

Domestic Exploration of Lithium

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In a major development, India has discovered its maiden lithium reserves discovery in the igneous rocks located in the Marlagalla-Allapatna region of Karnataka's Mandya district. Though the discovery is very small in size in the present and stands at only 1,600 tonnes of lithium, it marks an initial success for the nation's attempts to domestically mine the metal in India

In news: India finds a small deposit in Karnataka's Mandya District

Placing it in syllabus: Geography

Dimensions:

- About lithium
- Geographical Areas for mining in India and Abroad
- Strategic Importance
- Government initiatives

Content:

Preliminary surveys by the Atomic Minerals Directorate for Exploration and Research (AMD) have shown the presence of 1,600 tonnes of lithium resources in the igneous rocks of the Marlagalla-Allapatna region of Karnataka's Mandya district.

About Lithium

- Lithium is a widely used chemical element.
- Under standard conditions, it is the **lightest metal and the lightest solid element.**
- It is **highly reactive and flammable**, and **must be stored in mineral oil.**
- It appears as **soft, silvery-white metal**, and is **an alkali**

metal and a rare metal.

- The alkali metals consist of the chemical elements lithium, sodium, potassium, rubidium, caesium, and francium. Together with hydrogen they constitute group 1, which lies in the s-block of the periodic table.
- These metals are strategic in nature with wide **application in the nuclear and other high tech industries** such as electronics, telecommunication, information technology, space, defense etc.
- It was first discovered in 1817 by Swedish chemist Johan August Arfwedson in the mineral **petalite**.
- Lithium is also found in **brine deposits and as salts** in mineral springs and **pegmatite** ores

Geographical Areas for mining in India and Abroad

- Lithium production has greatly increased since the end of World War II. The main sources of lithium are brines and ores.
- The world's top four lithium-producing countries from 2019, as reported by the **US Geological Survey (USGS)** are **Australia, Chile, China and Argentina**.
- The intersection of Chile, Bolivia, and Argentina make up the region known as the **Lithium Triangle**.
- The Lithium Triangle is known for its high quality salt flats including Bolivia's Salar de Uyuni, Chile's Salar de Atacama, and Argentina's Salar de Arizaro.
- The Lithium Triangle is believed to **contain over 75% of existing known lithium reserves**.
- **India currently meets all its lithium demand and needs by means of imports.**

Lithium mine production (2019), reserves and resources in tonnes according to USGS^[101]

Country	Production	Reserves ^[note 1]	Resources
World total	77,000	17,000,000	80,000,000+
Australia	42,000	2,800,000	6,300,000
Chile	18,000	8,600,000	8,600,000
People's Republic of China	7,500	1,000,000	4,500,000
Argentina	6,400	1,700,000	17,000,000
Zimbabwe	1,600	230,000	540,000
Portugal	1,200	60,000	250,000

Lithium Extraction:

- Lithium can be extracted in different ways, depending on the type of the deposit.
- It is generally done either through solar evaporation of large brine pools or by hard-rock extraction of the ore.
- India currently does not have any mines of Lithium.
- In India, alongside the rock mining at Mandya, there is some potential for recovering lithium from the **brines of Sambhar and Pachpadra in Rajasthan, and Rann of Kachchh** in Gujarat.

The **major mica belts in Rajasthan, Bihar, and Andhra Pradesh**, and the **pegmatite belts in Odisha and Chhattisgarh** apart from Karnataka, are the other potential geological domains.

Strategic Importance of Lithium:

- Lithium and its compounds **have several industrial applications**, including heat-resistant glass and ceramics, lithium grease lubricants, flux additives for iron, steel and aluminium production, lithium batteries, and lithium-ion batteries.
- The principal industrial applications for lithium metal are in metallurgy, where the active element is used as a **scavenger (remover of impurities) in the refining** of such metals as iron, nickel, copper, and zinc and their alloys.
- It is also extensively used in the production of other organic chemicals, especially pharmaceuticals.
- Lithium metal is used to **make useful alloys** such as lead alloy to make 'white metal' bearings for motor engines, with aluminium to make aircraft parts, and with magnesium to make armour plates.
- It is also **used in thermonuclear reactions**. Lithium (**Li-7**) as a hydroxide is important in controlling the chemistry of **pressurised water reactor (PWR) cooling**

systems. It is a key component of fluoride coolant in molten salt reactors.

- Because of its light weight and large **negative electrochemical potential**, lithium metal serves as the anode (negative electrode) in many **non rechargeable lithium primary batteries** that power electric vehicles (EVs), laptops and mobile phones.
- The **push for greener technologies to mitigate climate change** have enhanced the strategic importance of Lithium. High-power rechargeable lithium storage batteries are an integral component of greener electric vehicles and power storage
- 2021 is likely to be an inflection point for battery technology – with several potential improvements to the li-ion technology, and alternatives to this tried-and-tested formulation in advanced stages of commercialisation.
- Over **165 crore lithium batteries are estimated to have been imported into India** between 2016-17 and 2019-20, at an estimated **import bill of upwards of \$3.3 billion**.
- Moreover, **China is a major source of lithium-ion energy storage products** being imported into India. Therefore securing Lithium supply is essential for the success of **India's economic offensive against China**.

Government initiatives

- India is seen as a late mover in attempts to enter the lithium value chain
- Alongside a move to tap into the global lithium value chain, India has initiated a concerted domestic exploration push.
- **Atomic Minerals Directorate for Exploration and Research (AMD)**, an arm of the **Department of Atomic Energy**, is carrying out surface and subsurface exploration for lithium in potential geological domains of India.
- Exploratory work to extract lithium from the brine pools

of Rajasthan and Gujarat and the mica belts of Odisha and Chhattisgarh is underway.

- The new company, **Khanij Bidesh India Ltd**, was incorporated in August 2019 by three state-owned companies, NALCO, Hindustan Copper, and Mineral Exploration Ltd.
- It's **specific mandate is to acquire strategic mineral assets** such as lithium and cobalt abroad. The company is learnt to be also exploring options in Chile and Bolivia.
- In 2020, India's newly-floated state-owned company **Khanij Bidesh India Ltd** had signed an agreement with an Argentinian firm to jointly prospect lithium in the South American country. It has the third largest reserves of the metal in the world.

Mould your thought: Discuss the strategic importance of Lithium for India. What steps have been taken by Indian government to ensure its adequate supply?

Approach to the answer:

- Introduction
- Mention the Strategic uses of Lithium
- Mention the Import dependence of India
- Discuss the recent initiatives of the government
- Conclusion