



UN Panel on Critical Energy Transition Minerals

For Prelims: [Critical Minerals](#), [Mining Sector](#), [Rare Earth Metals](#), [Electric vehicles](#), [Renewable energy](#), [United Nations Framework Agreement on Climate Change](#), [Paris Agreement](#)

For Mains: Key Critical Minerals and Their Applications, Significance of Critical Minerals for India.

Source: [UN](#)

Why in News?

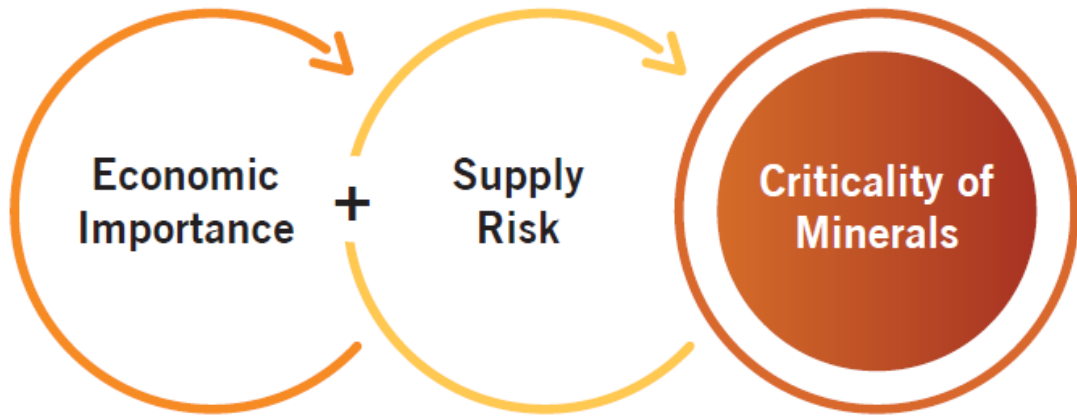
Recently, the [United Nations \(UN\)](#) Secretary-General appointed a **panel on Critical Energy Transition Minerals** to develop **global common and voluntary principles** for the **minerals value chain** to safeguard environmental and social standards and embed justice in the energy transition.

What are the Key Facts About the Panel on Critical Energy Transition Minerals?

- The panel will address issues relating to **equity, transparency, investment, sustainability, and human rights** in the context of critical minerals for renewable energy technologies.
 - Developing countries see **critical minerals as an opportunity** to create jobs, diversify economies, and boost revenues, but proper management is essential to avoid trampling over the poor.
- The **panel's objective** is aligned with the **2030 Agenda for Sustainable Development**, the [United Nations Framework Agreement on Climate Change](#), and its [Paris Agreement](#) to harness the potential of critical minerals for shared prosperity and leaving no one behind.
- The panel **utilises past UN efforts**, especially the Working Group on Sustainable Extractive Industries and its 'Harnessing Critical Energy Transition Minerals for Sustainable Development' initiative.
 - It will help to **develop principles to ensure a fair and transparent approach** globally and for local communities in the **entire value chain** — upholding the highest sustainability and human development standards.
- The goal of combating climate change and **limiting global warming to 1.5°C** hinges on a **secure and accessible supply of critical energy transition minerals**.
 - These minerals, such as copper, lithium, nickel, cobalt, and rare earth elements, are **essential components of clean energy technologies** like wind turbines, solar panels, electric vehicles, and battery storage, **which are crucial for powering a sustainable future**.

What are Critical Minerals?

- **Critical Minerals:**
 - These are those minerals that are **essential for economic development and national security**, the lack of availability of these minerals or concentration of extraction or processing in a few geographical locations may lead to supply chain vulnerabilities and even disruption of supplies.



Economic Importance

- Disruption Potential
- Substitutability Index (EI)
- GVA Multiplier Score
- Cross-Cutting Index (CCI)

Supply Risk

- Governance-Weighted Mineral Concentration
- End-of-life Recycling Rates (EOL-RR)
- Import Reliance (IR) and Self-Sufficiency (SS)
- Substitutability Index (SR)

▪ **Declaration of Critical Minerals:**

- It is a **dynamic process**, and it can evolve over time as new technologies, market dynamics, and geopolitical considerations emerge.
- **Different countries** may have their **own unique lists** of critical minerals based on their specific circumstances and priorities.
 - The **US has declared 50 minerals** critical in light of their role in national security or economic development.
 - **Japan** has identified a set of **31 minerals** as critical for its economy.
 - The UK considers **18 minerals** critical, **EU (34)** and **Canada (31)**.

▪ **Critical Minerals for India:**

- Expert Committee under Ministry of Mines has identified a set of **30 critical minerals** for India.
- These are Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, PGE, Phosphorous, Potash, **Rare Earth Elements (REEs)**, Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium and Cadmium.
- The creation of **Centre of Excellence for Critical Minerals (CECM)** in the **Ministry of Mines** is also recommended by the Committee.
 - CECM will **periodically update the list of critical minerals** for India and notify the critical mineral strategy from time to time.

What are the Key Critical Minerals and Their Applications?

- **Lithium, Cobalt, and Nickel:**
 - These minerals are indispensable components of [lithium-ion batteries](#), widely utilized in **electric vehicles, portable electronic devices, and energy storage systems.**
- **Rare Earth Elements (REEs):**
 - Consisting of **17 elements**, [REEs](#) play pivotal roles in manufacturing high-strength magnets, electronics, wind turbines, and military equipment.
 - Notably, **neodymium and dysprosium** are crucial for the production of **permanent magnets** used in motors.
- **Copper:**
 - It holds significant importance in **electrical wiring, renewable energy infrastructure, and [electric vehicle components](#)**, owing to its remarkable electrical conductivity.
- **Titanium:**
 - In the **aerospace industry**, titanium finds extensive use due to its **exceptional strength-to-weight ratio, resistance to corrosion**, and ability to withstand high temperatures.
- **Platinum Group Metals (PGMs):**
 - PGMs are indispensable in the **fabrication of catalytic converters for vehicles**, fuel cells, and various electronic devices.
- **Graphite:**
 - It is a **critical material** for the **anodes of [lithium-ion batteries](#)** and is valued for its lubricating properties in diverse industrial applications.

What is the Significance of Critical Minerals for India?

- **Economic Self- Reliance:**
 - **High-Tech Electronics:** Critical minerals like **lithium are used in lithium-ion batteries, powering laptops, smartphones**, and other devices. India's growing electronics industry heavily relies on a steady supply.
 - **Telecommunications:** **Rare earth elements** are essential for [fiber optic cables](#) and advanced telecommunication equipment, driving faster internet speeds and network capacity.
 - **Electric Vehicles:** **Lithium, cobalt, and nickel** are crucial for [electric vehicle batteries](#). As India pushes for cleaner transportation, access to these minerals is vital for domestic EV production.
- **Technological Innovation:**
 - **Defense Aircraft:** Rare earth elements and titanium are used in high-performance jet engines and airframes, enabling [advanced fighter jets](#) and military aircraft.
 - **Nuclear Energy:** **Vanadium and zirconium** are crucial for nuclear reactors, ensuring safe and reliable nuclear power generation.
 - **Space Exploration:** **Lithium and beryllium** are used in **lightweight and high-strength materials** for rockets and satellites, critical for India's space program ambitions.
- **Environmental Sustainability:**
 - **Solar Panels:** **Silicon** is a key component of [solar photovoltaic cells](#), enabling the conversion of sunlight into clean electricity.
 - **Wind Turbines:** **Neodymium and dysprosium** are used in high-strength magnets for wind turbine generators, promoting [renewable energy generation](#).
 - **Battery Storage:** **Lithium-ion batteries**, containing lithium and cobalt, are essential for storing energy from renewable sources like solar and wind, enabling a shift from fossil fuels.

What are the Challenges for India Related to Critical Minerals?

- **Supply Chain Disruptions:**
 - The ongoing **conflict between [Russia and Ukraine](#)**, both significant producers of critical minerals, disrupts established supply chains, threatening reliable access for India.
- **Limited Domestic Reserves:**
 - India **lacks sufficient reserves** of critical minerals like **lithium, cobalt, and rare earth**

elements, crucial for clean energy technologies and [electric vehicles](#).

▪ **Heavy Reliance on Imports:**

- The lack of domestic reserves forces India to rely heavily on imports, making it vulnerable to:
 - **Price Fluctuations:** Global market fluctuations can significantly impact the cost of critical minerals.
 - **Geopolitical Factors:** Strained relations with supplier countries can restrict access to critical minerals.
 - **Supply Disruptions:** Events like wars or natural disasters can disrupt critical mineral supply chains.

▪ **Growing Demand:**

- India's **ambitious clean energy and electric vehicle** goals require ever-increasing quantities of critical minerals.
 - India's has set the target of "[Panchamrit](#)" regarding its climate action plan. These include:
 - Achieving a **non-fossil energy capacity of 500 GW by 2030**.
 - **Sourcing 50%** of its total energy needs from **renewable energy** sources by 2030.
- This rising demand, coupled with limited domestic reserves, intensifies India's dependence on foreign suppliers.

Conclusion

With a focus on equity, sustainability, and international cooperation, this UN initiative underscores the importance of critical minerals in driving economic development, ensuring national security, and advancing environmental sustainability, particularly in the context of renewable energy technologies. As India pursues its ambitious renewable energy goals, international cooperation on critical minerals becomes increasingly vital, highlighting the need for a comprehensive and inclusive approach towards economic and environmental sustainable future.

Drishiti Mains Question:

Q. Discuss about key critical minerals and their applications. What is the significance of critical minerals for India.

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q. Recently, there has been a concern over the short supply of a group of elements called 'rare earth metals'. Why? (2012)

1. China, which is the largest producer of these elements, has imposed some restrictions on their export.
2. Other than China, Australia, Canada and Chile, these elements are not found in any country.
3. Rare earth metals are essential for the manufacture of various kinds of electronic items and there is a growing demand for these elements.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (c)

Mains

Q. Despite India being one of the countries of Gondwanaland, its mining industry contributes much less to its Gross Domestic Product (GDP) in percentage. Discuss. **(2021)**

Q. “In spite of adverse environmental impact, coal mining is still inevitable for development”. Discuss. **(2017)**

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