ujiyari

UPSC & STATE PCS CURRENT AFFAIRS · UJIYARI.COM

EDITORIAL ANALYSIS

The Case for India's Coal Chemistry Capability

THE HINDU

2 July 2026 · SCIENCE & TECH · GS3

CURATED & WRITTEN BY

Bharat Choudhary

UPSC Educator & Content Creator

linkedin.com/in/epicbharat

The Case for India's Coal Chemistry Capability

The Hindu 2 July 2026 GS3

Source: ujiyari.com — researched, fact-checked & UPSC-mapped

INTERVIEW ANGLE

"In a world racing to net zero, is it wise for India to build new capability around coal, even if the coal becomes chemicals rather than smoke?"

Source: Original editorial ↗ The Hindu

Every fact web-verified against primary sources (https://ujiyari.com/how-we-verify/)

WHY THIS MATTERS NOW

India sits on a paradox (https://ujiyari.com/vocab/paradox/). It has enough coal to power the country for generations, yet it spends lakhs of crores importing methanol, ammonia derivatives and petrochemicals that the same coal could produce. Burning coal for electricity extracts only a fraction of its value; turning it into chemicals extracts far more. With the Cabinet clearing a Rs 37,500 crore gasification scheme and a national target to gasify 100 million tonnes of coal by 2030, the question has shifted from whether India should build a coal chemistry capability to how it should do so without betraying its climate commitments.

THE CRUX IN 60 WORDS

India imports most of its methanol and much of its petrochemicals while sitting on vast coal reserves. Coal gasification can convert coal into syngas and then into methanol, DME, ammonia and fuels, cutting a Rs 2.77 lakh crore substitutable import bill. Backed by a Rs 37,500 crore scheme and indigenous science, coal chemistry offers feedstock (https://ujiyari.com/vocab/feedstock/) security, provided carbon and water costs are managed.

THE ISSUE, DECODED

CONCEPT	WHAT IT MEANS	WHY IT MATTERS
Coal gasification	Reacting coal with oxygen and steam to produce synthesis gas (H2 + CO)	Turns coal from a fuel to burn into a chemical feedstock
Syngas value chain	Syngas converted to methanol, DME, ammonia, urea, SNG and hydrogen	Each product substitutes a costly import, capturing value at home
Methanol and DME routes	Methanol as a base chemical and fuel; DME as a clean LPG substitute	High-demand products where India is heavily import-dependent
Strategic feedstock autonomy	Domestic supply of chemical building blocks	Reduces exposure to global price shocks and supply disruption

THE ANALYSIS

1. **Coal is worth more as chemistry than as combustion.** Burning coal for power captures a narrow slice of its energy and none of its chemical value. Gasification unlocks a portfolio of high-value products from the same tonne.
2. **The import bill is the strongest economic case.** India imports the bulk of its methanol and a large share of related products, with the substitutable import bill near Rs 2.77 lakh crore in FY2025. Domestic gasification directly attacks this outflow.
3. **Policy has now put money behind the idea.** The Rs 37,500 crore scheme for surface coal and lignite gasification targets about 75 million tonnes of coal and eligible products spanning methanol, ammonia, urea, SNG, hydrogen and DME, with a national goal of 100 million tonnes gasified by 2030.
4. **The strategic dividend is capability, not just chemicals.** Building gasifiers, catalysts and process plants at scale seeds indigenous engineering and R&D, reducing reliance on imported technology and creating skilled jobs in coal-bearing regions.
5. **The climate trade-off is unavoidable.** Gasification is carbon and water intensive. Expanding it without carbon capture and water efficiency would conflict with the net-zero-by-2070 goal and risk stranded assets as the transition accelerates.

DATA AND INSTITUTIONS VAULT

CARRY THESE INTO THE EXAM HALL.

Gasification scheme: Cabinet-approved outlay of Rs 37,500 crore to promote surface coal and lignite gasification.

Targets: about 75 million tonnes of coal under the scheme; national goal of 100 million tonnes gasified by 2030.

Downstream products: methanol, ammonia, urea, synthetic natural gas (SNG), hydrogen, dimethyl ether (DME).

Import dependence: methanol roughly 80 to 90 percent imported; substitutable import bill near Rs 2.77 lakh crore in FY2025.

Ministry: Ministry of Coal; National Coal Gasification Mission framework.

Chemistry: syngas is a mix of hydrogen (H_2) and carbon monoxide (CO); methanol economy links to the transport-fuel blending push.

THE DEBATE

Argument for coal chemistry: India cannot ignore an asset as large as its coal reserves while paying lakhs of crores for imported chemicals. Gasification converts a domestic resource into feedstock security, high-value manufacturing and indigenous technological capability, all in regions that need economic alternatives to thermal coal.

Argument against: Gasification is expensive, thirsty for water and carbon-heavy. Building new coal-based infrastructure risks stranded assets, locks in emissions and undermines the credibility of India's net-zero-by-2070 pledge, especially when green hydrogen and bio-routes could deliver similar products more cleanly over time.

Balanced verdict: The choice is not coal chemistry or the energy transition; it is coal chemistry within the transition. Deploy it selectively for feedstocks India genuinely lacks alternatives for, mandate (https://ujiyari.com/vocab/mandate/) carbon capture and water efficiency, invest in indigenous science, and set a clear phase-down horizon so the capability becomes a bridge rather than a lock-in.

HOW TO THINK ABOUT THIS (TRANSFERABLE SKILL)

> *When evaluating a fossil resource, separate the way it is currently used from the value it could yield. Coal burnt for power and coal converted to chemicals are entirely different propositions with different economics and emissions. In S&T and economy answers, ask whether a resource can be moved up the value chain, and always attach the environmental trade-off and the mitigation (https://ujiyari.com/vocab/mitigation/) (here, carbon capture) rather than treating benefits and costs separately.*

DIAGRAM-IN-WORDS

```
Coal reserves -> gasification -> syngas (H2 + CO) -> methanol / DME / ammonia / urea / SNG / hydrogen -> substitutes Rs 2.77 lakh crore imports -> feedstock autonomy + jobs -> (with CCS + water efficiency + sunset plan) -> strategic resilience within net-zero pathway
```

THE WAY FORWARD

1. **Pair gasification with carbon capture and storage:** make CCS integral to new projects to keep coal chemistry consistent with climate goals.
2. **Design for water efficiency:** prioritise low-water gasifier technologies and siting in coal regions with adequate, sustainable water.
3. **Invest in indigenous R&D:** develop domestic catalysts, gasifier designs and process engineering to avoid technology import dependence.
4. **Target high-import products first:** focus on methanol, DME and ammonia where import substitution delivers the largest strategic gain.
5. **Set a transition horizon:** align coal chemistry with the net-zero-by-2070 pathway and green-hydrogen scale-up so assets are not stranded.

THE TAKEAWAY BOX

Coal chemistry is a case study in resource value-addition, import substitution and the tension between energy security (https://ujiyari.com/terms/energy-security/) and climate commitments, mapping to GS3 S&T and economy.

"Burning coal for electricity extracts only a fraction of its value; turning it into chemicals extracts far more."

Rs 37,500 crore gasification scheme; 100 million tonnes by 2030 target; syngas = H2 + CO; methanol 80 to 90 percent imported; products include DME and SNG.

Weigh developmental need for feedstock security against intergenerational (https://ujiyari.com/vocab/intergenerational/) responsibility for emissions.

Connects to GS3 questions on energy security, indigenous technology and India's climate obligations.

National Green Hydrogen Mission; methanol economy and fuel blending; carbon capture policy.

Sources: The Hindu (https://www.thehindu.com/opinion), Ministry of Coal (https://coal.gov.in), PIB (https://www.pib.gov.in)

KEY ARGUMENTS AT A GLANCE

India should convert its abundant coal from a fuel burnt for power into a feedstock for high-value chemicals and fuels through gasification and the methanol and DME routes, building strategic import resilience on indigenous scientific capability.

✓ SUPPORTING

- India imports the bulk of its methanol and a large share of petrochemicals, with the substitutable import bill for such products around Rs 2.77 lakh crore in FY2025, a drain gasification could reduce.
- The Rs 37,500 crore scheme for surface coal and lignite gasification targets around 75 million tonnes of coal and downstream products including methanol, ammonia, urea, SNG, hydrogen and DME.
- Domestic coal chemistry deepens strategic autonomy in feedstock supply and can seed indigenous catalyst, reactor and process-engineering capability.

⚠ COUNTER

Coal gasification is capital-intensive, water-hungry and carbon-heavy, and locking in new coal-based infrastructure risks stranded assets and undercuts India's net-zero-by-2070 commitment unless paired with carbon capture.

→ WAY FORWARD

Pursue coal chemistry selectively with carbon capture and storage, water-efficient designs, indigenous R&D on catalysts and gasifiers, and a clear phase-down horizon aligned with the energy transition.

MAINS ANSWER FRAMEWORK

QUESTION

India's vast coal reserves can be converted from a combustion fuel into a chemical feedstock. Examine the economic and strategic case for a coal chemistry capability and the environmental trade-offs involved. (250 words)

INTRODUCTION

India holds some of the world's largest coal reserves yet imports a vast quantity of chemicals and fuels that coal itself can yield. Coal chemistry, the conversion of coal into syngas and downstream products through gasification, offers a route to turn a liability of overdependence into a source of feedstock security.

BODY

Gasification breaks coal into synthesis gas, a mix of hydrogen and carbon monoxide, that can be converted into methanol, dimethyl ether, ammonia, urea and synthetic natural gas. India imports roughly 80 to 90 percent of its methanol, and the substitutable import bill for such products stood near Rs 2.77 lakh crore in FY2025.

To capture this value domestically, the Cabinet approved a Rs 37,500 crore scheme to promote surface coal and lignite gasification, targeting about 75 million tonnes of coal and advancing the goal of gasifying 100 million tonnes by 2030. The strategic dividend is real: feedstock autonomy, high-value jobs in coal regions, and indigenous capability in catalysts, gasifiers and process engineering.

The trade-off is equally real. Gasification is carbon and water intensive, so scaling it without carbon capture would sit awkwardly with India's net-zero-by-2070 pledge.

The answer is selective deployment with CCS, water efficiency and a phase-down horizon, not an open-ended coal expansion.

CONCLUSION

Coal chemistry can make India more self-reliant in critical feedstocks while its energy transition matures. Pursued with carbon capture, indigenous science and a clear sunset plan, it converts a fossil burden into a bridge, not a trap.

RELATED DAILY ARTICLES

30 Jun Aarogya Setu 2.0 and the Ayushman Bharat Digital Health...

28 Jun India Conducts First Jet Landing Using Indigenous GAGAN...

27 Jun World's First Nuclear Process-Heat Hydrogen Plant at...

27 Jun **ISRO Hot-Tests Indigenous Semi-Cryogenic Engine**

CURATED & WRITTEN BY

Bharat Choudhary

UPSC Educator & Content Creator

linkedin.com/in/epicbharat

📖 Read Full Article on Ujiyari →

https://ujiyari.com/editorials/2026/07/th-coal-chemistry-capability-2026/