

# **Underground Mining of Metalliferous Deposits**

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**Lecture 04**

**Present Status of Underground Mining**

## **Indian Minerals Industry**

India nearly produces 88 different types of minerals that includes all types of minerals, such as fuel, metallic, non-metallic and atomic. India is the leading producer of several metallic minerals such as chromite, iron ore, zinc, bauxite, manganese, aluminum and copper. India has set its goal to completely switch to electric vehicles by end of 2030, to achieve this it needs to invest in domestic manufacturing of Lithium-ion batteries. The concentration of the mineral wealth is concentrated in state of Odisha, Andhra Pradesh, Rajasthan, Chhattisgarh, Jharkhand, Madhya Pradesh and Karnataka. Minerals are classified into two groups, Major minerals such as iron ore, copper etc. and minor minerals includes Calcite, fireclay, Mica, Ochre, Pyrophyllite etc. State government has the power to frame policy and regulate exploration, extraction and processing of all minor minerals such as sand and clay. The central government has the power to revise, fix royalty, issue regulation in respect of major minerals.

The Mines and Mineral (Development and Regulation) Act 1957 (MMDR Act) (MMDR 2021, amendment bill in progress) is the federal legislation which overall regulates the mining sector and ensures that the states exercise their power within a uniform national framework. The Mines Act 1952 safeguards the regulations for health and safety in mines and conduct of mining operations.

Ministry of Mines is responsible for legislation, policy formulation and administration of minerals and mines and it principally comprises of following wings to accomplish its

objectives. GSI (Geological Survey of India)- for regional exploration and mapping of minerals resources. IBM (Indian Bureau of Mines) maintains national mineral inventory, national regulator for state governments, approving mine plans, closure operations and conservation of minerals. CML (Controller of Mining Leases) governs modification of mining leases granted before 1972. DGMS (Directorate General of Mines Safety) principle health and safety regulator in mines and mining areas

For the major minerals only central government has the power to fix the royalties and mines minerals development and regulation act basically controls all these. There are other acts also related to mining, mines and minerals development and regulation act basically gives us the major definition of the major minerals and minor minerals and right up mining on that, mines act basically gives the regulation related to health safety and conduct of the mining operation. Director General of mine safety supervise the labour safety working in the mines. Geological survey of India is the autonomous body to an exercise the power of exploration and mapping of the mineral resources. Indian bureau of mines maintains the national mineral inventory national regulator for the state governments as well as approve the mine plans and closer operation of the mining.

**Mining:** Mining is defined as the process of obtaining or excavating minerals or rocks or other valuable materials either solid or liquid. More than 4,000 naturally occurring minerals (inorganic solids that have a characteristic chemical composition and specific crystal structure) have been found on Earth.

India has almost 2400 non-coal mines and 601 coal mines. Underground mining adopted for 67 non-coal mines and 337 coal mines.

- Average **DAILY** employment in non-coal sector :

Underground – 11200

Opencast – 107000

Others – 65000

Male:female = 92:8, along with 45000 contractual worker

Yearly explosive consumed in non-coal sector –  $1.2 * 10^5$  tonne

### STATUS OF UNDERGROUND MINING

ORE	NO OF MINES IN INDIA
BAUXITE	108
CHROMITE	29
COPPER	6
DIAMOND	1
EMERALD	1
GALENA+SPHALERITE	13
GOLD	6
IRON	367
LIMESTONE	565
MAGNESITE	15
MANGANESE	139

## **Chromite**

Chromite got its name from the word Chroma which means color

Chromite is the only commercially viable ore of chromium

Chromite is chemically known as Iron Chromium Oxide ( $\text{FeCr}_2\text{O}_4$ )

It is used in the making of various alloys in ferrous metallurgy

As per the NMI estimation, Chromite reserve as on 2015 is about 344 million tonnes

More than 96% of the country's chromite reserve is located in Odisha state

Some other states having Chromite reserves are Manipur, Nagaland, Karnataka, Jharkhand, Tamil Nadu, Telangana and Andhra Pradesh

According to the USGS report in 2019, the annual production of chromium ore in South Africa was about 44 million tonnes, followed by Turkey (10), Kazakhstan (6.7), India (4.1) and Finland (2.2) and other countries produce about 4 million tonnes collectively

## **Iron Ore minerals: India**

There are two types of ore of Iron, Haematite and Magnetite.

The iron ore reserve of both the ore is 33276 Mn tonnes

The reserve of Haematite is about 22487 Mn tonnes

The reserve of Magnetite is about 10789 Mn tonnes

The production of Iron ore is expected to be about 225 Mn tonnes in 2019-20

Odisha state is the largest producer of Iron ore minerals in the country whose share is about 55% , Chhattisgarh 17%, Karnataka 14% and Jharkhand 11%

The global iron ore production in 2020 was about 2.2 Bn tonnes

It is expected to increase by 111.3 Mn tonnes in 2021 to 2.3 Bn tonnes

Australia is the major exporter of iron ore in the world (as per 2019 data) which accounts to about 53.8 %, followed by Brazil 18.1%

### **Uranium: Atomic minerals- India**

Uranium is a silvery-gray metallic radioactive chemical element

Uranium deposits occur in Singhbhum and Hazaribagh district of Jharkhand

The largest source of uranium comprise the monazite sand

Monazite sand occurs in east and west coasts in some places of Bihar, but the largest concentration of monazite sand is on the coast of Kerala

Over 15,200 tonnes of uranium is estimated to be contained in monazite

India produces 2% of world's uranium production

Largest viable deposits are found in Australia, Kazakhstan and Canada

High-grade deposits are only found in the **Athabasca Basin** region of Canada

Cigar Lake, McArthur River basin in Canada are other important uranium mining sites

The Chu-Sarysu basin in central Kazakhstan is the largest uranium reserve of this country's and accounts about half of country's production

India imports thousands of tonnes of uranium from **Russia, Kazakhstan and France**

### **Diamond: India**

The deposit of diamond generally lies in a kimberlite or lamproite pipe

Total diamond reserve of India (in thousand carat) is about 960

The remaining resources is expected to be about 30876 th. carat in India

Madhya Pradesh is the major contributor of Diamond production in India, which accounts to about 39699 carat in 2017-18 and 38437 in 2018-19

### **Copper**

The main ore of copper is Chalcopyrite

The total reserve of copper ore in India is about 712.4 Mn tonnes, of which 9.4 Mn tonnes is the metal content

Major production comes from the Singhbhum District of Jharkhand, followed by Balaghat of Madhya Pradesh, Jhunjhunu and Alwar of Rajasthan

### **Limestone: India**

Limestone rocks are composed of either carbonates of calcium or double carbonates of calcium or mixture of both

Limestone also contains small quantities of silica, alumina, iron oxides and Sulphur

The deposits of limestone is sedimentary in nature

About 75% of limestone is used in cement industry, 16% in iron and steel industry

It is also used in fertilizer industries

The global market size of limestone was valued to about 73.02 billion USD in 2019

Every year the demand of limestone is increasing as the demand of products derived from it such as cement increasing

Asia Pacific regions produces about more than 50% limestone production around the globe

