



Coking Coal as Critical Mineral

For Prelims: [NITI Aayog](#), [Coking Coal](#), [Critical Minerals](#), [Steel Production](#), [European Union](#), [Lithium](#), [Rare Earths](#), [Sedimentary Rock](#), [Special Purpose Vehicles](#), [Volatile Compounds](#).

For Mains: Significance of coking coal and critical minerals for India.

[Source: IE](#)

Why in News?

Recently, a [NITI Aayog](#) report titled ‘**Enhancing Domestic Coking Coal Availability to Reduce the import of Coking Coal**’ advocated [coking coal](#) to be included in the list of [critical minerals](#).

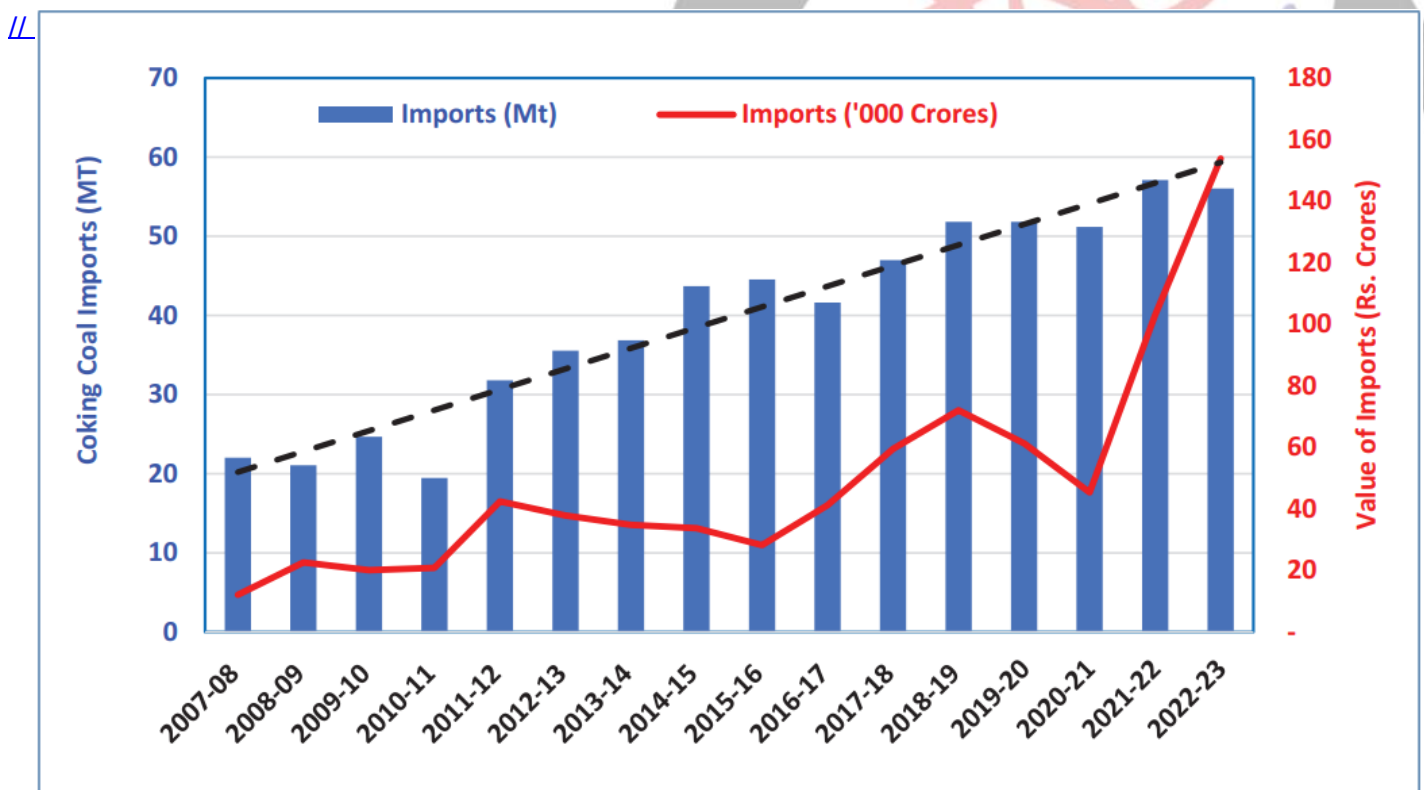
Why Should Coking Coal Be Declared a Critical Mineral?

- **Meeting Critical Mineral Criteria:** Coking coal meets **all the criteria** to declare coking coal as a ‘critical mineral’ for India.
 - Critical minerals have significant **economic importance for key sectors** in the national economy.
 - Critical minerals have a **high-supply risk** due to the **very high import dependence** and **high level of concentration** of set critical raw materials in particular countries.
 - There is a **lack of (viable) substitutes**, due to the unique and reliable properties of these materials for existing, as well as future applications.
- **Steel Production:** Coking coal is a vital **raw material for steel production**, constituting approximately **42% of the cost of steel**, which is crucial for **infrastructure** development and **job-creating sectors** in India,
 - The availability of **affordable coking coal** is crucial for the economy.
- **High Import Dependence:** India **imports about 85% of its coking coal**, much higher than the [European Union’s \(EU\) 62%](#), posing risks to its **steel industry and economic stability**.
 - Domestic production of coking coal could have **saved Rs 1.5 lakh crore in FY 2023-24** for import of **58 metric tonnes** of coking coal.
- **Large Domestic Reserves:** India holds significant proved reserves of coking coal—**16.5 billion tonnes of medium-quality and 5.13 billion tonnes of prime-quality coal**.
 - Using these reserves for metallurgical purposes can enhance **energy security**, **reduce supply chain risks**, and support domestic steel production.
- **Steel Industry’s Competitiveness:** In FY 2023-24, [Integrated Steel Plants \(ISPs\)](#) imported **58 metric tonnes** of coking coal, costing approximately **Rs 1.5 lakh crore**.
 - Declaring coking coal a critical mineral can boost domestic production, **lowering steel production costs** and enhancing **global competitiveness**.
- **Full Capacity Utilisation:** The **capacity utilisation** of PSU washeries was less than **32% in FY 2022-23** while the **washed (clean) coal yields** were only **35-36%**.
 - **Investment and subsidies** for adoption of **efficient technologies** in **washery equipment** can improve their **efficiency** and reduce costs.

- **Global Practices:** EU has declared **coking coal** as a **critical raw material** along with 29 other raw materials which include '**green energy**' minerals like **lithium, cobalt, and rare earths**.
 - India's decision to similarly classify coking coal would **align with global practices** and prioritise it as a key resource for economic development.
- **Energy Security and Sustainability:** India's focus on developing domestic coking coal reserves can **reduce import reliance** and strengthen energy security while supporting its **Net Zero emissions goal by 2070**.

Coking Coal and India

- **High Dependence on Imports:** India's **coking coal imports** for the **first half (H1)** of FY25 (April-September) reached **29.6 million tonnes (mt)**, marking a six-year high.
 - Globally, **India** is the **largest importer of coking coal**.
- **Higher Steel Production:** The increase in coking coal imports coincides with a rise in India's **steel production**.
 - Globally, India is the **second largest producer of crude steel** after China.
- **Top Importing Countries:** **Australia, US, and Russia** are the largest suppliers of coking coal to India.
- **Trend in Imports:** Shipments from **Russia** saw a substantial 200% increase between H1FY25 and H1FY24.
 - **Australia's share** of India's coking coal imports has **dropped to 54%** (16 mt) in H1FY25, down from 80% (21.7 mt) in H1FY22.
- **Diversification:** There has been a **slight increase** in sourcing from **Mozambique and Indonesia**.

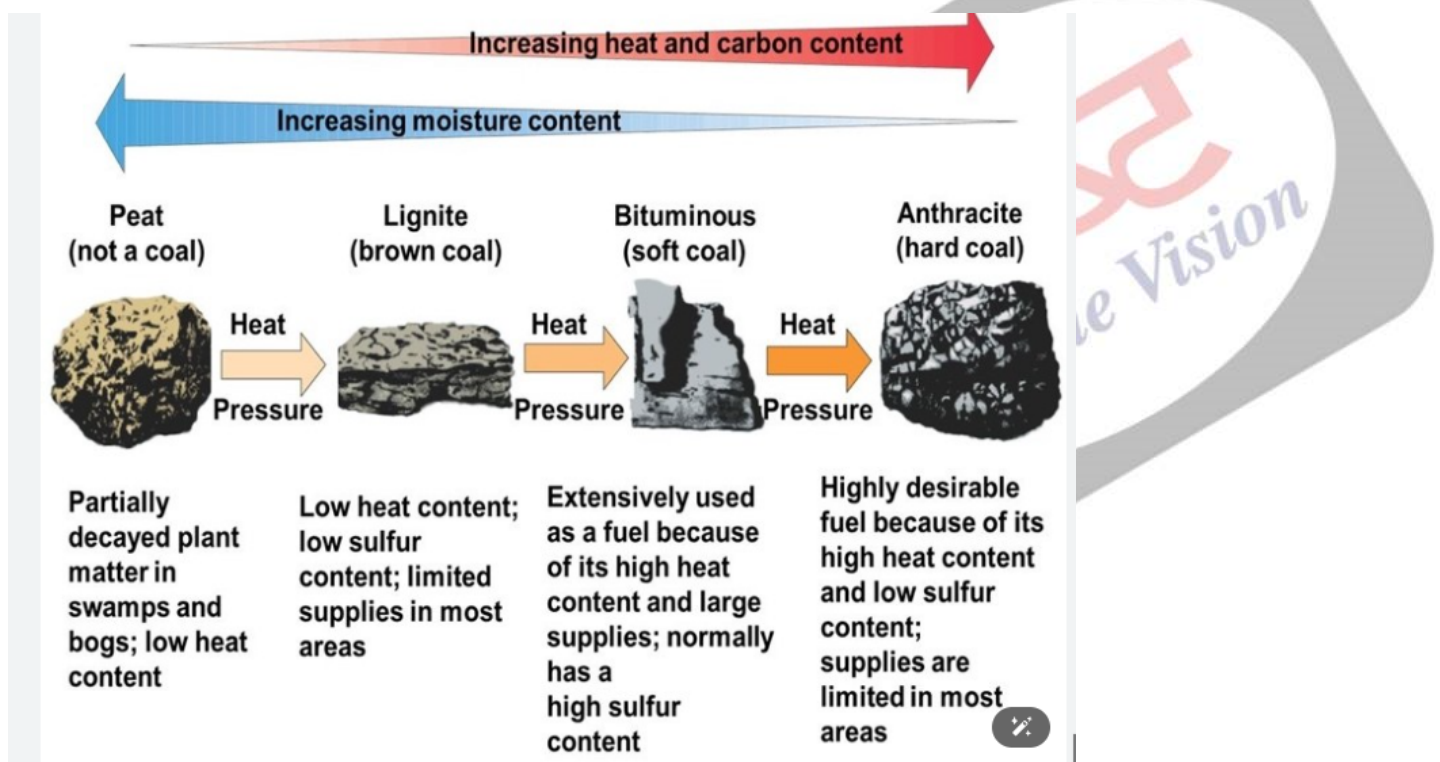


What are the Key Facts About Coking Coal?

- **About:** Coking coal (or Metallurgical coal) is a naturally occurring **sedimentary rock** found within the earth's crust.
 - It encompasses a wide range of quality grades including **hard** coking

coal, **semi-hard** coking-coal, and **semi-soft** coking coal. All are used to make steel.

- Coking coal typically contains **more carbon, less ash and less moisture** than thermal coal, which is used for electricity generation.
- **Formation of Coke:** Coking coal is **heated in the absence of air** in coke ovens to produce **coke**, a porous, carbon-rich material.
 - This process, called **coking**, removes **volatile compounds** from the coal, making the coke suitable for use in the blast furnace.
- **Role in Steelmaking:**
 - **Fuel:** Coke burns at high temperatures (around 1,000°C to 1,200°C) to produce **carbon monoxide (CO)**, which is used to **reduce iron ore (Fe₂O₃) into molten iron**.
 - **Reducing Agent:** Carbon monoxide (CO) reacts with iron ore in the blast furnace to **reduce iron oxide (Fe₂O₃) into iron (Fe)**.
- **Coking Coal Production:** The largest producers of coking coal in 2022 were **China (62%), Australia (15%), Russia (9%), USA (5%) and Canada (3%)**.
- **Strategic Importance:** Steel is cited as a **strategic material** in all industries related to the low-carbon transition.
 - About **780 kg of coking coal** is needed to produce **1 ton of steel**.
- **By-Products of Coke Production:** By-products such as **tar, benzole, ammonia sulphate, sulphur, and coke oven gas** are used in chemical manufacturing and for heat/power generation.



What are Critical Minerals for India?

- **Global Scenario:** The list of critical minerals **varies** among countries, depending on their **industries and priorities**.
 - For example, the **United States** has identified **50 critical minerals**, **Japan** has identified **34**, the **United Kingdom** has **18**, the **European Union** has **34**, and **Canada** has **31**.
- **Indian Scenario:** India has identified a total of **30 minerals** that are found to be most **critical** for India where India must prioritise its efforts to ensure an uninterrupted supply chain.
 - **List:** The identified minerals include 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.

- **States/UTs with Critical Minerals:** The states/UTs housing these minerals are Bihar, Gujarat, Jharkhand, Odisha, Tamil Nadu, Uttar Pradesh, Chhattisgarh, and Jammu and Kashmir.

Sl. No.	Critical Mineral	Percentage (2020)	Major Import Sources (2020)
1.	Lithium	100%	Chile, Russia, China, Ireland, Belgium
2.	Cobalt	100%	China, Belgium, Netherlands, US, Japan
3.	Nickel	100%	Sweden, China, Indonesia, Japan, Philippines
4.	Vanadium	100%	Kuwait, Germany, South Africa, Brazil, Thailand
5.	Niobium	100%	Brazil, Australia, Canada, South Africa, Indonesia
6.	Germanium	100%	China, South Africa, Australia, France, US
7.	Rhenium	100%	Russia, UK, Netherlands, South Africa, China
8.	Beryllium	100%	Russia, UK, Netherlands, South Africa, China
9.	Tantalum	100%	Australia, Indonesia, South Africa, Malaysia, US
10.	Strontium	100%	China, US, Russia, Estonia, Slovenia
11.	Zirconium(zircon)	80%	Australia, Indonesia, South Africa, Malaysia, US
12.	Graphite(natural)	60%	China, Madagascar, Mozambique, Vietnam, Tanzania
13.	Manganese	50%	South Africa, Gabon, Australia, Brazil, China
14.	Chromium	2.5%	South Africa, Mozambique, Oman, Switzerland, Turkey
15.	Silicon	<1%	China, Malaysia, Norway, Bhutan, Netherlands

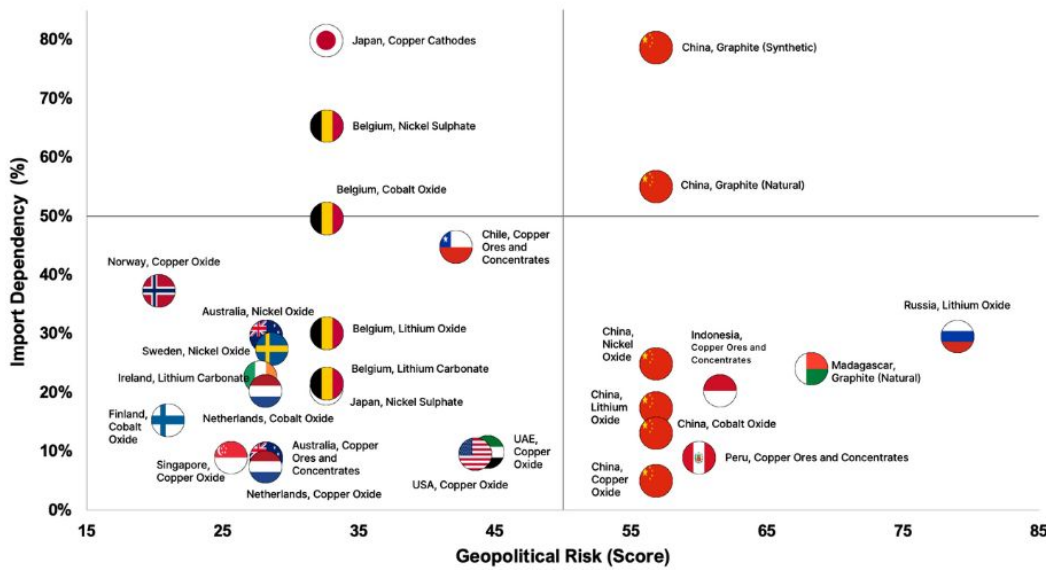
Table.1 The net import reliance for critical minerals of India (2020) (Source: A report on 'Unlocking Australia-India Critical Minerals Partnership Potential' by Australian Trade and Investment Commission, July 2021)

- **India's Import Dependency:** India is **heavily reliant** on imports for critical minerals, with **100% import dependency** for minerals like lithium, cobalt, and nickel.
 - This **dependency is likely to continue**, as demand for these minerals is expected to double by **2030**.



Breaking the Dependence

India hopes to have a rock-solid supply of critical minerals to achieve its renewable energy targets



Source: UN Comtrade, Control Risks, Fragile States Index, IEEFA

What are India's Initiatives to Secure Critical Minerals?

- [Mineral Security Partnership \(MSP\)](#)
- [Supply Chain Resilience initiative \(SCRI\)](#)
- [Investment Partnership with Australia](#)
- [Khanij Bidesh India Ltd \(KABIL\)](#)
- [Mines and Minerals \(Development and Regulation\) Amendment Act, 2023](#)
- [Offshore Area Minerals \(Development And Regulations\) Amendment Act, 2023](#)

Conclusion

- **Coking Coal as a 'Critical Mineral':** Coking coal should be declared a **critical mineral** as recommended by **NITI Aayog** to boost domestic production, enhance steel sector competitiveness, and create skilled manufacturing jobs.
- **Whole-of-Government Approach:** To address the shortage of domestic metallurgical coal, NITI Aayog recommends a **'whole-of-government' approach** involving multiple ministries (Coal, Steel, Environment, and Forests).
- **Private Participation:** [Special Purpose Vehicles \(SPVs\)](#) should be formed in the [Public-Private Partnership \(PPP\)](#) mode for the development of coalfield reserves.
- **Optimising Coal Production:** The production of metallurgical coal requires **collaborative teamwork** among mine planners, geologists, mining engineers, and washery operators.

Drishti Mains Question:

Discuss the strategic importance of coking coal for India's steel industry and economy. How can India address its high dependency on imports of coking coal?

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q. In India, the steel production industry requires the import of (2015)

- (a) saltpetre
- (b) rock phosphate
- (c) coking coal
- (d) All of the above

Ans: (c)

Q. Despite having large reserves of coal, why does India import millions of tonnes of coal? (2012)

1. It is the policy of India to save its own coal reserves for the future, and import it from other countries for the present use.
2. Most of the power plants in India are coal-based and they are not able to get sufficient supplies of coal from within the country
3. Steel companies need large quantity of coking coal which has to be imported

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: (b)

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)