

Chapter -7

Mineral and Energy Resources

Types of Mineral Resources

Mineral are classified on the basis of their physical and chemical properties which are as follows:

Metallic Minerals

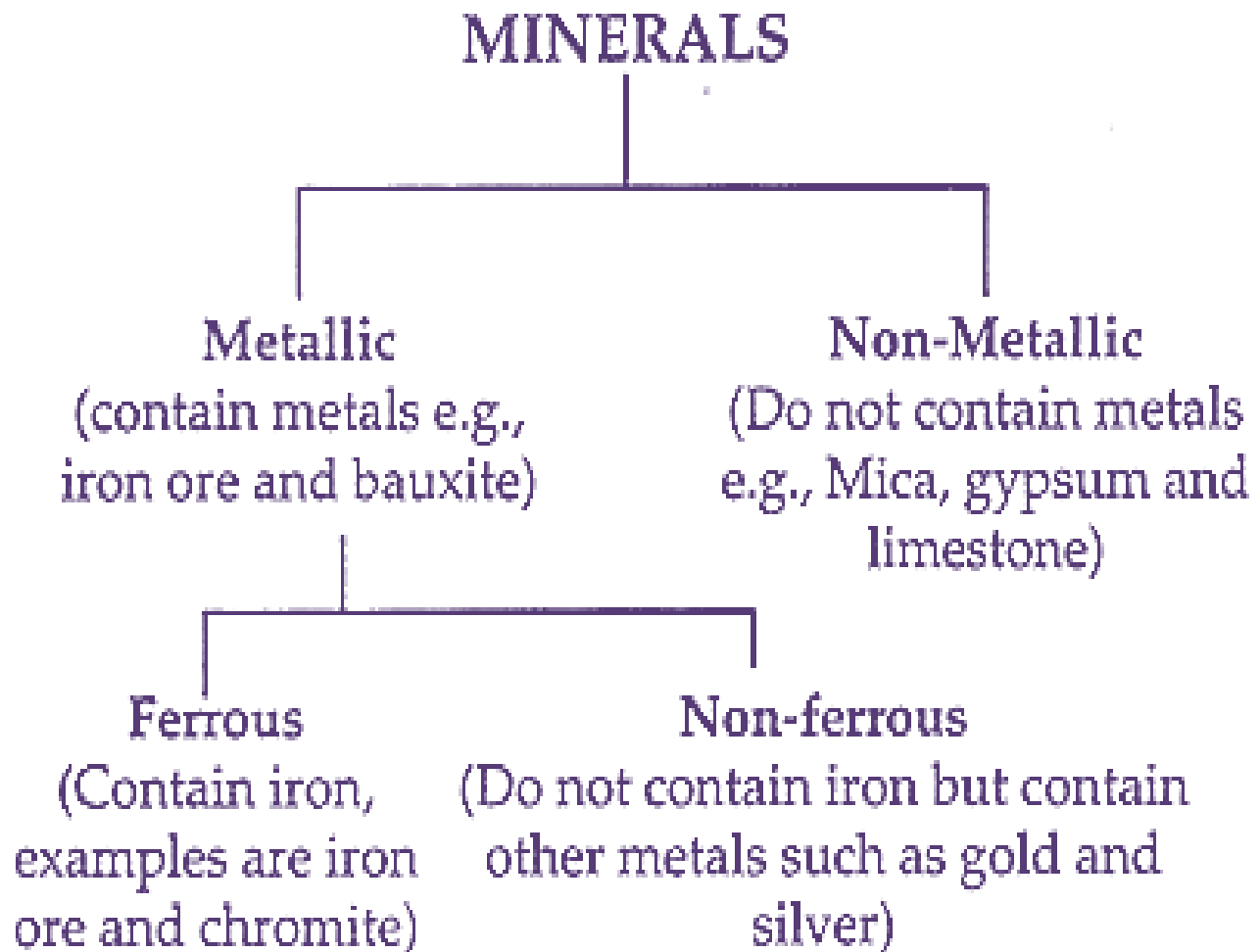
These minerals are rich in metals e.g. copper, bauxite, iron, manganese, etc. These are of two types:

- **Ferrous Minerals** These are rich in iron contents and an important source of iron.
- **Non-Ferrous Minerals** These do not have iron content and have highest proportion of other metals. For e.g. copper, bauxite, etc.

Non-Metallic Minerals

These minerals do not have contents of metals. They are classified into two groups:

- **Organic Minerals** These are made up of organic matter of buried animal and plants. For e.g. coal, petroleum.
- **Inorganic Minerals** These are inorganic in nature of origin. For e.g. Mica, limestone, graphite, etc.



Characteristics of Minerals Resources

The main characteristics of minerals are as follows:

1. Their distribution over the earth surface are uneven.
2. There is inverse relationship in quantity and quality of minerals i.e. good quality minerals are less in quantity as compared to low quality minerals.
3. Minerals are exhaustible. Once they used can not replenished immediately at the time of need. So, minerals have to be conserved and used judiciously.

Distribution of Minerals in India

- Most of metallic minerals in India occur in the Peninsular Plateau region in the old crystalline rocks.
- River valleys of Damodar, Sone, Mahanadi and Godavari have over 97% of coal reserves in India.
- Sedimentary basins of Assam and offshore region in the Arabian Sea (Gujarat and Mumbai High) are famous for their crude petroleum reserves.
- New reserves of petroleum also have been found in the basins of Krishna- Godavari and Kaveri.
- Most of the major mineral resources occur to the east of a line linking Mangalore and Kanpur.
- Minerals are generally concentrated in three broad belts in India.
- There may be some sporadic occurrences here and there in isolated pockets. These belts are:

The North-Eastern Plateau Region

- This belt includes the regions of Chotanagpur (Jharkhand), Odisha Plateau, West Bengal and parts of Chhattisgarh.
- Important minerals are iron ore, coal, manganese, bauxite and mica.
- Due to availability of these minerals, most of the iron and steel industries are located here.

The South-Western Plateau Region

- This belt extends to lower Karnataka, Goa and contiguous uplands of Tamil Nadu and Kerala.

- Ferrous metals and bauxite are concentrated here along with high grade iron ore, manganese and limestone. This belt is rich in coal packs except Neyveli lignite.
- Neyveli has lignite coal deposit. Deposits of monazite sand and thorium are found in Kerala.
- Mines of iron-ore are located in Goa.

The North-Western Regions

- Minerals of this belt are associated with Dharwar system of rocks which are found in the Rajasthan and parts of Gujarat.
- Major minerals are copper and zinc. Rajasthan is rich in building stones i.e. sandstone, granite, marble, fuller's earth and gypsum.
- Some cement industries are also concentrated here due to availability of dolomite and limestone which are the raw materials of these industries.
- Gujarat is rich in petroleum deposits. Salt is also produced in Gujarat and Rajasthan.

Other Areas/Regions

- Both Eastern and Western parts of the Himalayan belt have minerals like copper, lead, zinc, cobalt and tungsten.
- Assam Valley has mineral oil deposits. Besides, oil resources are also found in off-shore areas near Mumbai Coast (Mumbai High).

Spatial Pattern of Metallic Minerals

Spatial pattern of some of the important minerals are as follow:

Ferrous Minerals

- India is well placed in respect of ferrous minerals like iron-ore, manganese, chromite, etc.
- These minerals provide a strong base for the development of metallurgical industries.

Iron ore

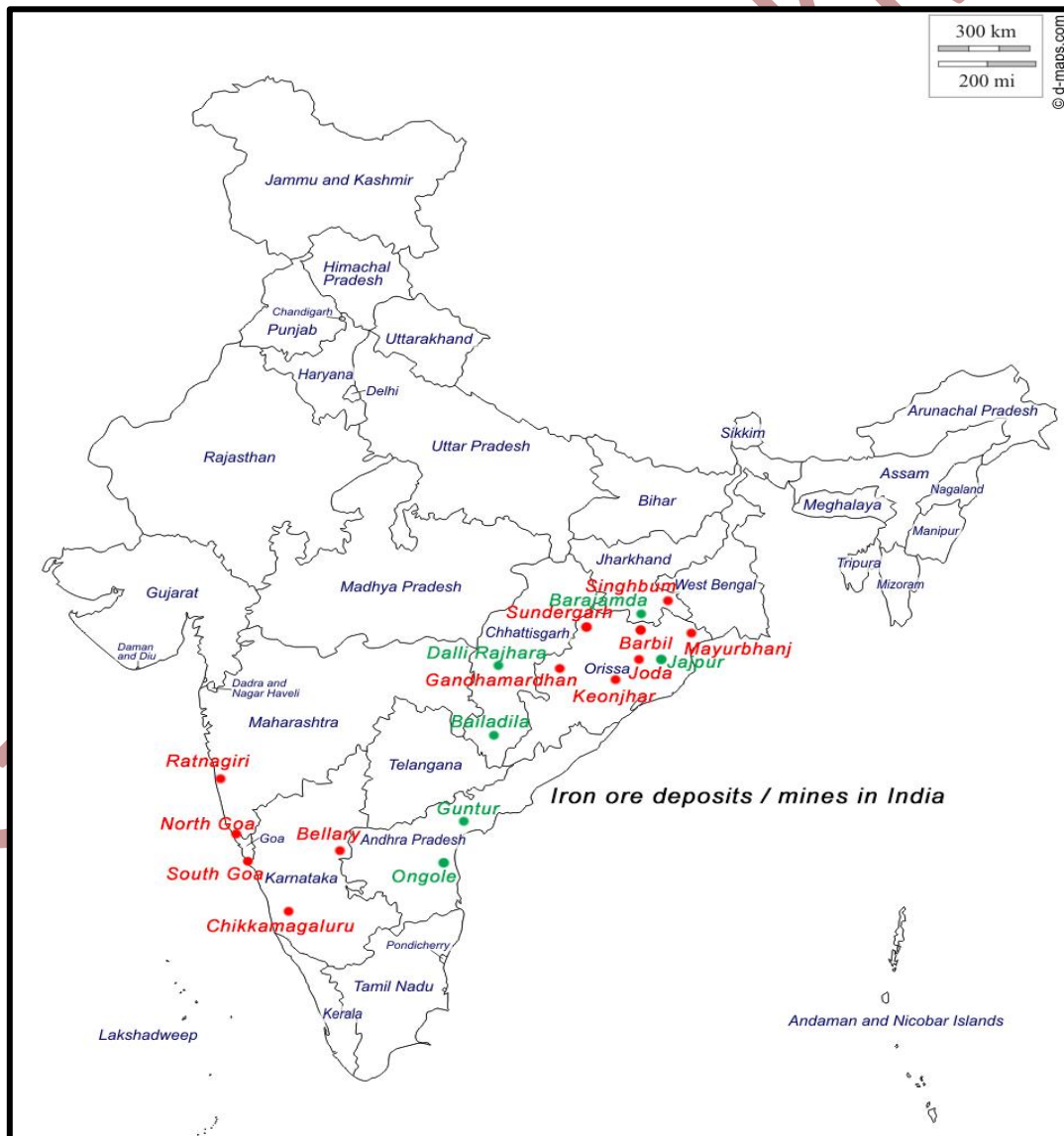
India has largest iron ore reserves in Asia. Its superior quality of hematite and magnetic iron-ore have a great demand in International market. Iron ore mines of India are found near the coal fields of North-Eastern Plateau region which is an advantage for iron-ore industries of India. During 2004-05, India has about 20 billion tonnes of iron-ore reserves. Few Indian states have about 95% of total iron-ore reserves in India.

These states are:

- **Odisha** The important mines are located at Sundergarh, Mayurbhanj and Jhar. Gurumahisani, Sulaipet, Badampahar in Mayurbhanj and Kiruburce and Bonai (Sundergarh) have important mines. Jharkhand It has oldest mines in India. Important mines are Noamundi and Guain Poorbi and Paschimi Singhbhum districts.
- **Chhattisgarh** The mine belt further extended to Durg, Dantewada, Bailadiala, Dalli and Rajhara.
- **Karnataka** Important mines are Sundar-Hospet area of

Bellary district, Baba Budan hills and Kundremukh in Chikmagalur Tumkur districts,

- **Maharashtra** Important iron-ore deposits are located in Chandrapur, Bhandara and Ratnagiri districts.
- **Andhra Pradesh** Important areas of ironore are Karimnagar Warangal, Kumool, Cuddapah and Anantpur districts.
- **Others** These include Salem and Nilgiris Districts of Tamil Nadu state and Goa state.



Manganese

It is an important raw material which is used in iron and steel industry for smelting of iron-ore and in the manufacturing of ferro alloys.

It is mainly associated with Dharwar system but found almost in all geological formations.

Important states are:

- **Odisha** It is the largest manganese producer of India. The central part of the iron-ore belt of India has most of the manganese mines of Odisha. Important mines are located in the districts of Bonai, Kendujhar, Sundargarh, Gangpur, Koraput, Kalahandi and Bolangir.
- **Karnataka** Dharwar, Bellary, Belgaum, North Canara, Chikmagalur, Shimoga, Chiradurg and Tumkur.
- **Maharashtra** The main disadvantage of its mines are that these are located away from iron and steel plants. Nagpur, Bhandara and Ratnagiri have manganese mines.
- **Madhya Pradesh** Balaghat, Chhindwara, Nirmar, Mandla and Jabalpur districts have manganese mines.
- **Others** Other producer states of manganese are Andhra Pradesh, Goa and Jharkhand.

Non-Ferrous Minerals

India has large deposits of bauxite but is lacking behind in other non-ferrous minerals.

Bauxite

It is the ore that used to manufacture aluminum and aluminium products.

It is found in laterite rocks mostly in the plateau or hilly regions of peninsular India and also in the coastal areas.

Important states are:

- **Odisha** It is the largest producer of bauxite and important producing areas are Kalahandi, Sambalpur, Bolangir and Koraput.
- **Jharkhand** Peldands of Jharhand in Lohardage home rich deposits.
- **Gujarat** Bhavanagar and Jamnagar are important sites of bauxite.
- **Chattisgarh** Amarkanatak plateau region has large deposits of bauxite.
- **Madhya Pradesh** Katni Jabalpur and Balaghat have important deposits of bauxite.
- **Others** Tamil Nadu, Karnataka and Goa are other producers of bauxite.

Copper

It is alloyable, malleable and ductile and an indispensable metal in electrical industry used for making wires, electric motors, transformers and generators.

It is also used to give strength in gold jewellery. Important copper producing states are:

- **Jharkhand** Singhbhum district
- **Madhya Pradesh** Balaghat
- **Rajasthan** Jhunjhunu and Alwar
- **Andhra Pradesh** Agnigundala in Guntur district
- **Karnataka** Chitradurg and Hasan
- **Tamil Nadu** South Arcot district



Non-Metallic Minerals

Limestone, dolomite, phosphate and mica are some non-metallic minerals produced in India. Mica is the important among them while others are produced for domestic consumption.

Mica

Mica is mainly used in the electrical/electronic industries which can be split into very thin, strong and flexible sheets. Due to its resistance quality it is used in electricals and electronic industry. Important producer states are:

- **Jharkhand** Hazaribagh plateau produces a high quality of mica.
- **Andhra Pradesh** Nellore district is important producer of mica, it produces best quality mica.
- **Rajasthan** A 320 km long belt from Jaipur to Bhilwara near Udaipur produces mica.
- **Karnataka** Mysore and Hasan are important producers of mica.
- **Others** Coimbatore, Tiruchirapalli, Madurai and Kanya Kumari (Tamil Nadu), Ratnagiri (Maharashtra), Alleppey, (Kerala), Purulia and Bankura (West Bengal) are also known for mica deposits.

Energy Resources

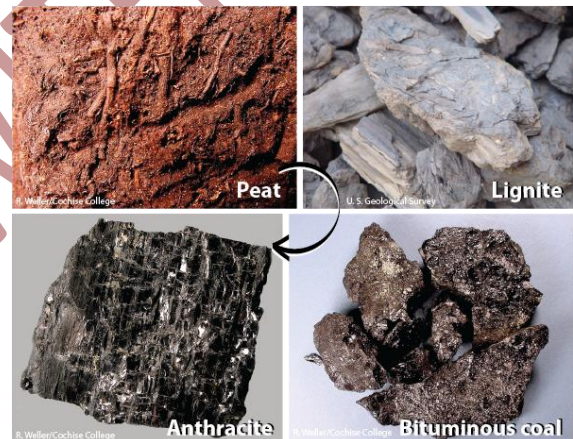
All sectors of economy i.e. agriculture, industry, transport are run by power which comes from mineral fuels whether conventional or non-conventional energy resources.

Conventional Sources of Energy

These are exhaustible in nature e.g. fossil fuels like coal, petroleum and natural gas.

Coal

- It is required in the generation of thermal power and smelting of iron-ore.
- India has about 80% of bituminous coal which is of non-cooking grade.
- It is found in two rock sequences i.e. Gondwana coal fields and tertiary coal fields.



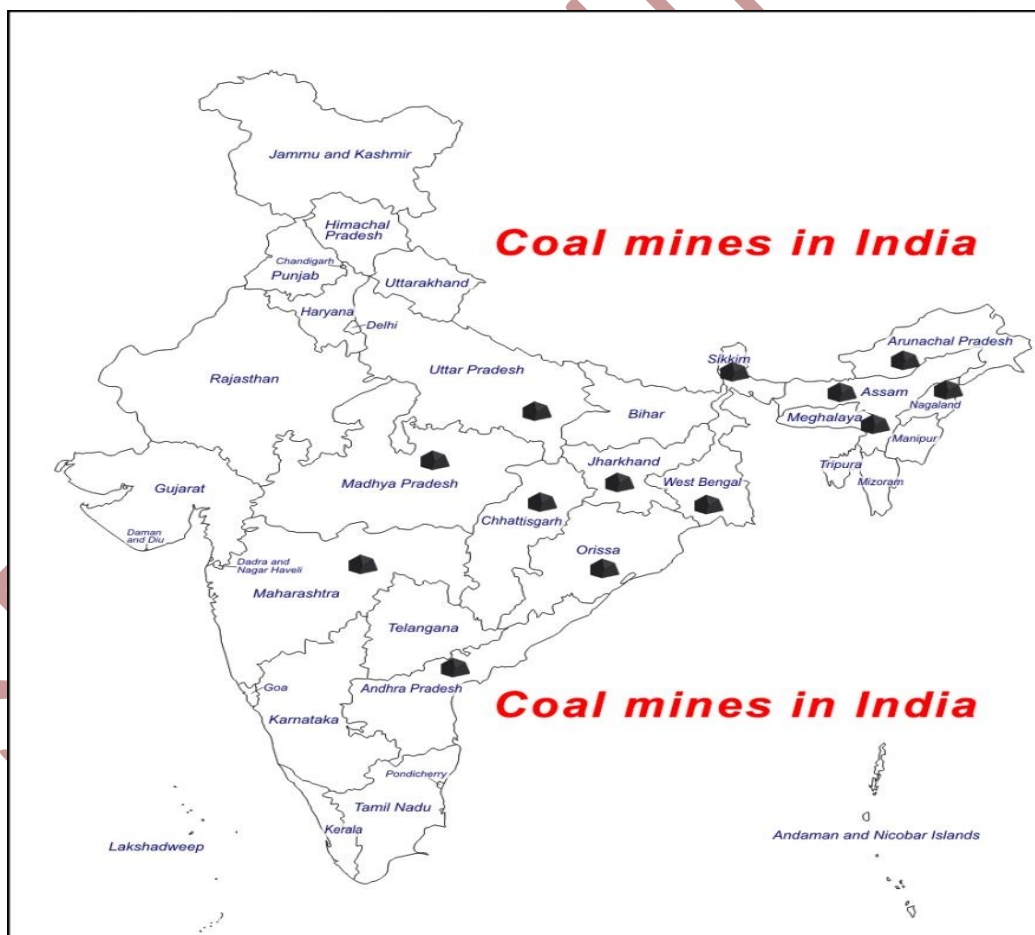
Gondwana Coal Fields

Damodar Valley is the important coal field of India. Jharkhand and West Bengal coal have the entire area of this coal field. Jharia (largest coal field), Raniganj (second fields largest), Bokaro, Giridih, Karanpura are important coal fields of this valley. Other river valleys are Godavari, Mahanadi and Sone.

Tertiary Coal Fields

Important states are:

- **Meghalaya** Darangiri, Cherrapunji, Mewlong and Langrin (Meghalaya).
- **Assam** Makum, Jaipur and Nazira in Upper Assam.
- **Arunachal Pradesh** Namchik-Namphurk jammu and Kashmir Kalakot Others Nagaland state
- **Other Coal Fields**
- Besides, the brown coal or lignite coal occurs in the coastal areas of Tamil Nadu, Puducherry, Gujarat and Jammu and Kashmir.



Petroleum

- Crude petroleum consists of hydrocarbons of liquid and gaseous states varying in chemical composition, colour and specific gravity.
- It is used as a source of energy in all internal combustion engines of automobiles, railways and aircrafts.
- It is also used as a raw material in petrochemical industries to produce fertilizer, synthetic rubber, synthetic fibre, medicines, vaseline, lubricants, wax soap and cosmetics, etc.
- It is also called liquid gold due to the scarcity and different uses.
- Crude oil is found in sedimentary rocks of tertiary age. Before independence, Digboi was the only crude oil producing region in India but after independence in 1956, Oil and Natural Gas Commission was set up.

Important oil producing regions are:

- **Assam** Digboi, Naharkatiya and Moran.
- **Gujarat and Mumbai High** Ankaleshwar, Kalol, Mehasana, Nawagam, Kosamba and Lunej. Krishna, Godavari and Kaveribasins also have Oil and Natural Gas reserves on the East coast of India.

There are two types of oil refineries in India:

- **Field Based Refineries** Digboi is an example of field based refinery.
- **Market Based Refineries** Barauni is an example of

market based refinery. There are total 21 refineries as on June 2011.

Natural Gas

- It occurs along with oil as well as separately in gas reserves in India.
- These gas reserves are located along with Eastern coast of Tamil Nadu, Odisha, Andhra Pradesh, Tripura, Rajasthan, Gujarat and Maharashtra.
- Gujarat and Maharashtra have off-shore wells of natural gas.
- According to a survey report, there are indications of huge gas reserves in Ramathanpuram in Tamil Nadu state.



Non-Conventional Energy Sources

- Unlike conventional sources of energy, non-conventional energy sources are renewable i.e. solar, wind, hydro- geothermal and biomass and are not threat to natural system.
- Their use ensure sustainable development as these are environmentfriendly and cheaper energy sources.

Nuclear Energy Sources

- Nuclear energy has emerged as a feasible source in recent times.
- Uranium and thorium are main minerals that are used to generate nuclear energy.

Uranium Deposits in India

It is found in Dharwar rock system. Important regions are:

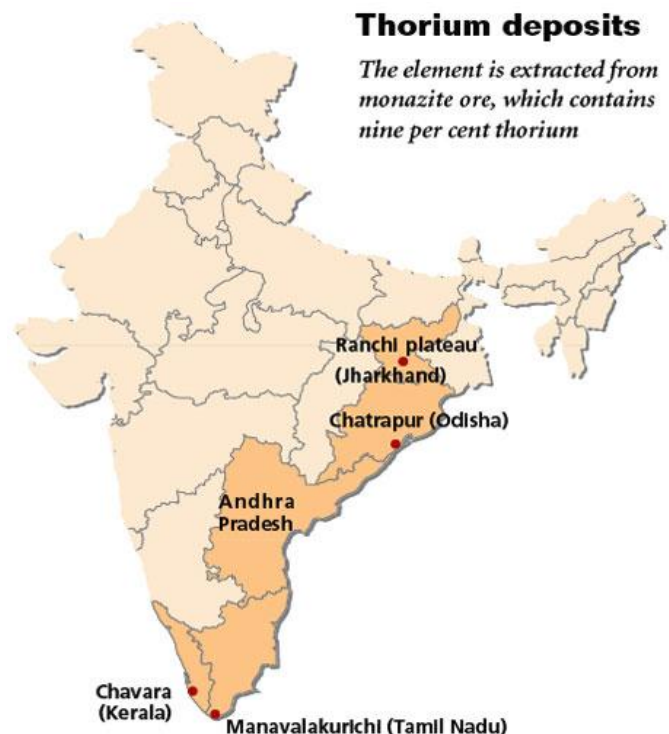
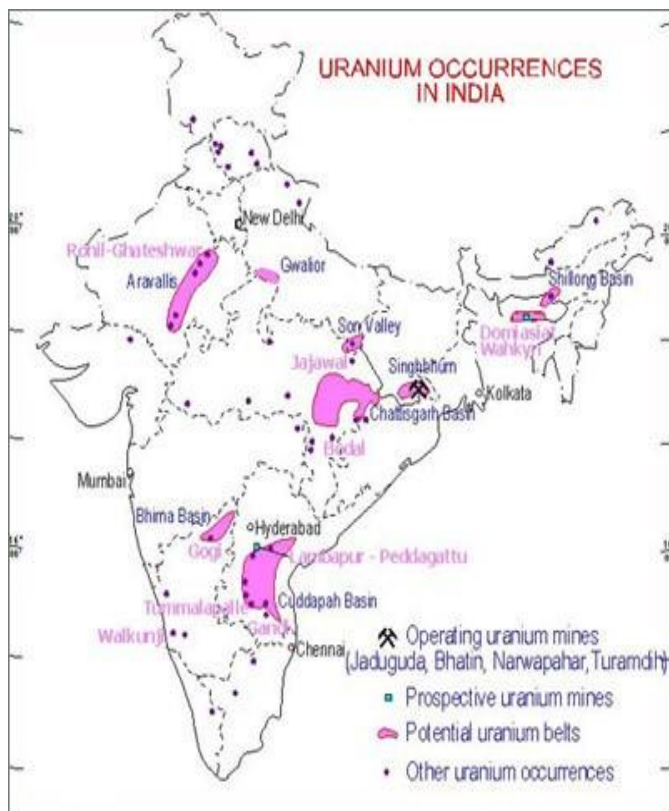
- **Jharkhand** Singhbhum (along with the copper belt)
- **Rajasthan** Udaipur, Alwar, Jhunjhunu districts.
- **Chhattisgarh** Durg district Maharashtra Bhandara district.
- **Himachal Pradesh** Kullu district.

Thorium Deposits in India

It is found in very few places in India:

- **Kerala** (in monazite and ilmenite beach sands) Plakkad and Kollam districts.
- **Andhra Pradesh** Vishakhapatnam.
- **Odisha** Mahanadi river delta

- These three states have world's richest monazite deposits. The development of nuclear energy was started after establishment of Atomic Energy Institute at Trombay in 1954 which was renamed as the Bhabha Atomic Research Centre in 1967.
- Tarapur (Maharashtra), Rawatbhata near Kota (Rajasthan), Kalapakkam (Tamil Nadu), Narora (Uttar Pradesh), Kaiga (Karnataka) and Kakrapar (Gujarat) are other nuclear power sites in India



Solar Energy

Sun's energy trapped by two methods i.e. photovoltaic cells and solar thermal technology and convert into electricity is called solar energy.

- Its construction is easy, eco-friendly and cost competitive.
- It is 7% and 10% more effective than coal and oil based plants and nuclear energy, respectively.
- Heaters, dryers, cookers and other heating appliances use solar energy more than others.
- Gujarat, Rajasthan and the Western part of India have higher potential for the development of solar energy.



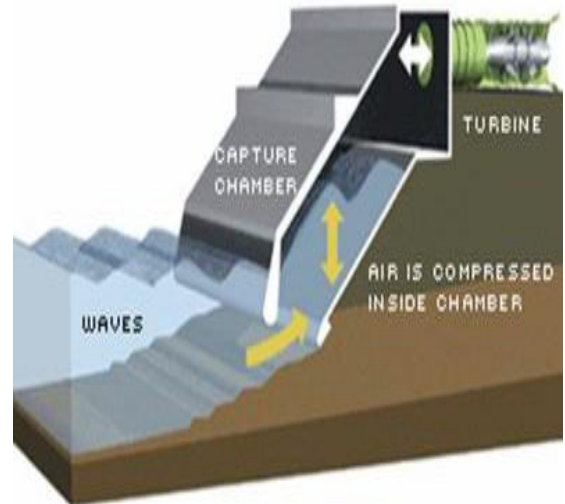
Wind Energy

Wind energy is non-polluting and renewable source. Through turbine mechanism, kinetic energy of wind can be directly converted into electrical energy.

- Electricity can be produced by permanent wind systems like trade wind, westerlies or seasonal winds like monsoon winds. Besides, production of electricity can also be done by local winds, land and sea breezes.
- India already has started generating wind energy to lessen the burden of oil import bill. It is estimated that India has 50000 megawatts potential of wind generation, of which one-fourth may be easily employed
- Rajasthan, Gujarat, Maharashtra and Karnataka have higher potential for the development of wind energy.

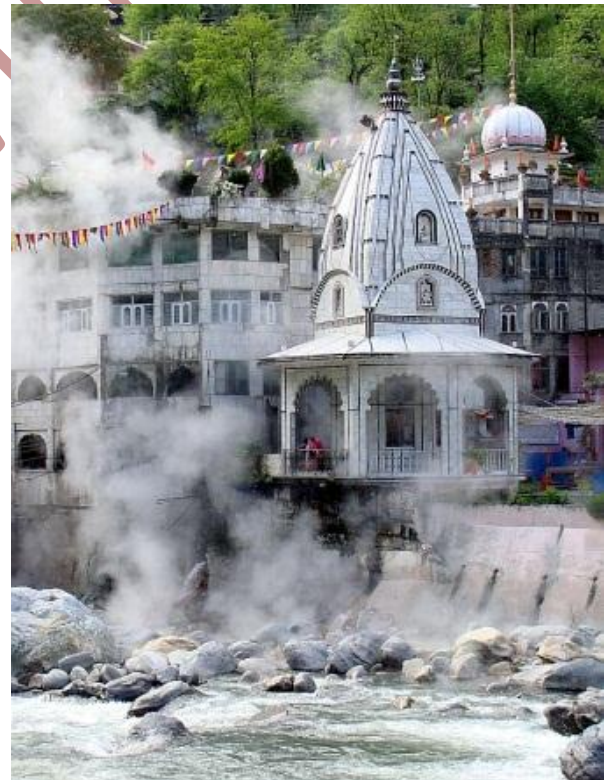
Tidal and Wave Energy

- Ocean currents are the store house of infinite energy. Large tidal waves are known to occur along the west coast of India.
- Many efforts for the efficient use of oceanic tides and waves were made since 17th and 18th century.
- But these waves have not yet been utilised properly because of lack of technology’.



Geothermal Energy

- Magma that comes over the earth’ surface releases vast amount of heat. This heat energy can be converted into electrical energy by tapping it. It is called geothermal energy
- Main sources of this energy are magma, hot spring (hot water), hot geysers, etc._
- Geothermal energy is gaining importance and can be used as an alternative to conventional energy sources.
- In India at Manikaran in Himachal Pradesh, a geothermal energy plant has been commissioned



Bio-Energy

- Bio-energy refers to energy derived from biological products which includes agricultural residues, municipal, industrial and other wastes.
- It can be converted into electricity or electrical energy, heat energy or gas for cooking food.
- This can also solve the problem of garbage and waste in urban areas because energy can also be derived from these.
- It can contribute in improving economic life of rural peoples in developing countries, increasing environmental problems like pollution, solid waste management, enhancing self-reliance and reducing pressure on fuel wood.
- A project in OKHLA (Delhi) is an example that generates energy from municipal waste.



Conservation of Mineral Resources

There are some methods through which we can conserve mineral resources:

1. Adoption of renewable resources in place of exhaustible resources like solar power, wind, geothermal energy can save our non-renewable resources.
2. Use of recycle scrap metals should be encouraged.
3. Use of substitutes for scarce metals may also reduce their consumption.
4. Export of strategic and scarce minerals must be reduced, so that the existing reserve may be used for a longer period.