



# Mineral Resources

## Mineral resources

- Use and exploitation
- Environmental effects of extracting and using mineral resources.



## Mineral resources

- A mineral is a naturally occurring substance of definite chemical composition and recognizable physical properties.
- Almost every area of human activity depends on minerals. Almost all industries viz. construction, manufacturing, transportation, medical technology, science and electronics utilize minerals.



## Mineral resources

- An ore is a mineral or combination of minerals from which a useful substance, such as a metal, can be extracted and used to manufacture a useful product.
- Minerals are formed over a period of millions of years in the earth's crust. Iron, aluminium, zinc, manganese and copper are important raw materials for industrial use.



## Mineral resources

- Most of the rocks, present everywhere around us, are composed of only a few common minerals like quartz, feldspar, dolomite, calcite etc.
- These rocks are composed of only a few elements like silicon, oxygen, iron, magnesium, calcium, aluminium etc.



## Mineral resources

Following are the two types of mineral resources:

- 1. Metallic
- 2. Non-metallic
- About 3500 minerals are known to man. The need and consumption of minerals has increased due to faster industrialisation and development of newer technologies with passing time.



## Environmental Problems

- Mining and processing of minerals/ores involve major environmental problems
- disturbance of land
- air pollution from dust and smelter emission,
- water pollution from disrupted aquifers.



## Mineral resources

- Important non-metal resources include coal, salt, clay, limestone and silica.
- Stone used for building material, such as granite, marble, limestone, constitute another category of minerals.
- Minerals with special properties that humans value for their aesthetic and ornamental value are gems such as diamonds, emeralds, rubies. The lustre of gold, silver and platinum is used for ornaments.



## Mineral resources

- Minerals in the form of oil, gas and coal were formed when ancient plants and animals were converted into underground fossil fuels.
- Minerals and their ores need to be extracted from the earth's interior so that they can be used. This process is known as mining.



## Mineral resources of India

- India produces around 100 minerals, which are an important source for earning foreign exchange as well for domestic needs.
- We import graphite, mercury, cobalt, etc., and export iron ore, granite, bauxite, titanium, manganese, etc.
- The availability of minerals in the country is uneven and mineral quality varies from region to region



## Mineral resources of India

- Coal, iron ore, manganese, mica, bauxite, copper, etc., are mostly found in Jharkhand, West Bengal and Orissa. These regions are called the mineral heartland of India.
- Gems, marble, coal, mica, graphite, manganese etc. are found in large quantities in Chattisgarh, Andhra Pradesh, Madhya Pradesh and Maharashtra.

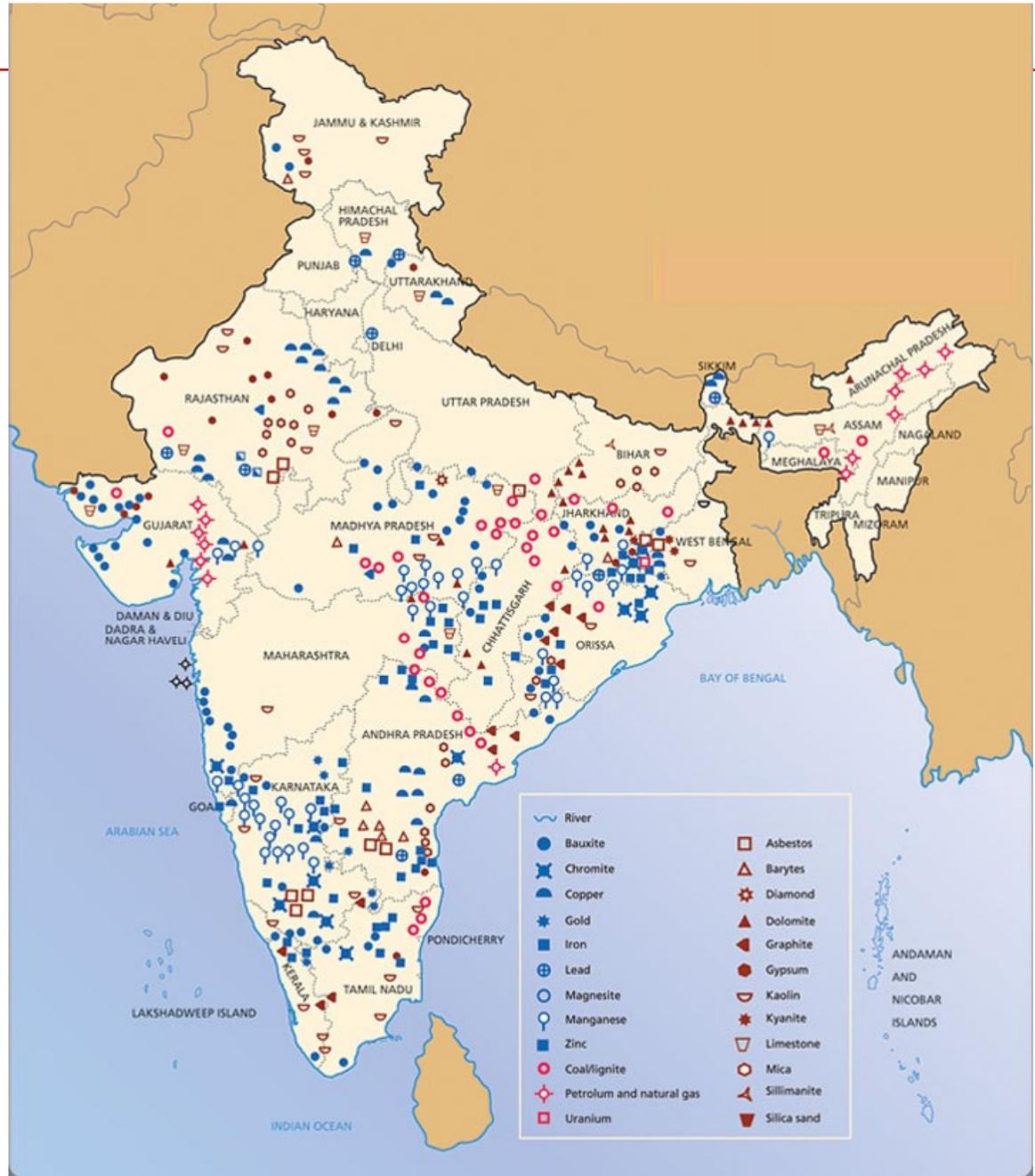


## Mineral resources of India

The major non-metal resources are: coal, petroleum, limestone, bauxite, hematite, marble, asbestos, granite, mica, phosphate, potash, sand and gravel etc.

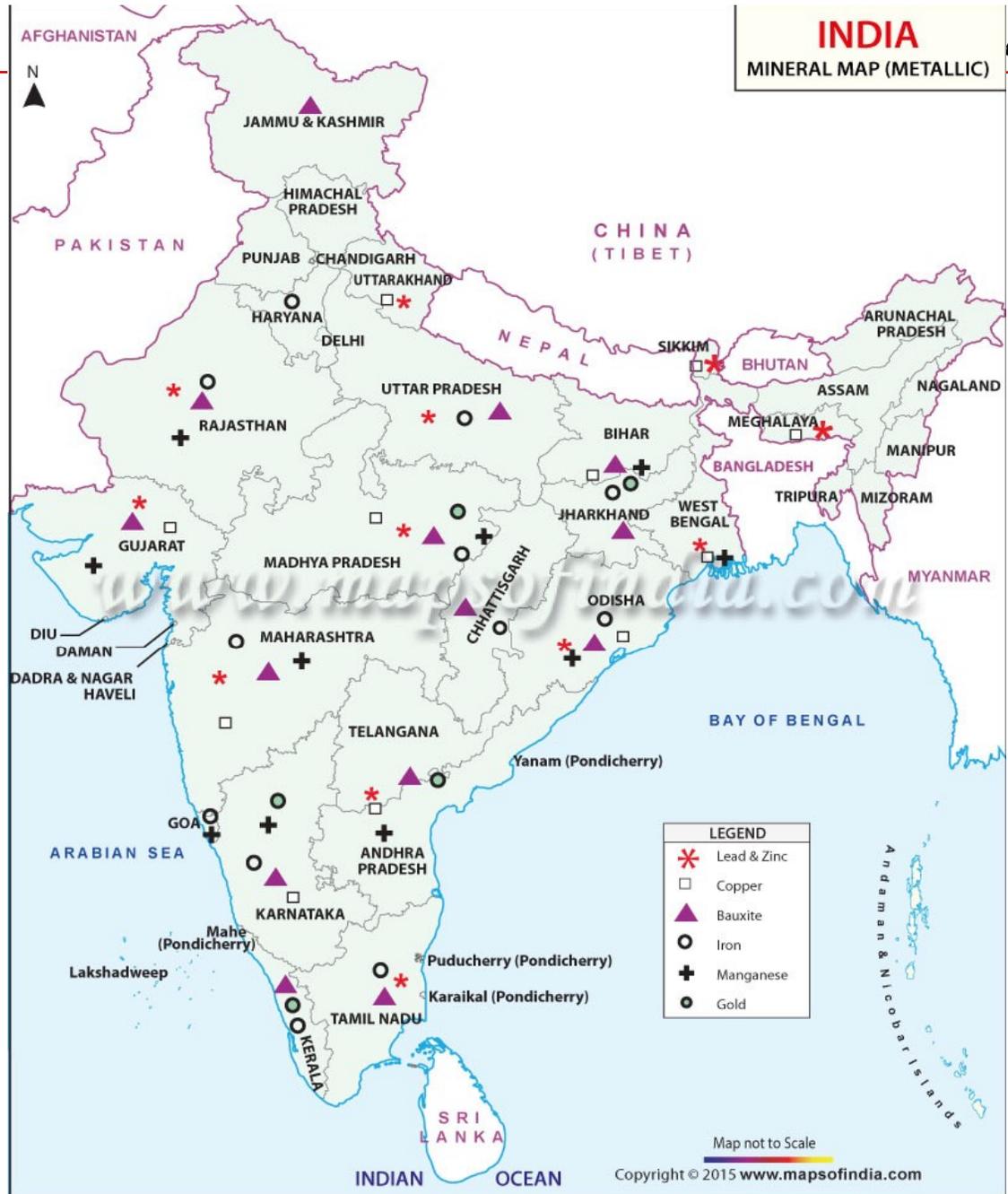


# Mineral resources of India



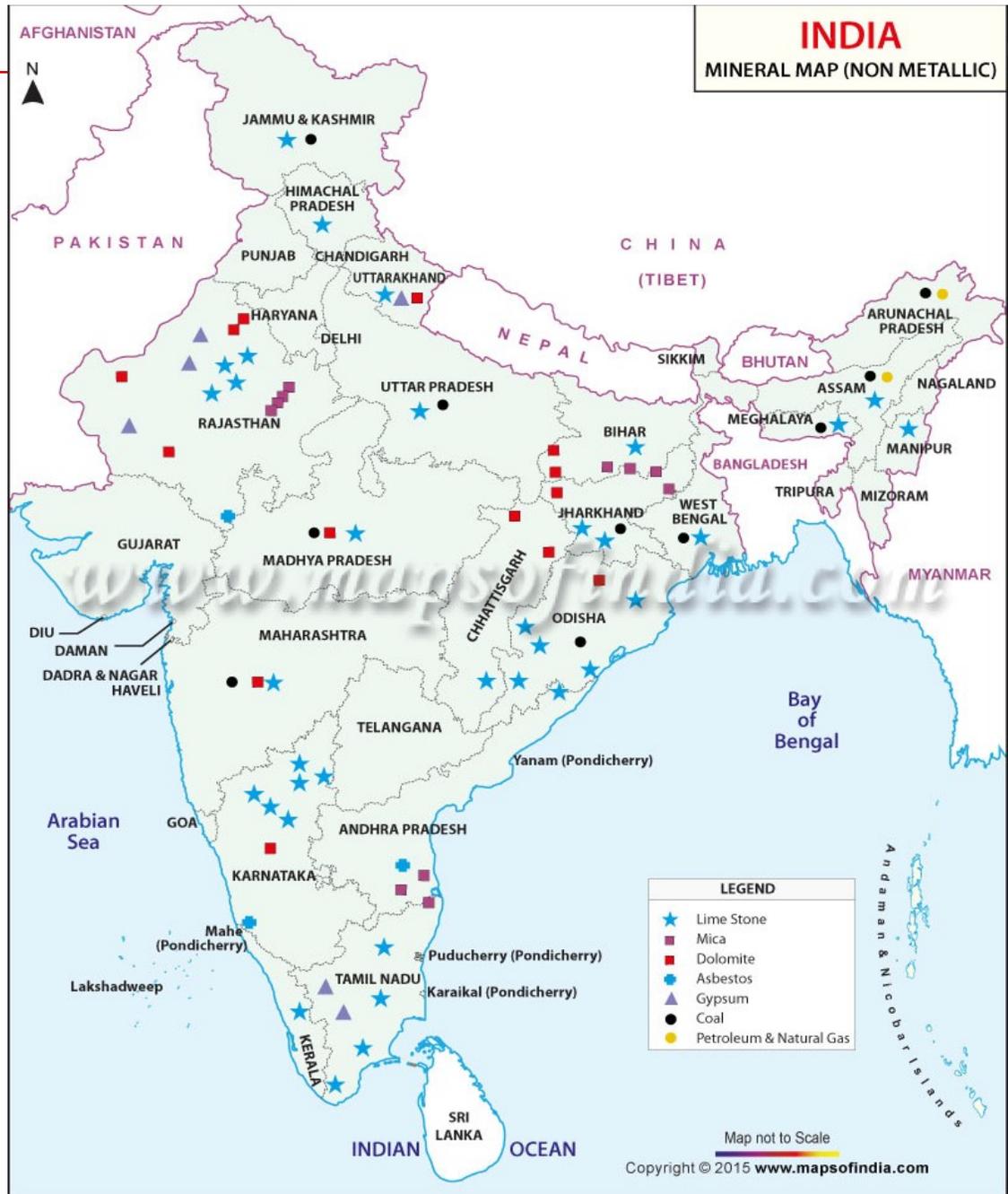


# Metallic Mineral resources of India



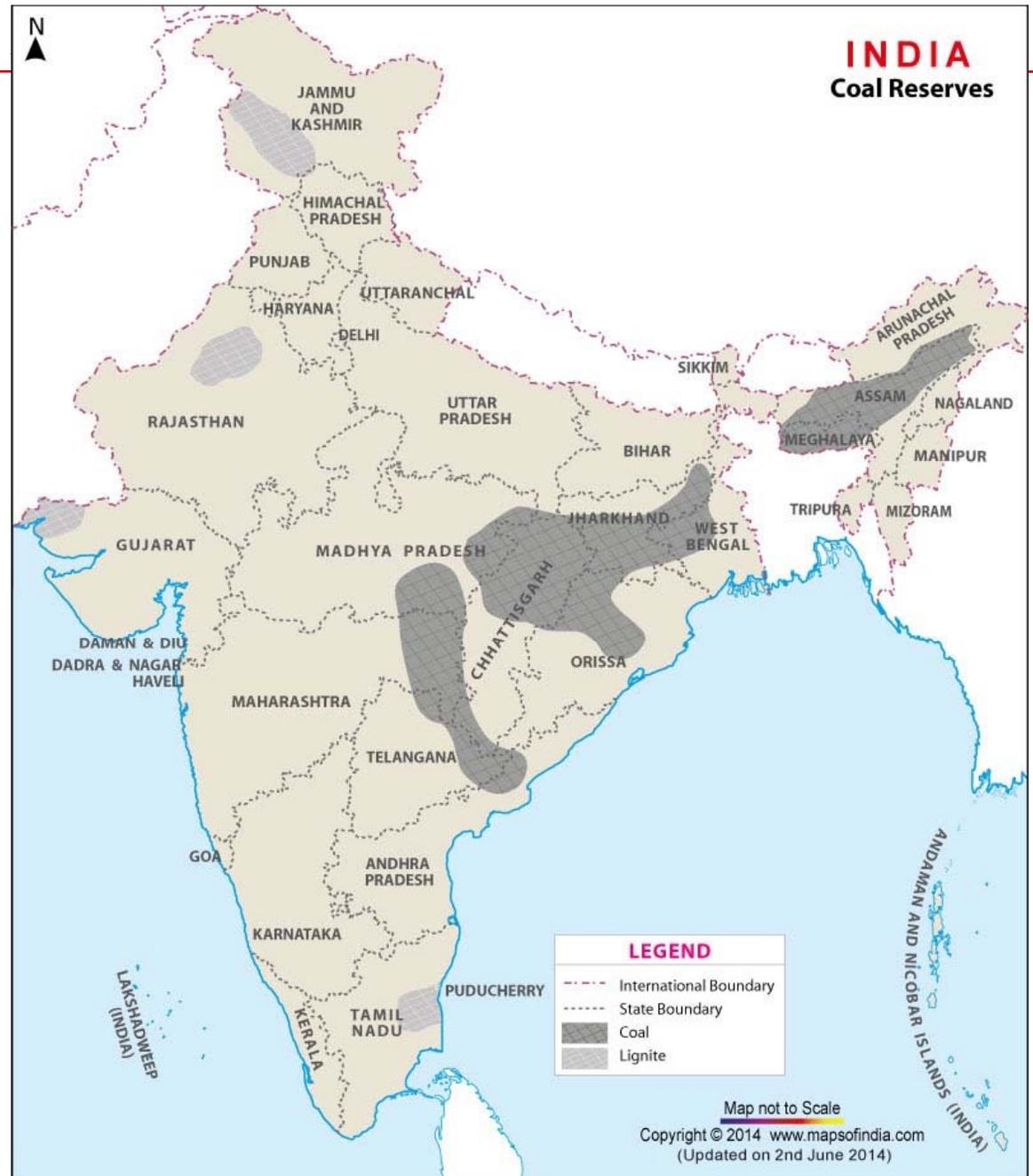


# Non-Metallic Mineral resources of India



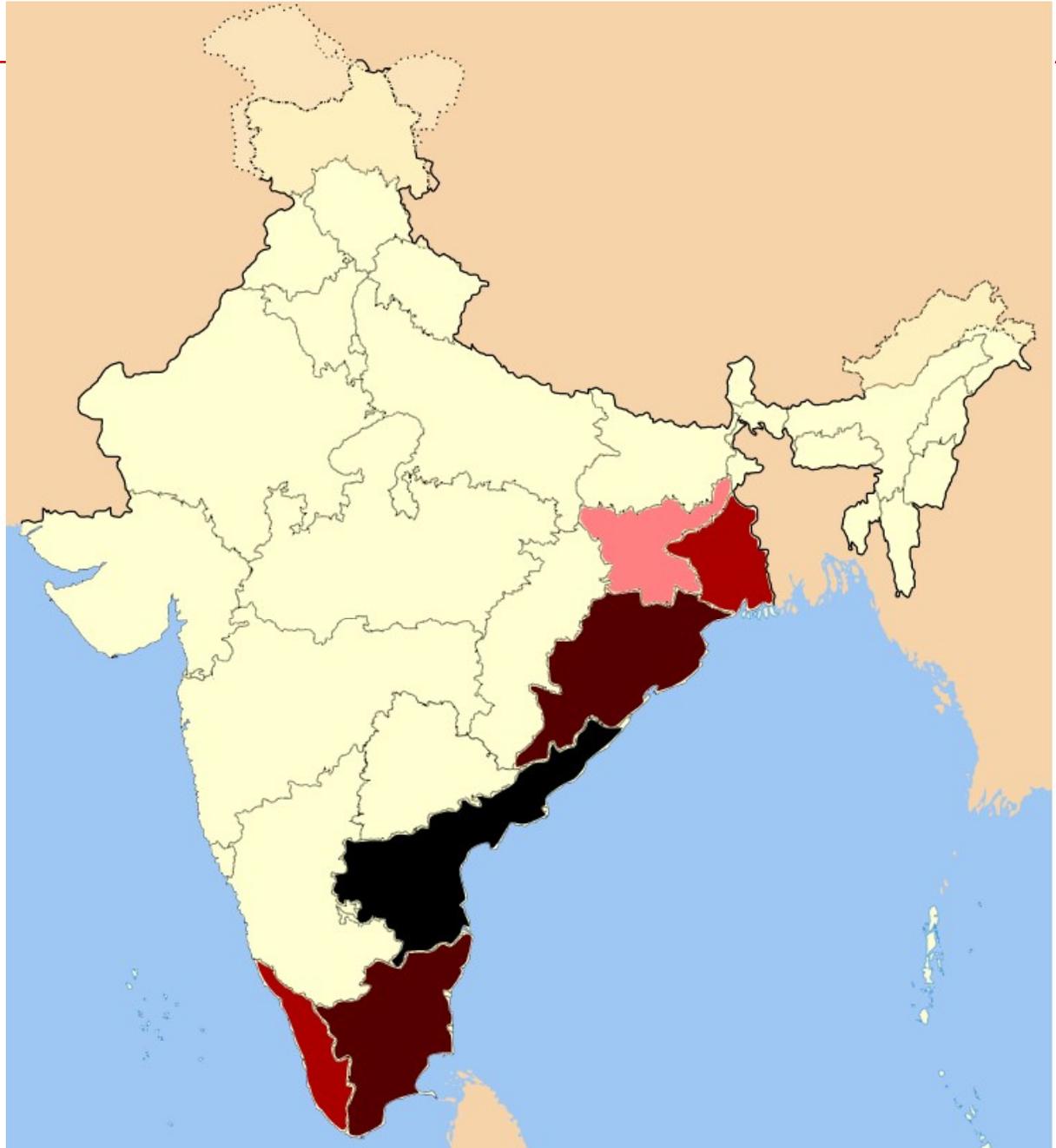


# Coal reserves of India





# Thorium Reserves





# Iron Mining





## Burning coal in Mines



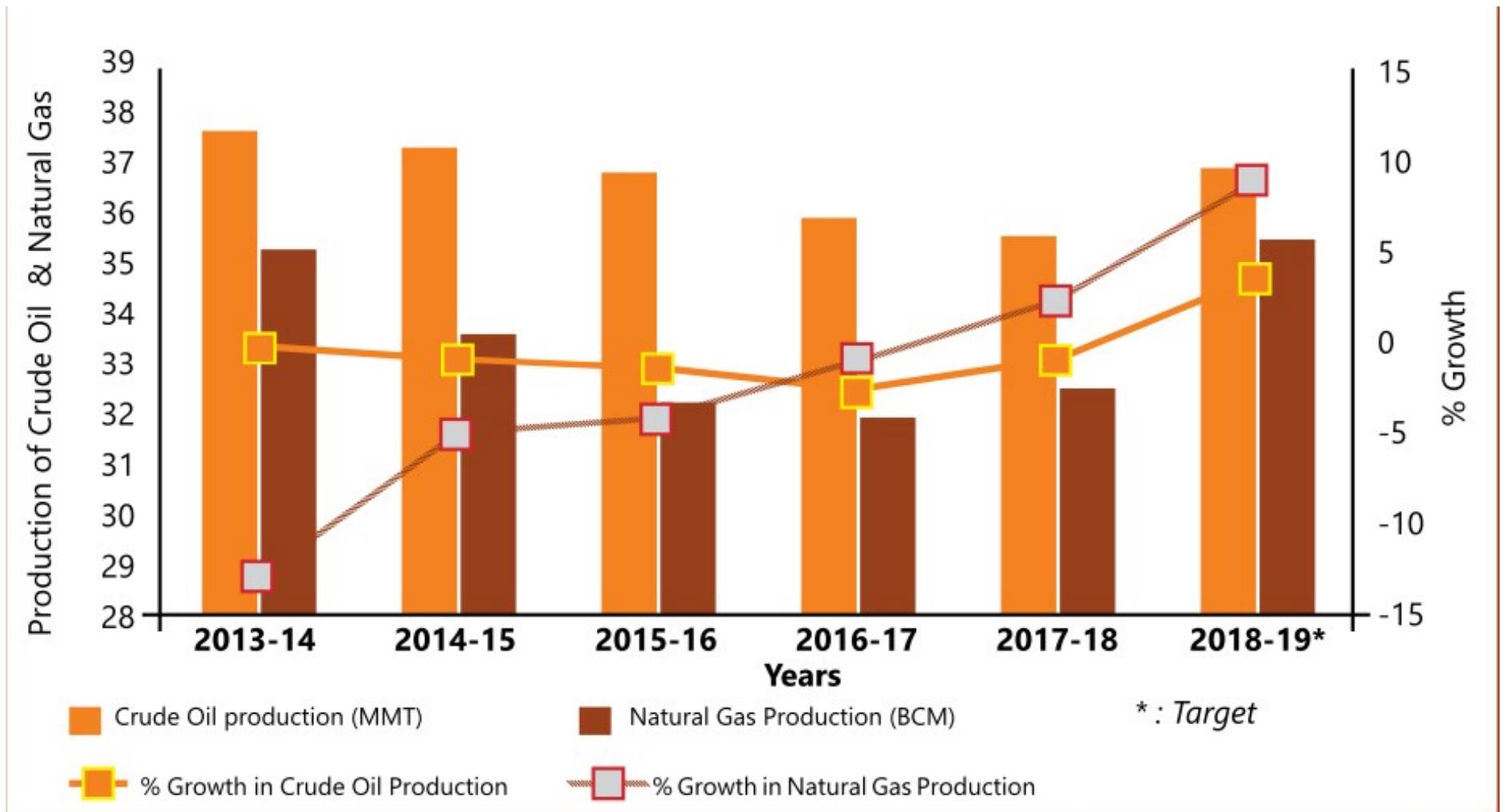


## Crude Oil And Natural Gas Production

Fin. Year	Crude Oil Production (MMT)	% Growth in Crude Oil Production	Natural Gas Production (BCM)	% Growth in Natural Gas Production
2013-14	37.79	-0.19	35.41	-12.96
2014-15	37.46	-0.87	33.66	-4.94
2015-16	36.94	-1.39	32.25	-4.18
2016-17	36.01	-2.53	31.90	-1.09
2017-18 (P)	35.68	-0.90	32.65	2.36
2018-19*	37.01*	3.72	35.60*	9.03
2017-18 (Apr-Dec) (P)	26.94	-	24.69	-
2018-19 (Apr-Dec) (P)	25.94	-3.70	24.65	-0.15



## Crude Oil And Natural Gas Production





## Estimated Hydrocarbon Resources In India

Basin Category	Sl. No.	Basin Name	Total Hydrocarbon In-place (MMTOE)	
			Estimate (1995-96)	Estimate (2017)
<b>Category I</b> (Basins with reserves being produced and exploited)	1	Krishna-Godavari (KG)	1,130	9,555
	2	Mumbai Offshore	9,190	9,646
	3	Assam Shelf	3,180	6,001
	4	Rajasthan	380	4,126
	5	Cauvery	700	1,964
	6	Assam-Arakan Fold Belt (AAFB)	1,860	1,633
	7	Cambay	2,050	2,586
		<b>SUB-TOTAL (Category I)</b>	<b>18,490</b>	<b>35,511</b>



## State-wise Crude Oil Production Trends (Thousand Metric Tonnes)

Basin Category	Sl. No.	Basin Name	Total Hydrocarbon In-place (MMTOE)	
			Estimate (1995-96)	Estimate (2017)
<b>Category I</b> (Basins with reserves being produced and exploited)	1	Krishna-Godavari (KG)	1,130	9,555
	2	Mumbai Offshore	9,190	9,646
	3	Assam Shelf	3,180	6,001
	4	Rajasthan	380	4,126
	5	Cauvery	700	1,964
	6	Assam-Arakan Fold Belt (AAFB)	1,860	1,633
	7	Cambay	2,050	2,586
		<b>SUB-TOTAL (Category I)</b>	<b>18,490</b>	<b>35,511</b>



## State-wise Natural Gas Production Trends (MMSCMD)

State/Source	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19 (upto Dec 2018)
<b>ONSHORE</b>						
Andhra Pradesh	3.2	1.5	1.7	2.4	2.6	3.0
Arunachal Pradesh	0.1	0.1	0.1	0.1	0.1	0.1
Assam	7.9	8.1	8.3	8.6	8.8	9.1
Gujarat	4.5	4.2	4.1	4.3	4.4	3.8
Rajasthan	2.7	3.2	3.7	3.5	4	4.0
Tamil Nadu	3.6	3.3	2.6	2.7	3.3	3.3
Tripura	2.3	3.1	3.6	3.9	3.9	4.2
CBM-WB, MP, Jharkhand	0.4	0.6	1.1	1.5	2.0	1.9
<b>Total Onshore</b>	<b>24.7</b>	<b>24.1</b>	<b>25.2</b>	<b>27.0</b>	<b>29.1</b>	<b>29.4</b>
Share of PSU	21.8	20.5	20.7	22.3	23.3	22.9
Share of Private/JV	2.9	3.6	4.5	4.7	5.8	6.5
<b>OFFSHORE</b>						
Share of PSU	49.2	47.3	44.8	46.3	48.7	51.6
Share of Private/JV	23.1	20.8	18.1	14.1	11.6	8.7
<b>Total Offshore</b>	<b>72.3</b>	<b>68.1</b>	<b>62.9</b>	<b>60.4</b>	<b>60.3</b>	<b>60.3</b>
<b>Total</b>	<b>97</b>	<b>92.2</b>	<b>88.1</b>	<b>87.4</b>	<b>89.5</b>	<b>89.7</b>



## Applications of Minerals

Name of Metal	Major Applications
<b>Aluminium</b>	Aluminium film for packaging, Utensils, Electrical wires, light-weight Aluminium-alloys
<b>Copper</b>	Electric wire, electronic equipment, vessels, brass, bronze
<b>Chromium</b>	High strength steel alloys, Tanning Industry, Dyeing
<b>Gold</b>	Jewellery, Electronic equipment, Medicine, Aerospace
<b>Iron</b>	Steel production for Building construction, Heavy machines, Vehicles, equipment, Bridges, Railroads
<b>Lead</b>	Lead Batteries, Paints, Bullets, Tetraethyl lead



## Applications of Minerals

Name of Metal	Major Applications
Manganese	High strength steel
Mercury	Thermometer, Medicine, Laboratory equipment, Mercury Lamps, dental fillings
Nickel	Chemical Industry, Steel alloys
Platinum Group metal (Pd, Pt, Ir, Rh)	Catalytic converters, as catalysts in chemical production, electronics, Jewellery
Silver	Jewellery, Electronics, medical applications, Brazing alloys, Traditional Photography
Zinc	Galvanizing iron, making brass and bronze, batteries, pigment



## Applications of Minerals

Mineral	Major Applications
Coal	Energy production
Graphite	Pencil lead, Lubricants, Electrodes, Sports equipment, Aerospace
Gypsum	Cement , Plasters, Soil conditioners, Pharmaceuticals
Garnet	Fine polishing and grinding, Abrasives, Gemstones
Limestone	Cement, Wall Paints, soil stabilization, Water treatment
Marble	Used as stone in building construction, decorative items, floor and bath tiles



## Applications of Minerals

Mineral	Major Applications
Phosphorus	Fertilisers, medicine
Sulphur	Gunpowder, Insecticides, medicine
Silica	glass and refractory materials, ceramics, abrasives
Soda Ash	Manufacture of glass, fiberglass, specialty glass, and flat glass; papermaking process.
Talc	talcum powder, paints



## Environmental Effects of Extracting and Using Mineral Resources

- The impacts on forest, land, occupation, water, ecological functions, rehabilitation
- of population, or impact on flowers due to pollution created during extraction and use of mineral resources are
- Deforestation including to loss of flora and fauna.
- Degradation of land due to excavations.
- Occupational health hazards.



## Environmental Effects of Extracting and Using Mineral Resources

- Pollution of ground and surface water resources due to accidental or periodic discharge of pollutants.
- Damage to local ecological functions, nutrient cycling and biodiversity due to alterations in water availability or quality.
- Problem in rehabilitation of affected population.



## Environmental Effects of Extracting and Using Mineral Resources

- Pollution of air due to emission of dust and poisonous gases during mining and processing stages. Problems in providing living environment and clean water, air, etc., for the survival of large number of workers who have migrated nearby mine sites.
- Problems in the safe disposal of tremendous amounts of solid waste generated during mining.



## Environmental Effects of Extracting and Using Mineral Resources

- Mining operations are considered one of the main causes of environmental degradation.
- Depletion of available land due to mining,
- Waste from industries
- Conversion of land to industry
- Pollution of land, water and air by industrial wastes
- Public awareness of this problem have led to enacting of many laws towards the prevention of activities that adversely affect the environment.



## Conservation of Mineral Resources

- The mineral resources are essential for the development of a country.
- The increasing population in the world with better lifestyles are responsible for the utilisation of mineral resources at a fast rate.
- The processes of mineral formation are so slow that the rates of replenishment are very small in comparison to the present rates of utilisation.



## Conservation of Mineral Resources

- Therefore, mineral resources will be available for a limited time only.
- Sincere efforts are required for the use of mineral resources in a sustainable manner. The following steps are very helpful for the conservation of mineral resources:
- Promotion of the use of improved technologies so as to reduce waste generation.



## Conservation of Mineral Resources

- Promotion of the recycling of metals.
- Regulation of the use of mineral resources.
- Reduction of the undesirable consumption of mineral resources.
- Promotion of research towards providing suitable ecofriendly alternatives for fossil fuels, metals, etc.