GS Paper I – History **Date: 02.07.26**

Army chief unveils road map 'VIJAY' for a future-ready force

Saurabh Trivedi
NEW DELHI

General Dhiraj Seth inspects the Guard of Honour, at the South Block Lawns, in New Delhi on Wednesday. SUSHIL KUMAR VERMA

Chief of the Army Staff General Dhiraj Seth on Wednesday unveiled a road map titled "VIJAY", outlining his vision for transforming the Indian Army into a technology-enabled, future-ready force capable of operating across multiple domains. The road map, inspired by the Defence Minister's vision for the Decade of Transformation, was unveiled a day after he assumed charge as the 31st Chief of the Army Staff.

Calling it a moment of "great pride and humility" to lead the Indian Army, General Seth reaffirmed his commitment to the principles of "Duty, Honour and Nation First" and thanked the Prime Minister and the Defence Minister for reposing their faith in him.

Describing the Indian Army as a combat-ready and battle-hardened force, the Army Chief said it remains fully prepared to meet emerging security challenges.

Explaining the road map, General Seth said "V" represents Vigilance, with emphasis on maintaining operational readiness and constant alertness along the borders. "I" stands for Innovation and Transformation, focusing on modern doctrine, cutting-edge technologies and capability development to keep pace with the changing character of warfare. The letter "J" signifies Jointness and Integration, highlighting deeper synergy among the Army, Navy and Air Force, alongside greater military-civil fusion through a Whole-of-Nation approach to strengthen national security. For "A", he emphasised Atmanirbharta, reiterating the Army's commitment to indigenous technologies. "Y" stands for Yodha First, reflecting the Army's focus on every soldier as its greatest strength. He said improving training standards, technological skills, welfare and the empowerment of veterans and Veer Naris would remain key priorities.

GS Paper II – Governance

Yes and no

Governments must respect the decision-making of gram sabhas

A new report, based on Rural Development Ministry surveys, opens a rare data-backed window into the erosion of India's grassroots democracy. But where the state has framed the issue as one of "vibrancy", the report highlights a paradox. It acknowledges that "participation fatigue" has kept citizens from engaging in gram sabhas whereas its solutions, such as more meetings and oversight, are a recipe to further alienate the rural working class. The 73rd Amendment empowers gram sabhas, but governments have reduced them to clearinghouses for central and State schemes. This fundamental aspect must change. However, in response to 18%-28% of respondents citing a lack of outcomes as the reason for low interest, the report pushes for greater use of the NIRNAY app and to upload meeting minutes in real-time. In the real world, panchayat secretaries thus have less time facilitating discussion even as lacklustre oversight has allowed officials to tell workers that their MGNREGA demands were 'not entered in the system' due to server errors. Similarly, that more than half of the barriers to participation are related to livelihoods could point as much to visibly systemic issues – such as the precarious nature of rural labour today – as to deliberate economic exclusion by the state, as scholars have highlighted. But the report does not acknowledge such divergent possibilities. Due to the state failing to institutionalise attendance as a paid component of social protection, gram sabhas have remained a playground for the leisured elite such as landlords and contractors.

According to the report, gram sabhas spend 13% of the time identifying local issues but only 4% discussing revenue generation. But gram panchayats have been systematically constrained from raising their taxes, leaving them dependent on grants. The 14th and 15th Finance Commissions grants tied panchayat spending to central priorities such as drinking water and sanitation, limiting local priorities to 'flagship' programmes such as the Jal Jeevan Mission and Swachh Bharat. There is thus no incentive for citizens to attend a meeting if the funds are being earmarked by Delhi bureaucrats. The report also states that Provisions of the Panchayats (Extension to the Scheduled Areas) (PESA) Act areas have "reasonably strong physical infrastructure". Under the PESA Act 1996 and related forest rights laws, gram sabhas have the right to provide prior informed consent for land acquisition and mining. However, the state routinely bypasses them or uses the excuse of low participation to manufacture consent. The Hasdeo Arand protests were rooted in this issue. There is a right to say 'no' and the state simply needs to acknowledge it. If 'yes' must be the only answer, the report's grouses are a farce.

GS Paper II – Governance

Over 99% of births, deaths registered in 2024: report

Ramya Kannan
CHENNAI

India's latest civil registration data, CRS 2024, released on Wednesday, suggest that registration is improving across the country, and that sex ratio at birth is improving in some places, but progress remains uneven across the States and Union Territories.

India's sex ratio at birth is 917 females per 1,000 males, meaning that 917 girls are born for every 1,000 boys.

While there is no surprise in the strong performance of Kerala (970 females per 1000 males) when it comes to sex ratio at birth, other States and Union Territories such as Arunachal Pradesh (1,050), Andaman and Nicobar Islands (984), Meghalaya (974), and Mizoram (972), are also top performers.

The weakest figures are from Nagaland (865), Lakshadweep (865), and Jharkhand (890).

A sex ratio at birth that is close to the biological norm, or slightly above it, is an indicator that birth rates are not heavily distorted by sex selective abortions/terminations. India, with its legacy issue of a son preference has struggled towards achieving a balance in sex ratio at birth historically. A masculine skew at birth has long dominated headlines in several parts of the country.

Haryana and Punjab have recorded the lowest child sex ratios at birth. In the 2011 Census, Haryana recorded 834 girls per 1,000 boys, followed closely by Punjab at 846. The battle to correct the skew has been long and hard fought from a policy level. The number of still births in 2024 was recorded as 81,117 with a heavy urban tilt, with 69% of still births happening in urban centres.

The civil registration system has continued to expand its coverage, and improving registration will offer a clearer picture of the country's demographic transition.

Expanded coverage

Registered births rose from 2.52 crore in 2023 to 2.54 crore in 2024, while registered deaths increased from 86.6 lakh to 89.4 lakh. Thirteen States recorded above 90% of births and 15 States recorded above 90% of deaths. The CRS report shows that the level of birth registration reached 99.1% in 2024 and the level of death registration reached 99.4%, both extremely close to full coverage.

The rise in registrations does not necessarily mean that either fertility or mortality is rising sharply; it means the system has begun to capture births, deaths, still births and sex ratio at birth more comprehensively.

GS Paper II – Governance

Under VB-G RAM G, States' expenditure could go up six-fold

An analysis by *The Hindu* shows that States will have to spend at least ₹51,000 crore in 2026-27, in contrast to about ₹7,700 crore they spent in 2024-25

DATA POINT

Nitika Francis
Pon Vasanth B. A.

The Viksit Bharat Guarantee for Rozgar and Ajeevika Mission (Gramin) (VB-G RAM G), which completely overhauls the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), came into force on July 1, despite serious concerns raised by many States.

One of the key concerns is the shifting of a significant part of the financial burden of this landmark employment guarantee scheme, which has been in force since 2005, from the Centre to the States. **Table 1** shows the key changes in the funding patterns.

Though the Government of India had earlier said that the transition to the new scheme "does not impose an undue financial burden on States," it has not spelt out the additional expenditure to be borne by each State. A release from the Ministry of Rural Development on Wednesday said the Centre has made an interim allocation of ₹95,692.31 crore for the States for 2026-27, without mentioning the contribution needed from the States or how much of the interim allocation would be used to settle past dues for the States. This is despite a fundamental shift: MGNREGA was a demand-driven model while under the VB-G RAM G, the Union government shall have the power to determine the "normative allocation (budget to be spent on the scheme)" for every State in a year based on certain "objective parameters" the Centre prescribes. Moreover, the new scheme shifts the responsibility fully to the States for any additional expenditure incurred beyond the "normative allocation"; for unemployment allowance (if employment could not be ensured for the guaranteed 125 days); and the compensation for delay in payments.

The general perception is that the earlier sharing pattern was roughly in the ratio of 90:10 between the Centre and the State; now the shift to a 60:40 pattern would result in a three-fold increase in States' expenditure.

However, an analysis by *The Hindu* showed that the increase in States' expenditure could be nearly 600%, when compared with 2024-25, the latest year for which actuals on expenditure are available. The analysis, based on conservative estimates, showed that States will have to spend at least ₹51,000 crore in 2026-27, in contrast to about ₹7,700 crore they spent in 2024-25. The projected figure does not include West Bengal. **Table 2** shows the country-level estimates and the method used to arrive at the projections, based on the new wage rates for each State notified by the Centre.

Minister for Rural Development Shivraj Singh Chouhan was quoted as saying that "no eligible rural worker should remain without work even for a day". However, the government had come under criticism in recent years for failing to ensure even 100 days of work.

The Hindu's estimates conservatively assume an increase of 25% in the total person days generated in 2024-25 instead of considering a minimum of 125 days of employment for registered households. For the administration and materials related expenditure, the analysis has applied the inflation based on Consumer Price Index (CPI) for the amount spent for each State in 2024-25. Uttar Pradesh, Tamil Nadu, and Bihar will be among States, whose expenditure could see an increase of 600% to 800% **(Chart 1)**.

Chart 2 shows how MGNREGA expenditure had come down since 2020-21 despite the Government's stated commitment to spend more for the scheme. Moreover, the report available for the year 2025-26 showed that the Centre had to clear ₹20,422 crore pending as dues to all States.

Overburdening the States

The data for the charts were sourced from the Ministry of Rural Department's reports available online, Ministry of Statistics and Programme Implementation, Reserve Bank of India, Union Budget, and the VB-G RAM G Act

Table 1: This shows the key changes in the funding pattern between the two schemes (Centre:State)

Category	MGNREGA	VB-G RAM G
Labour wages	100% by Centre	60:40 ratio
Material costs	75:25 ratio	60:40 ratio
Administrative expenses	75:25 ratio	60:40 ratio
Number of guaranteed workdays	100	125
Exceptions for any States or Union Territories	None	90:10 ratio in total expenditure for NE States, Himachal Pradesh, Uttarakhand, and Jammu and Kashmir. Full expenditure to be borne by the Centre for UTs without legislatures

Table 2: This shows the rough estimates for 2026-27 under VB-G RAM G and the increase in the expenditure of States

Category	2024-25	2026-27 (projections)	Calculation method
Wages	₹73,335.05 cr	₹1,05,769.18 cr	25% increase in PDG for each State multiplied by new wage rates
Person days generated (PDG)	268.2 cr	335.25 cr	25% increase assumed (100 to 125 days)
Materials	₹25,985.44 cr	₹27,884.24 cr	Adjusted for inflation as per CPI for 2025-26 and 2026-27 (projected)
Admin	₹4,770.55 cr	₹5,119.14 cr	Adjusted for inflation as per CPI for 2025-26 and 2026-27 (projected)
Total	₹1,04,091.04 cr	₹1,38,772.56 cr	
Centre's contribution	₹96,401.97 cr	₹87,804.25 cr	
Centre's share	92.6 %	63.3%	
States' contribution	₹7,689.07 cr	₹50,968.31 cr	10% for NE States, no cost for UTs without legislatures and 40% for the rest
States' share	7.4%	36.7%	

Chart 1: This shows the top 15 States that will have to spend the highest amount under the new scheme. A few States will experience a six-to-eight fold increase in expenditure

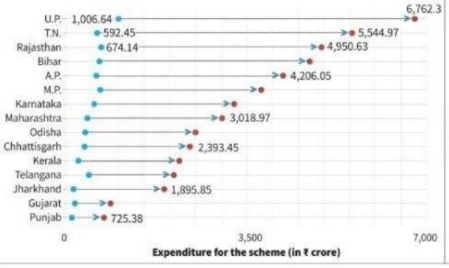
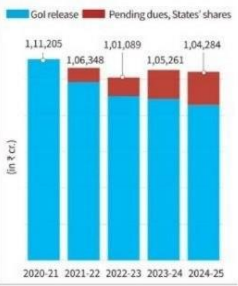


Chart 2: The Centre's allocation has seen a decline. *(Values above bars show total expenditure)*



GS Paper II – Governance

Disabled inmates must be allowed to self-identify: plea

Krishnadas Rajagopal
NEW DELHI

A Kerala-based activist, whose plea highlighting the traumatic prison days of the late G. Saibaba and Stan Swamy led the Supreme Court to form a high-powered committee to free Indian jails from the colonial yoke, suggested bringing in a mechanism to allow disabled prisoners or detainees to self-identify and declare their disabilities.

States have an obligation under Section 7 of the Rights of Persons with Disabilities Act to protect persons with disabilities from violence, abuse or exploitation, the detailed written submissions, prepared by advocates Kaleeswaram Raj and Thulasi K. Raj on behalf of activist-petitioner Sathyan Naravoor, said.

The submissions were filed before the court-appointed high-powered panel headed by former Supreme Court judge Justice S. Ravindra Bhat. The document argued that persons with disabilities were particularly vulnerable to exploitation at the hands of prison staff as well as fellow inmates. The government has to create conditions to protect them from the moment of their entry into prisons. "For this, there must be mechanisms to allow persons with disabilities to self-identify and declare their disabilities, which can then be verified through sensitive and informed medical check-ups," the submissions said.

'Government must ensure protection of disabled people from the moment they enter prison'

Standardised and objective assessment must be conducted, preferably by field experts, for individuals who claim to have intellectual disabilities. The submissions recommended that prison records must identify every person individually to make reasonable adjustments for them, while respecting their confidentiality. These steps were recommended under Section 55(B) of the Model Prisons and Correctional Services Act, 2023 issued by the Home Ministry as a framework for States and Union Territories to revise and update prison laws in their jurisdictions.

GS Paper II – Governance

Why has the govt. notified a new set of telecom rules?

How do the rules change the telecom regulatory framework? What powers does the Act give the govt.?

Aroon Deep

The story so far:

The Telecommunications Act, 2023, saw a clutch of rules being notified this month, namely the Telecommunications (Authorisation for Provision of Principal Telecommunication Services) Rules, 2026; the Telecommunications (Authorisation for Captive Telecommunication Services) Rules, 2026; and the Telecommunications (Authorisation for Provision of Miscellaneous Telecommunication Services) Rules, 2026.

What changes for telecom operators and users?

There are not many operational changes in India's telecom ecosystem due to the parent act or the rules being notified, as the major objective of the legislation is to simplify the oft-amended Indian Telegraph Act, 1885, which it replaces (along with other accompanying laws, like the Wireless Telegraphy Act, 1933.

Along the way, the Union government got some greater powers in the text of the parent statute, such as a definition of "telecommunication" that can be used to regulate messaging apps. (While the government initially denied this, last year the Department of Telecommunications (DoT) tried to force WhatsApp to log out users every six hours from web instances of the service, and to "bind" every user to a SIM, as an anti-spam measure.)

Which provisions of the Act have already been brought into force?

This is, of course, not the beginning of the notification of the Act. As early as 2024, the government notified parts of the law, such as one that renamed the Universal Service Obligation Fund (where telcos are required to pay into a corpus to fund financially unfeasible telecom infrastructure in remote and isolated areas) to the Digital Bharat Nidhi. Another part of the law that was notified was one that allowed the government to seize telecom infrastructure on national security or war grounds.

More parts of the law that have already been notified in previous months include a replacement for the interception orders, where in spite of an industry and civil society push, the government retained senior officials' powers to issue phone and internet tapping orders.

The specific rules notified this month replace the bulk of the licensing framework for telecom operators. This has been replaced with the term "authorisation," accompanied by language that simplifies and modifies some of the paperwork that telcos and Internet Service Providers (ISPs) have to do. It also adds anti-spam enforcement as an obligation under the Parent Act.

Why are some aspects of the new regime still uncertain?

The new telecom act also recognises satellite internet, but this has been taken away, even as Starlink, the largest satellite internet provider in the world, awaits approvals to launch. "The final Rules have removed explicit references to Global Mobile Personal Communications by Satellite (GMPCS), as contained in the Draft Rules," the law firm Khaitan & Co wrote in a brief. Separately, news reports (and the delay) indicate that the government is yet to give up on concerns of whether it can truly shut off Starlink, seeing how it is used in countries like Iran in defiance of the local government.

At any rate, telcos and ISPs can choose to migrate to this authorisation regime now, or wait until their licenses expire and then apply afresh. As Khaitan & Co pointed out, "a significant volume of operational detail is still awaited ... implementation detail awaits further clarity and remains dependent on further specifications, including the 'sound' track-record criterion, exemption thresholds and technical directions."

THE GIST

- The newly notified rules largely replace the old telecom licensing framework with an authorisation regime, simplify compliance for telecom operators and ISPs, and add anti-spam obligations, while leaving day-to-day operations largely unchanged.
- Although several provisions of the Telecommunications Act have already been brought into force, implementation is still incomplete, with satellite internet rules, Starlink approvals, and key operational details yet to be clarified.

GS Paper III – Environment

U.S. stand dents World Bank's climate finance targets

Jacob Koshy
NEW DELHI

Following disapproval from the U.S. administration, the World Bank Group (WBG) has indicated that it would do away with its funding target for climate-centric projects.

"We will complete our shift from inputs to outcomes to maximise development impact. We will retire the 45% climate co-benefits target and the 35% target in the Climate Change Action Plan [CCAP]. We have done significant work in answering client demand and needs," the World Bank said in its June 29 statement on its CCAP. Launched in 2020 and over a five-year period ending 2026, the CCAP mandated the WBG to allocate 35% of its total financing for projects that reduced emissions or helped communities adapt to climate change. The goal was increased to 45% in 2023.

The latest announcement by the World Bank may impact projects in developing countries. In India, the World Bank's climate-focused projects include electrified freight rail and inland waterways to cut transport emissions; forest restoration and biodiversity conservation in Madhya Pradesh and Meghalaya; climate-resilient agriculture for smallholders; rehabilitation of ageing large dams; community-led groundwater management under Atal Bhujal Yojana; mangrove restoration along both coasts; flood forecasting and embankment strengthening in Bihar's Kosi basin; solar parks and rooftop solar systems; green hydrogen for hard-to-abate industries; battery storage paired with renewables in Chhattisgarh; Kerala's post-2018 flood resilience overhaul; and the "One Health" livestock disease programme guarding against zoonotic spillover.

Policy shift: World Bank's climate-focused projects in India include those aimed at cutting transport emissions. SUSHIL KUMAR VERMA

The Hindu has reached out to the World Bank spokesperson, asking whether the development would impact India-based projects. The spokesperson has not responded so far.

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GS Paper III – Environment

Dent in World Bank's climate finance targets

The World Bank has said it would continue to support countries in their national plans and meeting their Nationally Determined Contributions (NDCs). While the CCAP would continue, an independent evaluation group would appraise it. "We will continue to track and report on our two scorecard indicators on (i) net greenhouse gas emissions and (ii) beneficiaries with enhanced resilience to climate risks...We will continue to report to the Board on progress."

In April, the U.S. – the WBG's largest shareholder – expressed its strong disapproval at the CCAP funding target. "The World Bank must maintain focus on its core mission of reducing poverty and increasing economic growth... It also means jettisoning the Group's 45% climate finance target that breeds inefficiency, distorts economic decision-making, and moves the Bank away from its core mission. At the same time, we expect greater efficiency, discipline, and accountability so that every dollar delivers more impact," said U.S. Treasury Secretary Scott Bessent.

U.S. President Donald Trump, who has labelled climate change a "con job", has withdrawn the country from the Paris Agreement, the 2015 pledge that binds countries to reduce greenhouse gas emissions so that global temperatures do not go up by two degrees Celsius over the pre-Industrial Age temperature, by 2100.

GS Paper III – Environment

A unified policy architecture for India's energy future

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A policy brief from the INSA-Centre for Science, Technology, Innovation and Policy outlines a four-pillar framework

India has made remarkable progress in transforming its energy landscape over the past decade. From achieving near-universal household electrification and expanding access to clean cooking fuel to becoming one of the world's fastest-growing renewable energy markets, it has demonstrated a strong commitment to ensuring energy access while advancing sustainable development.

As India looks ahead to the goals of energy self-reliance by 2047 and net-zero emissions by 2070, the next phase of the energy transition will require an increasingly integrated approach to planning and governance. A policy brief released by the Indian National Science Academy (INSA) in May 2026 highlights the importance of a unified national energy framework that can help align diverse energy resources, technologies and institutions towards common national objectives.

The complexity of India's energy system

The need for such an approach is evident from the scale and complexity of India's energy system. While domestic energy production continues to expand, there is a dependence on imports for a significant share of oil and natural gas requirements. At the same time, energy demand is expected to grow steadily as economic development, industrialisation and urbanisation continue. Managing these multiple priorities, energy security, affordability, sustainability and economic growth, requires coordinated planning across sectors and fuels.

India has already established strong foundations through initiatives such as the Saubhagya Scheme, the Pradhan Mantri Ujjwala Yojana, and ambitious renewable energy programmes. Renewable energy installed capacity has grown from approximately 40 GW in 2015 to approximately 260 GW by 2025, reflecting a determination to diversify the energy mix. As the energy ecosystem becomes more diverse, however, greater coordination among generation, transmission, storage, distribution and emerging technologies will become increasingly important.

How the framework works

The INSA policy brief proposes a framework built around four mutually reinforcing pillars: adequacy, access, affordability and appropriate sustainability.

First, adequacy focuses on ensuring reliable and diversified energy supplies through a balanced portfolio of conventional and emerging energy sources, supported by modern infrastructure, energy storage and digital technologies. The objective is to strengthen energy resilience while reducing long-term vulnerabilities.

Second, access emphasises reliable and equitable energy services for all citizens. Building on the country's achievements in electrification and clean cooking access, the framework advocates strengthening last-mile delivery, improving service quality and expanding decentralised energy solutions where appropriate.

Third, affordability recognises that a successful energy transition must remain economically viable for households, businesses and industries. The framework highlights the role of innovative financing mechanisms, efficient markets and consumer-focused safeguards in supporting an inclusive transition.

The fourth pillar, appropriate sustainability, underscores the importance of pursuing sustainability in a manner that is aligned with India's developmental priorities and resource endowments. Rather than adopting a one-size-fits-all approach, the framework advocates solutions that reflect India's unique social, economic and environmental context. This includes support for local communities, workforce development and region-specific transition pathways.

The policy brief also identifies circular economy practices and carbon capture, utilisation and storage (CCUS) as important cross-cutting enablers that can complement renewable energy deployment and contribute to reducing emissions from industrial sectors.

Recognising that energy transitions occur over decades, the framework proposes a phased approach. Near-term priorities include strengthening infrastructure, accelerating renewable energy deployment, supporting emerging technologies such as green hydrogen, and developing institutional mechanisms that can facilitate long-term coordination. Over time, the emphasis would shift toward deeper integration of low-carbon technologies, expanded use of bio-resources and the development of a more interconnected and resilient energy ecosystem.

Viewing energy as whole

At its core, the framework highlights the value of viewing India's energy system as an integrated whole. Coal, renewables, biomass, natural gas, waste-to-energy systems and emerging clean technologies each have a role to play in supporting the country's development aspirations. Their effectiveness can be enhanced through greater coordination and long-term strategic planning.

India's energy transition is not only about expanding capacity; it is about creating a resilient, affordable and sustainable energy system capable of supporting future growth. By providing a common framework for aligning diverse energy pathways, the proposed approach offers a constructive road map for advancing national priorities while strengthening energy security for generations to come.

GS Paper III – Environment

VB-G RAM G to offer minimum ₹300 a day

Other southern States, which were already above the ₹300 level, saw minimal hikes, including Andhra Pradesh (1.6%), Tamil Nadu (2.7%), and Karnataka (3.2%).

Excluding the special rate of ₹450 applicable to certain gram panchayats in Sikkim, Haryana continues to have the highest wage rate at ₹409, but recorded one of the lowest increases of just 2.25%.

Northern and northeastern States which saw wage hikes above 15% to reach the ₹300 level include Arunachal Pradesh, Nagaland, Himachal Pradesh, Uttarakhand, Jharkhand, Assam, Tripura, Sikkim, and West Bengal.

Congress general secretary and former Rural Development Minister Jairam Ramesh criticised the notification, saying the wages remain "unjustifiably low". He reiterated the Congress's demand, made during the 2024 Lok Sabha campaign under its Shramik Nyay programme, for a national daily minimum wage of ₹400 for all workers in India, including MGNREGA workers.

"The Expert Committee headed by Dr. Anoop Satpathy, set up by the Modi government, had also recommended a national minimum wage floor of ₹375 per day in 2019," he noted. Mr. Ramesh noted that the Parliamentary Standing Committee on Rural Development, chaired by Congress MP Saptagiri Ulaka, had also consistently recommended higher wages for MGNREGA workers.

Given the "widespread minimum wage protests in industrial hubs like Noida, and at a time when the stagnation of rural wages is recognised as a key constraint on our economic growth", the notification was both a "snub to India's workers and an unwise economic policy," he said.

Mr. Ulaka said his party had opposed the VB-GRAM G Act "from the streets to Parliament" and would continue to do so.

GS Paper III – Economy

The case for building India's coal chemistry capability

R.A. Mashelkar

Distinguished scientist and former Director General of the Council of Scientific and Industrial Research (CSIR)

India's refinery resilience in the West Asia crisis points to its coal chemistry future

There are two ways a country can survive an energy shock: by managing it skilfully through diplomacy, diversification, and fiscal measures, or by reducing dependence on the disrupted resource. India excelled at the first during the disruption in the Strait of Hormuz in 2026, with its refineries demonstrating exceptional technical flexibility in adapting to crude supply disruptions. The crisis reaffirmed that indigenous scientific capability and technological self-reliance are the decisive forms of insurance against energy market volatility – far more durable than any diplomatic or military arrangement alone. However, India has yet to reduce its underlying dependence, and coal offers a key opportunity to begin.

Same discipline for coal chemistry

Before turning to that opportunity, it is worth understanding why refinery flexibility proved so effective, because the same discipline will be required for coal chemistry. India's supplier base has nearly tripled over the past two decades. Each supplier provides a different crude slate, with distinct density profiles, sulphur content, and viscosity characteristics, and a refinery engineered for only one crude type becomes vulnerable to supply disruptions. Through investments in indigenous research, metallurgical advances, process innovation, and workforce training, India's refining sector developed the capability to process feedstock across a broad range of specifications. When the Strait of Hormuz closed and sourcing options shifted abruptly, Indian refineries adapted with technical confidence, processing crude from the Americas, the Atlantic Basin, West Africa, Russia, and India's West Asia partners. That flexibility at scale is the product of indigenous research and development, technical discipline, and engineers who understand their systems as interconnected processes rather than fixed machines.

The speed of the transition provides concrete evidence of this capability. Within weeks of the closure, non-Hormuz sourcing increased from 55% to 70% of India's crude intake. That pivot reflected a decade of upstream diversification combined with the downstream technical flexibility built into India's refinery fleet. India's private and public sector refineries had the engineering capability to process multiple crude types, adjust operating parameters at short notice, optimise fractionation patterns for different feedstock specifications, and maintain product quality and safety throughout the transition.

This capability was built through sustained investment in process understanding, operator training, and the institutional knowledge that enables a complex industrial system to absorb shocks without fracturing.

The liquefied petroleum gas (LPG) story offers a clear example of how indigenous refining capability can absorb a supply shock faster than markets can price it. India's LPG import infrastructure had roughly doubled over the preceding decade, providing greater distribution redundancy.

When the Strait of Hormuz closure threatened LPG availability, the bottleneck was not at the import ports but in how much LPG the existing refinery fleet could produce from the available feedstock. Under the LPG control order, refineries were directed to maximise yields, and within five days, domestic production increased from 35 Thousand Metric Tonnes (TMT) per day to 54 TMT per day, with engineers adjusting fractionation and cracking units in real time. That increase was engineering in action, not an accounting adjustment. It was one half of how India closed the gap; disciplined demand management provided the other. The production side – which is the focus of this article – rested entirely on technical capability built through years of sustained investment.

Energy security through molecules

Refinery flexibility solved the problem that the Strait of Hormuz crisis actually presented: how to keep a wide range of crude flowing through a fixed set of plants. It did not, and could not, solve the deeper structural problem the crisis exposed – that India's LPG dependence is far more concentrated than its crude dependence. A refinery can be engineered to process crude from 40 different countries. LPG, however, cannot be engineered to come from 40 different geographies, because the molecule is overwhelmingly sourced from a handful of Gulf and Atlantic Basin producers. The real long-term solution to LPG vulnerability is not refining the same imported molecule more efficiently. It is producing a domestic molecule that serves the same purpose.

That molecule already exists, and India has the raw material to produce it in extraordinary abundance. Dimethyl ether (DME) is a clean-burning gas chemically similar enough to LPG that it can be blended directly into existing cylinders and pipelines, requiring no new distribution network. It can be produced through coal gasification, which converts coal into syngas and then into DME. India possesses some of the world's largest coal reserves, and the Bureau of Indian Standards has already approved blending up to 20% DME with LPG. One recent industry assessment found that a 20% blend sourced from coal gasification could displace roughly 6.3 million tonnes of LPG imports each year, saving nearly ₹34,000 crore in foreign exchange annually. That is not a marginal gain. It is the kind of structural reduction in import dependence that the Hormuz crisis should have taught India to take seriously.

This crisis has demonstrated how India's investments – in institutions, infrastructure, diplomacy and human capability – can translate into national resilience. Innovation is often equated with breakthrough technologies. In reality, it is equally about creating new ways of integrating people, institutions, and ideas to solve unprecedented problems. The Ministry of Petroleum and Natural Gas's response exemplified this broader understanding of innovation.

From innovation to execution

Years ago, scientists at the CSIR's National Chemical Laboratory developed an indigenous technology for converting methanol into DME, a clean substitute for LPG. During the recent crisis, it was deeply gratifying to see the Centre for High Technology under the Ministry of Petroleum and Natural Gas move with remarkable speed to approve the scaling up of this indigenous pilot technology. It was a powerful reminder that investments in science made years earlier can become strategic national assets when unexpected crises arise.

This is exactly how innovation ecosystems should function. Research laboratories generate knowledge, government institutions identify strategic opportunities, and industry scales promising technologies. Together, they build national resilience.

That structural reduction is no longer waiting on policy. The Union Cabinet has approved a ₹37,500 crore scheme to promote surface coal and lignite gasification, explicitly citing the West Asia crisis as part of its rationale and targeting 100 million tonnes of coal gasification annually by 2030. The scheme provides an incentive of up to 20% of plant and machinery costs, separate from the DME blending ratio discussed above, and extends coal linkage tenure to 30 years – the kind of long-term horizon certainty that capital-intensive process industries require before committing investment. What remains is execution. India's coal has a higher ash content than the cleaner coal that underpinned China's dominant coal-to-chemicals industry, and domestic gasification capacity is still far below the ambition this scheme represents. Closing that gap is now a question of industrial discipline and investment, not policy intent. The intent has already been settled.

The remaining work – closing the ash-content gap, scaling gasification capacity, and building the technical depth China has spent two decades accumulating – is the same kind of work India's refining sector undertook over two decades of investment in metallurgy, catalysis, and process engineering. The lesson of Hormuz is not that India's refineries were ready and nothing else needs to change. It is that indigenous capability, once built, becomes a permanent strategic asset, and that the policy commitment to building the next one is now in place. The molecule is different, but the discipline required to master it is exactly the same as that which built the refineries that carried India through this crisis.