such as cassiterite (a source of tin), diamond, or gold, erode from their sources and get deposited with the heavier, coarser grains.
- The sites of deposition are most frequently the gravel and sandbars that form on the inside bends of meandering

- Placer mining has provided humankind with more than half of its gold.
- Well-known placer deposits include gravels formed about 40 million years ago during the Eocene Epoch in California, the discovery of which helped fuel the 1849 California Gold Rush.
- Much of this placer gold originally eroded from hydrothermal vein deposits of gold associated with igneous intrusions in western Nevada.
- Precambrian deposits in South Africa, formed more



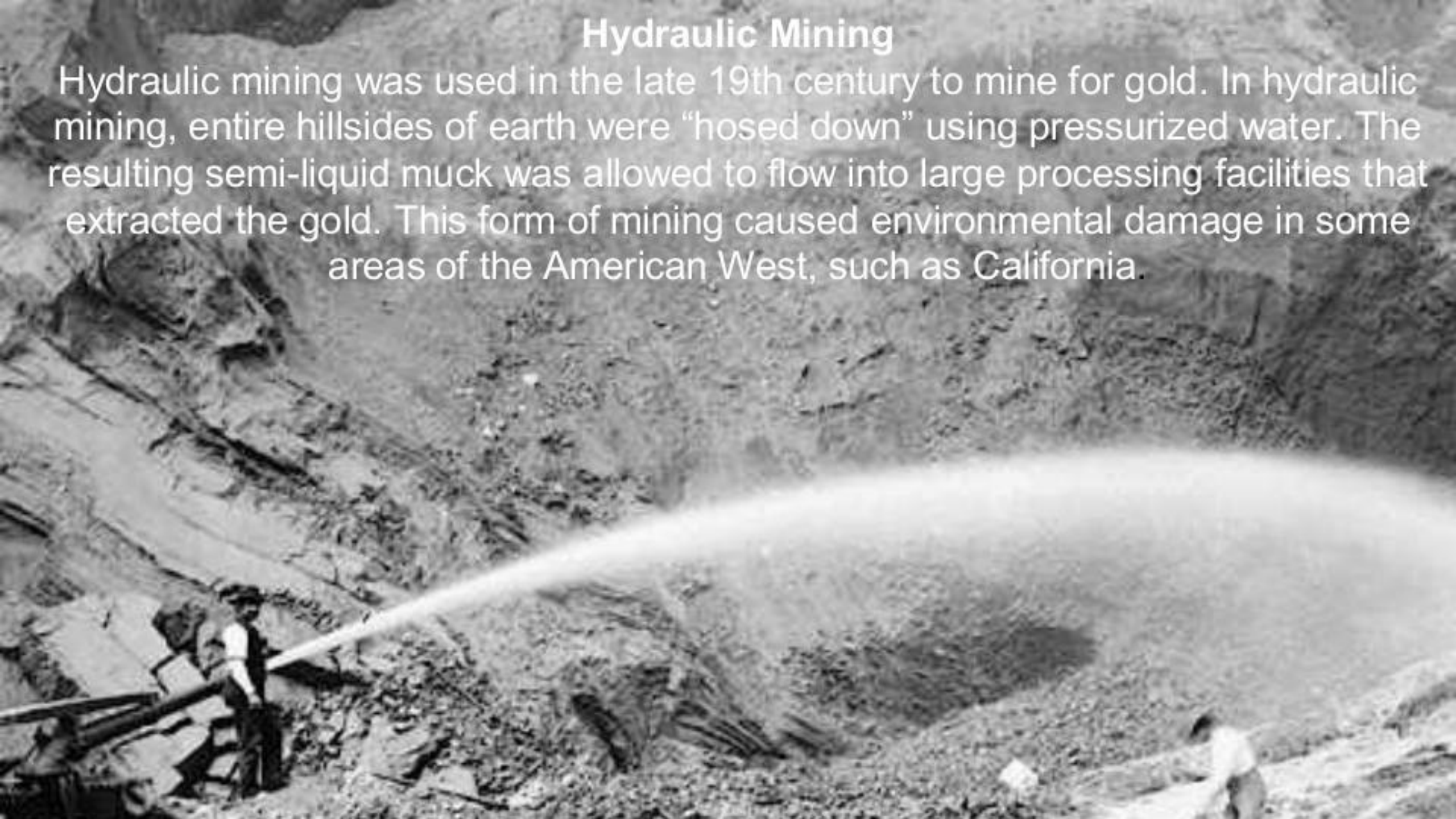
Panning for Gold

The broad, shallow rivers of Alaska have proved to be lucrative sources of gold over the last 150 years. Searching for grains of gold, and occasional nuggets, prospectors scoop up a small amount of gravel from the river bed and expertly swirl it around the pan with water. As the sediment settles, the heavier particles of gold fall to the bottom and the overlying gravel is gently tipped out. Although gold rushes have been started by the find of gold by prospectors, it is very difficult to collect more than tiny quantities



Hydraulic Mining

Hydraulic mining was used in the late 19th century to mine for gold. In hydraulic mining, entire hillsides of earth were "hosed down" using pressurized water. The resulting semi-liquid muck was allowed to flow into large processing facilities that extracted the gold. This form of mining caused environmental damage in some areas of the American West, such as California.



- Chemical weathering causes minerals to decompose into clays and other materials.
- This weathering typically leads to the removal of all material that does not resist weathering.
- In regions of especially intense weathering, such as the tropics, virtually everything except oxides of aluminum and iron becomes weathered and is eventually removed.
- Through this process of weathering and removal of the nonresistant material, aluminum and iron oxides

- Bauxite is a rock made from aluminum oxide residues and is the principal ore of aluminum.
- The world's leading producers of bauxite, the countries Surinam, Jamaica, and Guyana, are all located in the tropics.
- Commercial bauxite deposits that occur outside of the tropics, such as in the United States, the former Soviet Union, and China, indicate that these regions are non-tropical.

Hydrothermal Deposit

Travertine, a form of the mineral calcite, is a hydrothermal deposit. It forms in hot springs, where hot, mineral-rich water rises to the surface and cools. The cooler water can not hold as much dissolved material as the warmer water can, so some of the dissolved material precipitates, forming solid deposits. The travertine deposits of Mammoth Hot Springs at



Types of minerals

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graph TD; A[Types of minerals] --> B[Metallic]; A --> C[Non-metallic]; A --> D[Energy]; B --> B1[Non-ferrous]; B --> B2[Ferrous]; B1 --> B1a[Gold]; B1 --> B1b[Silver]; B1 --> B1c[Copper]; B1 --> B1d[Lead]; B2 --> B2a[Iron]; B2 --> B2b[Zinc]; B2 --> B2c[Nickel]; B2 --> B2d[Cobalt]; B2 --> B2e[Manganese]; B2 --> B2f[Aluminum]; B2 --> B2g[Chromium]; B2 --> B2h[Vanadium]; B2 --> B2i[Titanium]; B2 --> B2j[Platinum]; B2 --> B2k[Palladium]; B2 --> B2l[Rhodium]; B2 --> B2m[Iridium]; B2 --> B2n[Ruthenium]; B2 --> B2o[Rhenium]; B2 --> B2p[Osmium]; B2 --> B2q[Polonium]; C --> C1[Limestone]; C --> C2[Nitrate]; C --> C3[Potash]; C --> C4[Dolomite]; C --> C5[Mica]; D --> D1[Coal]; D --> D2[Petroleum]; D --> D3[Natural Gas];
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Metallic
Non-ferrous

Non-metallic

Energy

Gold

Silver

Copper

Lead

Limestone

Nitrate

Potash

Dolomite

Mica

Coal

Petroleum

Natural Gas

Ferrous minerals

- Ferrous minerals account for about three-fourths of the total value of the production of metallic minerals
- Provide strong base for the development of metallurgical industries
- India exports substantial quantities of ferrous minerals after meeting her internal demands

IRON ORE





HAMATITE

Coolybring Drill Core - Magnetite-Quartz Mineralisation



IRON ORE



IRON MINE









Iron-Ore Mine, Liberia

Iron-ore mines like this one have altered the landscape of Liberia. The Liberian Civil War (1989-1996) and the declining world demand for iron ore led to the complete shutdown of Liberian iron-ore mining in the early 1990s.







Smelting of Iron Ore in Blast Furnace



MINERALS

IRON ORE

Basic mineral & backbone of industrial development.

India is endowed with fairly abundant & good quality resources of iron ore.

Magnetite – 70% iron content finest iron ore, excellent magnetic quality, and valuable in the electrical industry.

Hematite – 50 -60% iron content most

AREAS

Major iron ore belt in India

Orissa-Jharkhand belt:

Orissa – high grade hematite ore is found in **Badampur** mines in the **Mayurb and Kendhurjhar districts**

Jharkhand- hematite iron ore is mined from the **Singbhum district in Gua and Noamundi**

Durg- bastar-Chandrapur belt in Chhattisgarh and Maharashtra:

Chattisgarh- very high grade hematite found in the **Baldila range of hills in Bastar district of Chattisgarh.** { Baldila range of hills comprise of 14 deposits super high grade hematite iron ore that has the best physical properties needed for steel making}

Iron ore exported from these mines is exported to **Japan and south Korea** via **Vishakapatnam port.**

Bellary-Chitradurga-Chikmagalur-Tumkur belt in Karnataka

Kudremukh mines in the Western Ghats are a 100% export unit. Kudremukh

MANGANESE ORE





MINERALS

MANGANESE

Manganese is **used** mainly in **manufacturing of steel and ferro-manganese alloy**
10 kg of manganese is required to manufacture **one tonne of steel.**

Used in the manufacture of **bleaching powder, insecticides and paints**

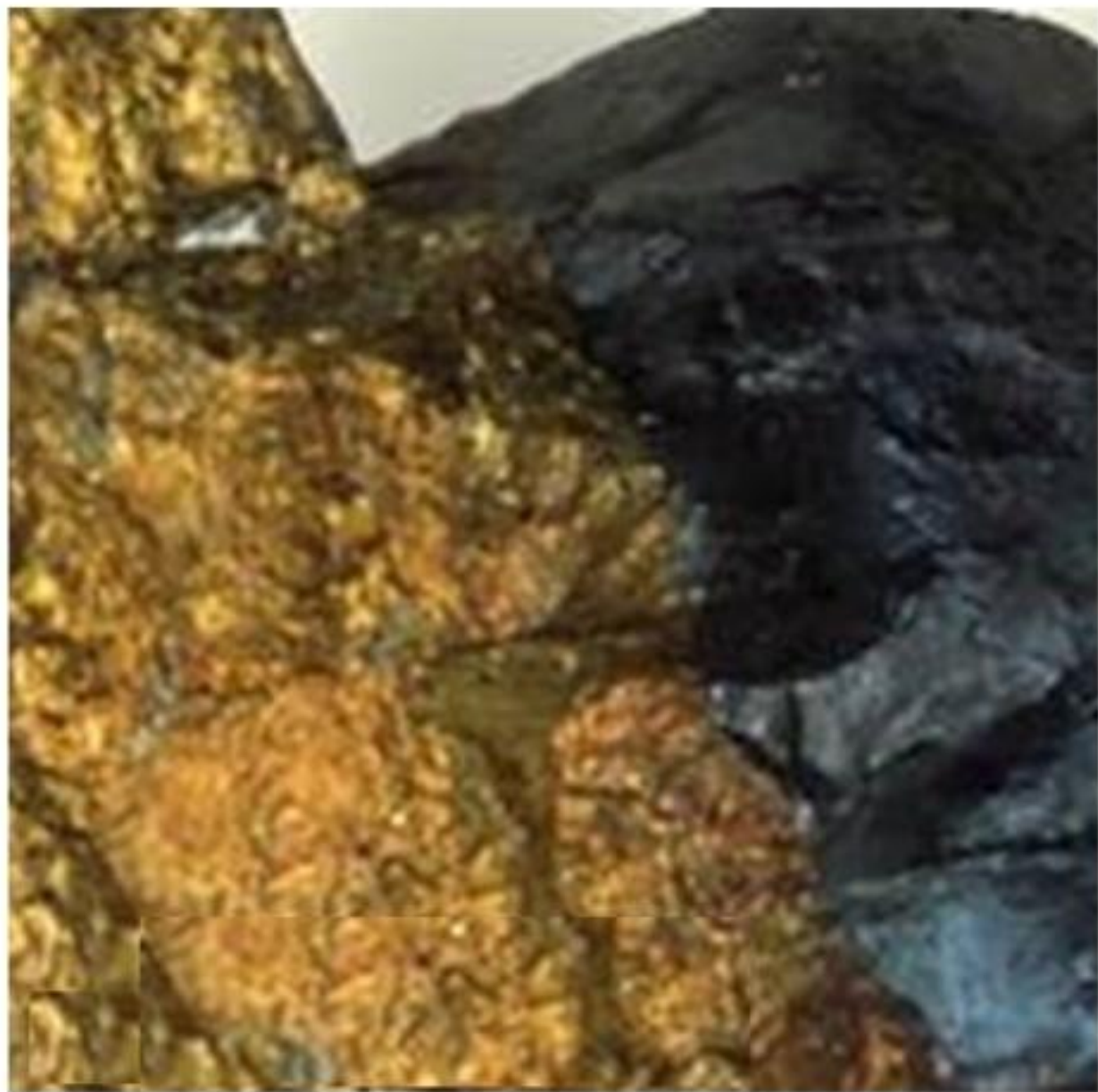
AREAS

Orissa – largest producer in India

Accounts for one-third of the country's total production in 2000-01

Non ferrous minerals

- India's reserves and production of non-ferrous minerals is not very satisfactory.
- These minerals include – copper, bauxite, lead, zinc, gold etc
- They play a vital role in a number of metallurgical, engineering and electrical



Copper Ore

Two important kinds of copper ore are contained in this sample:

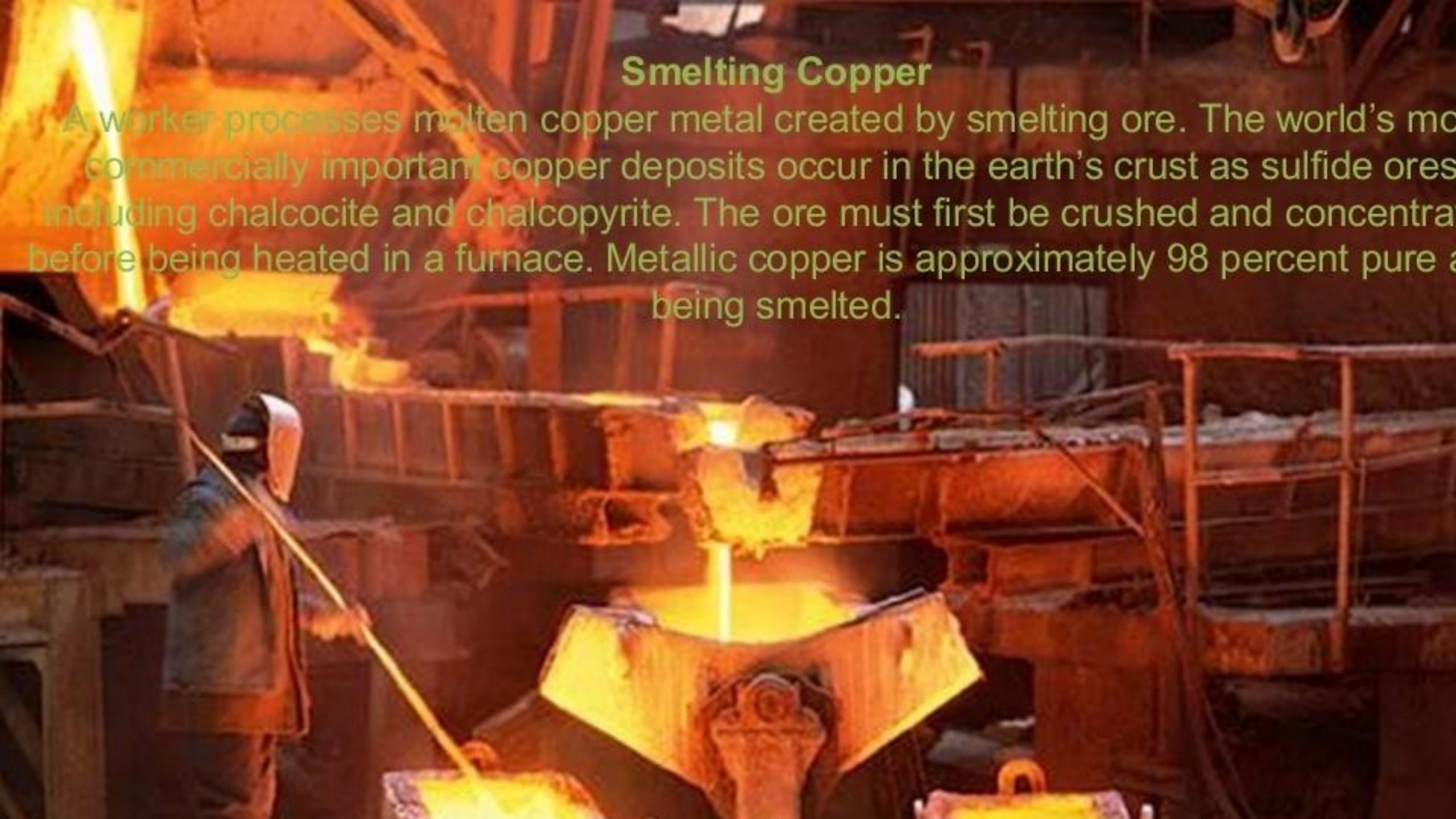


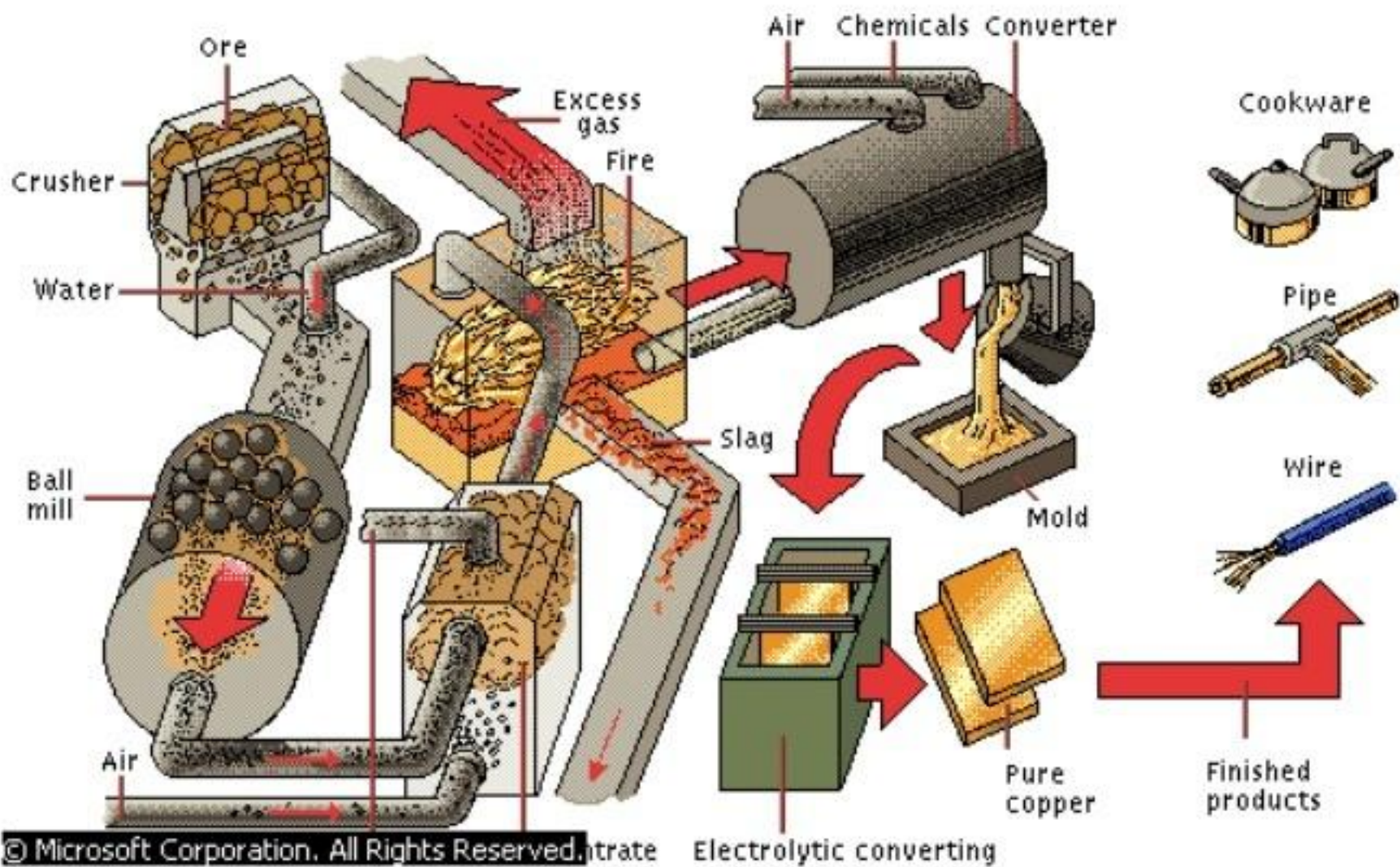
Open-Pit Copper Mine

- Metallic copper and copper ores, such as chalcopyrite and bornite, are mined in open-pit mines from deposits near the earth's surface.
- Further refining is necessary to separate the copper from impurities such as sulfides, carbonates, iron, and silicates.
- Copper is used extensively in electrical components because of its high conductivity.

Smelting Copper

A worker processes molten copper metal created by smelting ore. The world's most commercially important copper deposits occur in the earth's crust as sulfide ores including chalcocite and chalcopyrite. The ore must first be crushed and concentrated before being heated in a furnace. Metallic copper is approximately 98 percent pure as being smelted.





Production of Copper

Copper ores often contain very low concentrations of the metal. Because of this, many stages of the production process focus on eliminating impurities. The ore is crushed and milled before entering a flotation chamber, in which copper will concentrate at the top.

MINERALS

COPPER

India is **critically deficient in the reserve and production of copper**

Copper is **malleable ductile and a good conductor of electricity**

Used in **electrical cables ,electronic and chemical industries**

AREAS

Madhya Pradesh – balaghat mines produce 52% of India's copper

Jharkhand- Singbhum district is also a leading producer of copper.

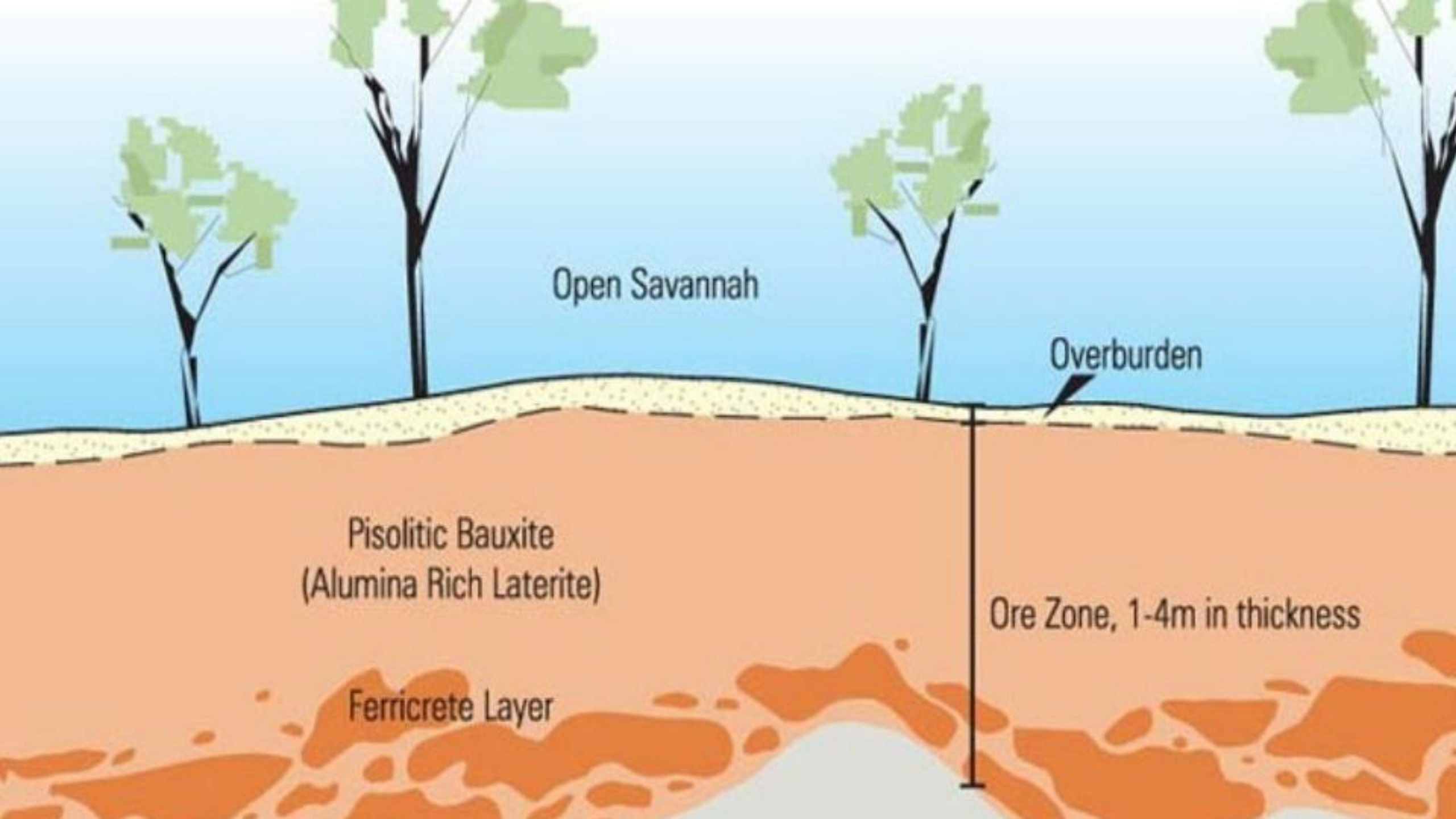
Rajasthan- khetri mines are also famous. 42%



BAUXITE



Bauxite – an ore of aluminium Though several ores contain aluminium it is from bauxite – a clay-like substance that alumina and later aluminium is obtained.



Open Savannah

Overburden

Pisolitic Bauxite
(Alumina Rich Laterite)

Ore Zone, 1-4m in thickness

Ferricrete Layer

MINERALS

BAUXITE

Bauxite deposits are formed by the **decomposition of a wide variety of rocks rich in aluminium silicates.**

Aluminium is an important metal because it combines the strength of metals such as iron, with extreme lightness and also with good

AREAS

Mainly found in **Amarkantak plateau, Maikal hills and the plateau region of Bilaspur-Katni**

Orissa is the largest bauxite producing state in india with 45% of the country's total production in 2000-01.

Panchpatmali deposits in koranup district are the most



MICA



MINERALS

NON METALLIC MINERALS

MICA

Mica is a mineral made of 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 di-electric strength, low power loss factor, insulating

AREAS

Found in northern edge of the Chota Nagpur Plateau.

Koderma-Gaya-Hazaribagh belt of Jharkhand is the leading producer. Rajasthan- major mica producing area is around Ajmer.

Nellore mica belt in Andhra Prades is also an important producer in the country

MINERALS

NON METALLIC MINERALS

LIMESTONE:

Found in association with rocks composed of Calcium Carbonate or Calcium and Magnesium Carbonates

Basic raw material for cement industry

Essential for smelting iron ore in

AREAS

Found in sedimentary rocks of most geological formations

Leading producers are Andhra Pradesh, Madhya Pradesh, Rajasthan, Gujarat, and Tamil Nadu

laws are essential to prevent mining from becoming a “Killer Industry”

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

Conservation of Minerals

- Strong dependence of industry and agriculture upon mineral deposits and the substances manufactured from them

E.g. metallurgical industries, cement industries, pharmaceutical industries. Fertilizers, pesticides, etc.

- The total volume of workable mineral deposits

- We are rapidly consuming mineral resources that require millions of years to be created and concentrated.
- The geological processes of mineral formation are so slow that the rates of replenishment are infinitely small in comparison to the present rate of consumption
- Mineral resources are finite and non-renewable
- Risk is high that we will run out of essential minerals

- Continued extraction of ores leads to increasing cost 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

ENERGY RESOURCES

ENERGY

- "**Energy is defined** as the ability to do work."
"Work is **defined** as the transfer of **energy**."





Energy is required for many activities

- ❖ *It is needed to cook*
- ❖ *To provide light and heat*
- ❖ *To propel vehicles*
- ❖ *To drive machinery in industries*

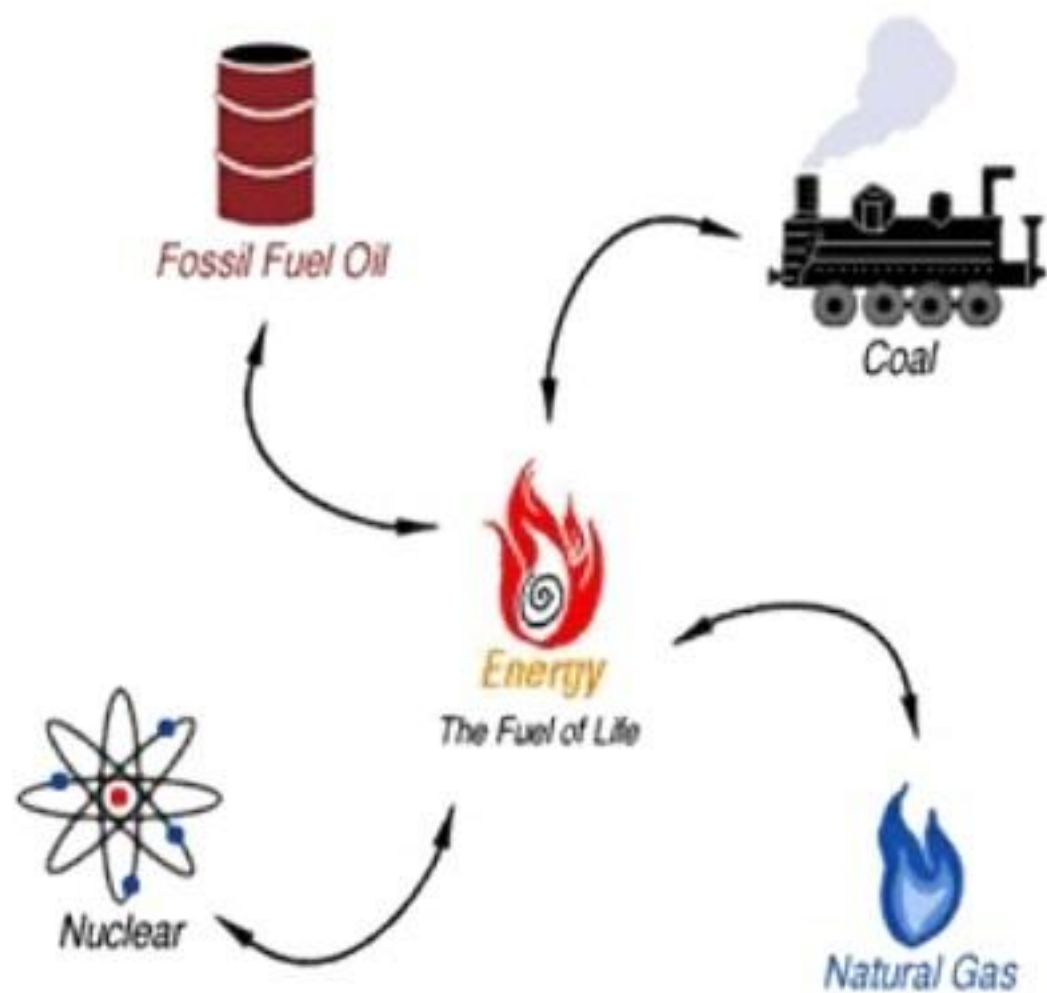
Energy can be generated from

- *Coal*
- *Petroleum*

Renewable Energy



Non-Renewable Energy



Energy resources are classified into

Conventional sources

- Firewood
- Cattle dung cake
- Coal
- Petroleum
- Natural gas
- Hydel & thermal energy

Non-conventional sources

- Solar energy
- Wind energy
- Tidal energy
- Geo thermal energy
- Biogas
- Atomic energy

🌸 70% of energy requirement in rural India is met by firewood and

Firewood and Cattle dung cakes are most common to Rural India



CONVENTIONAL SOURCES OF ENERGY

COAL

Coal is formed by the compression of plant material over millions of years and therefore is found in a variety of forms depending on the degree of compression, depth and time of burial.

Decaying plants in swamps produce **Peat**.- it has low carbon, high moisture content & low heating capacity.

Lignite is a low grade brown coal it is soft with high moisture content. Principle lignite reserves are in Neyveli in Tamilnadu. It is used for generation of electricity

Coal that has been buried deep and subjected to increased

ANTHRACITE



T
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BITUMIN



Burial pressure, heat, and time



Peat



Lignite



Sub-bituminous

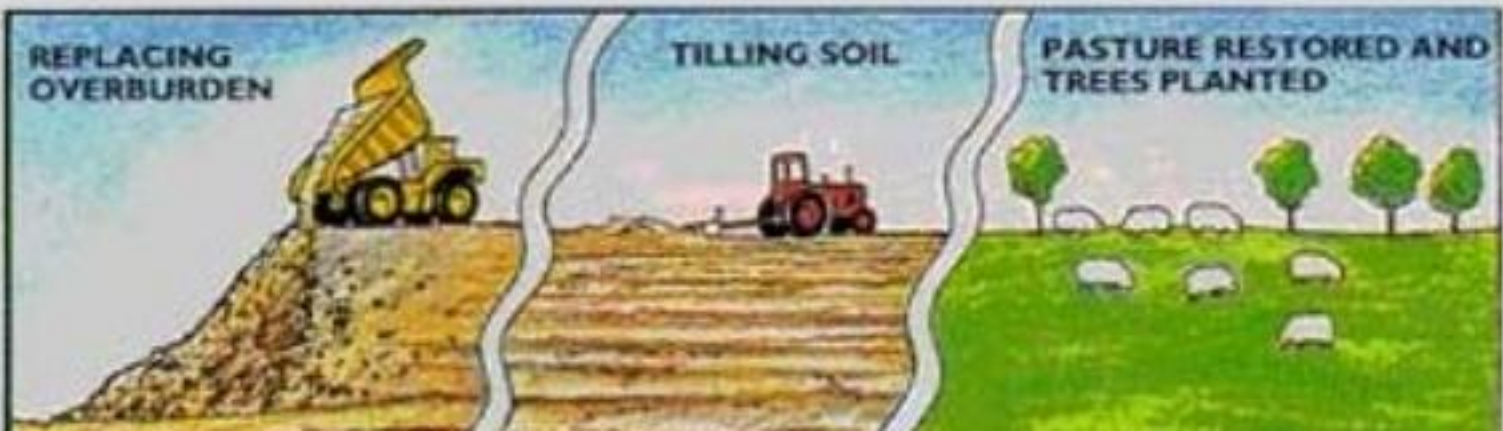
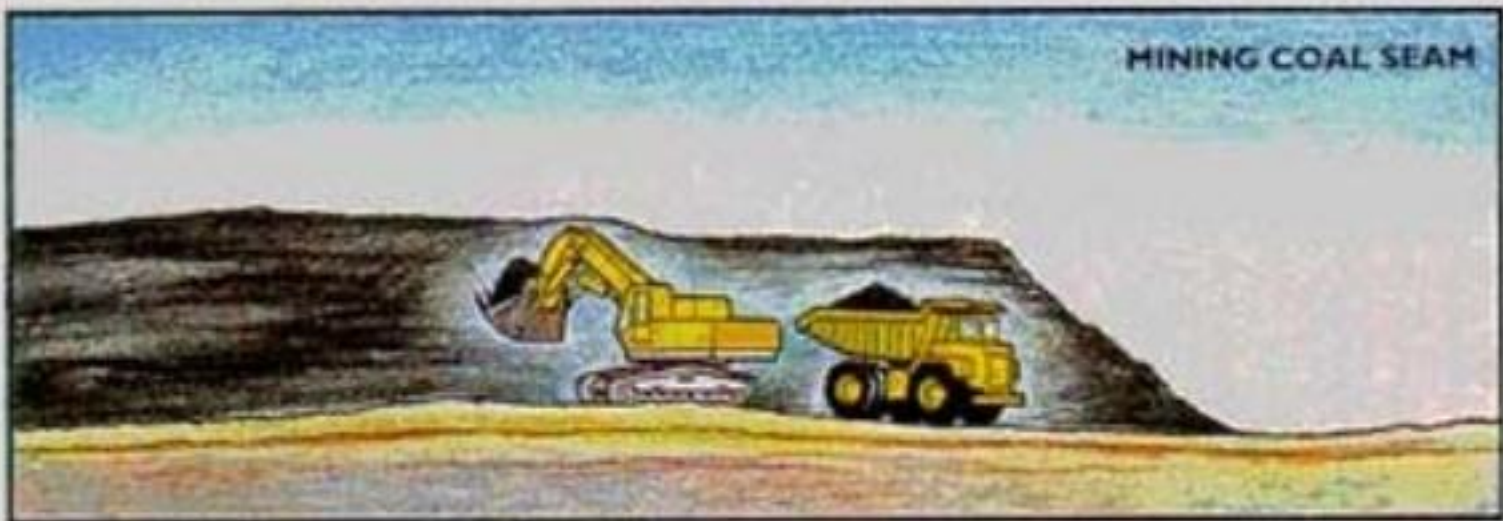


Bituminous

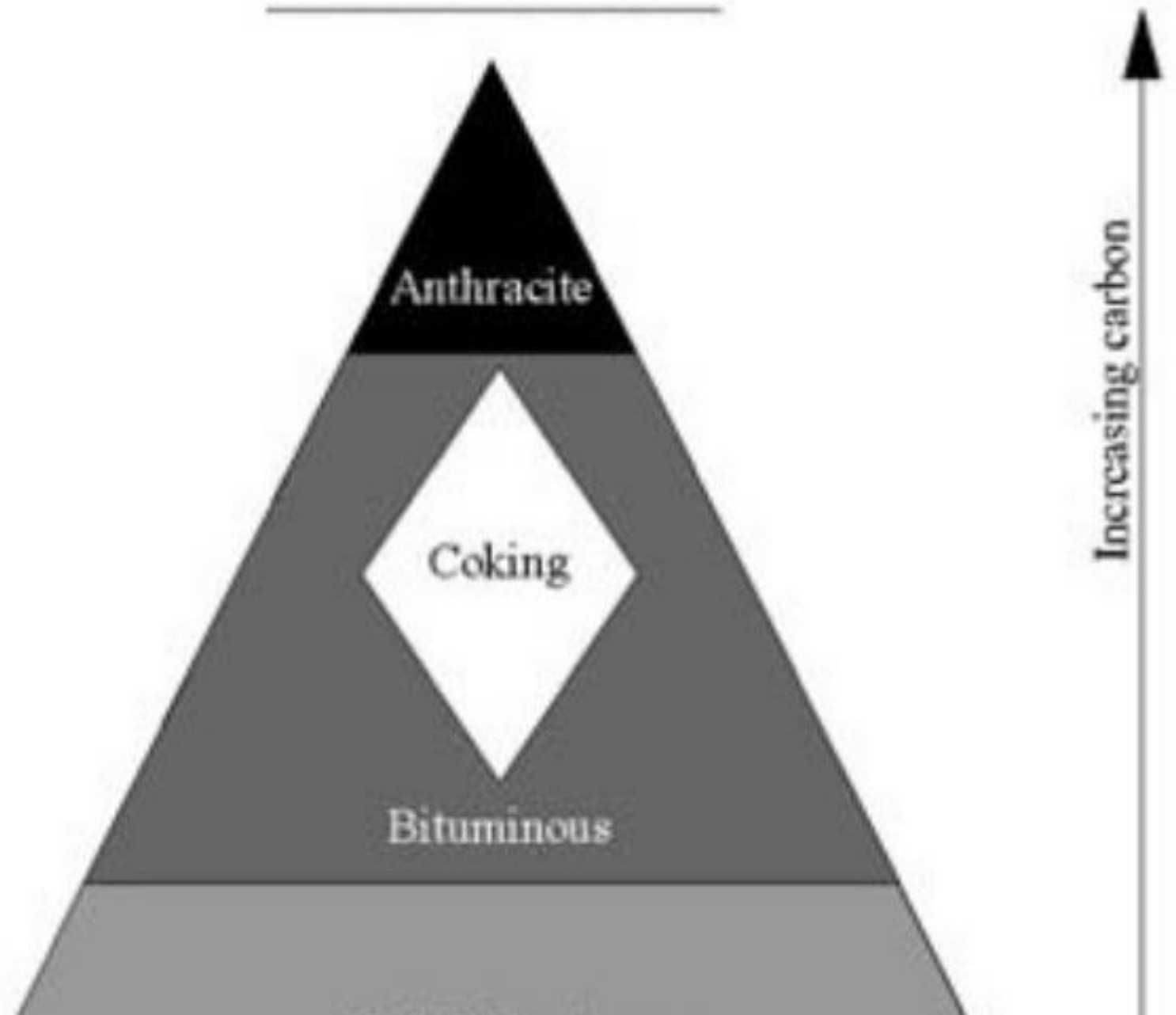


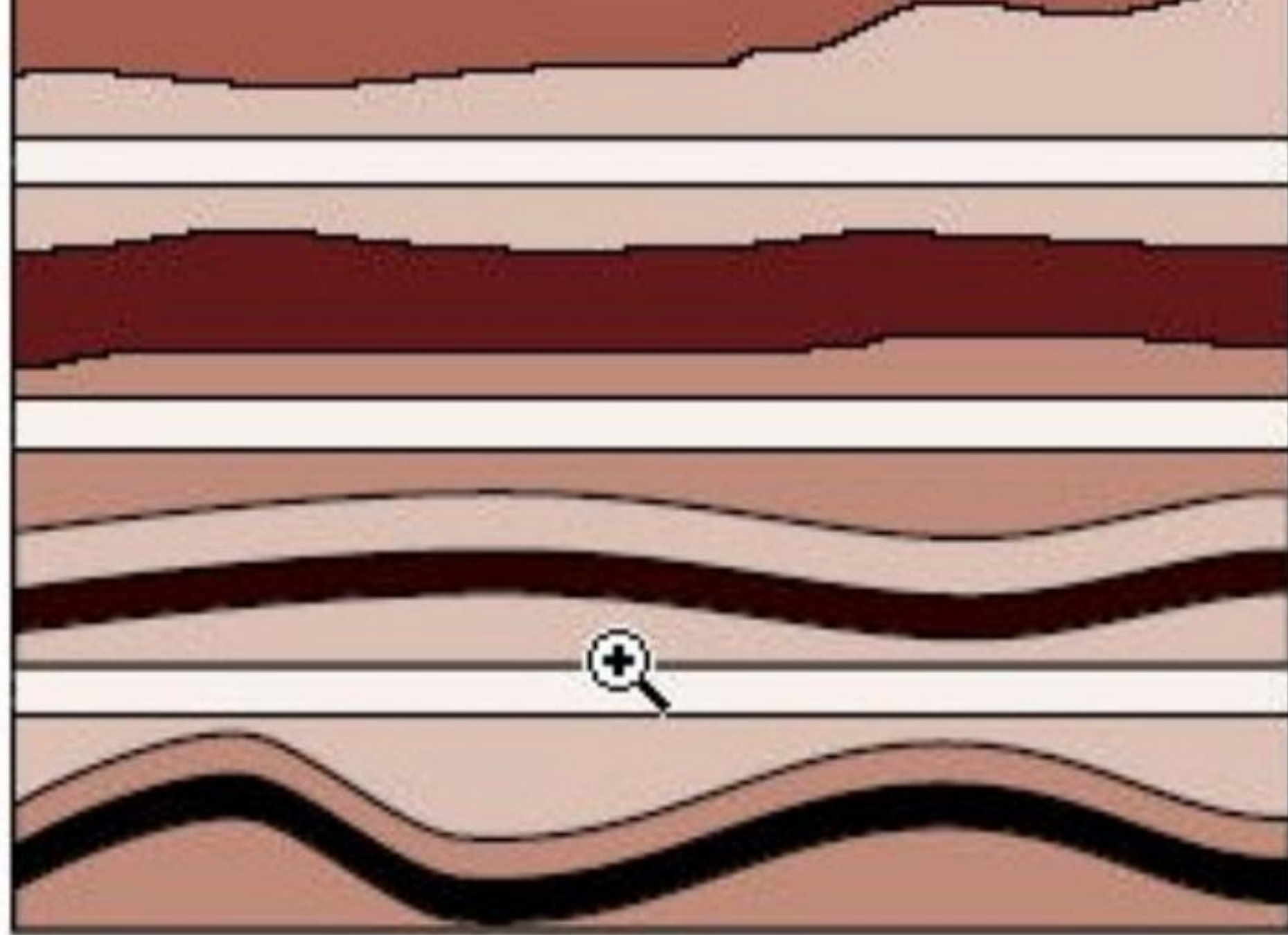
Anthracite





Ranks of Coal

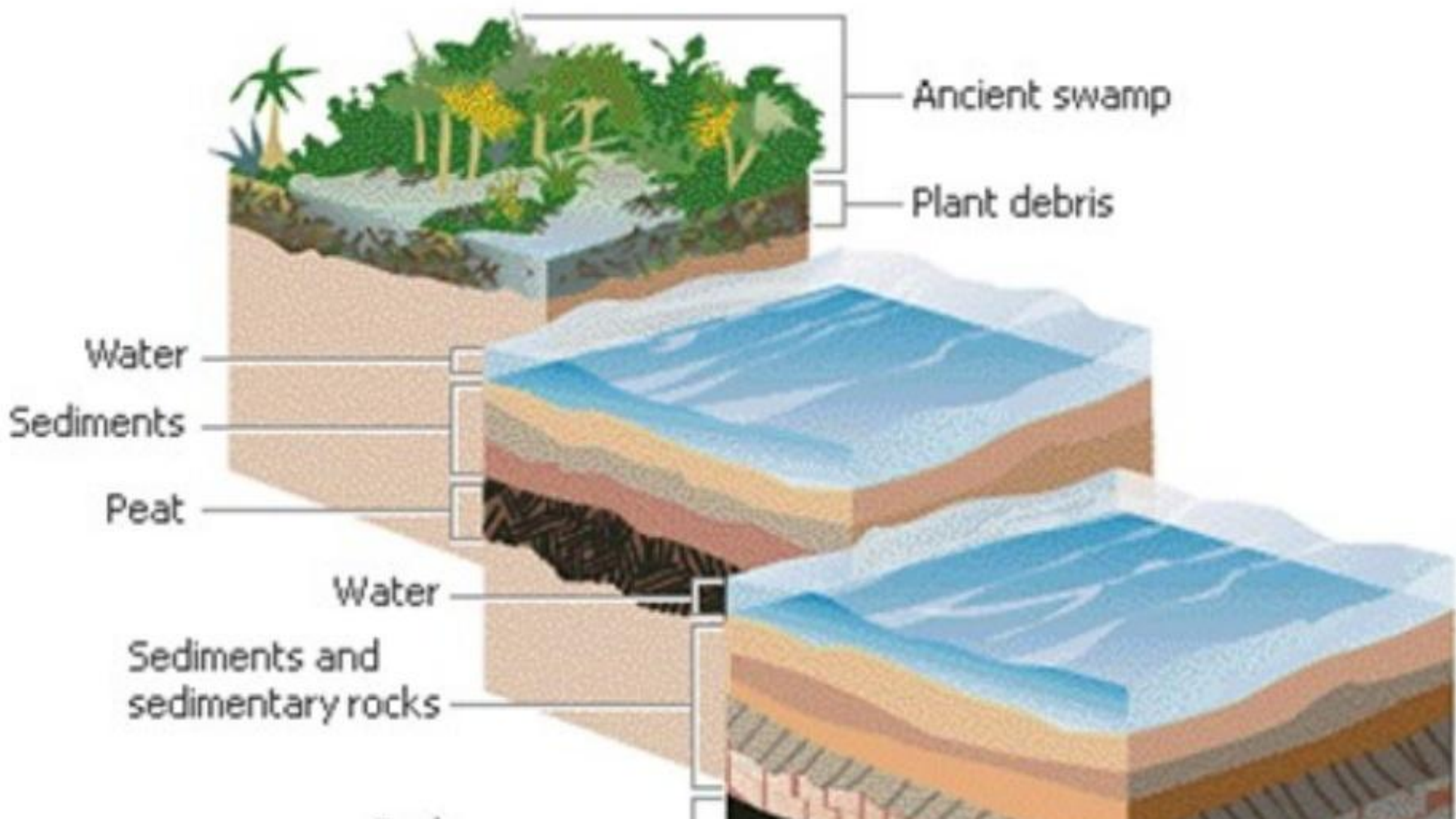




lignite (brown coal)

bituminous coal

anthracite (black coal)



- Coal is the most abundantly available fossil fuel in India.
- It provides a substantial part of the nation's energy needs
- It is used to generate power
- Used to supply energy to industries as well as for domestic needs
- India is highly dependent on coal for meeting its commercial energy requirements

In India coal occurs in rock series of two main geological ages name

Gondwana age – a little over 200 million years in age . The major resources of Gondwana coal which are metallurgical coal are located in Damodar valley(West Bengal- Jharkhand) Jharia, Raniganj, Bokaro are important coal fields. Other area that contain coal deposits are the valleys Godavari, Mahanadi, Son, and Wardha

COAL MINE





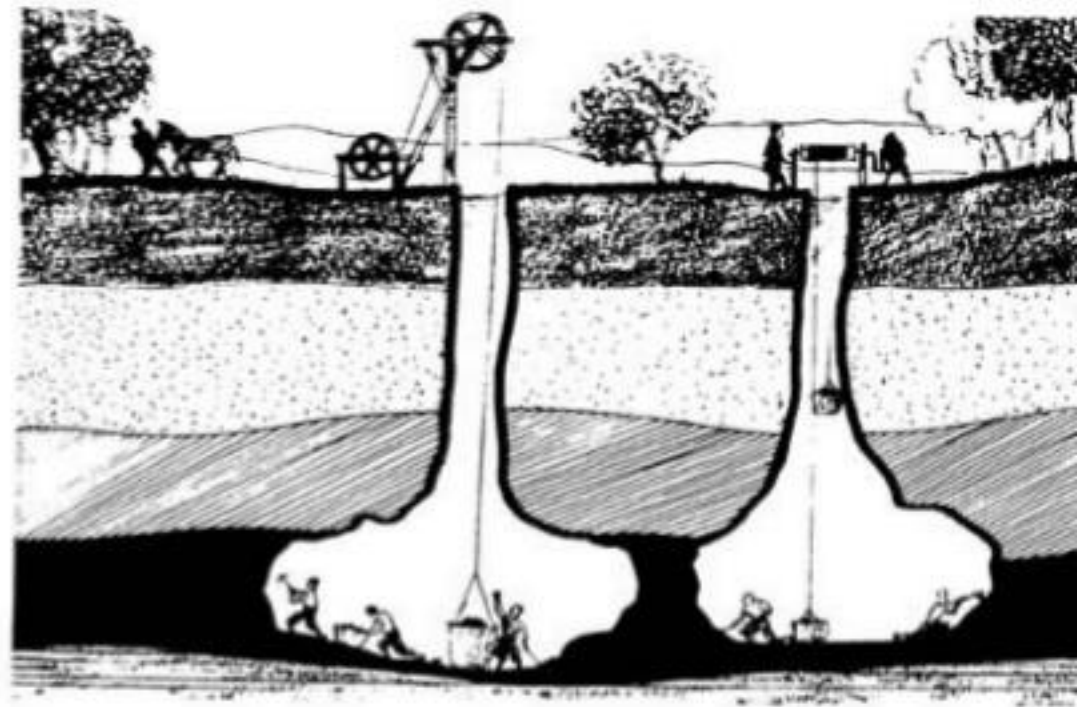


NEYVELI LIGNITE MINE



Deep Mine Shaft

- An Idaho miner operates a jack-leg drill more than 1500 m (5000 feet) below the surface.
- Miners in the Lucky Friday mine face the same dangers encountered in all deep shafts: potential buildup of hazardous gases, explosive coal dust, and possible roof collapse.
- Good ventilation systems, rock-dusting with limestone, and extensive steel reinforcement are used to lower the possibility of these accidents.



A cross-section of a bell-pit mine, the first system of underground mining

Shaft Mining of Coal

Coal Strip Mine

- This excavated area, which borders farmland, has been strip mined for coal.
- Since the late 1970s, strip mining has surpassed underground mining in the United States as a means for excavating coal.
- Because of the large coal removal equipment used in strip mining, this method is nearly

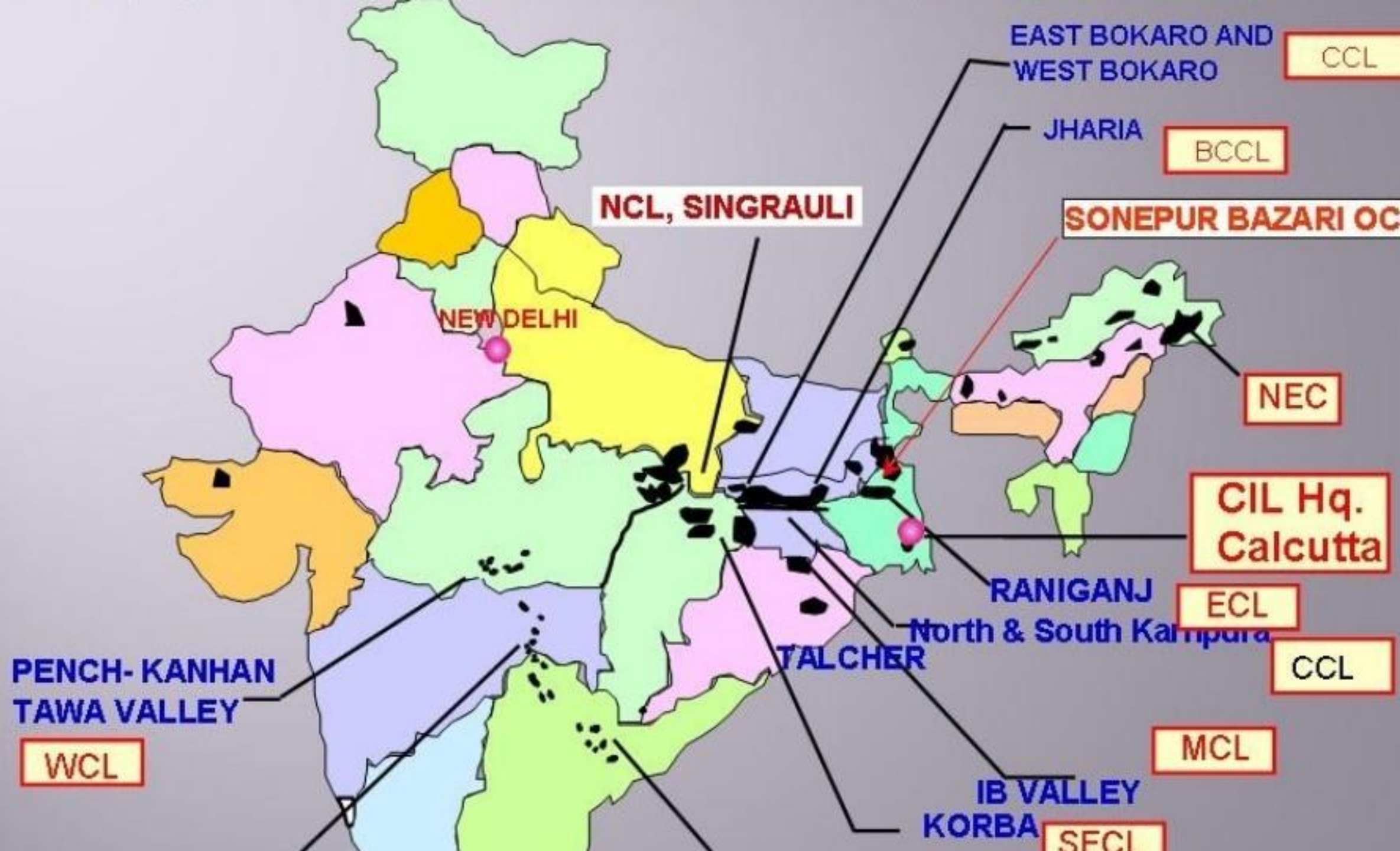
CUTTING PEAT



Coal is a bulky material which loses weight on use as it is reduced to ash. Therefore heavy industries and thermal power stations are located on or near the coal fields

COAL MINING





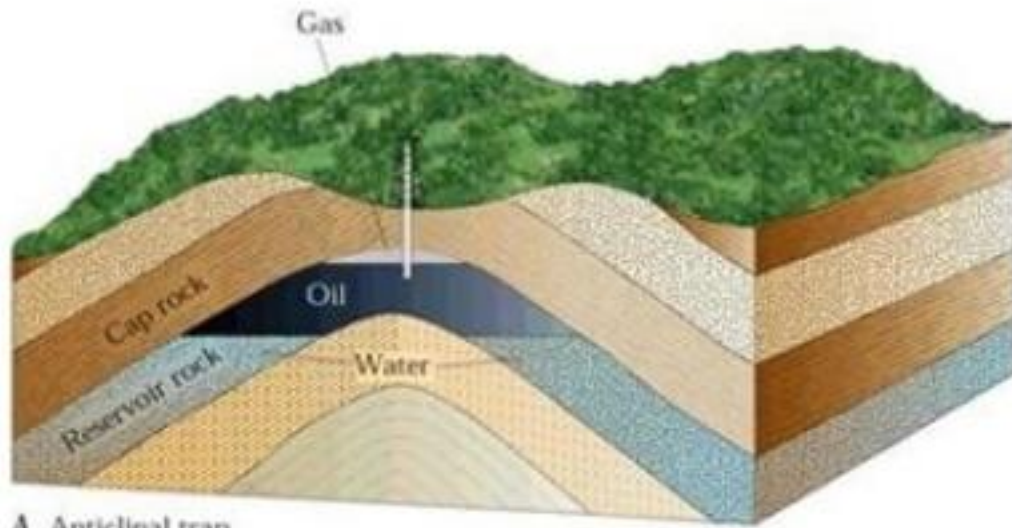
PETROLEUM / MINERAL OIL

- ❖ Next major energy resource after coal in India.
- ❖ provides fuel for heat and lighting
- ❖ Lubricants for machinery
- ❖ Raw material for a number of manufacturing industries.
- ❖ Petroleum refineries act as nodal industry for synthetic textile, fertilizer and chemical industries.

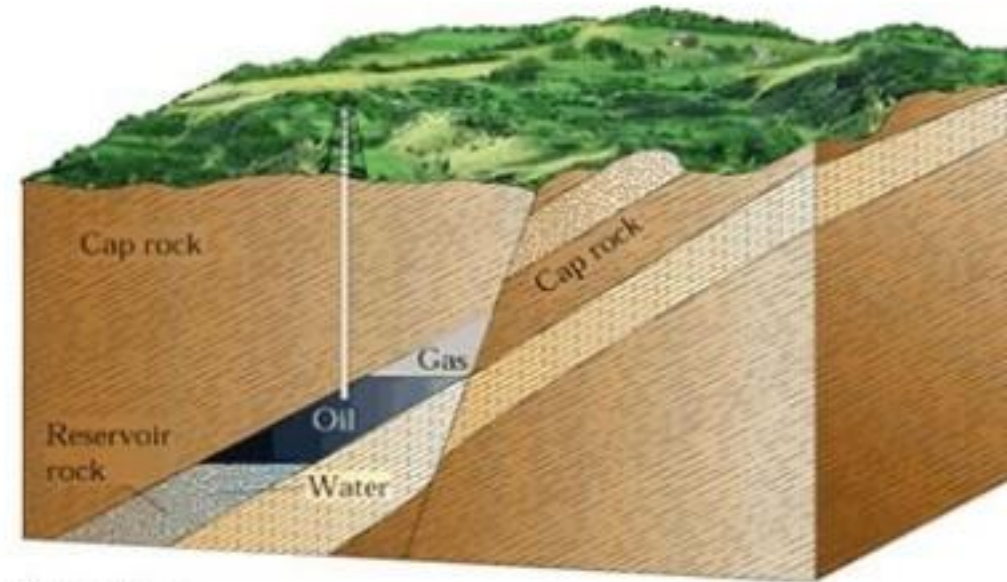
- About 63% of India's petroleum production is from Mumbai high. 18% from Gujarat and 16% from Assam
- Mumbai high, Bassein, Heera, Panna, Neelam, mukta ratna are some important offshore oil fields in western India.
- Ankaleshwar is the most important field of Gujarat



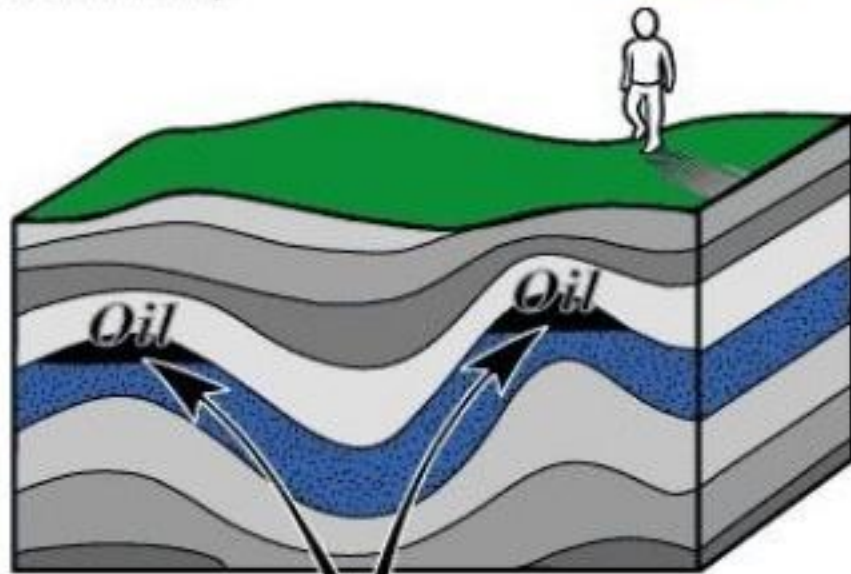
✓ Petroleum is also found in fault traps between porous and non porous rocks .gas being lighter usually occurs above the oil



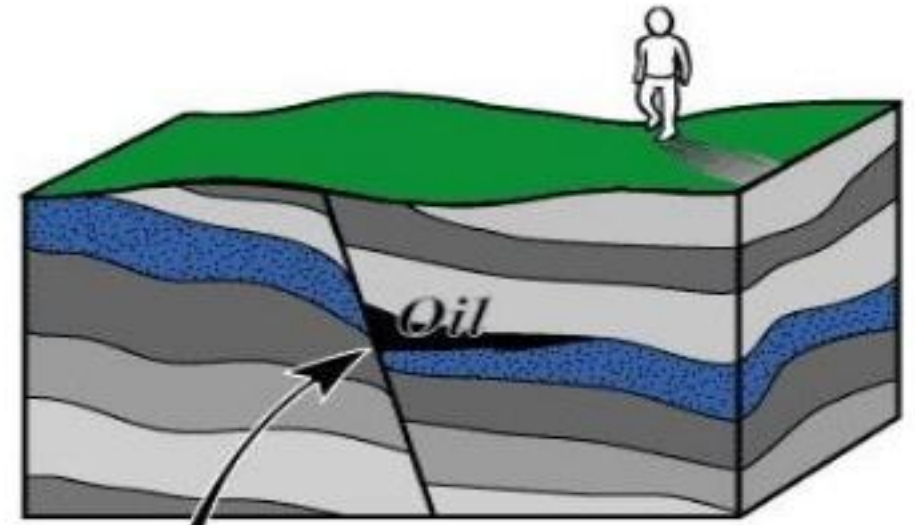
A. Anticlinal trap



B. Fault trap



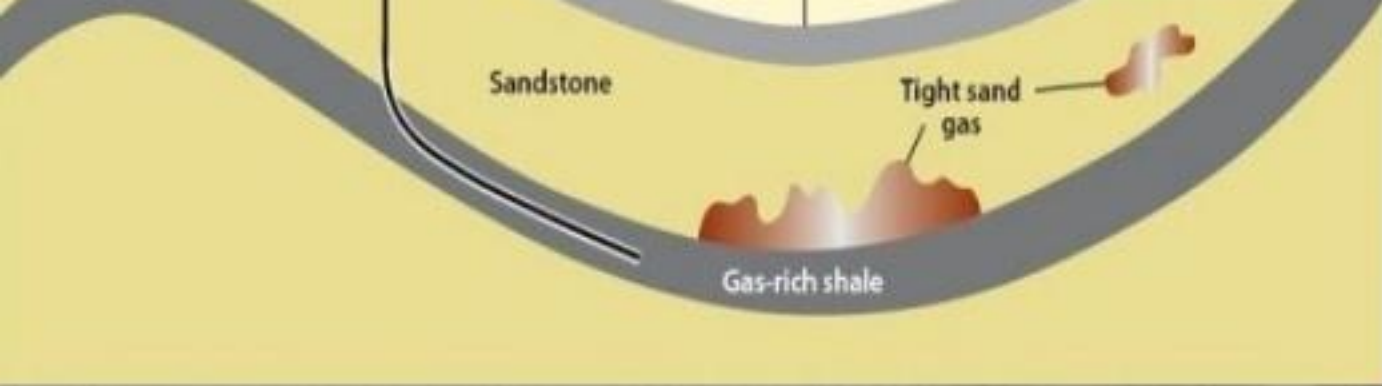
Anticline Traps



Fault Trap

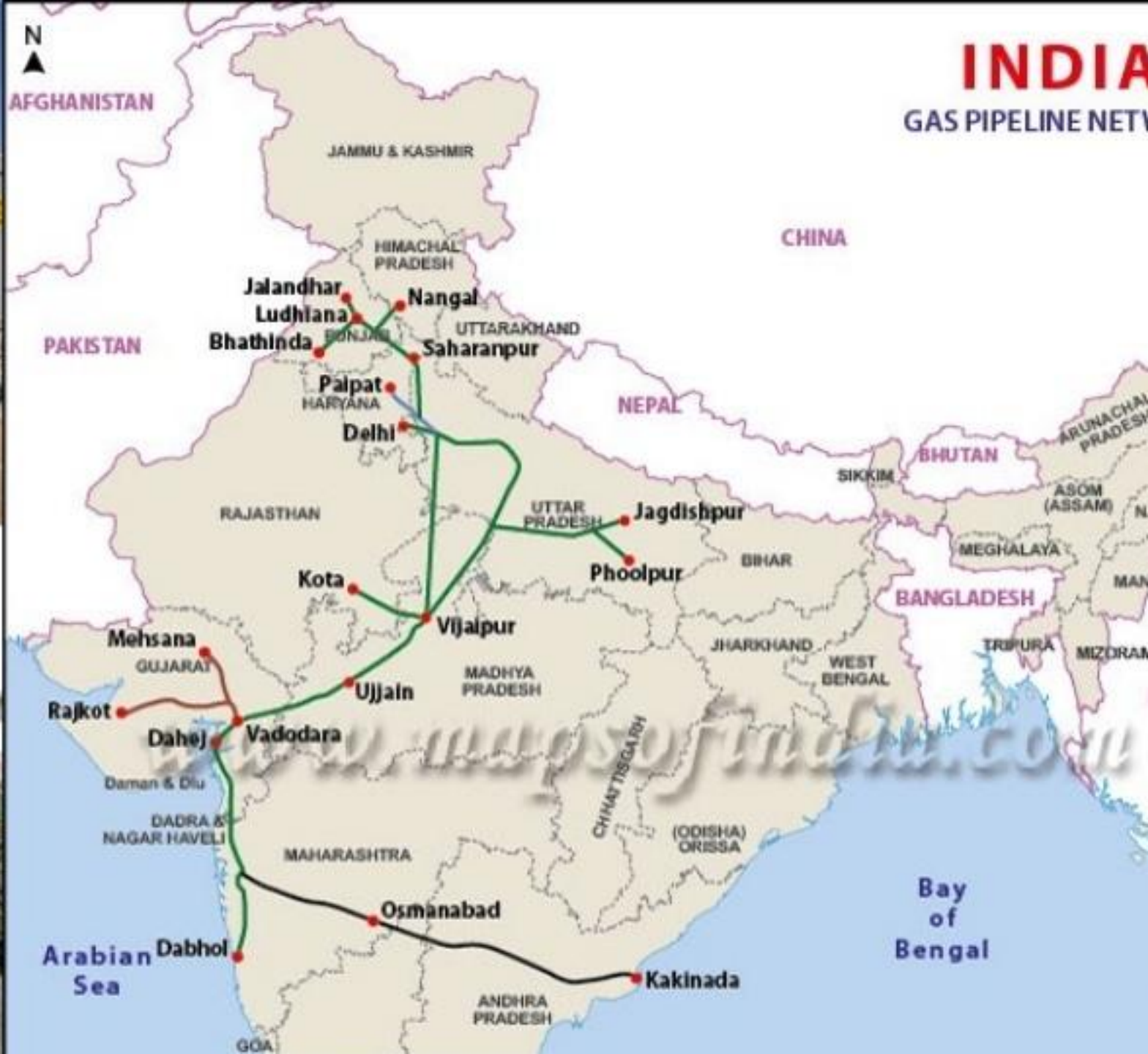
- ✓ Natural gas is an important clean energy resource found in association with or with petroleum.
- ✓ It is used as a source of energy as well as industrial rawmaterial in the petrochemical industry
- ✓ Natural gas is considered an environment friendly fuel because of low carbon dioxide emissions therefore is

- 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 the finds in the Gulf of Cambay.
- Andaman and Nicobar islands are also important areas having large reserves of



HVJ Pipeline

- ❖ The **1700 km long Hazira –Vijaipur-Jagdishpur** 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**
- ❖ The use of **compressed natural gas (CNG)** for





ELECTRICITY

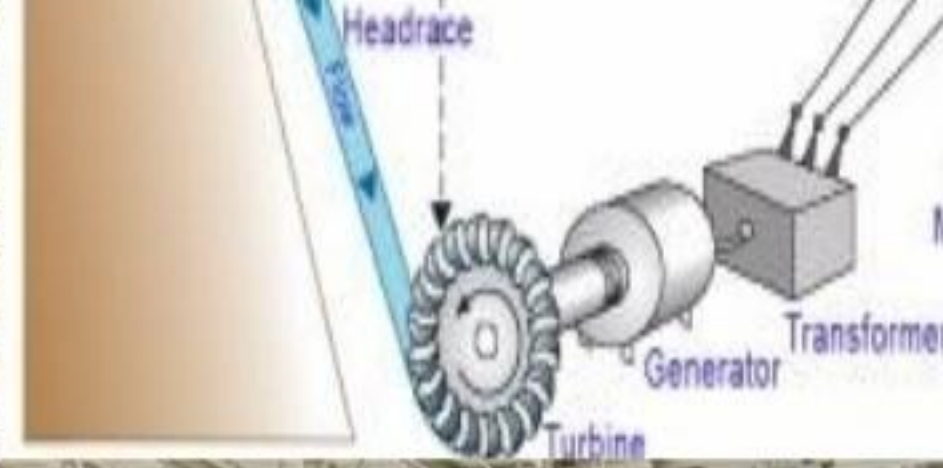
- Electricity has a wide range of applications in today's world.
- Its percapita consumption is considered as an index of development.
- Electricity is generated mainly in two ways
- By **running water** which drives Hydro turbines to generate **hydroelectricity**.
- By burning other fuels such as **coal, petroleum &**

HYDRO ELECTRICITY

Hydroelectricity is generated by fast flowing water, which is a renewable resource.

India has a number of multi-purpose projects like Bhakra Nangal, Damodar valley corporation, the Kopili Hydel Project etc.





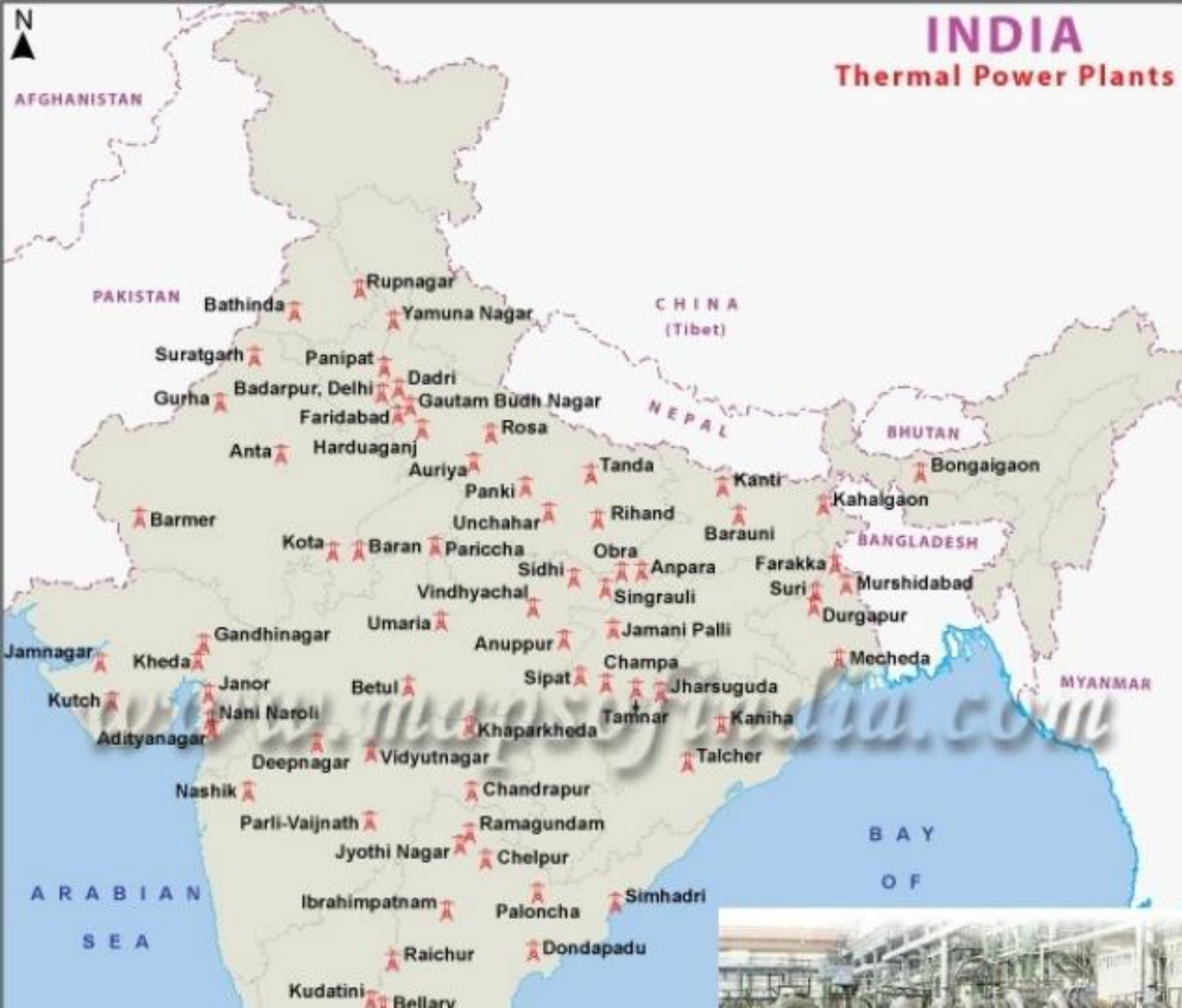
Generation of Hydro electric power



THERMAL ELECTRICITY

- 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





NON CONVENTIONAL SOURCES OF ENERGY

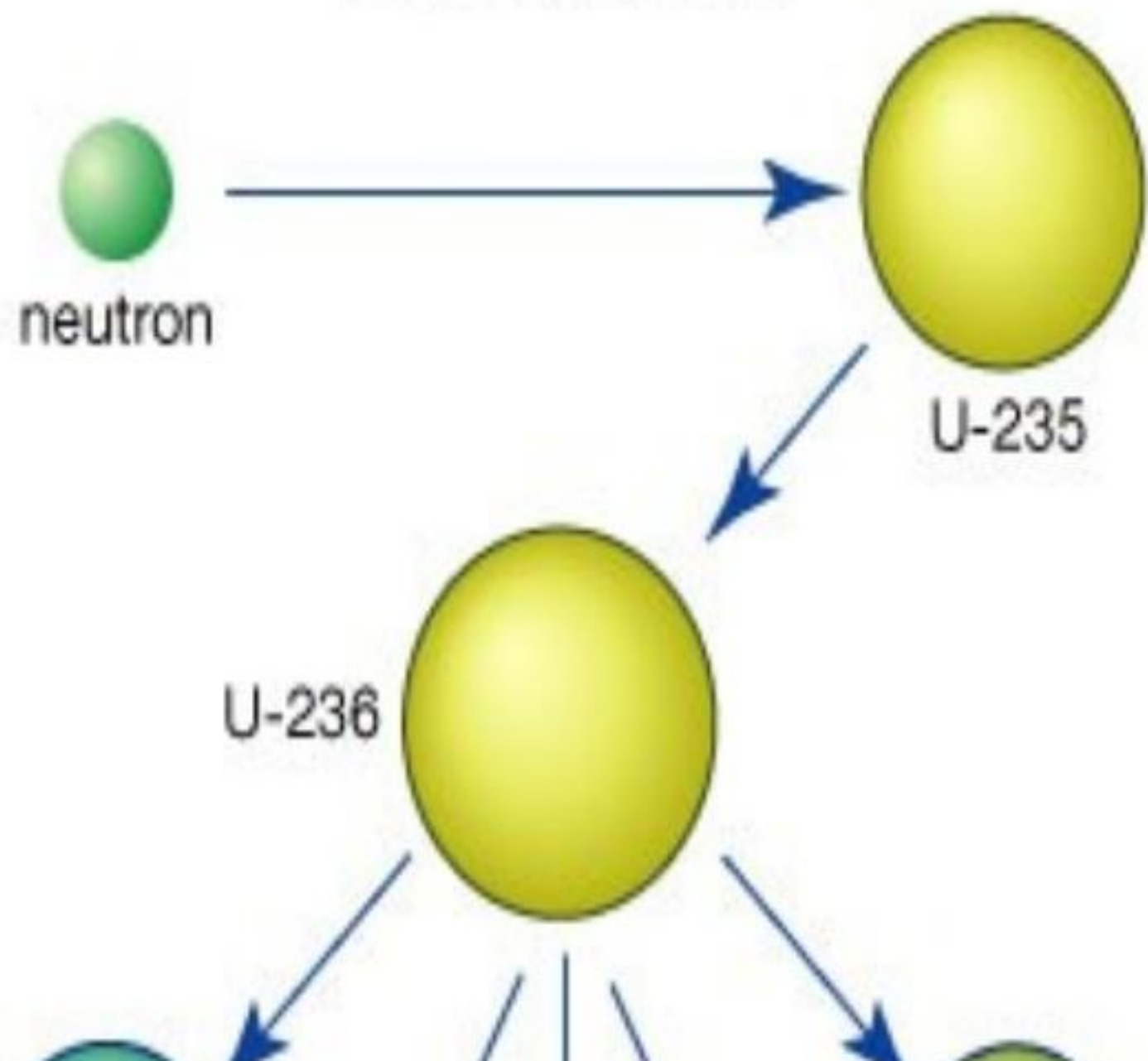
- Rising prices of oil and gas and their potential shortages have raised uncertainties about the security of energy supply in future, which in turn has serious repercussions on the growth of the national economy.
- The increasing use of fossil fuels also causes serious environmental problems, hence there is a pressing need to use renewable energy sources like solar energy, wind , tide, biomass and energy from waste material. These are called non conventional energy sources.

NUCLEAR / ATOMIC ENERGY

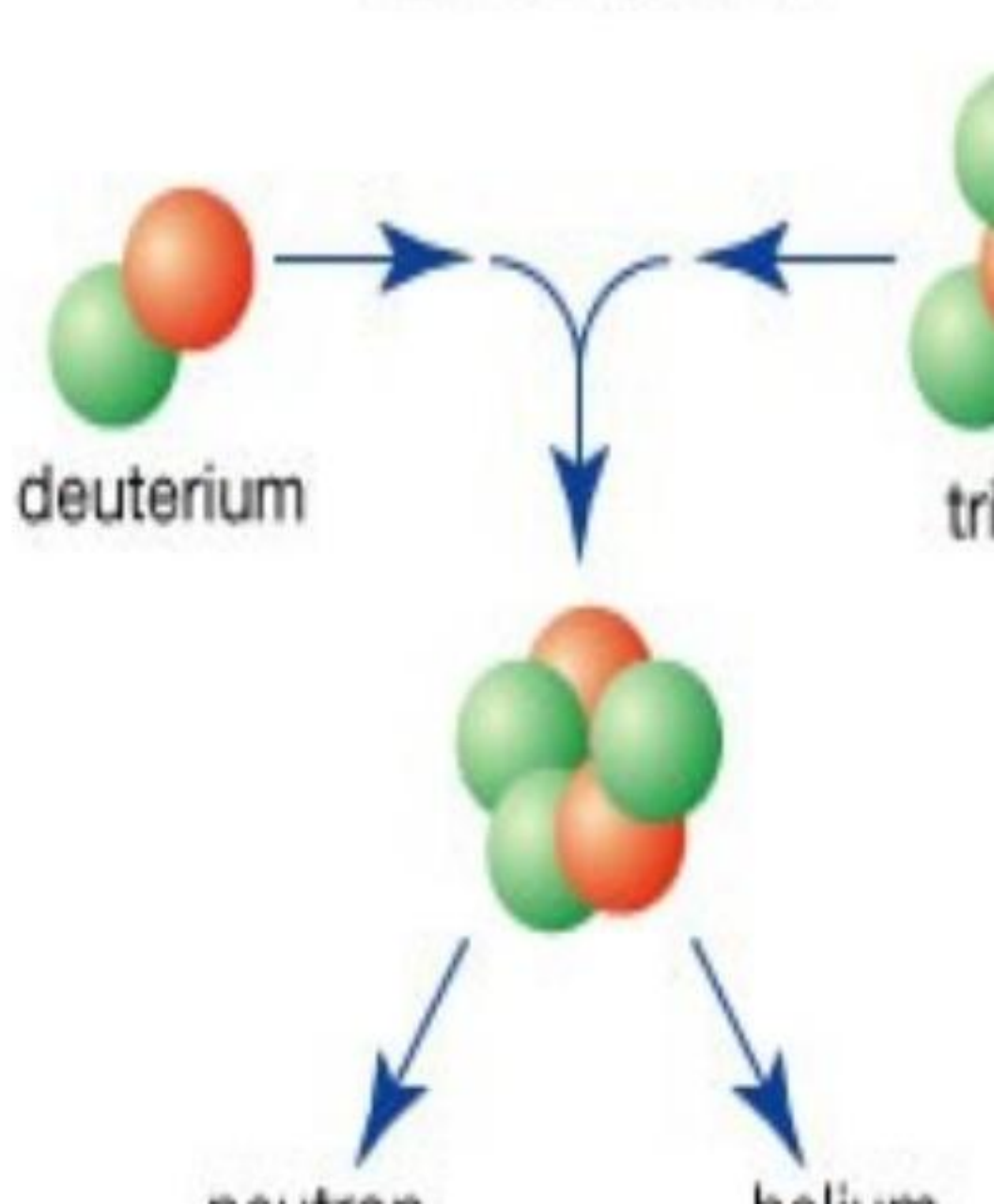
Nuclear energy is obtained by altering the structure of atoms. When such alteration is made much energy is released in the form of heat and this is used to generate electric power

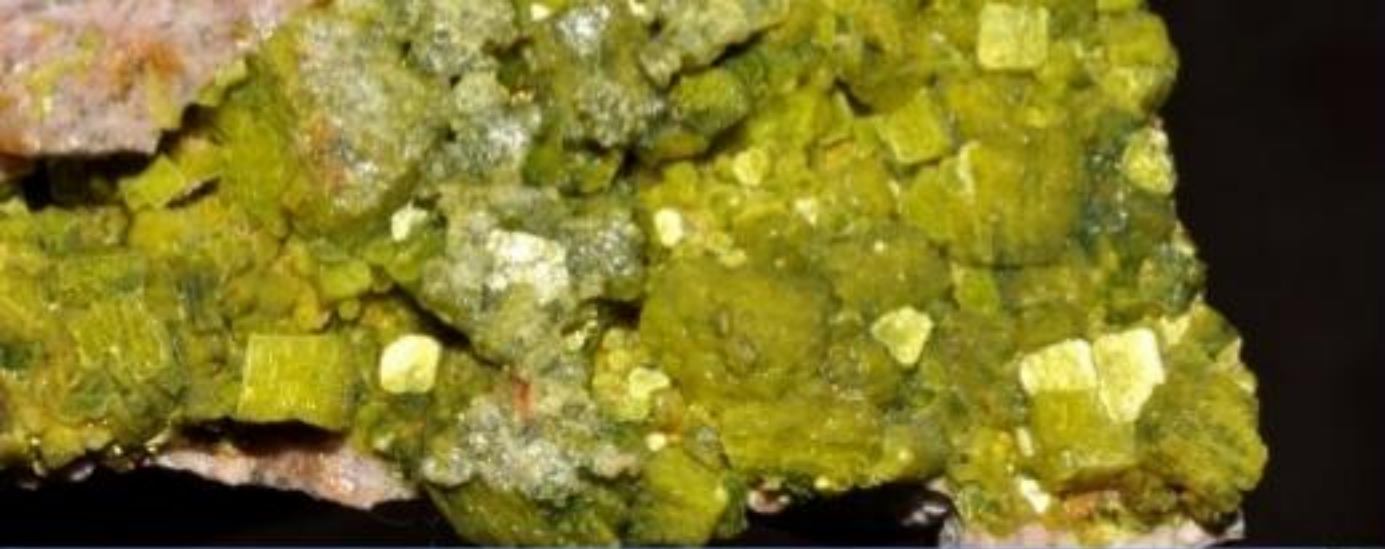
Uranium and thorium from Jharkhand and Aravalli ranges of Rajasthan are used to generate atomic or nuclear power

nuclear fission



nuclear fusion

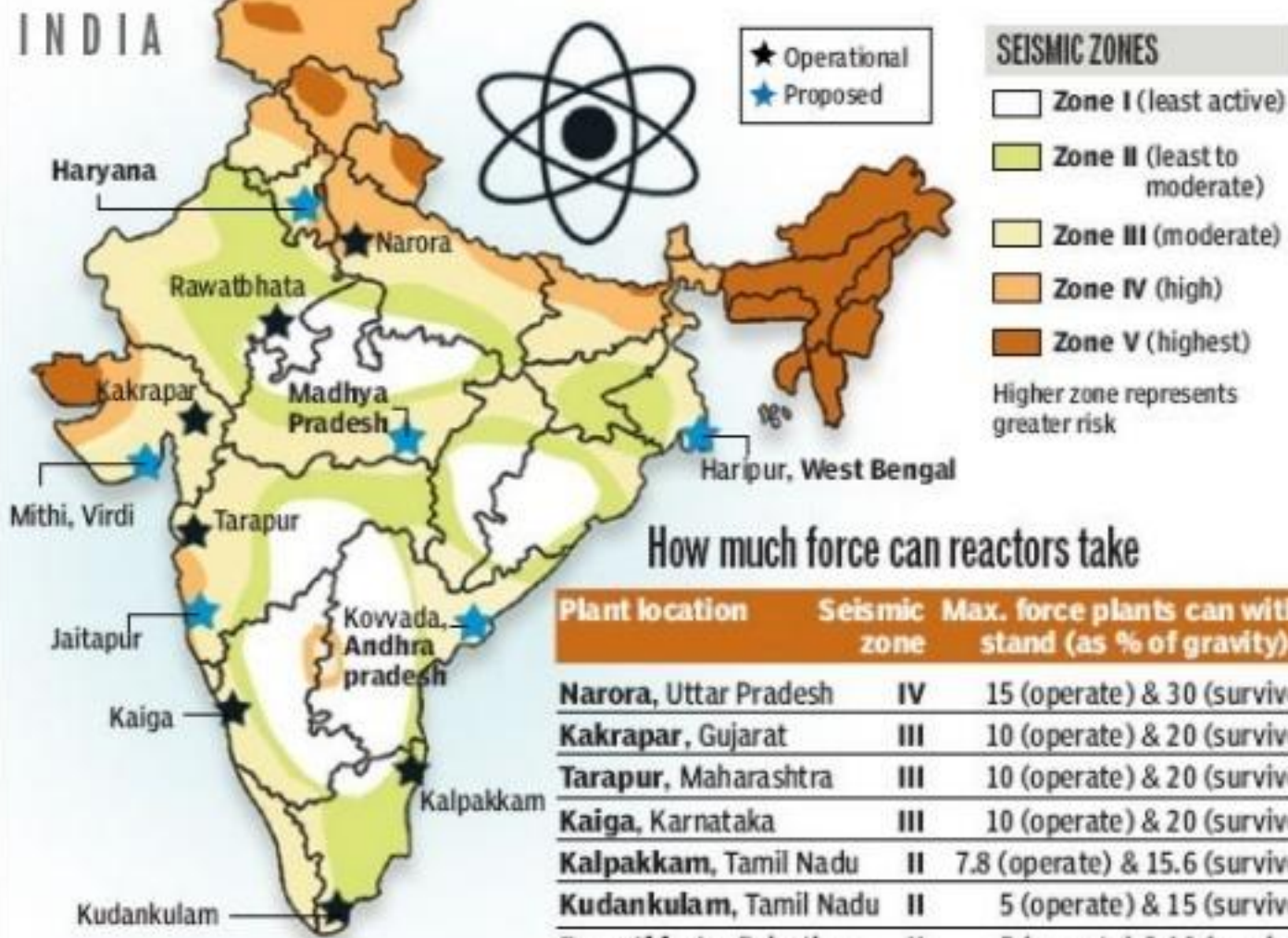




Nuclear Power stations	State
Kaiga Kalpakkam Kakrapara Rawatbhata Tarapur	Karnataka Tamil Nadu Gujarat Rajasthan Maharashtra

HOW SAFE ARE OUR REACTORS

A seismic map of India showing where our reactors are located and the risk they face



How much force can reactors take

Plant location	Seismic zone	Max. force plants can withstand (as % of gravity)#
Narora, Uttar Pradesh	IV	15 (operate) & 30 (survive)
Kakrapar, Gujarat	III	10 (operate) & 20 (survive)
Tarapur, Maharashtra	III	10 (operate) & 20 (survive)
Kaiga, Karnataka	III	10 (operate) & 20 (survive)
Kalpakkam, Tamil Nadu	II	7.8 (operate) & 15.6 (survive)
Kudankulam, Tamil Nadu	II	5 (operate) & 15 (survive)
Rawatbhata, Rajasthan	II	5 (operate) & 10 (survive)

#The first figure for each location represents the force of the shaking earth at which the reactors can continue operating, while the latter figure is the force till which the reactors can remain functional.

How the reactors react to quakes, tsunamis

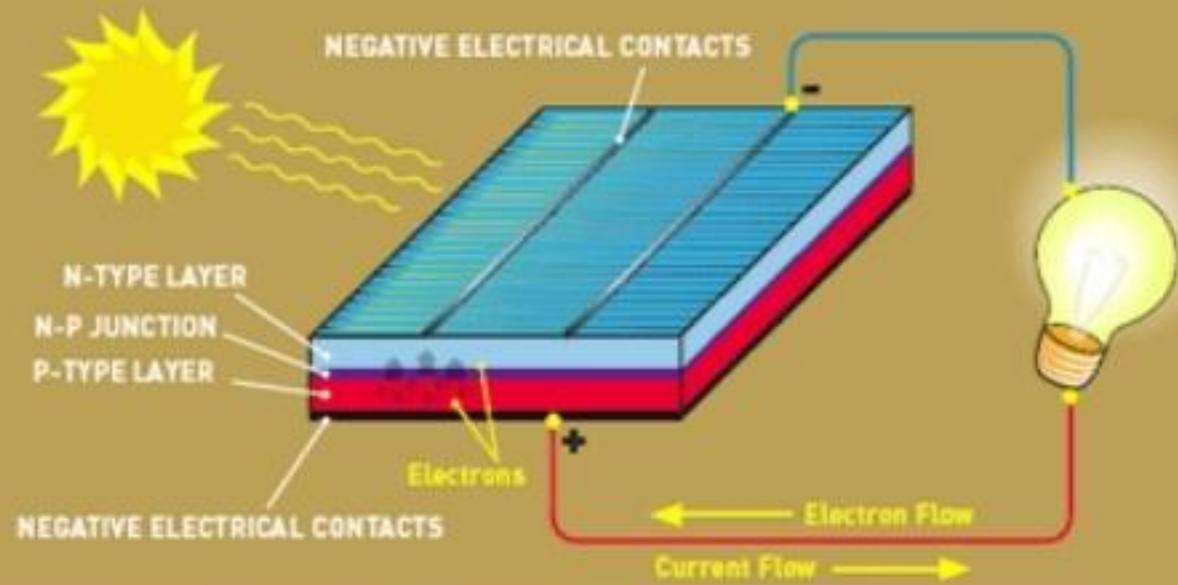
How India fared

Kakrapar, Gujarat: Operations continued after the Bhuj quake, 2011

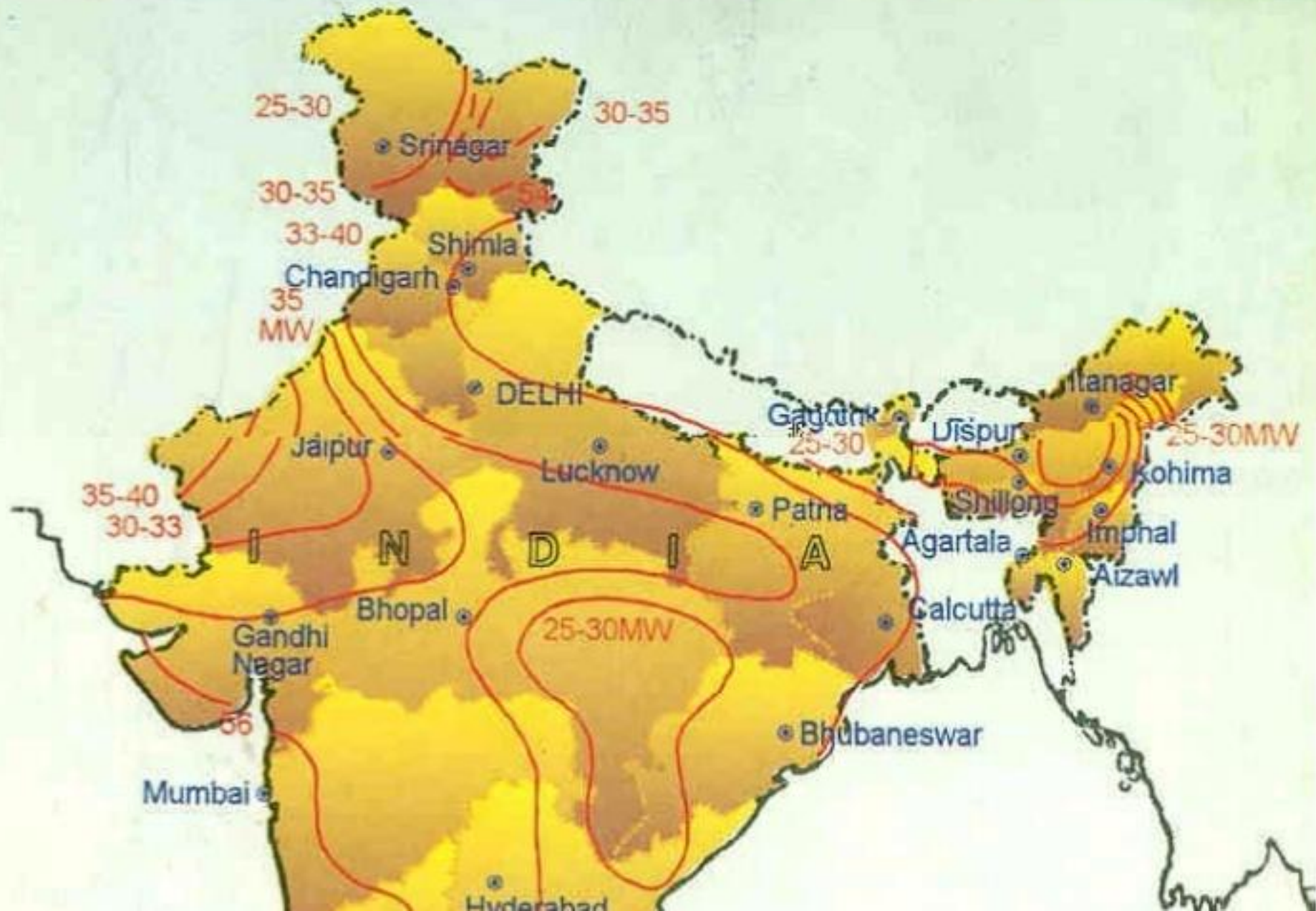
Operational and proposed nuclear power plants in India.

SOLAR ENERGY

- India is a tropical country & has enormous possibilities of tapping solar energy.
- 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 sterilise milk cans
- it is expected that use of solar energy will be able to minimise the dependence of rural households on firewood



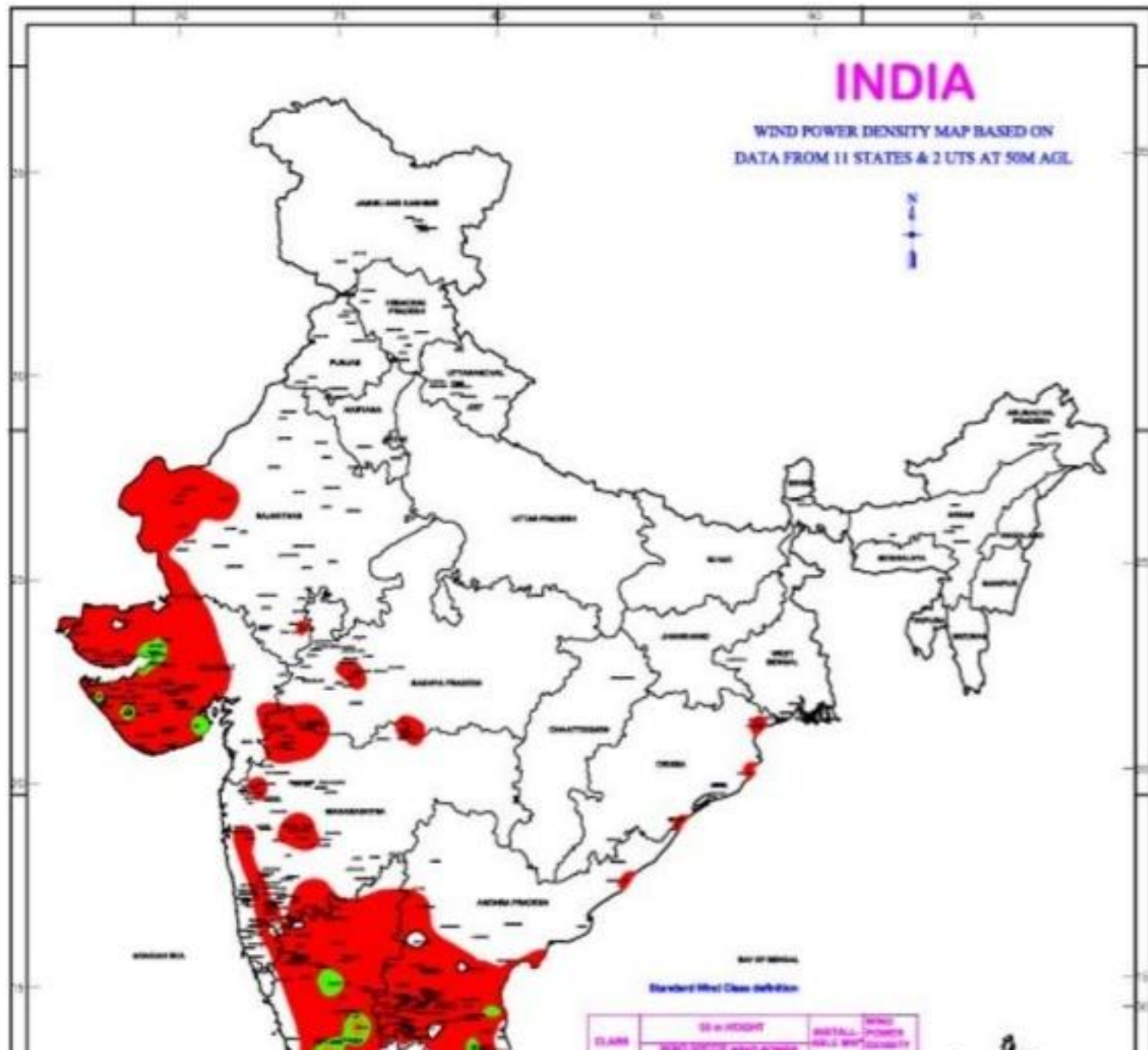
ANNUAL MEAN DAILY GLOBAL SOLAR ELECTRIC CONVERSION POTENTIAL IN INDIA (MW)



WIND POWER

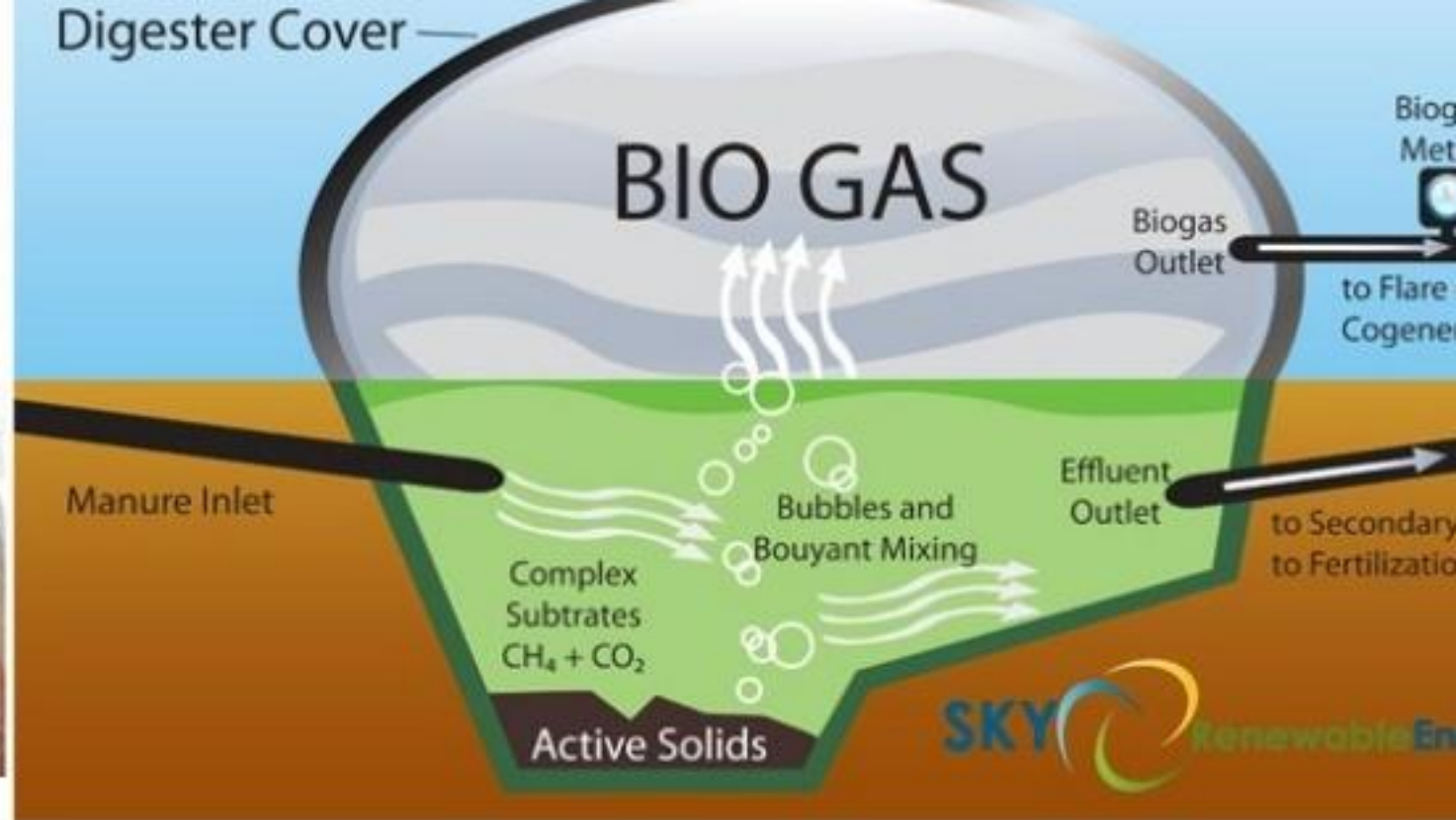
- India ranks as a “wind superpower” in the World.
- The largest wind farm cluster is located in Tamil Nadu from Nagarcoil to Madurai.
- Andhra Pradesh Karnataka, Gujarat, Kerala Maharashtra & Lakshadweep have important wind farms.
- Nagarcoil and Jaisalmer are well known for





BIOGAS

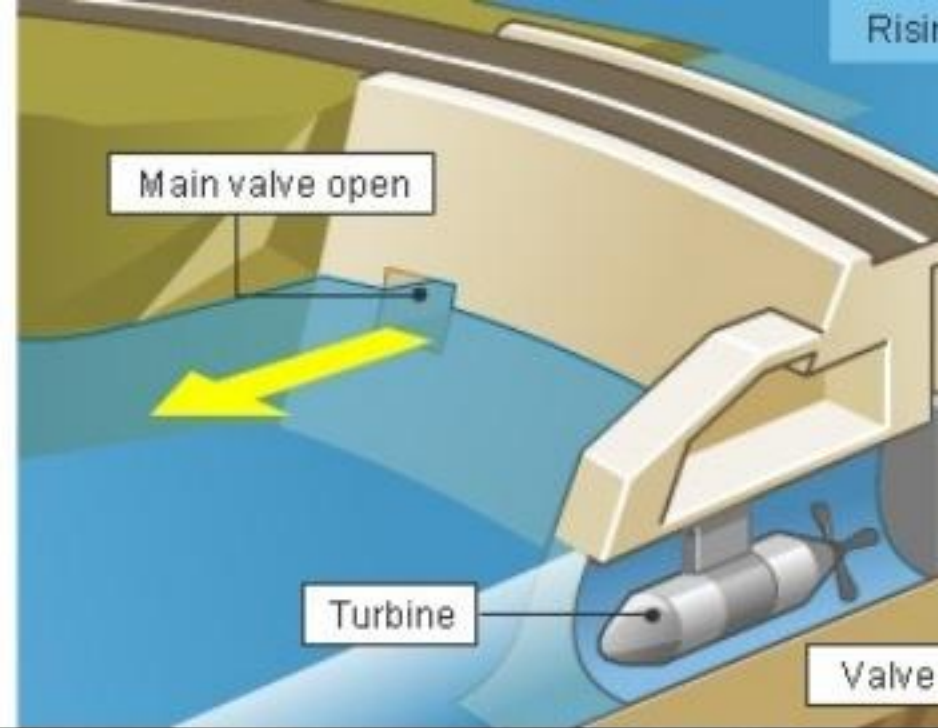
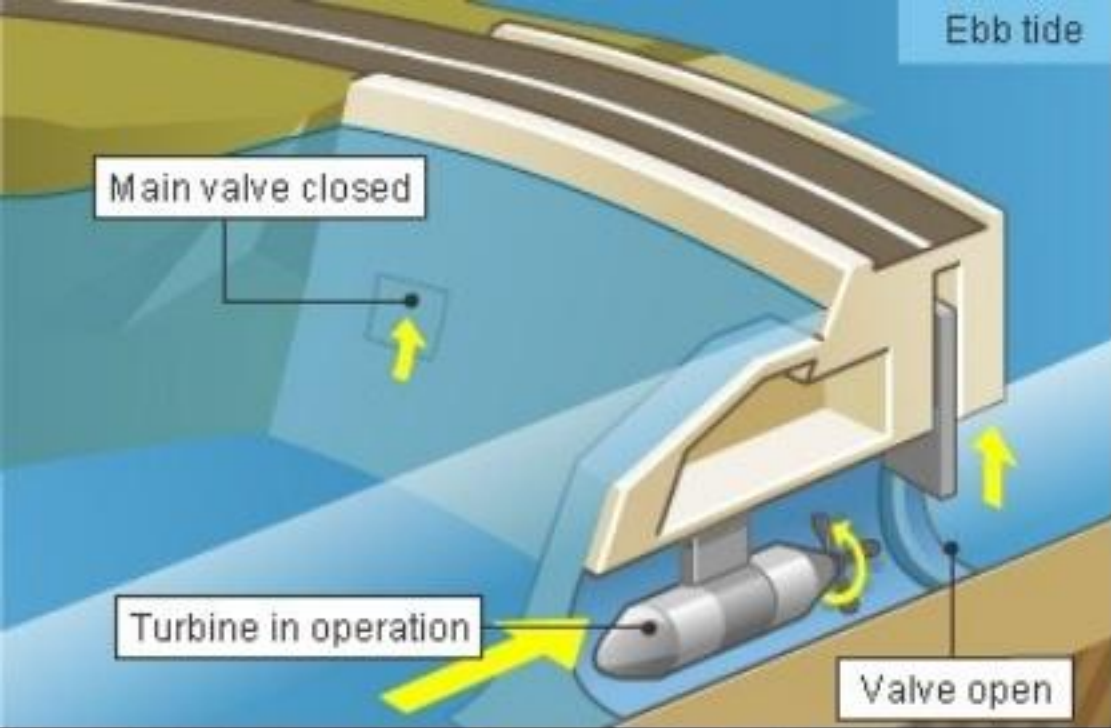
- Shrubs, farm waste, animal and human waste are used to produce biogas for domestic consumption in rural areas.
- Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake, and charcoal
- Biogas plants are set up at municipal, cooperative and individual levels.
- The plants using cattle dung are known as “Gobar gas plants” in rural India.
- These provide twin benefits to the farmer in the form of energy



TIDAL ENERGY

- Oceanic tides can be used to generate electricity flood gate 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 floodgate 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 Kutchh, provides ideal





PAKISTAN

Rajasthan

24

22

Gulf of Kuchchh

Gulf of

Rann of Kuchchh

Kuchchh

Little Rann of Kuchchh

Banaskantha

Patan

Mehsana

Sabarkantha

★ Gandhi Nagar

Kheda

Ahmedabad

Panchm

Surendranagar

Anand

Vadodara

Jamnagar

Rajkot

Porbandar

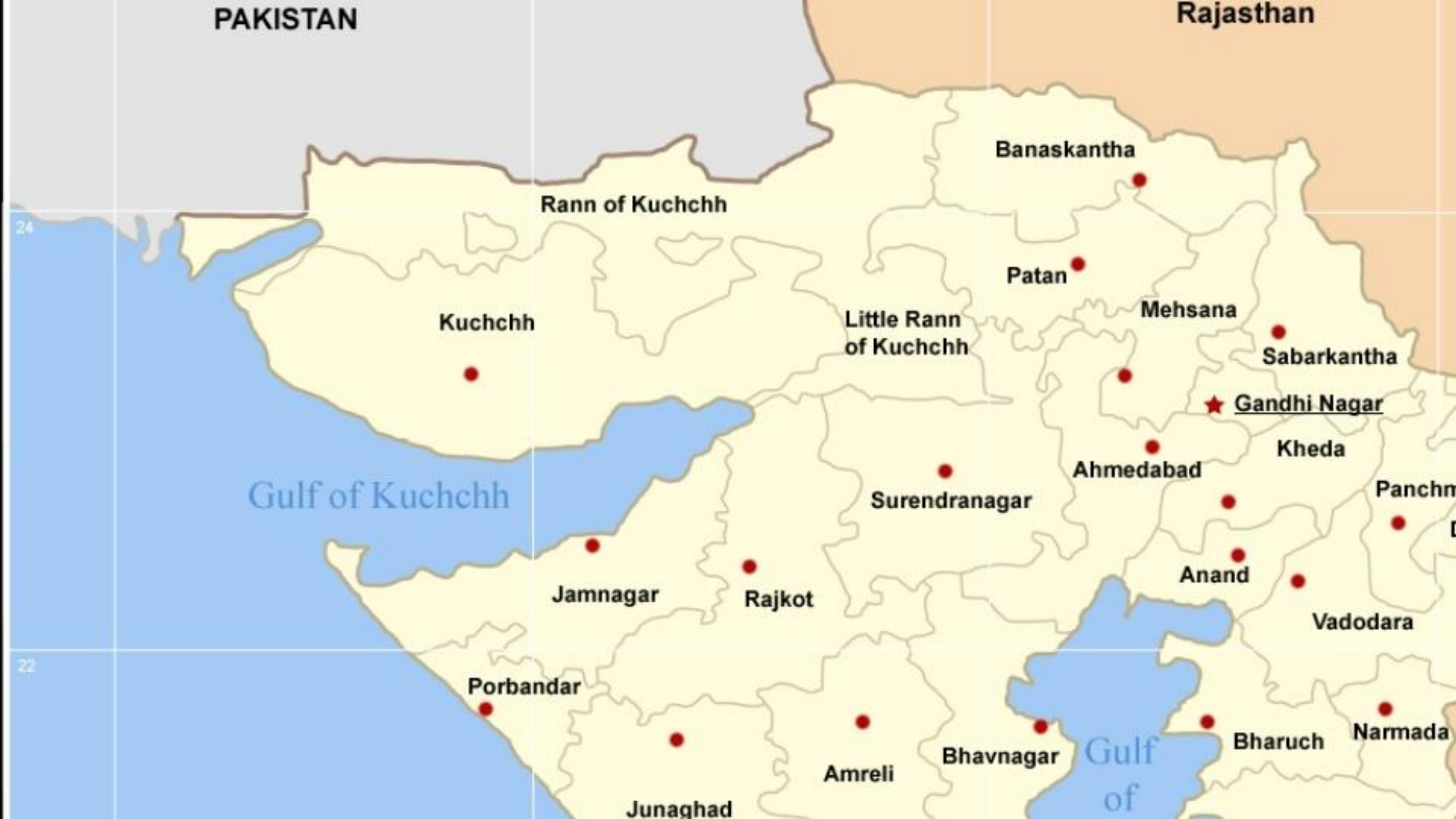
Junaghad

Amreli

Bhavnagar

Bharuch

Narmada



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.
- Ground water in such areas absorbs heat from the

There are several hundred hot springs in India. Which could be used to generate electricity.

Two experimental projects have been setup in India to harness Geothermal Energy

One is located in the Parvati Valley near Manikaran in Himachal Pradesh.

The other is located in Dehra Valley

***Manikaran Gurdwara,
Parvati Valley, Kullu,
Himachal***





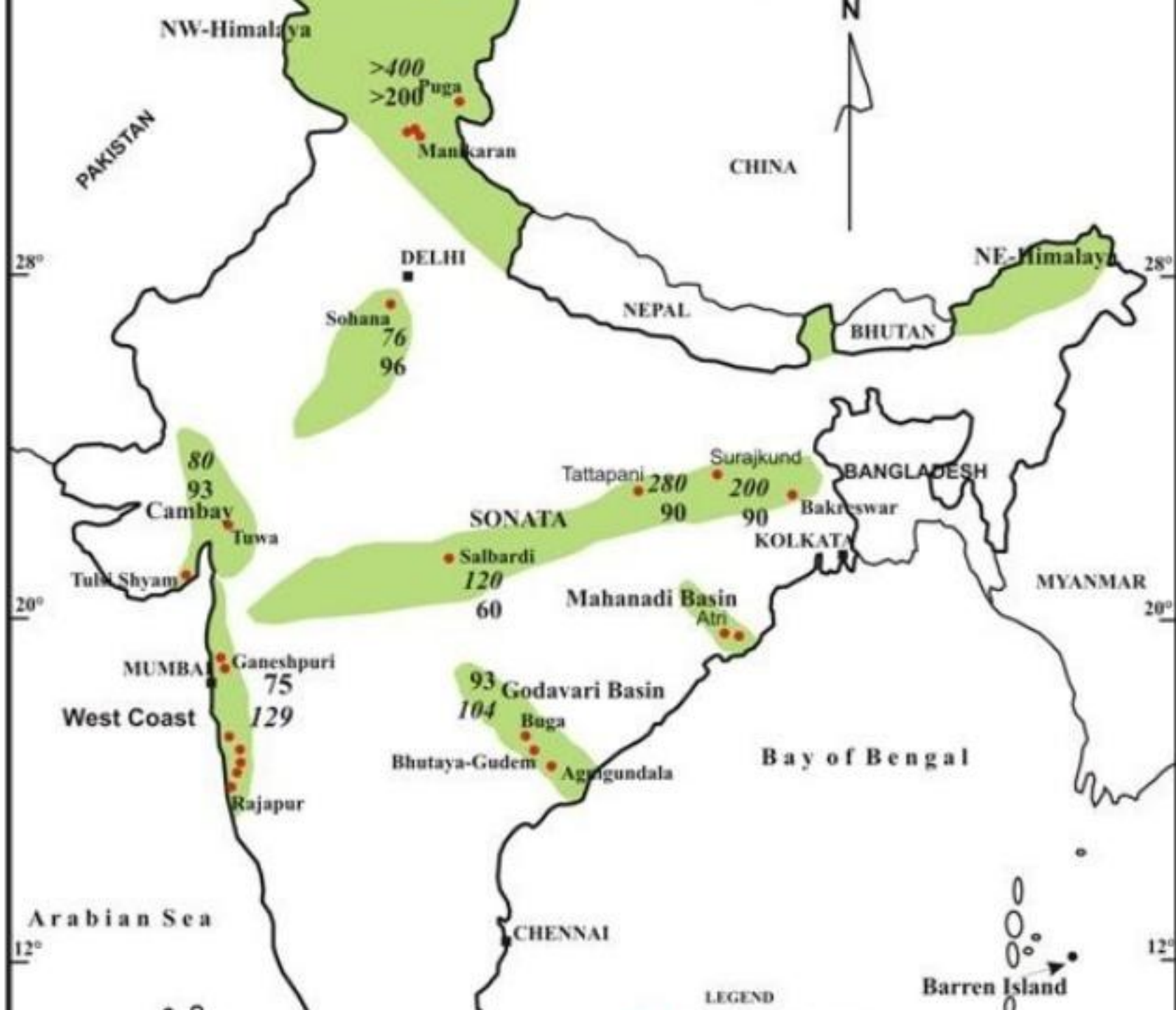
Manikaran





Puga valley , Ladakh





CONSERVATION OF ENERGY RESOURCES

- Energy is a basic requirement for economic development every sector of the national economy - agriculture, industry, transport, commercial and domestic needs inputs of energy.
- Consumption of energy in all forms has been already rising all over the country.
- There is urgent need develop a sustainable path of energy development. Promotion of energy conservation and increased use of renewable

- 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.
- E.g. As concerned citizens we can do our bit by using public transport systems instead of individual vehicles, switch off electricity



“ENERGY SAVED IS ENERGY PRODUCED”



LET'S SAVE THE



SAVE WATER
TO SAVE ENERGY



Reduce . Reuse . Recycle

ENJOY CAR POOL RIDES



**ENERGY SAVING
CLIMATE CHANGE TIPS
FOR YOUR SCHOOL**

CONSIDER GOING SOLAR FOR WATER HEATING SYSTEMS



CHOOSE FRIDGE WITH A GOOD ENERGY STAR RATING



MEATLESS MONDAY!
HAVE ONE DAY A WEEK THAT IS VEGETARIAN DAY



USE LOCALLY GROWN PRODUCE



PUT TIMERS ON URNS OR USE A KETTLE



WATER HEATING



CANTEEN

TRANSPORT



WALK



RIDE A BIKE

TAKE THE BUS TO SCHOOL



REDUCE LUNCH TIME RUBBISH



WWW.WASTEWISE.WA.GOV.AU

WASTE

LIGHTING

AT RECESS/
LUNCH

TURN LIGHTS OFF



USE ENERGY EFFICIENT LIGHTS

AIR HEATING
CONDIT

OFFICE EQUIPMENT

CHOOSING EQUIPMENT

WWW.SUSTAINABLESCHOOLS.WA.EDU.AU

AUSSI



ORGANISATIONS THAT CAN HELP

SOLAR SCHOOLS PROGRAM
(\$12,500 GRANT)
WWW.SEDO.ENERGY.WA.GOV.AU





SAVE
EARTH