

# UNIT - III

Recourses: Iron, Copper, Mica, Manganese, Bauxite, and Atomic minerals

Power Resources: Coal, Petroleum, Natural gas, Hydal Power

Multipurpose river projects

Atomic power stations

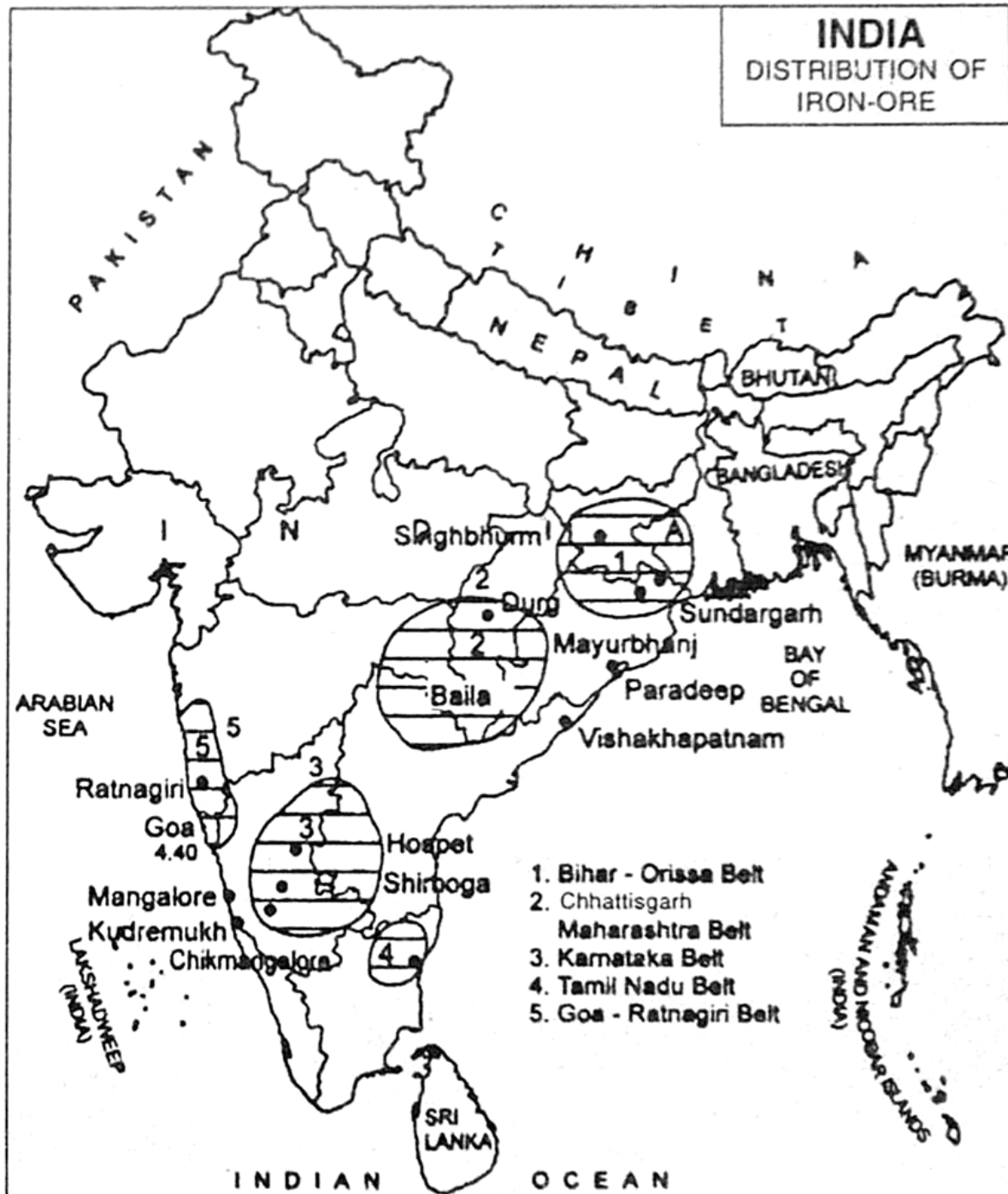
Need for non conventional energy sources.

# Iron

- India is one of the richest countries of the world in iron ore deposits, particularly the hematite ore.
- According to the latest Indian Year Book, 95 percent of the hematite resources are distributed in Odisha, Jharkhand, Karnataka and Goa.
- Magnetite resources are estimated at around 10,619 million tons out of which only 59 million tons is situated mainly in Goa, Rajasthan and Jharkhand.
- The rest 10,560 million tons or the 99 percent of the magnetite resource is in 'Remaining Resources' category which is mainly found in Karnataka (74 percent) and Andhra Pradesh (14 percent).

# INDIA

## DISTRIBUTION OF IRON-ORE



1. Bihar - Orissa Belt
2. Chhattisgarh  
Maharashtra Belt
3. Karnataka Belt
4. Tamil Nadu Belt
5. Goa - Ratnagiri Belt

- **Iron Ore Reserves**

Karnataka, Odisha, Jharkhand and Chhattisgarh.

- **Iron Ore Production**

- Odisha, Goa, Karnataka and Chhattisgarh.

- The iron ore is widely distributed in the India:

- **JHARKHAND**

The iron ores here exist as hill masses which are close to coal fields.

The iron ore generally occurs at the top of the hills, iron ore mining companies use aerial ropeways for bringing down the ore and pumping it into the railway wagons standing near the foot of the hills.

The major iron ore mining areas in Jharkhand are Noamudi, Gua, Jamda and Kiriburu.

- **CHHATTISGARH**

Exploitable rich iron deposits are located in Dalli-Rajhara region of Durg district (close to Bhilai Steel Works), Bailadilla region of Dantewada district, Arindogi region and Raoghat region.

- **ODISHA**

The major iron ore mining centre is in Singhbhum district. The districts of Keonjhar, Mayurbhanj and Sundargarh also form the richest reserves of quality iron ore.

The ore is also exported to different countries through the Paradip port.

- **GOA**

- The major iron ore mining centres are Sanguem, Safari, Ponda, Sahqualim, Bicholim and Quepem.
- The iron ore found in Goa is of high quality. The mining centres are located close to the port of Marmagao.
- The mines are worked by open-cast methods. They are close to rivers which enter the sea near the port.

- **KARNATAKA**

In Karnataka, the major iron ore mining areas are Baba Budan Hills, Kudremukh region, Hospet, Bellary, Chitradurga and Tumkur district.

Iron-ore mined in Bellary and Hospet area is transported to Hospet from where it is sent to the ports of Chennai and Marmagao through railways for export to other countries.

- **MAHARASHTRA**

Maharashtra produces a very small amount of iron ore. Major mining ore areas include Chandrapur, Ratnagiri and Bhandara districts.

- **ANDHRA PRADESH**

Iron ore is mined in small quantities in districts of Karimnagar, Warangal, Cuddapah, Kurnool, Adilabad and Anantapur.

- **TAMIL NADU**

In Tamil Nadu, the areas where iron ore is mined are Tirthamalai Hills in Salem district and Yadpalli and Killiomalai areas in Nilgiris.

# COPPER

- As per United Nations Framework Classification (UNFC), the total resources of copper ore are placed at 1.39 billion tonnes with a metal content of 11,418 thousand tonnes.
- Copper is an indispensable metal in the electrical industry for making wires, electric motors, transformers and generators.
- It is alloyable, malleable and ductile. It is also mixed with gold to provide strength to jewellery.
- The Copper deposits mainly occur in Singhbhum district in Jharkhand, Balaghat district in Madhya Pradesh and Jhunjhunu and Alwar districts in Rajasthan.
- Minor producers of Copper are Agnigundala in Guntur District (Andhra Pradesh), Chitradurg and Hasan districts (Karnataka) and South Arcot district (Tamil Nadu).





# MICA

- Mica is mainly used in the electrical and electronic industries. It can be split into very thin sheets which are tough and flexible.
- Mica in India is produced in Jharkhand, Andhra Pradesh, Telangana and Rajasthan followed by Tamil Nadu, West Bengal and Madhya Pradesh.
- In Jharkhand high quality mica is obtained in a belt extending over a distance of about 150 km, in length and about 22 km, in width in lower Hazaribagh plateau.
- In Andhra Pradesh. Nellore district produces the best quality mica. In Rajasthan mica belt extends for about 320 kms from Jaipur to Bhilwara and around Udaipur.
- Mica deposits also occur in Mysore and Hasan districts of Karnataka, Coimbatore, Tiruchirapalli, Madurai and Kanniyakumari in Tamil Nadu, Alleppey in Kerala, Ratnagiri in Maharashtra, Purulia and Bankura in West Bengal.

# MANGANESE

- Manganese is an important raw material for smelting of iron ore and also used for manufacturing ferro alloys.
- Manganese deposits are found in almost all geological formations, however, it is mainly associated with **Dharwar** system. **Odisha** is the leading producer of **Manganese**.
- Major mines in **Odisha** are located in **the central part of the iron ore belt of India**, particularly in **Bonai, Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi and Bolangir**.

- Karnataka is another major producer and here the mines are located in Dharwar, Ballari, Belagavi, North Canara, Chikkmagaluru, Shivamogga, Chitradurg and Tumkur.
- Maharashtra is also an important producer of manganese which is mined in Nagpur, Bhandara and Ratnagiri districts.
- The disadvantage to these mines is that they are located far from steel plants.
- The manganese belt of Madhya Pradesh extends in a belt in Balaghat-Chhindwara-Nimar-Mandla and Jhabua districts.
- Telangana, Goa, and Jharkhand are other minor producers of manganese.

# BAUXITE

- Bauxite is the ore which is used in manufacturing of aluminium. Bauxite is found mainly in tertiary deposits and is associated with laterite rocks occurring extensively either on the plateau or hill ranges of peninsular India and also in the coastal tracts of the country.
- Odisha happens to be the largest producer of **Bauxite**. Kalahandi and Sambalpur are the leading producers. The other two areas which have been increasing their production are **Bolangir and Koraput**.
- The patlands of Jharkhand in Lohardaga have rich deposits. **Gujarat, Chhattisgarh, Madhya Pradesh and Maharashtra** are other major producers. **Bhavanagar, Jamnagar in Gujarat** have the major deposits.
- Chhattisgarh has bauxite deposits in Amarkantak plateau while Katni-Jabalpur area and Balaghat in M.P. have important deposits of bauxite.
- **Kolaba, Thane, Ratnagiri, Satara, Pune and Kolhapur in Maharashtra** are important producers. **Tamil Nadu, Karnataka and Goa** are minor producers of bauxite.

# ATOMIC MINERALS

- Atomic minerals are the most important among non-fossil energy resources.
- They are found in the slate rocks of the pre-Cambrian (Archean Schist) and Dharwar periods in India.
- **Uranium and Thorium** are major minerals for the production of atomic energy.
- Uranium is mined directly where as for thorium is obtained mainly from monazite and limonite.
- **Thorium** is also obtained from **beryllium, zircon, antimony and graphite.**
- **Uranium:** It is found in Singhbhum and Hazaribagh districts of Jharkhand, and Gaya District of Bihar, and in sedimentary rocks of **Saharanpur District of Uttar Pradesh.**

- The largest source of uranium comprise the monazite sands, both beach and alluvial.
- Monazite sand rich in uranium is found in **Kerala**. Some uranium is found in the copper and zinc mines of **Udaipur (Rajasthan)**.
- The total reserves of uranium as estimated by the Department of Atomic Energy, Government of India, are about 31,000 tonnes.
- **Thorium:** It is derived from monazite. It is produced in **Kerala, Jharkhand, Bihar, Tamil Nadu, and Rajasthan**.
- In addition to uranium and thorium, beryllium and lithium are also the atomic minerals found mainly in **Jharkhand, Madhya Pradesh, and Rajasthan**.

- **Beryllium:** Its reserves are in the states of Rajasthan, Jharkhand, Andhra Pradesh and Tamil Nadu.
- **Zircon:** It is found mainly in the coastal sand of Kerala.
- **Antimony:** It is found Himachal Pradesh and Madhya Pradesh.
- **Graphite:** Odisha is the largest producer of graphite.
- Its largest reserve is in Ramanathpuram in Tamil Nadu.
- Its reserves are also in Jharkhand, Rajasthan and Andhra Pradesh.

# POWER RESOURCES

- 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.

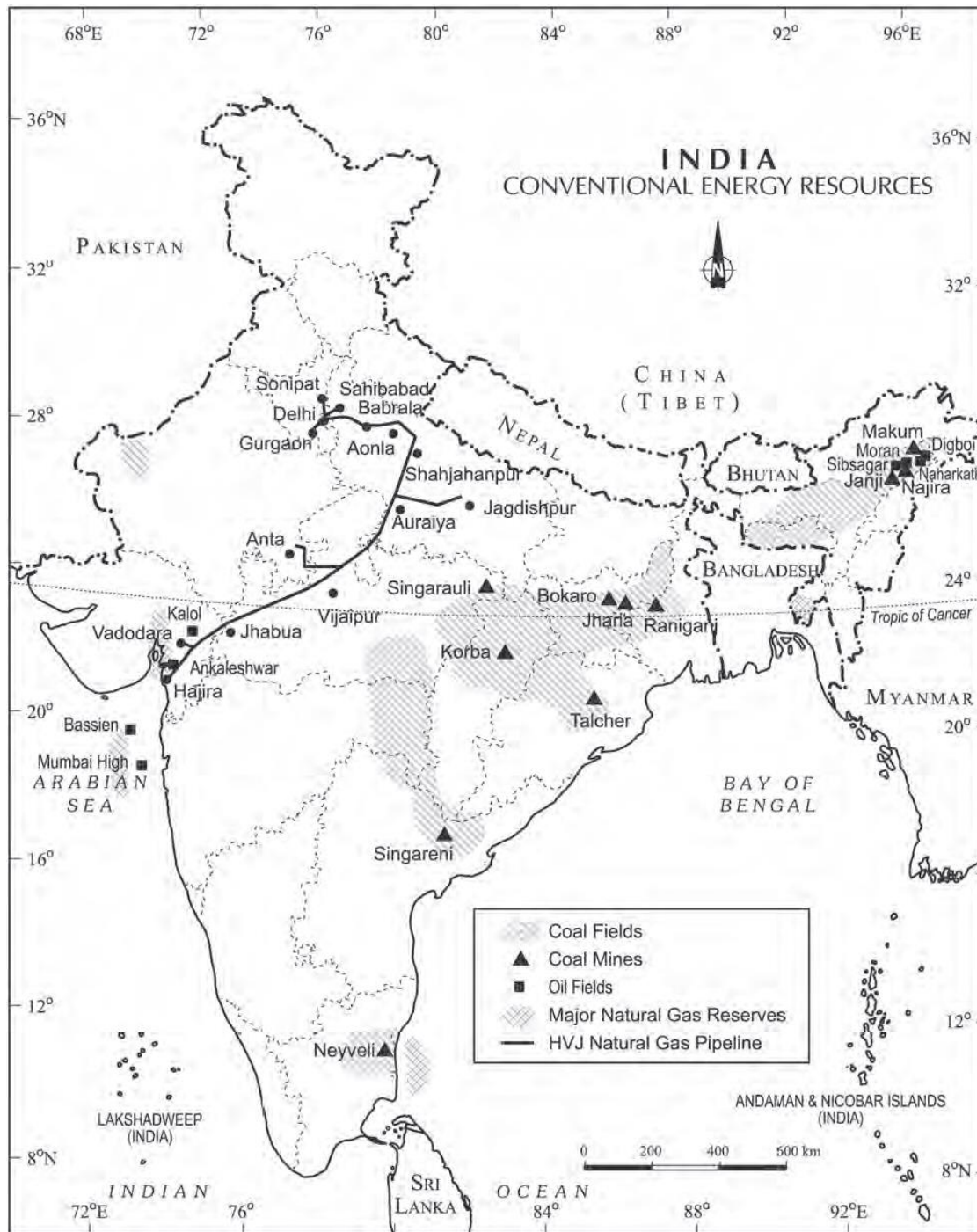


- The energy resources can be divided into renewable and non-renewable resources.
- **Renewable Energy Resources:** It includes Biomass, Wind, Hydro-power, Geothermal and Solar sources. It can be used again and again.
- **Non-renewable Energy Resources:** It is that energy which is extracted from from the fossil fuels (coal, crude oil, natural gas) and uranium.
- Fossil fuels are mainly made up of **Carbon**.
- It is believed that fossil fuels were formed over 300 million years ago, when the earth was a lot different in its landscape.

# COAL

- Coal is a one of the important minerals which is mainly used in the generation of thermal power and smelting of iron ore.
- Coal occurs in rock sequences mainly of two geological ages, namely **Gondwana and tertiary deposits**.
- About **80 per cent of the coal deposits in India** is of bituminous type and is of non-coking grade.
- The most important **Gondwana coal fields of India** are located in **Damodar Valley**.

- They lie in **Jharkhand-Bengal coal belt** and the important coal fields in this region are **Raniganj, Jharia, Bokaro, Giridih, Karanpura.**
- Jharia is the largest coal field followed by **Raniganj.**
- The other river valleys associated with coal are Godavari, Mahanadi and Sone.
- The most important coal mining centres are **Singrauli in Madhya Pradesh (part of Singrauli coal field lies in Uttar Pradesh), Korba in Chhattisgarh, Talcher and Rampur in Odisha, Chanda–Wardha, Kamptee and Bander in Maharashtra and Singareni in Telangana and Pandur in Andhra Pradesh.**



# PETROLEUM

- Crude petroleum occurs in **sedimentary rocks** of the tertiary period.
- Oil exploration and production was systematically taken up after the **Oil and Natural Gas** Commission was set up in 1956.
- Till then, the **Digboi in Assam** was the only oil producing region but the scenario has changed after 1956.
- In recent years, new oil deposits have been found at the extreme **western and eastern parts** of the country.

- In **Assam, Digboi, Naharkatiya and Moran** are important oil producing areas.
- The major oil fields of **Gujarat are Ankaleshwar, Kalol, Mehsana, Nawagam, Kosamba and Lunej.**
- Mumbai High which lies 160 km off Mumbai was discovered in 1973 and production commenced in 1976.
- Oil and natural gas have been found in exploratory wells in **Krishna-Godavari and Kaveri basin** on the east coast.

# NATURAL GAS

- The Gas Authority of India Limited was set up in 1984 as a public sector undertaking to transport and market natural gas.
- It is obtained alongwith oil in all the oil fields but exclusive reserves have been located along the eastern coast as well as (Tamil Nadu, Odisha and Andhra Pradesh), Tripura, Rajasthan and off-shore wells in Gujarat and Maharashtra.

# HYDAL POWER

- Energy is an essential input for economic development and improving the quality of life.
- India is the seventh largest producer of hydroelectricity in the World.
- Power development in India commenced at the end of the 19th century with the commissioning of electricity supply in Darjeeling during 1897, followed by the commissioning of a hydropower station at Sivasamundram in Karnataka during 1902.
- list of Hydro Power Plants in India that will help in the enhancement of general knowledge of the readers.



# List of Hydro Power Plants in India:

- 1. Tehri Dam Operator: THDC Limited, Uttarakhand.
- 2. Koyna Hydroelectric Project, Operator: MAHAGENCO, Maharashtra State Power Generation Co Ltd., Maharashtra.
- 3. Srisaïlam, Operator: APGENCO, Andhra Pradesh.
- 4. Nathpa Jhakri, Operator: Satluj Jal Vidyut Nigam, Himachal Pradesh.
- 5. Sardar Sarovar Dam, Operator: Sardar Sarovar Narmada Nigam Ltd., Navagam, Gujarat.
- India's Cement Industry, Cement Producing States and Plants.
- 6. Bhakra Nangal Dam (Gobind Sagar), Operator: Bhakra Beas Management Board, Sutlej River, Bilaspur - Himachal Pradesh.
- 7. Chamera I Operator: NHPC Limited, Himachal Pradesh.
- 8. Sharavathi Project, Operator: Karnataka Power Corporation Limited, Karnataka.
- 9. Indira Sagar Dam, Operator: Narmada Valley Development Authority, Madhya Pradesh.

## List of the Railway Production Units in India

- 10. Karcham Wangtoo Hydroelectric Plant, Operator: Jaypee Group, Himachal Pradesh.
- 11. Dehar (Pandoh) Power Project, Operator: Bhakra Beas Management Board, Himachal Pradesh.
- 12. Nagarjuna Sagar Dam Guntur, Operator: Andhra Pradesh Power Generation Corporation Limited, Andhra Pradesh.

## List of Major Coal Fields in India

- 13. Purulia Pass Operator: West Bengal Electricity Distribution Company, West Bengal.
- 14. Idukki, Operator: Kerala State Electricity Board, Kerala.
- 15. Salal I & II, Operator: NHPC Limited, Jammu & Kashmir.

## List of Important National Highways of India:

- 16. Upper Indravati, Operator: Odisha Hydro Power Corporation, Orissa.
- 17. Ranjit Sagar Dam, Operator: Punjab State Power Corporation Limited., Punjab.
- 18. Omkareshwar, Operator: Narmada Hydroelectric Development Corporation, Madhya Pradesh.
- 19. Belimela Dam, Operator: Odisha Hydro Power Corporation, Orissa.
- 20. Teesta Dam, Operator: NHPC Limited, Sikkim.

## MULTIPURPOSE RIVER PROJECTS

- Multipurpose river projects are basically designed for the development of irrigation for agriculture and electricity through the construction of dams. Initially, dams were built only for storing rain water to prevent flooding but now it became multipurpose. Here, we are giving the list of important river-valley projects in India which will help the students for quick revision.
- Multipurpose river project are basically designed for the development of irrigation for agriculture and electricity through the construction of dams. Initially, dams were built only for storing rain water to prevent flooding but now it became multipurpose. Here, we are giving the list of important river-valley projects in India which will help the students for quick revision .

## **Multipurpose River Projects in India:**

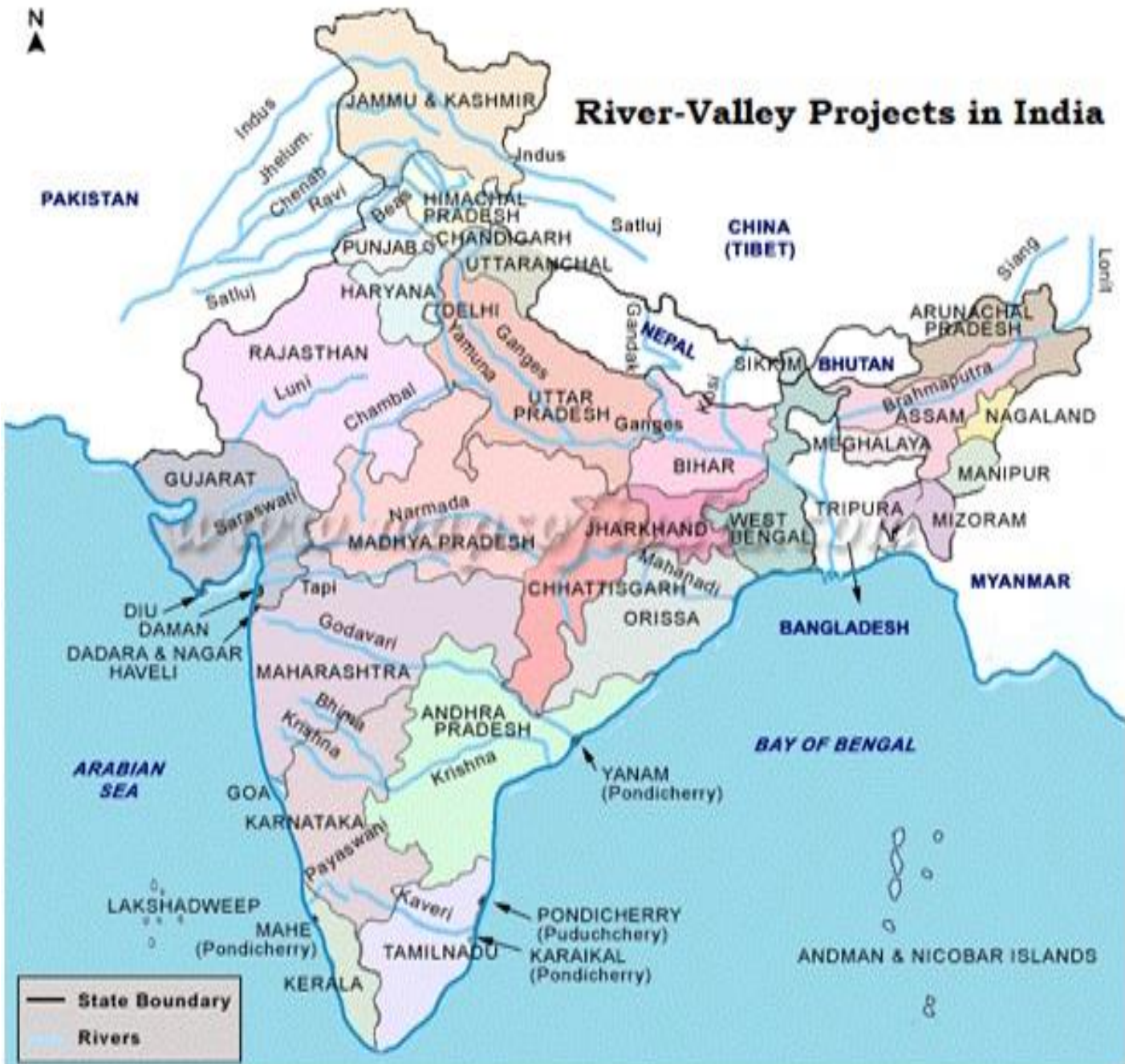
- 1. Almatti Dam: It is a hydroelectric project constructed on the river Krishna.
- 2. Baspa Hydro-Electric Project: It is the first Independent Power Producer (IPP) project after the Government of India liberalized the power policy by inviting private sector participation in setting up a hydropower project on “BOO” basis. It is located in Kinnaur district of Himachal Pradesh.
- 3. Beas Project: It is a joint venture of the governments of Punjab, Haryana and Rajasthan. It consists of two units: (i) Beas-Sutlej Link and (ii) Beas Dam at Pong. The project links the Beas and the Sutlej rivers in Punjab through 38.4 km of hills and valleys.

## List of Towns situated on the Banks of River

- 4. Bhadra Reservoir Project: It is constructed across the river Bhadra which is in Karnataka.
- 5. Bhakra-Nangal: Project (Himachal Pradesh) Largest multipurpose project in India and the highest straight gravity dam in the world (225.5 m high) on the river Sutlej.

## River Project Towards East (Bay of Bengal)

- 6. Damodar Valley Project (West Bengal and Bihar): Principal object of this multipurpose scheme is to control the flowing of the Damodar which is notorious for its vagaries and destructiveness. It is designed on the lines of the Tennessee Valley Authority (T.V.A.) in U.S.A.
- 7. Dul-Hasti Hydro-Electric Project: The Rs. 1263 crore project is being built on river Chenab in Jammu and Kashmir. The foundation of the project was laid in September 1984. The project will consist of a power plant of 390 MW capacities. The power house will be located underground.



## River Valley Projects of Peninsular India

- 8. Farakka Barrage: The basic aim of the Farakka Barrage is to preserve and maintain Calcutta port and to improve the navigability of the Hooghly river.
- 9. Gandak Project (Bihar and U.P): This is a joint venture of India and Nepal as per agreement signed between the two governments on Dec 4, 1959. **Bihar and Uttar Pradesh are the participating Indian States. Nepal would also derive irrigation and power benefits from this project.**
- 10. Hirakud Project (Odisha): It is the first of a chain of three Dams planned for harnessing the Mahanadi.

## River Valley Projects of North - East India (Brahmaputra)

- 11. Idukki Hydro-Electric Project: It is a giant hydro-electric project of Kerala and one of the biggest in the country, constructed with Canadian assistance with an installed capacity of 390 MW in the first stage and 780 MW in the second stage.
- 12. Jayakwadi Dam (Maharashtra): The 10-km-long Jayakwadi dam on the Godavari is Maharashtra's largest irrigation project located near Paithan.
- 13. Kalpong Hydro-Electric Project: This is the first hydel power plant of Andaman and Nicobar Islands. The 5.25 MW project was commissioned on July 1, 2001. It is located near Kalara village of Diglipur Tehsil in North Andaman and has been built by National Hydel Power Corporation.



## River Valley Projects of River Ganga:

- 14. Parambikulam Aliyar Project: It is a joint venture of Tamil Nadu and Kerala States.
- 15. Parappalar Dam: The Rs 1-crore Parappalar Dam with a storage capacity of 167 million cubic feet near Oddenchatram, about 75 km from Madurai in Palni taluk (Tamil Nadu), was inaugurated on August 30, 1976.
- 16. Parvati Valley Project: It is the first inter-State hydel power project of India. Gujarat, Rajasthan, Haryana and Delhi have joined hands with Himachal Pradesh to set up the project.

# ATOMIC POWER STATIONS

- India boasts a fleet of seven nuclear power plants, profiled here in order of size from largest production capacity to smallest.
- Kudankulam Nuclear Power Plant, Tamil Nadu.
- Tarapur Nuclear Reactor, Maharashtra.
- Kalpakkam Nuclear Power Plant, Tamil Nadu.
- Narora Nuclear Reactor, Uttar Pradesh.

# List of Operational Nuclear power plants India:

S.No.	Plant	Unit	Type	Capacity (MWe)	Date of Commercial Operation
01	Tarapur Atomic Power Station (TAPS), Maharashtra	1	BWR	160	October 28, 1969
02	Tarapur Atomic Power Station (TAPS), Maharashtra	2	BWR	160	October 28, 1969
03	Tarapur Atomic Power Station (TAPS), Maharashtra	3	PHWR	540	August 18, 2006
04	Tarapur Atomic Power Station (TAPS), Maharashtra	4	PHWR	540	September 12, 2005
05	Rajasthan Atomic Power Station (RAPS), Rajasthan	1	PHWR	100	December 16, 1973
06	Rajasthan Atomic Power Station (RAPS), Rajasthan	2	PHWR	200	April 1, 1981
07	Rajasthan Atomic Power Station (RAPS), Rajasthan	3	PHWR	220	June 1, 2000
08	Rajasthan Atomic Power Station (RAPS), Rajasthan	4	PHWR	220	December 23, 2000
09	Rajasthan Atomic Power Station (RAPS), Rajasthan	5	PHWR	220	February 4, 2010

10	Rajasthan Atomic Power Station (RAPS), Rajasthan	6	PHWR	220	March 31, 2010
11	Madras Atomic Power Station (MAPS), Tamilnadu	1	PHWR	220	January 27,1984
12	Madras Atomic Power Station (MAPS), Tamilnadu	2	PHWR	220	March 21,1986
13	Kaiga Generating Station (KGS), Karnataka	1	PHWR	220	November 16, 2000
14	Kaiga Generating Station (KGS), Karnataka	2	PHWR	220	March 16, 2000
15	Kaiga Generating Station (KGS), Karnataka	3	PHWR	220	May 6, 2007
16	Kaiga Generating Station (KGS), Karnataka	4	PHWR	220	January 20, 2011
17	Kudankulam Nuclear Power Station (KKNPS), Tamilnadu	1	VVER -1000 (PWR)	1000	December 31, 2014
18	Kudankulam Nuclear Power Station (KKNPS), Tamilnadu	2	VVER -1000 (PWR)	1000	March 31, 2017
19	Narora Atomic Power Station (NAPS), Uttarpradesh	1	PHWR	220	January 1,1991
20	Narora Atomic Power Station (NAPS), Uttarpradesh	2	PHWR	220	July 1,1992
21	Kakrapar Atomic Power Station (KAPS), Gujarat	1	PHWR	220	May 6, 1993
22	Kakrapar Atomic Power Station (KAPS), Gujarat	2	PHWR	220	September 1,1995

# NEED FOR NON CONVENTIONAL ENERGY SOURCES

- India is blessed with an abundance of non-Conventional Sources of Energy like sunlight, water, wind and biomass.
- The growing need of energy has resulted in the country made dependent on fossil fuels such as coal, oil and gas.
- The potential shortages of oil and gas due to price rise and over-exploitation of energy which in turn, raised uncertainties about the security of energy supply in future.
- 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 nonconventional energy sources. It has the largest programmes for the development of these renewable energy resources.

## Wind Power:

- 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 known as ‘Gobar gas plants’ in rural India.

## Tidal Energy

- 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.
- One is located in the Parvati valley near Manikarn in Himachal Pradesh and the other is located in the Puga Valley, Ladakh.



## References :

- <https://neostencil.com/iron-ore-distribution-world-and-india.>
- <https://ncert.nic.in/ncerts/l/legy207.pdf>
- <https://www.jagranjosh.com/general-knowledge/power-resources-of-india-1448695331-1>
- <https://www.jagranjosh.com/general-knowledge/list-of-hydro-power-plants-in-india-1501159366-1>
- [www.simplydecoded.com](http://www.simplydecoded.com)
- <https://www.jagranjosh.com/general-knowledge/multipurpose-river-valley-projects-in-india-1292061339-1>
- <https://www.jagranjosh.com/general-knowledge/nonconventional-sources-of-energy-1448698715-1>