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Daily News Analysis

The Hindu Important News Articles & Editorial For UPSC CSE

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Edition : International Table of Contents

The commissioning of ICGS Samudra Pratap marks a significant milestone in India's maritime security and environmental protection framework. Inducted by Defence Minister Rajnath Singh, the vessel is the first indigenously designed and built Pollution Control Vessel (PCV) for the Indian Coast Guard, reflecting India's growing self-reliance in defence manufacturing under the Aatmanirbhar Bharat initiative.

Coast Guard adds pollution control vessel to its fleet

Samudra Pratap, built with over 60% indigenous content, will substantially enhance the Coast Guard's capability in fire-fighting, maritime safety, environmental protection, and surveillance

Saurabh Trivedi
NEW DELHI

Defence Minister Rajnath Singh commissioned the Indian Coast Guard Ship *ICGS Samudra Pratap*, the first of two indigenously designed pollution control vessels (PCVs) for the Indian Coast Guard (ICG), in Goa on Monday. The Minister described the ship, built with over 60% indigenous content, as a symbol of India's maturing defence industrial ecosystem.

The vessel was built by Goa Shipyard Limited (GSL). The Defence Ministry said *Samudra Pratap* is India's first homegrown pollution control vessel and the largest ship in the Coast Guard's fleet so far. Its induction substantially enhances the ICG's capability in pollution response, fire-fighting, maritime safety, environmental protection, and extended surveillance across the country's vast maritime zones.

Defence Minister Rajnath Singh during the commissioning of Indian Coast Guard Ship Samudra Pratap in Goa on Monday. ANI

Commissioning the ship, Mr. Singh reiterated the government's goal to increase indigenous content in warships to 90%. He said the vessel integrated multiple roles on a single platform, making it effective not only for pollution control but also for coastal patrol and maritime security in today's complex maritime environment.

The ship is equipped with advanced pollution detection systems, specialised pollution response boats, modern firefighting equipment, and aviation facilities including a helicopter hangar, enabling greater operational reach even in rough sea conditions.

Protecting marine life

Mr. Singh noted that these capabilities would ensure rapid detection and containment of pollution incidents, helping protect coral reefs, mangroves, fisheries, and marine biodiversity, directly supporting coastal communities and the blue economy. Emphasising that marine environmental protection is both a strategic necessity and a moral responsibility, the Defence Minister praised the ICG's role in oil spill response, maritime law enforcement, and coastal cleanliness.

Women officers

In a notable first, *Samudra Pratap* will have two women officers aboard. Mr. Singh hailed it as a proud step towards a more inclusive and gender-neutral Coast Guard, highlighting the growing role of women in frontline maritime operations.

Reaffirming the government's commitment to modernising the ICG, he stressed the need for an intelligence-driven and integration-centric force to address emerging technology-led threats. He expressed confidence that *Samudra Pratap* will significantly strengthen India's maritime governance.

Key Facts

Type of Vessel: Pollution Control Vessel (PCV)

Name: ICGS Samudra Pratap

Builder: Goa Shipyard Limited

Indigenous Content: Over 60% (Government target: 90% for future warships)

Significance:

India's first homegrown pollution control vessel

Largest ship in the Indian Coast Guard fleet to date

Operational Capabilities

Pollution Response:

Advanced pollution detection systems

Specialised pollution response boats

Fire-Fighting:

Modern, high-capacity firefighting equipment

Maritime Safety & Security:

Coastal patrol and maritime law enforcement

Extended surveillance across India's maritime zones

Aviation Facilities:

Helicopter hangar enabling operations in rough sea conditions

Strategic and Environmental Importance

Enhances India's capacity for oil spill response and marine environmental protection

Protects coral reefs, mangroves, fisheries, and marine biodiversity

Supports coastal livelihoods and the Blue Economy

Reflects an integrated, multi-role platform approach suited to complex maritime threats

Social and Institutional Dimension

First-time deployment of women officers aboard a Coast Guard ship

Signals progress towards a gender-neutral and inclusive armed force

Reinforces the Coast Guard's evolving role beyond security to environmental governance

Conclusion

The induction of ICGS Samudra Pratap is not merely an addition to the Indian Coast Guard's fleet, but a strategic leap towards self-reliant defence manufacturing, robust maritime governance, and sustainable ocean management. By combining pollution control, security, and inclusivity on a single platform, the vessel strengthens India's preparedness to safeguard its maritime interests while fulfilling its environmental and social responsibilities.

UPSC Prelims Exam Practice Question

Ques: With reference to ICGS Samudra Pratap, consider the following statements:

1. It is India's first indigenously designed pollution control vessel for the Indian Coast Guard.

2. It has been built with more than 60% indigenous content.

3. It is the first pollution control vessel inducted into the Indian Navy.

Which of the statements given above is/are correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans: a)

Page 06 : Prelims Exam

In a significant administrative and economic outreach measure, India has introduced a new e-Production Investment Business Visa (e-B-4 Visa) for Chinese nationals, effective from January 1. The initiative reflects India's calibrated approach to facilitating selective economic engagement with China while maintaining regulatory oversight, especially in sectors linked to manufacturing and investment.

Key Features of the e-B-4 Visa

- Visa Category: e-Production Investment Business Visa (e-B-4)
- Eligible Applicants: Chinese businessmen
- Mode of Application:
  - Fully online application
  - No requirement to visit the Indian Embassy or intermediaries
- Processing Time: Approximately 45–50 days
- Duration of Stay:
  - Permission to stay in India for up to six months

Permitted Activities under e-B-4 Visa

- Installation of industrial and manufacturing equipment
- Commissioning and technical support activities
- Business engagements linked to production and investment projects
- Ancillary activities connected with approved business purposes

Notably, this visa is activity-specific, indicating controlled and purpose-driven entry rather than unrestricted business travel.

INBRIEF

India launches new e-Business visa for Chinese nationals

India has introduced an e-Production Investment Business Visa called e-B-4 Visa that Chinese businessmen can apply for to travel to India for specific business activities, including installation and commissioning of equipment. A latest advisory on the Indian Embassy website here said the e-B-4 Visa, which was introduced on January 1, can be applied for online without visiting the embassy or agents. The new visa is introduced in view of the growing demand for business visas to travel to India. It will be issued in about 45 to 50 days, with permission to stay in India for up to six months. PTI

Rationale Behind the Move

- Introduced in response to the growing demand for business visas from Chinese investors and technical professionals
- Aims to support:
  - Manufacturing sector requirements

Supply-chain continuity

Industrial and production-linked investments in India

Aligns with India's broader goal of attracting foreign investment with safeguards, particularly from neighboring countries

Strategic and Policy Significance

Indicates a pragmatic economic engagement with China despite geopolitical sensitivities

Reflects India's emphasis on:

Ease of doing business through digital governance

Targeted facilitation rather than blanket liberalisation

Relevant in the context of:

India's manufacturing push

Technology and equipment-based collaborations

Conclusion

The launch of the e-B-4 Visa marks a nuanced shift in India's visa policy, balancing economic imperatives with strategic caution. By enabling purpose-specific, digitally processed business travel for Chinese nationals, India signals openness to productive investment while retaining regulatory control—an approach increasingly characteristic of its contemporary foreign economic policy.

UPSC Prelims Exam Practice Question

Ques: The recently introduced e-B-4 Visa by India is best described as:

(a) A tourist e-visa allowing Chinese nationals to visit India for leisure purposes

(b) A long-term work permit for Chinese professionals employed in Indian companies

(c) An online business visa for Chinese nationals to undertake production- and investment-linked activities in India

(d) A transit visa issued on arrival for Chinese citizens passing through India

Ans : c)

Page 09 : GS III : Internal Security / Prelims Exam

The article "Stepping in with Maoism in rapid retreat" highlights a significant internal security development in India: the rapid decline of Left Wing Extremism (LWE), particularly of the CPI (Maoist), in its core strongholds such as the Dandakaranya region. Large-scale surrenders, elimination of top leadership, and shrinking geographical spread indicate that Maoism is no longer a major military threat. However, the article rightly shifts focus from security success to the larger governance challenge—addressing the socio-economic grievances that originally enabled Maoist mobilisation.

Stepping in with Maoism in rapid retreat

R.K. Vij
is a former IPS officer

The government needs to ensure consistent development in the affected tribal areas

Maoism seems to be on its last legs with mass surrenders by Maoists in the Dandakarnaya (DK) and other regions since October 2025. While the movement was on the decline since 2011-12, and faced a setback in 2018, it changed the form of its organisation as well as struggle in August 2024. The polit bureau (PB) of the CPI(Maoist) decided to split into smaller formations to avoid encirclement by the security forces. It also decided to remain in defensive mode unless the situation warranted attacking the security forces.

However, the adoption of this strategy, the party split when some central committee (CC) members and DK special zonal committee members (since August 2024) and the general secretary, Nambala Keshava Rao (alias Basavaraju) was killed in May 2025 with almost his entire security posse was wiped out in a gun battle with the security forces in Maad (Narayanpur district in Chhattisgarh). Some leaders, particularly PB member, Venugopal alias Sonu favoured peace talks with the government and asked to consult with other senior leaders. When the government declined such conditional talks, he surrendered along with 60 others (with weapons) in Gadchiroli. Another senior cadre under the name 'Rupesh' (in-charge of the north and west sub-zonal bureau of DK) surrendered with 210 Maoists and their weapons in Jagdalpur. CC member (from Chhattisgarh) and person in-charge of the People's Liberation Guerrilla Army (PLGA) battalion-1, Madvi Hidma, was killed in Alluri Sitharamaraju district in Andhra Pradesh. Another CC member (from Chhattisgarh), Ramdher, surrendered recently in another special zone, Maharashtra-Madhya Pradesh-Chhattisgarh.

The PLGA Battalion commander and the secretary South Bastar division, have also surrendered, some of the cadres of West Bastar and others are still holding out. The central military commission head of the CPI (Maoist), Thippiri Tirupati alias Deoji, is for continuing the fight. In October, the Ministry of Home Affairs said that only seven districts in India were Left Wing Extremism-affected districts, with only three in Chhattisgarh the 'most affected' districts.

How is the government going to address the issues which prompted the Maoists to organise the masses against the state? Some of the cadres who surrendered have said that their struggle for tribal rights in the areas is still ongoing. While the surrendered cadres are being given benefits under the surrender and rehabilitation (S and R) policy of the Centre and the States concerned, there is no doubt that the DK region which lacks even basic amenities needs to be developed.

First, the network of medical facilities should be extended to interior locations so that villagers have access to health care. Anaemia is a health issue among the tribals of DK. Cerebral malaria is also widespread in certain pockets. The lack of safe drinking water has led to outbreaks of dysentery. There is also the issue of snake bites which are not uncommon in the jungles. Health centres must cater to the needs of tribals in areas freed from the Maoist influence.

Second, most tribals depend on agriculture and forest produce for their basic needs. Maoists dug ponds and created orchards to win the confidence of the tribals and induct them into the movement. They also forced contractors to pay increased rates to villagers for plucking *tendu-patta* leaves. Later, they took up land levelling to increase production and gain even more support. The government should now ensure the supply of good seeds (including fish seeds) and create better irrigation facilities by constructing check dams. While the minimum support price of many items of forest produce is notified by the government(s) annually, processing units need to be established where tribals can access them easily. The focus should be on increasing economic activity and the standard of living.

Third, more educational ashrams should be established in DK. This model has been quite successful in the past because it is not practical to open schools in villages that were sparsely populated. It is also necessary to undo the 'education' imparted to villagers by the Maoists through their *krantikari jantana sarkar* (revolutionary) schools. Most of the surrendered cadres are illiterate and need to be sent to government schools for basic education and rehabilitation. Many surrendered cadres are already trained in useful vocations and their skills can be tapped.

While the S and R policy provides financial benefits, jobs and housing, it must not be forgotten that most male cadres were forced to undergo vasectomy while in the Maoist movement. It is necessary they have a reverse vasectomy procedure to enable them to start a family. This facility must be provided free of cost in district hospitals. Similarly, the wives of the surrendered cadres should also be assisted with reproductive technology.

Many of the women who joined the Maoist movement were those who wanted to escape forced marriages by their families. Therefore, awareness needs to be spread through the *siyan* (elderly people) of villages to respect a girl's consent with respect to marriage.

The State government has been implementing the *Niyad Nellanar* ('Your good village') scheme to provide the benefits of government schemes (about 25) to villages which fall within five kilometres of the remote security camps (about 50). However, with districts gradually becoming free of Maoists, this scheme must be extended to previously affected villages.

Background and Current Situation

Maoism has been in decline since 2011–12 due to sustained security operations, better intelligence coordination, and development-led interventions.

After organisational restructuring in 2024 to evade security forces, the movement suffered severe setbacks, including the killing of its General Secretary and surrender of senior leaders and cadres.

As per the Ministry of Home Affairs, LWE-affected districts have reduced sharply, with only a few districts—mostly in Chhattisgarh—remaining severely affected.

This reflects the success of a calibrated approach combining security, development, and surrender-cum-rehabilitation policies.

Key Issues Highlighted in the Article

1. Development Deficit in Tribal Areas

The Dandakaranya region continues to suffer from poor health infrastructure, lack of safe drinking water, and prevalence of diseases such as malaria, anaemia, and dysentery. Maoists earlier filled this governance vacuum by undertaking minor welfare activities, which helped them gain local support.

2. Livelihood and Economic Security

Tribal dependence on agriculture and minor forest produce remains high. Issues such as lack of irrigation, absence of processing units, and poor market access persist despite the declaration of MSP for forest produce.

Relevance:
Implementation gaps in Forest Rights Act (FRA), PESA, and tribal livelihood schemes weaken state legitimacy and can allow extremist narratives to re-emerge.

3. Education and Social Integration

Low literacy among surrendered cadres and tribal populations remains a concern. Maoist-run "revolutionary schools" propagated ideological indoctrination rather than education. Ashram schools and skill-based rehabilitation are critical for long-term peace.

4. Rehabilitation and Human Rights Concerns

The article raises an important but often ignored issue—forced vasectomies of male cadres within the Maoist movement. Comprehensive rehabilitation must go beyond monetary incentives to include physical, psychological, and social reintegration, including healthcare and family life restoration.

5. Gender and Social Reform

Women joined the movement partly to escape patriarchal practices like forced marriages. Post-Maoist governance must involve community sensitisation through traditional institutions to ensure women's consent and dignity.

Government Initiatives and the Way Forward

The Niyad Nellanar scheme is a notable example of development-led counter-insurgency, delivering multiple welfare schemes through security camp outreach.

With Maoist influence receding, such schemes must be expanded beyond security perimeters to all previously affected villages.

The focus should now shift from "area domination" to "trust consolidation" through accountable governance, participatory development, and rights-based delivery.

Conclusion

The retreat of Maoism marks a decisive phase in India's internal security landscape, but it should not breed complacency. History shows that extremism thrives where governance fails. Sustained peace in former LWE areas depends not merely on the absence of violence, but on the visible presence of the state as a provider of justice, dignity, and opportunity.

UPSC Prelims Exam Practice Question

Ques: With reference to surrender and rehabilitation (S&R) policies for LWE cadres, consider the following statements:

1. They provide monetary assistance and housing support.

2. Skill development and vocational training form part of rehabilitation.

3. They are implemented only by the Union Government.

Which of the statements given above is/are correct?

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

Ans : b)

UPSC Mains Exam Practice Question

Ques: Maoism in India is no longer primarily a security challenge but a governance and development challenge. Discuss in the context of the recent decline of Left Wing Extremism. **(150 Words)**

Page 10 : GS II : Polity & Governance/ Prelims Exam

India's Parliament has cleared the Sustainable Harnessing and Advancement of Nuclear Energy in India (SHANTI) Bill, marking the most significant restructuring of India's nuclear power sector since Independence. By permitting private and limited foreign participation in a sector historically monopolised by the State, the Bill seeks to accelerate nuclear capacity addition to meet India's energy security and climate commitments. However, it has also triggered intense debate on liability, regulatory independence, transparency, labour safety, and democratic oversight, making it a critical issue for UPSC examination under Polity, Economy, Environment, and Governance.

What does the SHANTI Bill change?

How open is India's nuclear sector now? What role will private firms play? What powers does the AERB now have? How self-reliant is India's nuclear programme? How has nuclear liability changed? Why is the Opposition opposing SHANTI?

EXPLAINER

Saee Pande

The story so far:

Parliament has cleared the Sustainable Harnessing and Advancement of Nuclear Energy in India (SHANTI) Bill, despite Opposition demands for amendments and review by a Select Committee. To achieve India's energy security needs, the government has boosted the Nuclear Energy Mission with ₹20,000 crore dedicated to Small Modular Reactors and advanced pressurised water reactors. India's nuclear power sector has remained State-controlled and unchanged since 1956. The private and foreign partnership has been restricted under earlier laws – the Atomic Energy Act, 1962, and the Civil Liability for Nuclear Damages Act, 2010. Private and Foreign companies avoided India due to its strict liability laws.

What is the SHANTI Bill?

The SHANTI Bill is an overarching legislation that opens India's nuclear power sector to private and foreign participation, which was earlier entirely State-controlled and deeply regulated. Under the Bill, private Indian companies can seek licences to own, build, and operate nuclear power plants. It is also open for foreign supplier participation.

The SHANTI Bill allows up to 49% private participation, while maintaining 51% government control over sensitive activities such as nuclear fuel production, heavy water manufacturing, radioactive waste management, safety mechanisms, licensing, and strategic oversight.

The Bill ends the monopoly of Nuclear Power Corporation of India Limited (NPCIL) in plant operations. It allows private companies and joint ventures to build, own, and operate nuclear power plants. The private sector will be involved in fuel fabrication, equipment manufacturing, plant operations, and research and development. It will essentially be a public-private partnership model aimed at attracting private capital with government oversight.

The Bill facilitates advanced nuclear technologies by enabling private participation and regulatory clarity. It supports the deployment of Small Modular Reactors (SMRs) and indigenous reactor designs, contributing to the clean energy transition and long-term energy security.

What is the role of AERB?

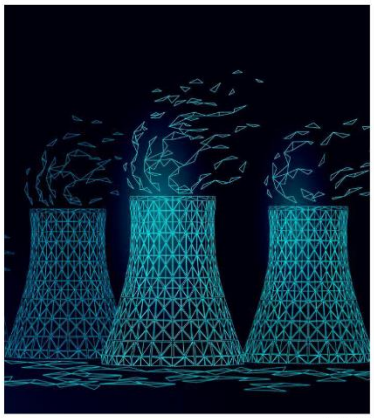
The Atomic Energy Regulatory Board (AERB), constituted in 1983 under the Atomic Energy Act, has now been given statutory status and is answerable to Parliament rather than solely to the executive.

The AERB is responsible for ensuring nuclear safety, radiation protection, emergency preparedness, and quality assurance across civilian nuclear installations. It issues safety measures, licences and standards; administers industrial safety provisions of the Factories Act, 1948, for units under the Department of Atomic Energy as per Section 23 of the Atomic Energy Act and conducts inspections to prevent radiation hazards. It plays a crucial role in strengthening regulatory oversight under the SHANTI Bill due to increased private sector participation. However, the Bill has been criticised for concentrating power in one institution.

What safeguards are in place?

The Bill does not explicitly permit foreign direct investment in the nuclear power sector. The private companies will have to seek authorisation from the AERB. Authorisations are required for setting up a plant range from production, possession, to disposal of radioactive material and radiation generation equipment, as well as for establishing, operating, or withdrawing radioactive facilities.

The government controls the reprocessing and management of spent fuel and high-level radioactive waste; production and upgradation of heavy water; enrichment and isotopic separation of radioactive substances. The law also provides for the establishment of a nuclear liability fund to meet compensation needs in case of nuclear accidents.



GETTY IMAGES

What has changed with respect to liability?

Compared to the earlier regime, the SHANTI Bill ensures that the liability aspect is transparent and predictable for operators. Liability caps are fixed as follows: ₹3,000 crore for large plants of 3,600 MW capacity; ₹1,500 crore for medium plants of 1,500-3,600 MW; and ₹100 crore for Small Modular Reactors of 150 MW capacity. Penalties for legal violations in cases of severe breach are capped at ₹1 crore.

The Union government will bear liability beyond the operator's cap, with additional support from the proposed nuclear liability fund. Earlier, operators could hold suppliers liable for defective parts, faulty equipment, design inefficiency, and deliberate acts causing damage. The current Bill removes supplier accountability completely.

What is the government's viewpoint?

The Centre aims to strengthen India's energy security by diversifying the power mix, reducing dependence on fossil fuels and fuel imports, and expanding atomic energy capacity.

Energy security is one of the main aims for boosting India's development index. It ensures 24x7 baseload power as compared to solar energy and wind energy, which are subject to geographical conditions. It will be a boost for the energy sector, which is still heavily dependent on coal. It also ensures an enhancement for technology and the economy.

Nuclear power ensures clean energy with very low carbon emissions. It facilitates achieving India's net-zero targets for 2070. The Bill may also revive the stalled civil nuclear deals with the U.S., France, and Japan, reduce dependence on Russia alone, and enhance India's image as a responsible global nuclear player.

Why does India need nuclear energy?

India struggles with solar, wind, and hydro energy due to its geographical and climate variables and still majorly relies on coal for electricity generation. Storage and grid integration costs for renewables remain high.

Thus, having sufficient baseload generation capacity is mandatory for an affordable and unrestricted supply. In order to achieve energy security for the growing economy, India has to strengthen and expand its nuclear energy sector. Moreover, the electricity mix must have enough baseload generation capacity in order to make it affordable and reliable for consumers. Nuclear power plants are one of the most effective in ensuring this.

What is India's nuclear energy mission?

India has a largely indigenous nuclear power programme based on a fuel cycle that aims to utilise India's vast thorium reserves. Currently, India manages 25 nuclear reactors in seven power plants – 21 pressurised heavy water reactors and four light water reactors – all managed by NPCIL.

According to R.B. Grover, distinguished Professor Emeritus at the Homi Bhabha National Institute and member of the Atomic Energy Commission, as India does not have enough uranium, the Nuclear Power Corporation of India Limited has mastered the design and operation of pressurised heavy water reactors. The Bhabha Atomic Research Centre has developed technologies to reprocess spent fuel to recover valuable materials and handle nuclear waste. In that sense, India is independent and self-sufficient in its nuclear power generation. India has operationalised the fast breeder reactor for thorium use.

Why has the Opposition strongly criticised the Bill?

The Opposition argues that the Bill dilutes accountability by allowing profit-driven private participation while placing liability on the State and society. There is a fear of repeating incidents like the Bhopal Gas tragedy, where accountability and remuneration were evaded by the foreign firms in spite of recourse to civil courts; moreover, such recourse is unavailable according to the new Law. Removing supplier liability and capping operator liability and penalties at a nominal cost, as compared to the actual volume and expanse of damages, is considered unreasonable. The 'polluter pays' principle has been undermined, and this compromises public safety. Private firms have no liability for accident costs, public safety issues and long-term risks. The cap on operator liability does not change in 15 years despite inflation or long-term assessment of health, environment, livelihood cost of any serious accident.

The cases such as Fukushima and Chernobyl point out the huge expense of liability. In the case of the Fukushima disaster, the actual civil damages were 700 times more than the cap proposed by the SHANTI bill.

Section 39 of the Bill seeks to override the RTI Act of 2005. It has raised several concerns as it seeks to remove public interest review and public appeal mechanisms. This will make the most crucial nuclear sector-related information – including plant details, operations, mechanisms, regulatory submissions and data on nuclear materials – 'restricted'. This dilutes the transparency and questions the public accountability of the proposed system. The RTI Act 2005, in its wisdom, already exempts revealing information regarding India's security, national interest, commercial information, and personal data. But these exemptions are subject to justification in cases of public accountability and public interest.

Section 42 overrides occupational safety, health and working conditions for nuclear facilities. Nuclear workers are removed from the country's general labour safety framework. This has triggered opposition from ten central trade unions, including the Samyukta Kisan Morcha and the National Coordination Committee of Electricity Employees and Engineers, who have termed the Bill "draconian."

The Opposition insists that the Bill is vendor-driven despite India's self-reliance in nuclear technology. It argues that India has deep thorium reserves, around which nuclear reactors were built, which should be utilised. The Opposition demands that the private companies be compelled to install India's technology.

The Bill lacks provisions for mandatory public hearings, environmental impact assessment disclosures, community consent mechanisms, regular public reporting of safety inspections, or Parliamentary scrutiny.

The Opposition also cited the example of France, where all nuclear reactors are under government control. The Bill is criticised for being pro-profit, pro-oligarch, catering to the crony capitalists while gambling with public safety.

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THE GIST

- Parliament has cleared the SHANTI Bill, opening India's State-controlled nuclear power sector to private and foreign participation, ending NPCIL's monopoly while retaining 51% government control over sensitive activities.
- The Bill removes supplier liability, caps operator liability, and shifts responsibility beyond the cap to the Union government and a nuclear liability fund, a move defended as providing predictable liability but criticised as diluting accountability and the 'polluter pays' principle.
- The Centre argues the law will strengthen energy security, provide 24×7 baseload power, support clean energy and net-zero targets, and enable SMRs and advanced reactor technologies, while the Opposition warns of weakened transparency, safety, and public accountability.

Key Features and Structural Changes

1. Opening of the Nuclear Sector

Ends the operational monopoly of Nuclear Power Corporation of India Limited.

Allows private Indian companies to build, own, and operate nuclear power plants under a PPP model.

Permits foreign supplier participation, though without explicit FDI approval.

Caps private participation at 49%, while retaining 51% government control over sensitive activities such as fuel production, waste management, and reprocessing.

2. Regulatory Strengthening – Role of AERB

The Atomic Energy Regulatory Board is accorded statutory status and made accountable to Parliament, enhancing formal regulatory independence.

AERB gains expanded powers for licensing, inspections, radiation safety, and emergency preparedness—crucial in a liberalised sector.

Critics argue that excessive concentration of powers without parallel accountability mechanisms may weaken checks and balances.

Changes in Nuclear Liability Regime

The Bill introduces fixed liability caps:

₹3,000 crore for large plants,

₹1,500 crore for medium plants,

₹100 crore for Small Modular Reactors (SMRs).

Supplier liability is entirely removed, unlike the Civil Liability for Nuclear Damage Act, 2010.

Liability beyond operator caps shifts to the Union government, supported by a proposed nuclear liability fund.

Penalties for severe violations are capped at ₹1 crore, raising concerns about deterrence.

UPSC Relevance: This marks a shift away from the 'polluter pays' principle, with implications for environmental jurisprudence and disaster governance.

Strategic and Economic Rationale of the Government

Nuclear energy provides 24×7 baseload power, unlike intermittent renewables.

Supports India's Net Zero by 2070 commitment.

Reduces dependence on coal and imported fossil fuels.

Revives stalled civil nuclear cooperation with the U.S., France, and Japan, reducing strategic over-reliance on Russia.

Facilitates deployment of SMRs and advanced reactor technologies, aligning with global energy transitions.

Self-Reliance and Indigenous Capability

India operates 25 reactors across seven plants, largely based on indigenous Pressurised Heavy Water Reactor (PHWR) technology.

Mastery over spent fuel reprocessing, fast breeder reactors, and thorium fuel cycle underlines technological self-sufficiency.

Critics argue that opening the sector risks sidelining indigenous designs in favour of vendor-driven imports.

Major Concerns Raised by the Opposition

Dilution of Accountability

Removal of supplier liability and capped operator liability shifts risk to the State and citizens.

Comparisons drawn with Bhopal Gas Tragedy and global disasters like Fukushima and Chernobyl.

Transparency and RTI Dilution

Section 39 overrides the RTI Act, 2005, restricting public access to nuclear safety and operational data.

Weakens public interest litigation and democratic scrutiny.

Labour and Occupational Safety

Section 42 excludes nuclear workers from the general labour safety framework.

Strong opposition from trade unions, citing erosion of worker rights.

Democratic Deficit

No mandatory public hearings, environmental disclosure, or community consent mechanisms.

Absence of regular Parliamentary review of safety audits.

International Comparison

France cited as a model where nuclear energy remains fully State-controlled, prioritising public safety over profit.

Conclusion

The SHANTI Bill represents a paradigm shift in India's nuclear governance, reflecting the State's urgency to balance energy security, climate goals, and economic growth. While the Bill promises capital infusion, technological diversification, and faster capacity addition, it simultaneously raises serious concerns regarding liability dilution, transparency, labour protection, and public accountability. For India's nuclear expansion to be both credible and sustainable, liberalisation must be accompanied by

robust regulation, transparent oversight, and strong safety jurisprudence. The success of the SHANTI framework will ultimately depend on whether it prioritises public trust and safety as much as it pursues efficiency and investment.

UPSC Prelims Exam Practice Question

Ques: Which of the following principles is most directly diluted by the SHANTI Bill?

(a) Federalism

(b) Polluter Pays Principle

(c) Principle of Natural Justice

(d) Precautionary Principle

Ans: (b)

UPSC Mains Exam Practice Question

Ques: The SHANTI Bill marks a shift from a State-dominated nuclear governance model to a market-oriented framework. Critically examine the implications of this shift for accountability, transparency, and public safety. **(150 Words)**

Page 11 : GS I & III : Governance & Environment / Prelims Exam

Remote-sensing technology has emerged as a critical tool in modern governance, environmental management, and resource exploration. By analysing the interaction between electromagnetic radiation and the Earth's surface, satellites and drones enable scientists to monitor forests, water bodies, minerals, and even subsurface features without physical contact. The recent discussion on how satellites detect plant health, groundwater depletion, mineral deposits, and oil-bearing structures highlights the growing strategic importance of space-based observation for sustainable development, climate action, and economic planning.

BUILDING BLOCKS

What remote-sensing reveals about plants, forests, and minerals from space

Remote-sensing technology allows engineers and scientists to map land, forests, water bodies, and minerals without physically touching the ground: by detecting spectral signatures from visible and invisible light, satellites and drones reveal the health and location of natural resources

Vasudevan Mukunth

Say you're on a desert island on a quest for buried treasure. You've lost your map and run out of clues. Now you have two options: you could walk around with a shovel, digging holes at random and hoping for the best, or you could fly a drone overhead equipped with special cameras that can 'see' through the sand or detect the magnetic pull of the gold coins.

This isn't a pirate move but an existing technology called remote-sensing. It's what engineers and scientists use to map the earth's resources without ever touching the ground. From tracking the health of a forest to finding water deep underground, their satellites and drones are changing the way humans understand our planet.

What is remote-sensing?

Our eyes only see visible light, e.g., the colours of the rainbow. But the sun emits many other types of electromagnetic energy that we can't see, like infrared and ultraviolet light.

Everything on the earth, including the rocks, the water, the trees, etc., reflects these energies differently. The reflections are called spectral signatures; they are sort of like the fingerprint of the materials these objects are made of.

By studying this light, a sensor installed onboard a satellite can look at a patch of ground and say, "This reflects a lot of near-infrared light but absorbs red light. Therefore, it must be a healthy plant." This is the basic idea of remote-sensing.

What do different materials 'look' like?

Farmers and forest rangers use satellites to check the health of plants. Healthy leaves are full of chlorophyll, which absorbs red light for photosynthesis and reflects near-infrared light to avoid overheating.

Scientists use a formula called the normalised difference vegetation index to determine if a plant is healthy based on its spectral signatures. If a satellite observes high near-infrared reflection, the crops are healthy. If the reflection of that part of the spectrum drops, the plants might be thirsty or sick.

According to a review published in the *Journal of Plant Ecology* in 2008, by analysing the spectral signatures, researchers can distinguish between different plant communities and tree species across entire forests.

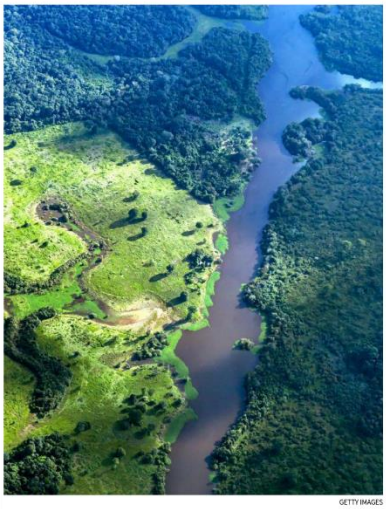
Such mapping is the first critical step in calculating the biomass of a forest, which is essentially weighing the trees from space, to understand how much carbon they are storing to help fight climate change.

How do satellites map water?

To map water bodies from space, scientists mainly use two complementary techniques: optical indexing, using reflected sunlight, and synthetic aperture radar, using active radio waves.

The optical indexing technique makes use of the fact that water reflects visible green light, which is why deep water often looks blue-green, but strongly absorbs near-infrared and shortwave infrared light. These readings are combined in the normalised difference water index (NDWI).

This way, in remote-sensing data, the index has a high positive value over water bodies and a negative value over land. A newer version called modified NDWI, or MNDWI, uses only shortwave infrared light. This is often preferred in cities because it's better at distinguishing between water and the shadows cast by tall buildings.



GETTY IMAGES

Of course, optical cameras have a weakness: they can't see through clouds or at night. To map water in these conditions, including floods during a storm, scientists use synthetic aperture radar (SAR). To understand how this technology works, please see *The Hindu* article 'What makes the NASA-ISRO SAR satellite so special?', dated July 27, 2025.

In SAR's gaze, surfaces like soil, grass, and buildings – which scatter radio waves in all directions – look bright. Calm water, however, is very smooth, almost like a mirror, and looks pitch black. So by looking for these black matches in a radar image, scientists can map floodwaters even through a cyclone.

Satellites can also estimate water quality. Muddy water reflects light differently than clear water, and water full of algae has a specific spectral signature. This helps environmentalists track pollution or harmful algal blooms.

So much for features above the earth's surface; how do scientists and engineers use satellites to find what's underground?

How do satellites map subsurface features?

Experts look for clues on the surface or use different types of physics.

Valuable minerals like copper, gold, and lithium often form deep underground, but geological forces push some of them to the surface over millions of years. Even if they're just traces in the soil, hyperspectral sensors can find them.

When sunlight strikes an object, it's reflected. A normal camera may group that reflection into a combination of three main colours: red, green, and blue, e.g. a hyperspectral sensor uses a prism or grating to split that light into hundreds of very narrow, continuous colours and measures the intensity of light at every single frequency across the spectrum.

As a result these sensors can create a spectral signature for every pixel in the image.

So while a 'normal' satellite might look at a forest and say, "This is green. It's a tree", a hyperspectral sensor could look at the same forest and say, "This is a banyan tree. It has a nitrogen deficiency. And the rock next to it is limestone, not granite."

According to a 2023 study in *Ore Geology Reviews*, geologists also use these sensors to even map alteration zones, areas where heat and fluids from deep underground have changed the chemistry of surface rocks.

Oil and gas are trapped deep in the earth but small amounts often leak upwards through very small cracks, a process called micro-seepage. When this gas reaches the surface, it changes the soil chemistry and can even turn the leaves of plants slightly yellow, by stressing them out.

Satellites can detect these subtle changes in vegetation health and soil colour, giving exploration companies a sense of where to drill.

What if there isn't micro-seepage?

If there's no seepage, there's no way satellites' sensors can 'see' the oil or gas directly. However, satellites are still crucial in these situations because, instead of looking for the oil, geologists use satellites to look for the container holding the oil.

Oil and gas don't just lie in big underground lakes, they're also trapped in the pores of rocks and are usually naturally squeezed into specific shapes called traps. The most common trap is an anticline, where rock layers curve upwards like a dome or an arch.

NASA's Landsat satellites or Japan's Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) sensor onboard NASA's Terra satellite take pictures of exposed rock layers on the earth's surface. And if geologists see layers on the surface that are folded into the shape of a dome, there's a good chance they're folded the same way deeper underground.

Another technique makes use of the fact that oil forms when organic materials are buried deep and 'cooked' by the earth's heat for millions of years. This happens in deep depressions called sedimentary basins.

Over the oceans, satellites measure the height of the sea surface with incredible precision. Large underwater geological structures, which might contain oil traps, have a gravitational pull that actually piles water up above them. By mapping these bumps in the ocean, scientists can map the rock structures below the seafloor.

Oil is found in sedimentary rock like sandstone or limestone, which is generally not magnetic. However, the basement rock deep below it, such as granite or volcanic rock, is magnetic. So satellites measure the earth's magnetic field to find where the magnetic basement is very deep.

And where the basement is deep, it means there could be a thick layer of sedimentary rock on top, with the prospect of oil.

In effect, when there's no micro-seepage, satellites can't say "there's oil here" but rather that "there's a geological structure here capable of holding oil".

How do satellites track groundwater?

Since water is heavy, a large underground aquifer actually has a stronger gravitational pull than dry rock.

From 2002 to 2017, NASA operated its Gravity Recovery and Climate Experiment (GRACE) mission with two satellites that chased each other around the earth. When the lead satellite flew over a heavy underground aquifer, gravity would pull it slightly faster, changing the distance between the two satellites.

By measuring this change in distance, scientists could weigh the water underground.

One famous 2009 study published in *Nature* used GRACE data to show that groundwater levels in North India were dropping at alarming rates because they were being extracted to irrigate crops.

Remote-sensing makes resource exploration faster, cheaper, and more environmentally friendly. Instead of drilling thousands of holes to find oil or water, we can target specific areas.

It also helps us protect resources: by monitoring forests and aquifers from space, we can ensure we aren't using them up faster than nature can replenish them.

Core Concept: What Remote Sensing Reveals

Remote sensing works on the principle of **spectral signatures**—distinct patterns of reflection and absorption of electromagnetic radiation by different materials.

Vegetation: Healthy plants absorb red light and reflect near-infrared radiation due to chlorophyll activity. Indices like NDVI (Normalised Difference Vegetation Index) help assess crop health, drought stress, and forest biomass, which is crucial for carbon accounting and climate change mitigation.

Water Resources: Optical indices such as NDWI and MNDWI distinguish water bodies from land, while Synthetic Aperture Radar (SAR) enables flood mapping even during cyclones or cloud cover. Satellites also assess water quality by detecting sediment load and algal blooms.

Minerals and Energy Resources: Hyperspectral sensors identify surface mineral traces and alteration zones, aiding exploration of copper, gold, lithium, and rare earths. For oil and gas, satellites cannot "see" hydrocarbons directly but help map geological structures (anticlines, sedimentary basins) and gravity–magnetic anomalies that indicate potential reserves.

Groundwater: Gravity-based missions such as **NASA's **GRACE mission** have demonstrated that changes in Earth's gravity field can reveal groundwater depletion, as seen in North India.

Significance for India and Governance

Agriculture and Food Security : Satellite-based crop monitoring supports precision farming, early drought warning, and better irrigation planning—vital for a groundwater-stressed agrarian economy.

Climate Change and Environment : Forest biomass estimation, carbon stock assessment, glacier monitoring, and flood mapping strengthen India's climate adaptation and mitigation strategies.

Mineral and Energy Security" Remote sensing reduces exploratory costs and environmental damage while supporting India's push for critical minerals (lithium, REEs) and energy self-reliance.

Disaster Management: SAR-based flood and cyclone monitoring improves early warning systems and disaster response under the Sendai Framework.

Evidence-based Policy: Continuous satellite data allows objective monitoring of resource depletion, aiding regulation, inter-state water disputes, and sustainable extraction policies.

Limitations and Challenges

Remote sensing provides **indirect evidence**, not absolute confirmation—ground truthing remains essential.

High-resolution hyperspectral data is expensive and technologically demanding.

Data interpretation requires skilled manpower and integration with geological, hydrological, and socio-economic datasets.

Conclusion

Remote sensing has transformed how states understand and manage natural resources—from "digging blindly" to targeted, science-driven decision-making. For India, it bridges the gap between development and sustainability by enabling efficient agriculture, responsible mining, water security, and climate resilience.

UPSC Prelims Exam Practice Question

Ques : Modified Normalised Difference Water Index (MNDWI) is preferred over NDWI in urban areas mainly because it:

(a) Uses thermal infrared radiation

(b) Reduces confusion between water bodies and building shadows

(c) Detects groundwater aquifers

(d) Works only with radar data

Ans: b)

UPSC Mains Exam Practice Question

Ques : How has remote sensing improved evidence-based policymaking in the areas of climate change mitigation, agriculture, and disaster management? Identify key challenges in its effective use**. (250 words)**

The parallel track that keeps U.S.-India ties going

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In 2025, despite political strains and the postponement of the much-anticipated Quad Leaders' Summit hosted by India, the underlying machinery of India-United States cooperation remains vigorous and steadily advancing. While political engagement appears low, notably amid U.S. trade sanctions on India and its warming ties with Pakistan, the institutional collaboration between the two democracies continues to expand, particularly in defence and technology cooperation. The visits of India's External Affairs Minister S. Jaishankar's and the Indian Navy Chief to the U.S. must be seen in this framework.

The Quad Leaders' Summit, which New Delhi was supposed to host, has been delayed amid opaque communication from officials, reflecting current bilateral tensions that have been marked by challenges such as worsening trade relations. The U.S. tariff regime levied on Indian goods and New Delhi's recalibration of its diplomatic posture amid perceptions of a "G-2" style rapprochement between the U.S. and China have some underlying factors. India's exports to the U.S., which dropped sharply in 2025, are a stark indicator of these tensions.

Economic frictions persist, especially with U.S. tariffs on India's purchase of Russian crude oil, while China and Pakistan enjoy lower tariffs and even strengthened relations with the U.S. In return, Islamabad's offering, highlighted by port access to the U.S. and critical minerals shipments to American firms, is an economic decision with geopolitical imperatives. Washington's balance-of-interest pragmatism manifests itself in signals from U.S. officials that relations with New Delhi remain vital despite transactional pressures.

Continuing institutional cooperation

In contrast to strained political signals, institutional engagement has accelerated. The July 2025 Quad Foreign Ministers' meeting in Washington unveiled new initiatives that spanned maritime security, transnational threats, economic cooperation, critical technologies and humanitarian efforts. On similar lines, Quad's Counterterrorism Working group also held its third meeting in December 2025, all demonstrating the Quad's continued operational relevance beyond high-level political optics.

Defence cooperation forms the backbone of this resilience. Since the 2008 India-U.S. civil nuclear deal, defence and technology agreements have steadily deepened. The landmark signing of a decade-long Defence Framework Agreement in 2025 marks a new chapter, enhancing joint coordination, information sharing and technological collaboration that is designed to buttress Indo-Pacific regional stability. This is exemplified through regular bilateral military exercises, such as Yudh Abhyas ('War Practice'), Tiger Claw and Malabar, which promote interoperability and trust among forces.

While political engagement appears low, institutional collaboration continues to expand

Oiled by defence and technology agreements

Since the political upheaval brought by the India-U.S. nuclear deal, bilateral ties have been predominantly driven by defence and technology agreements. Over the years, the two countries have signed various agreements, including the 2023 India-US Defence Acceleration Ecosystem (INDUS-X) and foundational defence agreements such as the Logistics Exchange Memorandum Of Agreement (LEMOA) in 2016, the Communications Compatibility and Security Agreement (COMCASA, 2018) and the Basic Exchange and Cooperation Agreement (BECA, 2020) and the Initiative on Critical and Emerging Technologies (2023) to provide and promote logistical support, cooperation and information sharing between the two militaries. India's Ministry of Defence and the U.S. Department of Defence also signed the Security of Supply Arrangement (SOSA) in 2024. Despite political challenges, defence cooperation remains strong.

In October 2025, a significant 10-year defence framework agreement was signed by U.S. Secretary of War Pete Hegseth and India's Defence Minister Rajnath Singh. This long-awaited pact aims to enhance coordination, information sharing and technological collaboration to promote regional stability and deterrence.

Building on years of growing strategic convergence, the agreement reinforces defence as a core pillar of India-U.S. relations. Further bolstering defence ties, Indian aerospace giant, Hindustan Aeronautics Limited signed a billion-dollar deal, in November 2025, with the U.S.'s General Electric for fighter jet engines. Similarly the joint U.S.-India NASA ISRO Synthetic Aperture Radar (NISAR) satellite, launched in July 2025 for disaster resilience, agriculture and infrastructure planning requirements adds to the technological jointmanship. At the infrastructural and regional levels, the inaugural Quad Ports of the Future Conference, held around India Maritime Week in Mumbai in early November 2025, brought together delegates from 24 Indo-Pacific partners, focusing on developing resilient and secure ports that leverage shared expertise and investments. Co-organised by the Ministry of Ports, Shipping, and Waterways and the Ministry of External Affairs, it emphasised that quality infrastructure development is a crucial dimension of Quad cooperation, underlining the broader regional connectivity.

Build deeper institutional understanding

Despite political challenges, this enduring institutional engagement reveals the India-U.S. relationship's dual-track dynamic. While political leaders manage strategic diplomacy with and national interests, the bureaucratic and institutional frameworks continue to sustain and evolve core collaborations. Despite institutional challenges such as domestic regulatory frameworks and concerns about technology interoperability, mutual regional interests drive this continuity.

Such institutional continuity may well be the relationship's greatest strength, fostering trust while shielding essential cooperation from political volatility. However, analysts have cautioned that bilateral ties may struggle to regain full momentum, even if trade disputes are resolved.

Looking ahead to 2026, both nations must invest in a deeper institutional understanding – defence and beyond. Learning about structures and institutions, appreciating the processes, and developing resilient relationships with other countries require continuous efforts. Expanding cooperation into broader sectors can build the mutual trust essential during political lows. The resilience of the India-U.S. partnership will depend heavily on these parallel institutional tracks, which have so far, quietly but effectively, maintained the alliance's robustness and strategic relevance in an ever-evolving geopolitical landscape. While political summits may pause, institutions keep the dialogue alive, working together on mutual areas, and having long-term partnerships that can survive the short and medium-term headwinds.

GS Paper II : International Relations

UPSC Mains Exam Practice Question : Discuss how defence and technology cooperation have emerged as the most resilient pillars of India–U.S. relations despite trade frictions and diplomatic strains. Illustrate with suitable examples. **(150 words)**

Context :

India–United States relations in 2025 present a dual-track dynamic. While political engagement has shown visible strain—evident in trade frictions, tariff disputes, and the postponement of the Quad Leaders' Summit—the institutional and bureaucratic foundations of the partnership remain robust. This article highlights how defence, technology, and multilateral institutional cooperation continue to sustain the strategic relationship despite short-term political headwinds.

Background and Context

Political signals in 2025 reflected stress: U.S. tariffs on Indian goods, differences over India's purchase of Russian crude oil, and Washington's calibrated engagement with China and Pakistan.

India's declining exports to the U.S. further underscored economic tensions.

The delayed Quad Leaders' Summit hosted by India symbolised diplomatic unease at the leadership level.

However, these challenges did not translate into a breakdown of cooperation, as institutional mechanisms functioned independently of summit-level politics.

Key Dimensions of Institutional Cooperation

1. Quad as an Operational Framework

Despite leadership-level delays, the Quad remained active:

The July 2025 Quad Foreign Ministers' Meeting in Washington advanced cooperation on maritime security, critical technologies, counterterrorism, and humanitarian assistance.

The Quad Counterterrorism Working Group met again in December 2025, demonstrating continuity beyond political optics. This shows that the Quad has evolved from a consultative forum into a functional institutional platform.

2. Defence Cooperation: Backbone of the Relationship

Defence remains the most resilient pillar of India–U.S. ties:

Foundational agreements such as LEMOA, COMCASA, and BECA have institutionalised logistics sharing, secure communications, and geospatial intelligence cooperation.

The 2023 INDUS-X initiative and the Initiative on Critical and Emerging Technologies (iCET) strengthened defence-industrial and innovation linkages.

The 10-year Defence Framework Agreement signed in October 2025 formalised long-term coordination, interoperability, and technological collaboration.

Regular military exercises like Yudh Abhyas and Malabar Exercise reinforce trust and operational synergy in the Indo-Pacific.

3. Defence Industrial and Technology Partnerships

Hindustan Aeronautics Limited's billion-dollar fighter jet engine deal with General Electric reflects growing defence co-production and co-development.

The launch of the NISAR satellite by ISRO and NASA highlights cooperation in high-end civilian technologies with strategic spillovers.

4. Regional and Infrastructure Cooperation

The Quad Ports of the Future Conference (Mumbai, November 2025) underlined cooperation in quality infrastructure, resilient supply chains, and Indo-Pacific connectivity, aligning strategic interests with developmental objectives.

Significance

Demonstrates institutionalisation of foreign policy, where bureaucratic and military cooperation cushions political volatility.

Reflects India's strategy of issue-based alignment rather than formal alliance.

Highlights the Indo-Pacific as the central theatre of India–U.S. convergence.

Shows how defence and technology act as stabilisers in great-power relations amid economic and diplomatic disputes.

Challenges and Limitations

Trade disputes and protectionist tendencies can erode strategic trust over time.

Technology transfer concerns, regulatory mismatches, and interoperability issues persist.

Over-reliance on defence cooperation may limit diversification into other sectors like health, education, and climate governance.

Conclusion

The India–U.S. relationship in 2025 illustrates a parallel-track model of diplomacy: political engagement may fluctuate, but institutional cooperation endures. Defence, technology, and multilateral frameworks such as the Quad have created structural resilience in bilateral ties. For 2026 and beyond, deepening institutional understanding beyond defence—into economic, infrastructural, and societal domains—will be critical. This quiet but consistent institutional engagement remains the strongest guarantor of the partnership's long-term strategic relevance, even when political summits pause.