

Saturday, Jul 01, 2023

EPAPER TODAY'S PAPER

The Indian EXPRESS

JOURNALISM OF COURAGE

Home Get Access India Cities Videos Audio Explained Education Politics Opinion Entertainment

TRENDING Play See UPSC Manipur UPSC Health Express et
Crossword offer Violence Special Specials al.

News / Explained / Explained Sci-Tech / Centre identifies 30 critical minerals: Why, how, and importance of the exercise

Premium

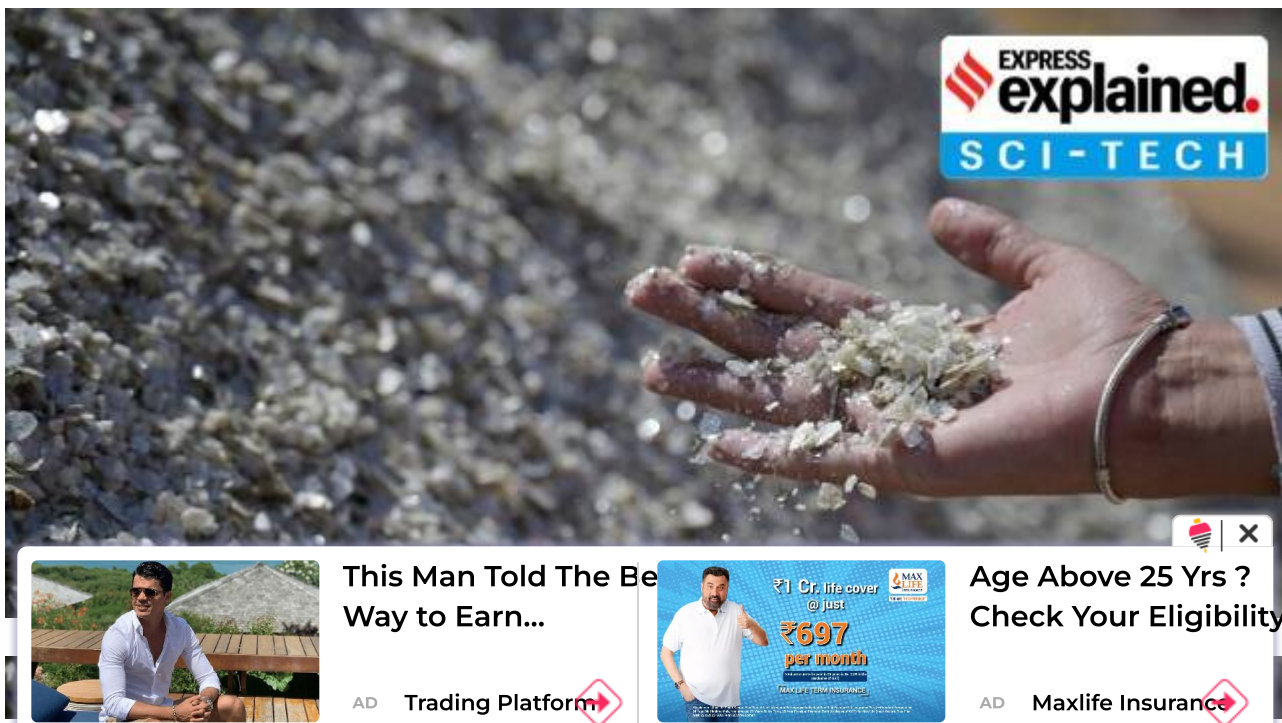
Centre identifies 30 critical minerals: Why, how, and importance of the exercise

What are critical minerals and on what basis are they designated as such? How have different countries across the world identified their 'critical minerals', and why has India carried out the exercise now?

Written by **Anil Sasi** [Follow](#)

New Delhi | Updated: July 1, 2023 07:32 IST





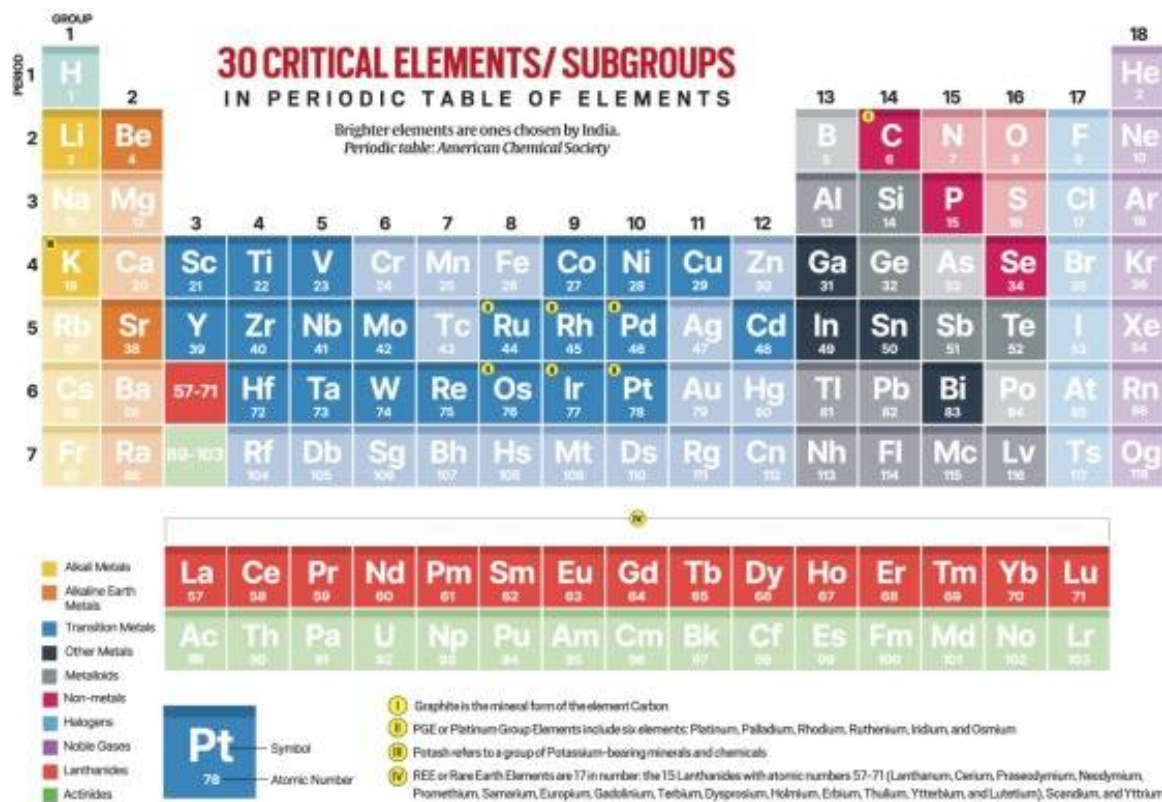
A worker of a lithium mine takes samples at the Grotto do Cirilo mine in Brazil. Elements like lithium are required for batteries used in electric vehicles or cellphones. (Photo: Reuters)

Listen to this article

00:00 1x 1.5x 1.8x

In a strategic move, the Centre has identified 30 critical minerals, including lithium, cobalt, nickel, graphite, tin and copper, which are essential for the country's economic development and national security.

The identification of these minerals — which form part of multiple strategic value chains, including clean technologies initiatives such as zero-emission vehicles, wind turbines, solar panels; information and communication technologies, including semiconductors; and advanced manufacturing inputs and materials such as defence applications, permanent magnets, ceramics — was done on the basis of a report on critical minerals prepared by an expert team constituted by the Ministry of Mines last November. The ministry will revisit the list periodically.



The exercise

While elements such as cobalt, nickel and lithium are required for batteries used in electric vehicles or cellphones, rare earth minerals are critical, in trace amounts, in the semiconductors and high-end electronics manufacturing. Most countries of the world have identified critical minerals as per their national priorities and future requirements.

In India too, some efforts have been made in the past to identify the minerals that are critical for the country, including an initiative in 2011 by the Planning Commission of India (now NITI Aayog) that highlighted the need for the “assured availability of mineral resources for the country’s industrial growth”, with a clear focus on the well-planned exploration and management of already discovered resources. That report analysed 11 groups of minerals under categories such as metallic, nonmetallic, precious stones and metals, and strategic minerals. From 2017 to 2020, a big thrust was accorded to the study of exploration and development of rare earth elements in the country.

Also in Explained | What are the challenges India faces in assuring resilient critical minerals supply chains?

The specific trigger for the latest exercise are India's international commitments towards reducing carbon emissions, which require the country to urgently relook at its mineral requirements for energy transition and net-zero commitments. In November 2022, the Ministry of Mines had constituted a seven-member Committee under the chairmanship of Joint Secretary (Policy), Ministry of Mines to identify a list of minerals critical to our country and the panel decided to have a three-stage assessment to arrive at a list of critical minerals.

Critical minerals

These are minerals that are essential for economic development and national security, and the lack of availability of these minerals or the concentration of extraction or processing in a few geographical locations could potentially lead to "supply chain vulnerabilities and even disruption of supplies". This is true for minerals such as lithium, graphite, cobalt, titanium, and rare earth elements, which are essential for the advancement of many sectors, including hightech electronics, telecommunications, transport, and defence.

Best of Explained

[India and the US-China chips war](#)

[Groundwater extraction shifted the Earth's axis: What a new study says](#)

[How NRF aims to boost research in higher educational institutes](#)

[CLICK HERE FOR MORE](#)

One of the definitions cited in the report characterises a mineral as critical when the risk of supply shortage and associated impact on the economy is (relatively) higher than other raw materials. This definition of a critical mineral was first adopted in the US and the subsequent legislation that resulted from the analysis, the report said. The European Union also carried out a similar exercise and categorised critical minerals on the basis of two prerequisites: supply risk and economic importance.

Australia refers to critical minerals as: “metals, non-metals and minerals that are considered vital for the economic well-being of the world’s major and emerging economies, yet whose supply may be at risk due to geological scarcity, geopolitical issues, trade policy or other factors”.

CRITICAL MINERALS: INDIA'S NET IMPORT RELIANCE (2020)

Critical Mineral	%age	Major import sources
Lithium	100%	Chile, Russia, China, Ireland, Belgium
Cobalt	100%	China, Belgium, Netherlands, US, Japan
Nickel	100%	Sweden, China, Indonesia, Japan, Philippines
Vanadium	100%	Kuwait, Germany, South Africa, Brazil, Thailand
Niobium	100%	Brazil, Australia, Canada, South Africa, Indonesia
Germanium	100%	China, South Africa, Australia, France, US
Rhenium	100%	Russia, UK, Netherlands, South Africa, China
Beryllium	100%	Russia, UK, Netherlands, South Africa, China
Tantalum	100%	Australia, Indonesia, South Africa, Malaysia, US
Strontium	100%	China, US, Russia, Estonia, Slovenia
Zirconium (zircon)	80%	Australia, Indonesia, South Africa, Malaysia, US
Graphite (natural)	60%	China, Madagascar, Mozambique, Vietnam, Tanzania
Manganese	50%	South Africa, Gabon, Australia, Brazil, China
Chromium	2.5%	South Africa, Mozambique, Oman, Switzerland, Turkey
Silicon	<1%	China, Malaysia, Norway, Bhutan, Netherlands

Source: 'Unlocking Australia-India Critical Minerals Partnership Potential', Australian Trade and Investment Commission, July 2021

Three-stage process

In its three-stage assessment for identifying the minerals critical to India, the panel, in the first stage, looked at the strategies of various countries such as Australia, USA, Canada, UK, Japan and South Korea. Accordingly, a total of 69 elements/ minerals that were considered critical by major global economies were identified for further examination, the report said, adding that due importance was given to domestic initiatives as well.

In the second stage of assessment, an inter ministerial consultation was carried out with different ministries to identify minerals critical to their sectors. Comments and

suggestions were received from the Ministry of Power, Department of Atomic Energy, Ministry of New and Renewable Energy, Department of Fertilisers, Department of Science and Technology, Department of Pharmaceuticals, NITI Aayog, etc.

Explained | **India and the US-China chips war**

The third stage assessment was to derive an empirical formula for evaluating minerals criticality, taking cognizance of the EU methodology that considers two major factors — economic importance and supply risk.

Based on this process, a total of 30 minerals were found to be most critical for India, out of which two are critical as fertiliser minerals: Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, PGE, Phosphorous, Potash, REE, Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium and Cadmium.

Specialised agency

Alongside this list, the committee also called for a need for establishing a National Institute or Centre of Excellence on critical minerals on the lines of Australia's CSIRO, which is the largest minerals research and development organisation in Australia and one of the largest in the world. A wing in the Ministry of Mines can be established as a Centre of Excellence for Critical Minerals, the report said, adding that this proposed Centre will periodically update the list of critical minerals for India and notify the critical mineral strategy from time to time and will execute a range of functions for the development of an effective value chain of critical minerals in the country.

To build competitive value chains in India, the discovery of mineral wealth and identifying areas of its potential by use of advanced technologies has been cited as essential. The identification of critical minerals “will help the country to plan for the acquisition and preservation of such mineral assets taking into account the long

term need of the country, and, in turn, reduce the import dependency as India is 100% import dependent for certain elements”.

Global practices

The US, according to the report, adopted a two-stage screening methodology to arrive at the list of critical minerals. An early warning screening tool assesses a mineral's potential criticality using three fundamental indicators: supply risk, production growth, and market dynamics. This was followed by an in-depth supply chain analyses and inter-agency collaboration, wherein detailed analysis of the underlying factors were carried out.

In the UK, the criticality to the British economy was determined in terms of their global supply risks and the economic vulnerability to such a disruption. Three indicators were used to estimate the production concentration, companion metal fraction and recycling rate. A total of 18 minerals were identified as critical to the UK economy, the report noted.

The European Commission has been issuing a list of critical raw minerals since 2011 that is updated every three years. The main parameters used to determine the criticality of the mineral for the EU are the economic importance, in terms of end-use applications and the value added of corresponding EU manufacturing sectors. Supply risk is the other parameter. A total of 34 raw materials are identified as Critical Raw Materials for 2023.

Japan's first list of critical minerals was prepared by the country's Advisory Committee on Mining Industry in 1984, under the direction of the Ministry of International Trade and Industry (current METI). In March 2020, Japan released its latest perspective on how to secure its supply chains for critical minerals and materials as part of the New International Resource Strategy. The strategy underscored the growing importance of critical minerals for EVs and renewable power generation equipment. Japan has identified a set of 31 minerals as critical for their economy.

The Australian Government, in 2019, released its inaugural Critical Minerals List and associated national strategy and a list of 24 critical minerals was first

identified. Two more elements were added in the latest critical mineral strategy.

Domestic and global outreach

The Geological Survey of India, an attached office of Ministry of Mines, has carried out a G3 stage mineral exploration (fairly advanced) during Field Season 2020-21 and 2021-22 in Salal-Haimna areas of Reasi district, Jammu & Kashmir, and estimated an inferred resource of 5.9 million tonnes of lithium ore. The estimated value of lithium at that site will be estimated on completion of further exploration. Based on the mapping outcome, more exploration programmes on various mineral commodities including lithium will be taken up in future in different parts of the country, including Jammu & Kashmir.

Also in Explained | Lithium ‘inferred’ in J&K — how significant is this find, what next?

In addition, a joint venture company namely Khanij Bidesh India Ltd. (KABIL) has been incorporated with equity contribution from three Central Public Sector Enterprises. It is mandated to identify and acquire overseas mineral assets of critical and strategic nature such as lithium, cobalt and others so as to ensure supply side assurance. KABIL has initiated engagement with several state owned-organisations of the shortlisted source countries through the Ministry of External Affairs and the Indian Embassies in countries like Argentina and Australia to acquire mineral assets, including lithium, cobalt and rare earth elements.

In a fresh boost, India has recently been inducted into the Mineral Security Partnership (MSP), a US-led collaboration of 14 countries that aims to catalyse public and private investment in critical mineral supply chains globally. India's inclusion assumes significance given that one of the key elements of New Delhi's growth strategy is powered by an ambitious shift in the mobility space through the conversion of a large part of public and private transport to electric vehicles. This, alongside a concerted electronics manufacturing and semiconductor push, underlines the need to secure the supply of critical minerals.

Also in Explained | What are rare earth elements, and why is India keen to join a global alliance to ensure their supply?

The proposal to onboard India comes after a strong diplomatic push by New Delhi, given that there was considerable disquiet within sections of the Union government over the country not finding a place in the strategic partnership that is also aimed at reducing dependency on China for securing critical minerals. The concerns grew after the partnership, originally floated mid last year, was expanded earlier this year to include a new member, Italy.

ALSO READ



What caused the implosion of the Titan sub?



Chandrayaan-3 to be launched on July 12: Chandrayaan-2 and why it partial...



Scientist John B Goodenough dies: How his creation of lithium-ion battery...



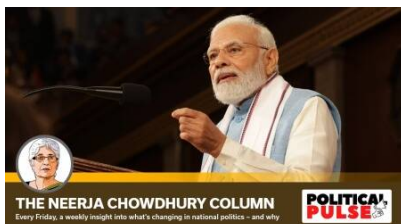
Why Google has appealed NCLAT's order in an antitrust case

India is seen as a late mover in attempts to enter the lithium value chain, coming at a time when EVs are predicted to be a sector ripe for disruption. The year 2023 could be an inflection point for battery technology – with several potential improvements to the Li-ion technology, and alternatives to this combination in various stages of commercialisation.

First published on: 29-06-2023 at 19:07 IST

TAGS: Explained Economics Express Premium

SUBSCRIBERS READING NOW



THE NEERAJ CHOWDHURY COLUMN
Every Friday, a weekly insight into what's changing in national politics - and why

