



DAILY NEWS PAPER ANALYSIS

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**CIVILS WITH AKASH
SECTOR 25 CHANDIGARH**

Form used in Census second phase rehearsal has 'open column' for caste

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The questionnaire used in the rehearsal for the second phase of Census, which started in 16 States and Union Territories on Monday, has an "open column" for respondents to record their castes, several officials involved in the exercise told *The Hindu*.

Though this gives an indication of how caste is likely to be enumerated in the country as part of the Population Census 2027, officials said that this was just a "pre-test". The final questionnaire will be prepared based on the feedback received during the exercise, which concludes on July 20.

The castes of all residents will be recorded in

the second phase of the Census, named Population Enumeration (PE).

The 2027 Census is the first digital Census and the first to enumerate caste in Independent India.

Until now, only the Scheduled Castes (SCs) and Scheduled Tribes (STs) were enumerated during the Census exercise.

The PE phase will be conducted in February 2027 across the country but in Ladakh and snow-bound areas of Jammu and Kashmir, Uttarakhand and Himachal Pradesh, it will be concluded by September 30. The final questionnaire will be known by September.

Debate continues

The discourse on the methodology of caste enumeration has largely swung be-



An enumerator takes notes during a door-to-door survey for the Census in New Delhi. SUSHIL KUMAR VERMA

ween either leaving an open column for caste – as in the 2011 Socio-Economic Caste Census (SECC) – or preparing a list of castes for people to pick from, as the Bihar government did in its 2022-23 caste-based survey.

Interestingly, the open column methodology had resulted in the 2011 SECC returning over 46 lakh different "caste names", largely owing to the difference in what people understood by caste. Significantly, the Prime

Minister Narendra Modi-led government has consistently maintained over the last decade that the 2011 SECC's caste data were unreliable because of "errors" in data collection.

The total number of castes enumerated by the

Census exercise held in 1931 was 4,147.

Meanwhile, the pre-test exercise under way also allowed self-enumeration, and the portal had been accessible from July 1 to 5 only in the specific areas where the rehearsal is being conducted.

In Faridabad, Haryana, the exercise is being conducted in 17 enumeration blocks.

Each block typically has 150 to 180 residential units with a population of 650 to 800 people.

"To evaluate field procedures, digital applications, and operational arrangements ahead of the nationwide population enumeration, a pre-test will be conducted in Ward No. 24 – comprising 17 enumeration blocks – from July 1 to July 20," the office of the

Deputy Commissioner, Faridabad said.

The PE phase in 2011 Census had 29 questions covering demographic, cultural and economic parameters, as well as literacy, migration, marital status, travel to place of work, and fertility.

An official said, "While SC and ST communities will be enumerated as they have always been, with codes for communities in the SC and ST lists, other people will have an open column to fill in their caste and enumerators will enter whatever a resident says their caste is."

This comes even as scholars and experts have been speculating how the government will decide to enumerate castes in India ever since the Union Cabinet approved it in 2025.

KEY HIGHLIGHTS:

Context

- The Government has begun a pre-test (1–20 July 2026) for the Population Enumeration (PE) phase of Census 2027 in 16 States/UTs.
- The pre-test questionnaire contains an open column for caste, allowing respondents to self-report their caste.
- The final methodology will be decided after analysing the pre-test feedback.
- Census 2027 will be:
 - India's first digital Census.
 - First Census after Independence to enumerate all castes.

Key Points

- Population Enumeration (PE): Scheduled in February 2027.
- Snow-bound areas (Ladakh, J&K, Himachal Pradesh and Uttarakhand): Enumeration to be completed earlier.
- Self-enumeration facility introduced through a digital portal.
- SCs and STs will continue to be enumerated using notified codes.
- Other castes will be recorded through an open-text entry during the pre-test.
- 2011 SECC adopted an open-entry approach and generated over 46 lakh caste entries, creating classification challenges.
- The Government had not released the complete caste data of SECC citing data inconsistencies.
- 1931 Census was the last Census to enumerate all castes comprehensively.
- Since Independence, Population Census has collected caste data only for Scheduled Castes (SCs) and Scheduled Tribes (STs).

Static Linkages

- Census Act, 1948 provides the legal framework for Census.
- Entry 69, Union List (Seventh Schedule): Census is a Union subject.

- Conducted by the Registrar General and Census Commissioner of India (RGI) under the Ministry of Home Affairs.
- First synchronous Census in India: 1881.
- Census is conducted every 10 years.
- Article 340: Appointment of a Commission to investigate the conditions of Socially and Educationally Backward Classes.
- Articles 15(4), 16(4) & 46: Constitutional basis for affirmative action.
- 102nd Constitutional Amendment Act, 2018: Constitutional status to NCBC.
- 105th Constitutional Amendment Act, 2021: Restored States' power to identify SEBCs.

Critical Analysis

Advantages

- Enables evidence-based welfare planning.
- Helps assess socio-economic disparities among caste groups.
- Improves targeting of government schemes.
- Strengthens empirical basis for public policy.

Challenges

- Open-text responses may create multiple spellings and synonyms.
- Standardisation of caste names is administratively difficult.
- Possibility of inaccurate self-reporting.
- Political sensitivity surrounding caste data.
- Privacy and confidentiality concerns in digital enumeration.

Way Forward

- Develop a uniform national coding framework.
- Use AI-enabled validation and digital standardisation.
- Strengthen enumerator training.
- Ensure confidentiality under the Census Act.
- Publish transparent methodology for coding and classification.
- Integrate caste data with socio-economic indicators for policy design.

'El Niño set to dent India's wind, hydropower output'

Study projects rise in coal-fired power: it says weaker wind and hydropower output, combined with rising demand for air conditioning, could lead to a generation shortfall of nearly 18 TWh

Jacob Koshy
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India's power system stands to be strained more by the developing El Niño than that of any other country, according to an analysis by the think tank Centre for Research on Energy and Clean Air (CREA). It projects that weaker wind and hydropower output, combined with rising demand for air conditioning, could open a generation gap of nearly 18 TWh (terawatt hour) over a period of one year, till June 2027.

Set against India's total electricity generation of about 1,846 billion units in 2025-26, the shortfall CREA models is small or under 1% of annual output. Non-fossil sources supplied 29.2% of that generation.

The group's concern is less the size of the gap than how it is filled. The projected median output puts it at 17.7 TWh and its most severe at 24 TWh – one TWh is a billion units of electricity – and says the likeliest outcome is a surge in coal-fired power, which will release an estimated 17 million tonnes of carbon dioxide. It stresses that these are scenario projections, not forecasts.

The India Meteorological Department (IMD) confirmed last month that El Niño conditions had emerged over the equatorial Pacific and were expected to strengthen through the monsoon.

It has forecast below-normal southwest monsoon rainfall at 90% of the long-period average, with a 60% chance of a deficient season.

June rainfall closed with



Generating power: A wind farm at Gudimgalam in Tiruppur district of Tamil Nadu is 30% operational

51.41 GW of large hydro and 8.78 GW of nuclear – after a record 44.6 GW of solar and 6 GW of wind were added in 2025-26. Coal remains the largest single source of power, at about 42% of installed capacity, though coal generation fell 3.69% over the year. Peak demand touched 270.82 GW on May 21, according to official data.

CREA, which reports that solar now meets 24% of daytime demand, argues that storage could have absorbed more of it. Grid operators curtailed about 2.1 TWh of solar and wind last year to keep coal plants running – waste that CREA, citing energy analytics firm Ember, says roughly 10 GWh of battery storage could have averted.

India must "move much faster on batteries and grid upgrades", said Nandkishore Sivalingam, CREA's director, so that clean energy can meet future demand surges. The country is lining up around 130 GW of new coal capacity that provides on-demand power and helps buffer against record peaks such as in May.

KEY HIGHLIGHTS:

Context

- The Centre for Research on Energy and Clean Air (CREA) has projected that the ongoing El Niño could create an electricity generation gap of 17.7 TWh (median estimate) in India during July 2026–June 2027.
- The projected shortfall is attributed to:
 - Reduced hydropower generation due to weak monsoon.
 - Lower wind power output.
 - Increased electricity demand for cooling during hotter conditions.
- According to the India Meteorological Department (IMD):
 - El Niño conditions have developed over the equatorial Pacific.
 - Southwest Monsoon 2026 is likely to be 90% of Long Period Average (LPA) with a 60% probability of a deficient monsoon.
- CREA estimates that the electricity deficit may be met through additional coal-based generation, leading to nearly 17 million tonnes of additional CO₂ emissions.

Key Points

- India's total electricity generation (2025–26): 1,846 Billion Units (BU).
- Share of non-fossil electricity generation: 29.2%.
 - Installed non-fossil capacity (March 2026): 283.46 GWSolar – 150.26 GW
 - Wind – 56.09 GW
 - Large Hydro – 51.41 GW
 - Nuclear – 8.78 GW
- Capacity addition during 2025–26:
 - Solar – 44.6 GW
 - Wind – 6 GW
- Coal accounts for nearly 42% of installed power capacity.

- Peak electricity demand reached 270.82 GW (May 2026).
- Around 2.1 TWh of renewable energy was curtailed due to grid constraints.
- Battery storage can significantly reduce renewable energy curtailment and improve grid flexibility.

Static Linkages

- El Niño is characterized by abnormal warming of sea surface temperatures in the central and eastern equatorial Pacific Ocean.
- El Niño generally weakens the Walker Circulation, reducing southwest monsoon rainfall over India.
- Hydropower depends on reservoir storage and river discharge, making it sensitive to monsoon variability.
- Solar and wind are intermittent energy sources requiring storage and grid balancing.
- Battery Energy Storage Systems (BESS) and Pumped Storage Projects (PSPs) improve renewable energy integration.
- India aims to achieve 500 GW of non-fossil electricity capacity by 2030 under its updated Nationally Determined Contributions (NDCs).

Critical Analysis

Significance

- Highlights the growing impact of climate variability on energy security.
- Reinforces the need for climate-resilient power infrastructure.
- Demonstrates the importance of balancing energy transition with grid reliability.

Challenges

- Declining hydropower and wind generation during El Niño years.
- Rising peak electricity demand due to heatwaves.
- Continued dependence on coal for dispatchable power.
- Inadequate battery storage and transmission infrastructure.
- Renewable energy curtailment due to grid limitations.

Way Forward

- Accelerate deployment of Battery Energy Storage Systems (BESS).
- Expand Pumped Storage Hydropower capacity.
- Strengthen Green Energy Corridors and transmission infrastructure.
- Improve renewable energy forecasting and grid management.
- Promote energy-efficient cooling and demand-side management.
- Diversify clean energy through offshore wind, nuclear energy, and green hydrogen.
- Integrate climate risk into long-term energy planning.

In India, voting cannot remain merely a statutory right

Recently, a Congress leader revived an old constitutional debate by demanding that voting should be recognised as a fundamental right. At first sight, the demand appears unexceptionable. In a democracy, what could be more fundamental than a citizen's right to choose those who govern? Yet, for more than seven decades, the Supreme Court of India has consistently held that the right to vote is not a fundamental right but merely a statutory right.

This judicial position, though well established, has become increasingly difficult to reconcile with the Court's own evolving jurisprudence. In a series of landmark decisions, the Court has gradually transformed the voter from a passive statutory creature into an active constitutional actor.

The result is a curious paradox: while the act of voting itself continues to be described as statutory, many of its essential features have already acquired constitutional protection.

The traditional position dates back to *N.P. Ponnuswami v Returning Officer* (1952), where the Court held that the right to vote and the right to contest elections are not common law rights but rights created by statute. The principle was reaffirmed in *Jyoti Basu & Others v Debi Ghosal & Others* (1982), where Justice O. Chinnappa expressly observed that the right to elect, "fundamental though it is to democracy", is neither a fundamental right nor a common law right, but "purely a statutory right". A Constitution Bench reiterated this position in *Kuldeep Nayar v Union of India* (2006), holding that while democracy forms part of the basic structure of the Constitution, the individual right to vote flows from legislation, principally the Representation of the People Acts.

The logic behind this approach is understandable. The Constitution does not expressly enumerate the right to vote among the fundamental rights contained in Part III. Parliament, therefore, enjoys considerable latitude in prescribing qualifications, disqualifications and procedures governing elections.

However, the story does not end there.

Constitutionalising the poll process
Beginning in the early years of this century, the Court embarked upon a process of constitutionalising the electoral process. In *Union of India v Association for Democratic Reforms* (2002), the Court held that voters have a right to know the criminal antecedents, educational qualifications and financial assets of candidates. This right was located squarely in Article 19(1)(a), the fundamental right to freedom of speech and expression. The Court reasoned that meaningful participation in democracy is impossible unless voters are adequately informed.



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A year later, in *People's Union of Civil Liberties v Union of India* (2003), the Court drew an important distinction. While reiterating that the right to vote is statutory, it held that the freedom of voting – that is, the freedom to make an informed choice – is a fundamental right protected by Article 19(1)(a).

The most intriguing development came in the 2013 *NOTA* judgment. Recognising the option of "None of the Above", the Court held that a voter's decision to reject all candidates is a form of political expression protected by Article 19(1)(a). The Court further held that secrecy of the ballot must extend even to those who choose not to vote for any candidate.

This produces an extraordinary constitutional anomaly. The Court has effectively held that the right to know is fundamental, the freedom to make an informed choice is fundamental, the secrecy of the ballot is fundamental, and even the right to reject all candidates is constitutionally protected. Yet, the act of voting itself continues to be treated as a mere statutory entitlement.

One is tempted to ask: if the Constitution protects the right to reject all candidates, why does it not protect the right to choose one? Recent constitutional jurisprudence also points in this direction. In *Anoop Baranwal v Union of India* (2023), Justice Ajay Rastogi, in his separate opinion, expressly favoured recognising voting as a fundamental right. Although this view did not command a majority, the Constitution Bench repeatedly referred to voting as a constitutional right rather than merely a statutory one. This marks an important shift in judicial understanding.

The anomaly becomes even more striking when viewed through the prism of the basic structure doctrine. Since *Kesavananda Bharati v State of Kerala* (1973), the Court has repeatedly held that democracy forms part of the Constitution's basic structure. In *Indira Nehru Gandhi v Shri Raj Narain & Anr* (1975), the Court underscored that free and fair elections are an essential feature of democracy. Subsequent decisions have consistently reaffirmed this principle.

Democracy begins with votes
But democracy does not exist in the abstract. It operates through elections, and elections derive their legitimacy from the participation of citizens through the ballot. The vote is the very instrument through which popular sovereignty is exercised. It is through the vote that "We, the People" periodically renew the legitimacy of the state and hold governments accountable. If democracy is a part of the Constitution's

basic structure, and if free and fair elections are indispensable to democracy, it is difficult to explain why the citizen's right to vote should remain outside the constitutional core. To say that democracy is basic to the Constitution while the citizen's vote is merely a statutory right appears incongruous. A democracy without voters is inconceivable.

This does not necessarily mean that every aspect of voting should be elevated into an absolute fundamental right immune from regulation. Parliament must continue to prescribe qualifications, disqualifications and procedures necessary for the conduct of elections. Age requirements, electoral rolls, residency conditions, disqualifications for corrupt practices and other regulatory provisions are indispensable for orderly elections.

What requires constitutional recognition is not every procedural detail but the core right of every eligible citizen to participate in the democratic process.

This becomes particularly evident when one examines Article 326 of the Constitution. The Article mandates that elections to the Lok Sabha and State Legislative Assemblies shall be based on universal adult suffrage. Every citizen above the age of 18 is constitutionally entitled to be registered as an elector, subject only to narrowly defined disqualifications. The source of this entitlement is not legislation but the Constitution itself. The Representation of the People Acts merely operationalise that constitutional command.

Thus, while the mechanics of voting may be statutory, the citizen's entitlement to be a voter flows directly from the Constitution. Exclusion from the electoral roll, except in accordance with constitutionally permissible limitations, therefore, strikes at a constitutional guarantee.

A matter for the Court to revisit
The distinction between statutory and constitutional rights may have served a useful purpose in the early years of the Republic, when electoral jurisprudence was still in its infancy. But the Court's own decisions have steadily blurred that distinction by progressively constitutionalising various facets of voting.

Perhaps the time has come for the Court to revisit an old doctrine. In a Constitution where democracy and free and fair elections constitute the basic structure, the citizen's vote cannot remain a statutory privilege conferred by Parliament. It is the instrument through which popular sovereignty is expressed and the Republic periodically renews its democratic legitimacy.

After all, if the Constitution protects the right to reject every candidate, it can scarcely deny protection to the right to choose one.

- PUCL (2003): Freedom to make an informed electoral choice is a Fundamental Right.
- NOTA Judgment (2013): Right to reject all candidates is protected under Article 19(1)(a).
- Anoop Baranwal (2023): Separate opinion favoured recognizing voting as a Fundamental Right.
- Basic Structure Link
 - Kesavananda Bharati (1973): Democracy is part of the Basic Structure.
 - Indira Nehru Gandhi v. Raj Narain (1975): Free and fair elections are part of the Basic Structure.

Static Linkages

- Article 324 – Election Commission of India.
- Article 325 – One general electoral roll.
- Article 326 – Universal Adult Suffrage.
- Articles 324–329 – Constitutional provisions relating to elections.
- Article 19(1)(a) – Freedom of Speech and Expression.
- Representation of the People Act, 1950.
- Representation of the People Act, 1951.
- Basic Structure Doctrine.
- Secret Ballot.
- Universal Adult Franchise.

Critical Analysis

Arguments in Favour

- Strengthens participatory democracy.
- Protects citizens from arbitrary disenfranchisement.
- Makes the constitutional framework consistent with judicial recognition of voting-related rights.
- Reinforces popular sovereignty and democratic accountability.

Arguments Against

- Parliament requires flexibility to regulate electoral qualifications and procedures.
- Fundamental Right status may increase election-related litigation.
- Existing constitutional safeguards under Article 326 already ensure universal suffrage.

Constitutional Issue

- Democracy and free & fair elections are part of the Basic Structure, but the act of voting continues to be treated as a statutory right.

Way Forward

- Revisit the constitutional status of the right to vote through judicial interpretation or constitutional amendment.
- Ensure transparent and error-free electoral rolls.
- Strengthen voter awareness and informed participation.
- Continue electoral reforms to uphold free and fair elections.
- Safeguard the independence and credibility of the Election Commission.

KEY HIGHLIGHTS:

Context

- A demand has been raised to recognize the Right to Vote as a Fundamental Right instead of a statutory right.
- The debate has gained importance as recent Supreme Court judgments have increasingly constitutionalized various aspects of voting while continuing to classify the act of voting itself as a statutory right.

Key Points

- Current Legal Status
 - Right to vote is a Statutory Right under the Representation of the People Act, 1950 & 1951.
 - Right to contest elections is also a statutory right.
- Constitutional Basis
 - Article 326 provides for Universal Adult Suffrage.
 - Every citizen 18 years and above has the constitutional entitlement to be registered as an elector, subject to constitutional and statutory disqualifications.
- Important Supreme Court Judgments
 - N.P. Ponnuswami (1952): Right to vote is statutory.
 - Jyoti Basu (1982): Right to elect and contest elections flows from statute.
 - Kuldeep Nayar (2006): Democracy is part of the Basic Structure, but voting remains statutory.
 - Association for Democratic Reforms (2002): Voter's Right to Know candidate information is protected under Article 19(1)(a).

The right not to vote enjoys constitutional protection; paradoxically, the right to vote does not

AI governance and a voice for the Global South

In February 2026, India hosted the India AI Impact Summit 2026, that sought to put the needs and challenges of the Global South at the centre of the Artificial Intelligence (AI) discourse. The summit's themes framed by India were rooted in the contextual realities of the Global South with a focus on real-world harms. This was a departure from the previous summits (at Bletchley Park, 2023, U.K.; Seoul 2024, and Paris 2025) that prioritised both catastrophic and existential risks over questions of present harms, equity and inclusion.

As the Summit evolved, the political and policy momentum shifted toward raising capital for AI development in India and accelerating adoption through domestic use cases. In this process, India increasingly began to position itself within the newly framed "middle power" discourse, at the cost of Global South solidarity which underpinned the Summit's original vision. India clarified this stance by joining Pax Silica, signalling strategic alignment with the United States-dominated semiconductor supply chain. As part of the agreement, India agreed to adopt a pro-innovation regulatory approach, thereby compromising its pursuit of strategic autonomy.



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partner in the AI adventure to India. The U.S. has declared its disinterest in AI governance, especially global multilateral or multistakeholder governance. This raises fundamental questions for India and the Global South on concentration of infrastructure, and economic power in the U.S. Will this be a repeat of the social media story – when U.S. foreign policy pushed back against regulating for user harms to safeguard the interests of social media platforms concentrated in the U.S.? Furthermore, economic value primarily accrues to American industry despite significant business and users outside its borders, while disproportionate externalities and harms also persist in domestic markets.

Pertinent issues

In the AI story, numerous questions arise. Will India mainly be a consumer of U.S. tech with Indian users bearing disproportionate harm? Will India be a site for extraction of data, labour for data labelling, minerals for manufacturing, and land, water, electricity and resources for data centres, primarily enabling the growth of American Big Tech?

Since the summit in February, India has sanctioned land for data centres displacing communities, triggering protests. There are no meaningful guardrails to protect local communities as American companies scrape public content to build language and indigenous knowledge datasets. The non-profit ecosystem is signing memoranda of understanding to diffuse AI and adopt use cases. However, fundamental AI innovation has been slow – India remains unable to compete with global foundational models, its semiconductor development is focused on low-value assembly and there is a question of adequate capital to invest and grow the national AI ecosystem.

But perhaps all is not lost for India. The first of a two-part UN Global Dialogue on AI is underway in Geneva (July 6-7, 2026). Stakeholders will

convene to discuss how the multilateral and multistakeholder ecosystem can come together to collectively define the rules for the governance of AI.

A window for leadership

India can use the opportunity to stitch together a fractured AI policy agenda that currently lacks a leader. It remains one of the few countries with the political will, the technical capacity, and a diverse market to play this role. Rather than positioning itself merely as a destination for investment or a market for AI, India could rooster a vision of technological development rooted in public purpose, user safety, strategic autonomy, and international cooperation.

India should reiterate the need for international norms that empower Global South countries to focus on building local AI ecosystems and fostering innovation, safeguarding users, enhancing regulatory capacity, enabling skilling and developing domestic infrastructure. It should also advance critical debates on competition and consumer protection and ensure economic value accrues within national markets.

Concurrently, India must create pathways for international cooperation on AI within the Global South. The Geneva dialogue is a critical moment for Global South countries to come together to enable enhanced agency and strategic autonomy.

This requires developing innovative approaches to pool capacity and resources including cooperation on data, compute, interoperable standards and shared protocols and governance, and strengthening institutional capacity both regulatory and technical across the Global South.

As heterogeneous as the Global South is, it can be a counterweight to the hegemony of Big Tech. India can lead this march to ensure that shared governance norms are created and benefits are shared with the people in the Global South, appropriately protecting them from harm.

- AI for public good.
- Inclusive digital transformation.
- International cooperation on AI governance.

Static Linkages

- Strategic Autonomy remains a core principle of India's foreign policy.
- Digital Public Infrastructure (DPI) promotes inclusive digital governance.
- Semiconductors are strategic components for AI, defence and electronics.
- Data is increasingly treated as a strategic economic resource.
- Competition policy seeks to prevent monopolistic dominance in digital markets.
- Consumer protection extends to AI-enabled digital platforms.
- Ethical AI principles include fairness, transparency, accountability, privacy and safety.

Critical Analysis

Opportunities

- Strengthens India's AI ecosystem.
- Attracts investment and technology.
- Enhances digital economy and innovation.
- Positions India as a voice of the Global South.
- Expands AI applications in governance and public service delivery.

Challenges

- Risk of dependence on foreign AI infrastructure.
- Limited indigenous foundational AI models.
- Data extraction and privacy concerns.
- High energy and resource consumption by data centres.
- Weak global governance mechanisms for AI.
- Market dominance of global Big Tech firms.

Way Forward

- Develop indigenous foundational AI models.
- Strengthen domestic semiconductor manufacturing.
- Promote open-source AI and public digital infrastructure.
- Build robust AI governance with transparency and accountability.
- Enhance data protection and cybersecurity.
- Lead Global South cooperation on AI standards, data and compute infrastructure.
- Promote responsible AI aligned with national interests and strategic autonomy.

KEY HIGHLIGHTS:

Context

- India hosted the India AI Impact Summit 2026 (February 2026), placing the concerns of the Global South—equity, inclusion, AI accessibility, and real-world harms—at the centre of AI governance.
- This marked a shift from earlier AI summits (Bletchley Park-2023, Seoul-2024, Paris-2025), which focused largely on existential and catastrophic AI risks.
- India later joined Pax Silica, aligning with the U.S.-led semiconductor supply chain and adopting a pro-innovation regulatory approach, triggering debates on strategic autonomy and AI sovereignty.
- The UN Global Dialogue on AI (Geneva, July 2026) has become a key platform for evolving global AI governance norms.

Key Points

- India seeks to become a global AI innovation and semiconductor hub.
- Debate centres on balancing AI innovation, regulation, and strategic autonomy.
- Key concerns for the Global South:
 - AI governance and equitable access.
 - Data sovereignty.
 - Digital colonialism.
 - AI infrastructure concentration.
 - Fair distribution of AI benefits.
- Challenges for India:
 - Dependence on foreign foundational AI models.
 - Limited indigenous semiconductor ecosystem.
 - High investment requirement for compute infrastructure.
 - Environmental costs of AI data centres.
- India advocates:
 - Responsible AI.

Falling behind

Urbanisation in Mumbai is evolving faster than its infrastructure upgrades

The southwest monsoon has been highly active over western India, with south-westerly winds loaded with moisture sweeping over the Western Ghats and delivering intense rains along the Konkan coast, while other weather systems offshore are routing more moisture over Mumbai and the surrounding areas. In urban areas in general, rainfall intensity matters more than volume. Mumbai itself can generally absorb moderate rainfall over several hours; however, its drainage – like in many Indian cities – cannot handle several hundred millimetres in short bursts. Heavy rainfall also overwhelmed river catchments in parts of Maharashtra, including around Nashik, while high tides reduced the efficiency of Mumbai's stormwater drainage, worsening flooding in the city. Mumbai-Pune rail services were suspended after landslides in the Bhor Ghat and flights were affected. The closures of the Mumbai-Pune expressway and the Mumbai-Goa highway and significant flooding on the Mumbai-Ahmedabad expressway were disruptive, speaking to the increasing erraticity of monsoon rainfall, the vulnerabilities associated with linear infrastructure projects, and the ease with which the effects of natural disasters are compounded by cascading failures. A chawl collapse in Mankhurd took the lives of five children.

Mumbai lies on a peninsula built mostly on reclaimed land, former marshes, tidal flats, and low-lying coastal areas, creating the characteristic risk of higher flooding when rainfall coincides with high tide. It is compounded by decades of haphazard urbanisation that has encouraged water to run-off rather than be absorbed by the ground, forcing drains to handle more water than their design limits. After the July 2005 floods, when it received 944 mm in 24 hours, Mumbai launched the BRIMSTOWAD project and widened drains, installed pumping stations, and undertook premonsoon de-silting. Many of these works remain incomplete while some completed upgrades are based on assumptions about the monsoon that climate change has since undermined. Officials have also argued that pre-monsoon desilting helped reduce flooding in parts of Mumbai, but water on the Mumbai-Ahmedabad expressway, the chawl collapse, deadly tree falls in Kurla and Aarey, lack of redundancies in public transport, and the BMC's belated advisory to builders to halt hazardous construction all suggest a governance lapse. Mumbai's accountability also remains split across the BMC for local drainage and roads, the IMD for forecasting, the NDRF, two Railway zones, the State government, and highway authorities. Overall, the city has improved at shutting down to save lives and minimising the death toll – but as climate change and urbanisation evolve faster than infrastructure upgrades, simply waiting for system capacity to catch up to demand will be a failing strategy.

KEY HIGHLIGHTS:

Context of the News

- The southwest monsoon became highly active over western India, causing extremely heavy rainfall over Mumbai, Konkan and parts of Maharashtra.
- Heavy rainfall coinciding with high tides led to severe urban flooding in Mumbai.
- Landslides disrupted Mumbai-Pune rail services, while major highways witnessed flooding and closures.
- The event highlights increasing concerns over urban flooding, climate change, disaster preparedness, and resilient infrastructure.

Key Points

- Meteorological Factors
 - Moisture-laden Arabian Sea branch of the southwest monsoon intensified rainfall.
 - Orographic uplift by the Western Ghats enhanced precipitation over the Konkan coast.
 - High tides reduced the discharge of stormwater into the Arabian Sea.
- Reasons for Urban Flooding
 - Short-duration, high-intensity rainfall exceeding drainage capacity.

- Extensive concretisation leading to reduced groundwater infiltration.
- Loss of wetlands, mangroves and natural drainage channels.
- Urban expansion over reclaimed and low-lying coastal land.
- BRIMSTOWAD Project
 - Launched after the 2005 Mumbai floods (944 mm rainfall in 24 hours).
 - Objectives:
 - Expansion of stormwater drainage network.
 - Installation of pumping stations.
 - Modernisation of drainage outfalls.
 - Periodic desilting of drains.
 - Several components remain incomplete.
- Governance Issues
 - Fragmented responsibilities among:
 - BMC
 - IMD
 - NDMA/NDRF
 - Maharashtra Government
 - Railway authorities
 - National Highway agencies
 - Need for integrated urban flood management.
- Climate Change Dimension
 - Rising frequency of extreme rainfall events.
 - Existing drainage standards are inadequate for changing rainfall patterns.
 - Urban infrastructure requires climate-resilient redesign.

Static Linkages

- Arabian Sea branch of Southwest Monsoon.
- Orographic rainfall over Western Ghats.
- Urban Flooding vs Riverine Flooding.
- Role of wetlands and mangroves in flood mitigation.
- Disaster Management Act, 2005.
- NDMA Guidelines on Urban Flooding (2010).
- Sendai Framework for Disaster Risk Reduction (2015–2030).
- Sponge City concept and Nature-based Solutions.

Critical Analysis

Challenges

- Increasing frequency of extreme rainfall due to climate change.
- Encroachment of wetlands and floodplains.
- Inadequate drainage capacity in metropolitan cities.
- Delayed implementation of flood mitigation projects.

- Poor inter-agency coordination.
- Climate risks not fully integrated into infrastructure planning.

Significance

- Demonstrates growing vulnerability of coastal megacities.
- Highlights need for climate-resilient urban planning.
- Reinforces importance of ecosystem-based flood management.
- Underlines necessity of integrated disaster governance.

Way Forward

- Complete pending BRIMSTOWAD works with updated climate projections.
- Restore wetlands, mangroves and natural drainage systems.
- Implement NDMA Urban Flood Management Guidelines.
- Integrate climate resilience into urban infrastructure projects.
- Strengthen real-time flood forecasting and early warning systems.
- Adopt GIS-based urban planning and flood zoning.
- Improve coordination among municipal, state and disaster management agencies.

Bad for both

Russia and Ukraine must end the war and concede mutual concessions

More than four years into Russia's invasion, Ukraine has found ways to raise the cost of the war for the Kremlin – striking its energy infrastructure with drones and imposing a drone blockade on Crimea. When the war began in February 2022, Ukraine's immediate response was to resist Russia's battlefield advances, while mobilising international support. As the war dragged on, Ukraine received advanced defensive and offensive weapons from its western partners, while Russia was subjected to sweeping sanctions. But this approach did not slow Russia, which reinforced its front lines and captured more Ukrainian territory. Both sides have suffered tens of thousands of casualties. Ukraine's economy has become heavily dependent on western aid. Kyiv has also transformed the way the war is fought by launching hundreds of drones each day at Russian troops and critical infrastructure. For President Vladimir Putin, who initially sought to shield the Russian public from the consequences of the war, these attacks are a stark reminder that the war has come home. Strikes on Russian oil facilities, described by Ukrainian President Volodymyr Zelenskyy as "long-range sanctions", have knocked out parts of Russia's refining capacity. Ukraine has also targeted the electricity infrastructure and fuel logistics of Crimea, the Black Sea peninsula Russia annexed in 2014, forcing a state of emergency.

Mr. Zelenskyy wants to use this offensive pressure to force Mr. Putin to the negotiating table and secure a ceasefire. But drone warfare has only slowed Russian advances. Last week, Russia's Defence Ministry announced the capture of the eastern city of Kostiantynivka and a closing in on Lyman. Russia now controls over 20% of Ukraine since 2014. Russia has repeatedly accused NATO countries of enabling Ukraine to strike deep inside its territory. Mr. Putin is already under pressure over his inability to secure a decisive victory, and nationalist voices have urged him to widen the conflict to increase pressure on NATO. The situation remains highly volatile with no political settlement in sight. Ukraine can hurt Russia economically, but it continues to lose ground on the battlefield. Russia can inflict military losses on Ukraine, but it is also facing attacks on a scale unseen since the Second World War. Neither side has a viable military path to achieving its objectives. Mr. Putin and Mr. Zelenskyy should adopt a more accommodative position with mutual concessions. They should agree to a ceasefire and be ready to begin substantive negotiations on the outstanding issues, including the security concerns of both countries and the future of NATO.

KEY HIGHLIGHTS:

Context

- More than four years after Russia's invasion of Ukraine (February 2022), the conflict remains a prolonged war of attrition.
- Ukraine has intensified long-range drone attacks on Russian oil refineries, energy infrastructure and military logistics to raise the economic cost of the war.
- Russia continues territorial advances in eastern Ukraine despite Western sanctions and military aid to Ukraine.
- The conflict has reinforced the importance of drone warfare, energy security, food security and geopolitical alliances in contemporary international relations.

Key Points

- Russia invaded Ukraine: 24 February 2022.
- Crimea was annexed by Russia in 2014 after a disputed referendum.
- Russia currently controls over 20% of Ukraine's territory.
- Ukraine employs low-cost drones to target:
 - Oil refineries
 - Fuel depots

- Electricity infrastructure
- Military logistics
- Western countries continue to provide military, financial and humanitarian assistance to Ukraine.
- The conflict has disrupted:
 - Global food supply chains
 - Energy markets
 - Black Sea shipping
 - International security architecture

Static Linkages

- Article 2(4), UN Charter: Prohibits the threat or use of force against the territorial integrity or political independence of any State.
- Article 51, UN Charter: Recognises the inherent right of individual or collective self-defence.
- UN Security Council (UNSC): Primary responsibility for maintaining international peace and security.
- NATO: Collective defence alliance under Article 5 of the North Atlantic Treaty.
- Hybrid Warfare: Combines conventional warfare with cyber attacks, drones, information warfare and economic coercion.
- Economic Sanctions: Non-military instrument used to influence State behaviour.

Critical Analysis

Significance

- Demonstrates the growing role of drone warfare in modern conflicts.
- Highlights the strategic importance of energy infrastructure.
- Illustrates the limits of economic sanctions in altering battlefield outcomes.
- Reflects increasing reliance on asymmetric warfare.

Challenges

- No decisive military victory for either side.
- Continuing humanitarian and refugee crisis.
- Risk of wider NATO-Russia confrontation.
- Persistent disruptions to global food and energy security.
- Weak prospects for an immediate political settlement.

Way Forward

- Immediate humanitarian ceasefire.
- Resume credible peace negotiations.
- Strengthen UN-led diplomatic efforts.
- Ensure protection of civilian infrastructure under international humanitarian law.
- Address legitimate security concerns of all stakeholders.
- Promote confidence-building measures to reduce escalation.

In disruptive times, an arc of trust to hold Indo-Pacific together

PRIME MINISTER Narendra Modi is travelling to Jakarta, Auckland and Melbourne, undertaking a sequence of visits that may define New Delhi's approach to the Indo-Pacific in the coming decades. A bold and audacious redrawing of the map of this vast maritime region is underway. This effort will seek to recover autonomy for the powers that reside here, and it will recast the region's story on good growth and inclusive development, away from the whims of extractive superpower contestation. India envisions a new geometry of collaboration, one not dependent on axioms outlined in Washington or Beijing, but drawn up by those who live there and thus have the most to gain or lose.

The first step, and the lynchpin of any plan for the Indo-Pacific, is Indonesia. The world's third-most populous nation is the archetypal Indo-Pacific power. Indeed, it is the nation the term might almost have been coined to describe. The archipelago sits astride every crucial trade route between the two oceans, has abundant natural resources and, like India, is a civilisational state that has long been committed to a "free and active" foreign policy that secures its autonomy.

It is the relationship between India and Indonesia that will set the course for the broader maritime region. And what is often overlooked is that this partnership has already grown manifold. Objectively, Jakarta

is one of New Delhi's most important partners. If you look at goods alone, trade between the two nations, at just under \$30 billion a year, is significant. It has overtaken trade between India and the United Kingdom, and runs neck and neck with Indo-German trade. Goods trade will only grow, stimulated by the upgradation of India's free trade agreement with the Association of Southeast Asian Nations (ASEAN), and so will services, under-represented and under-reported at present. With a focus on marine logistics, technology and financial services, and new supply chains, this partnership will form the foundation for a free and open trading architecture in the region.

And it will be necessary, as well, for Prime Minister Modi and President Prabowo Subianto to move the relationship forward. If the Indo-Pacific is to create a genuinely indigenous and independent security framework, these two maritime powers are the only ones with the scale, capacity and presence required to manage the region's most vital chokepoints. Together they are the only powers positioned to become net security providers of this ocean, not by invitation from Washington or defence to Beijing, but because the sea lanes are theirs to protect in the first place.

Australia, meanwhile, is India's breakout partner. A new economic partnership, Australia-India Econ-



SAMIR SARAN

omic Cooperation and Trade Agreement (ECTA) was negotiated in 2022, signalling New Delhi's new vision for trade. But it also built trust, a far scarcer commodity. That trust can serve to underpin the next stage of this relationship. That would require deeper integration: Our financial services, nuclear energy and resource processing industries must be integrated. These are areas where we both have great abilities, and our search is for autonomy, scale, and new technology. The strategic objective, once the habit of cooperation settles, must be defence co-production, where both could serve as trained enablers of broader regional, and global security.

New Zealand is a crucial key to the puzzle and not only because of its own strengths. The innovation island hosts advanced manufacturing capabilities, space and deep technology enterprises and agri-processing innovation, making it a vital processing of India's innovation sectors, food-security imperative and farm-income strategy. With the fourth largest exclusive economic zone (EEZ), the blue economy in its entirety is a natural domain of partnership with Australia.

Alongside Canberra, Wellington will provide another crucial bridge to the Five Eyes security-intelligence ecosystem. This adds further resilience to a still new relationship.

Finally, together, India and the Australian New Zealand Army Corps (ANZAC) can become the delivery mechanism for development across the South Pacific and neighbouring parts of ASEAN. They will provide the financing, digital and physical infrastructure, and human capital the region badly needs, as well as a credible alternative to exploitative or unreliable partners. India is, after all, the largest theatre for discovering development solutions for the planet; once that innovative energy is paired with the capital and standing in the Pacific of the ANZAC nations, it offers a development pathway that does not force smaller nations to be burdened with perverse debt or lease a naval base to supposed benefactors.

Modi's new arc of trust will hold the Indo-Pacific together in these disruptive times. With India at its centre, draw the arc east from India through Indonesia, Australia and New Zealand. Then draw it west through the United Arab Emirates and the Gulf and down the eastern seaboard of Africa.

This is the real story of the upcoming tour: The geographical centre of the Indo-Pacific resetting and redrawing an emerging order so that those who share this oceanic domain write the rules instead of just inheriting them.

The writer is president, Observer Research Foundation

India-New Zealand

- Cooperation in:
 - Agri-technology
 - Blue Economy
 - Renewable energy
 - Digital economy
 - Innovation
- New Zealand possesses one of the world's largest Exclusive Economic Zones (EEZs).

Importance for India

- Secures Sea Lines of Communication (SLOCs).
- Diversifies supply chains.
- Enhances maritime domain awareness.
- Strengthens India's role as a net security provider in the Indian Ocean Region.
- Counters strategic vulnerabilities without entering military alliances.

Static Linkages

- Act East Policy (2014)
- SAGAR (Security and Growth for All in the Region) (2015)
- Indo-Pacific Oceans Initiative (IPOI) (2019)
- UNCLOS, 1982 governs maritime rights and obligations.
- Exclusive Economic Zone (EEZ): 200 nautical miles.
- Quad: India, Australia, Japan and USA.
- ASEAN Outlook on the Indo-Pacific (AOIP) emphasizes ASEAN Centrality.
- Major Indo-Pacific chokepoints:
 - Strait of Malacca
 - Sunda Strait
 - Lombok Strait
 - Hormuz Strait
 - Bab-el-Mandeb Strait

Critical Analysis

Significance

- Enhances India's strategic influence in the Indo-Pacific.
- Strengthens economic and maritime partnerships.
- Promotes resilient and diversified supply chains.
- Supports a rules-based maritime order under UNCLOS.
- Expands cooperation in emerging technologies and critical minerals.

Challenges

- Intensifying geopolitical rivalry in the Indo-Pacific.
- Maritime disputes in the South China Sea.
- Dependence on external maritime trade routes.
- Infrastructure and financing gaps in the region.
- Balancing relations among Quad, ASEAN and other regional partners.

Way Forward

- Deepen implementation of SAGAR and IPOI.
- Expand defence and maritime cooperation.
- Strengthen critical mineral partnerships.
- Enhance Blue Economy collaboration.
- Promote resilient regional supply chains.
- Support ASEAN Centrality and adherence to UNCLOS, 1982.
- Increase connectivity through transparent and sustainable infrastructure projects.

KEY HIGHLIGHTS:

Context of the News

- Prime Minister Narendra Modi visited Indonesia, Australia, and New Zealand to strengthen India's strategic engagement in the Indo-Pacific.
- The visits focused on enhancing maritime security, trade, connectivity, supply chain resilience, critical minerals, and strategic cooperation.
- The outreach reflects India's commitment to a Free, Open, Inclusive and Rules-based Indo-Pacific while promoting strategic autonomy.

Key Points

India-Indonesia

- Indonesia occupies a strategic location between the Indian and Pacific Oceans.
- Controls major maritime chokepoints:
 - Malacca Strait
 - Sunda Strait
 - Lombok Strait
- Cooperation areas:
 - Maritime security
 - Blue Economy
 - Defence
 - Connectivity
 - Trade
- Both support ASEAN Centrality in the Indo-Pacific.

India-Australia

- Economic Cooperation and Trade Agreement (ECTA) came into force in 2022.
- Cooperation includes:
 - Critical minerals
 - Defence and maritime security
 - Clean energy
 - Education
 - Supply chain resilience
- Both are members of:
 - Quad
 - Indian Ocean Rim Association (IORA)
 - Indian Ocean Naval Symposium (IONS)

NATO's challenge: Spending on collective defence



AJAI SHIRUKA

WITH EASTERN Europe and West Asia in prolonged turmoil, leaders of NATO's 32 member countries are gathered in Turkey for the Ankara Summit. The cornerstone of the world's most powerful alliance, enshrined in Article 5 of the North Atlantic Treaty, stipulates that an armed attack against one or more of its members will be considered an attack against all. But now, alongside the military threat from its principal adversary, Russia, NATO faces demands for more equitable burden-sharing from its principal financial contributor, the US.

Last fortnight, NATO outlined the broad themes expected to dominate discussions during the Ankara Summit. The first is a topic that has been contentious ever since NATO's beginnings: Spending levels on defence by the alliance's European members.

At last year's summit in The Hague, the European members committed to investing 5 per cent of GDP in defence. This covers two categories. Each member must spend at least 3.5 per cent of GDP on core defence equipment and to meet NATO capability targets. In addition, NATO countries must spend 1.5 per cent of GDP on defence- and security-related investments, such as protection of critical infrastructure, defence networks, and strengthening the defence industrial base.

The focus of the summit will be on delivering on the 5 per cent pledge with the US piling pressure on the European allies to step up. Washington is altering its contribution to NATO, pressing Europe to grow high-end capabilities such as logistics, command and control, aerial refuelling, missile defence, and special operations forces.

NATO watchers expect three themes to dominate the summit. The first will be a continued focus on "alliance adaptation", as NATO seeks to transform from a force optimised for crisis management to one focussed on collective defence against peer competitors. The second will be "capability delivery", with NATO identifying its security requirements and actually fielding those capabilities at the speed demanded by today's security environment. The third will be "technology and industrial resilience".

The rocky path to NATO's current 5 per cent commitment dates back to its founding in 1949. For its first 40 years, NATO formed the first line of western European defence against the threat of invasion by the

Soviet-led Warsaw Pact. During the 1960s, NATO's European allies willingly spent an average of 4.8 per cent of their GDP on defence. Alongside this, the US heavily subsidised NATO, picking up 60-76 per cent of the tab for Europe's defence.

With the collapse of the Soviet Union in 1991, NATO countries sharply pared defence spending to fund public infrastructure and social programmes. In 2006, at the Riga Summit, NATO's defence ministers issued a guideline advising member countries to spend at least 2 per cent of their GDP on defence. But, with the Soviet threat having receded, the non-binding Riga commitment was largely ignored.

Russia's annexation of Ukraine's Crimean peninsula in 2014 was the wake-up call that goaded NATO into reversing a quarter century of spending cuts. At the 2014 Wales Summit, the allies signed the Defence Investment Pledge, committing themselves to a spending target of 2 per cent of GDP by 2024.

Even so, it took a full-scale Russian invasion of Ukraine in 2022 to push NATO countries into adopting the new target of 5 per cent of GDP by 2035. Galvanised by the Russian threat, 2023 saw an unprecedented 11 per cent increase in NATO's real defence spending. In 2024, the European allies spent a combined total of \$380 billion. In 2025, collective defence spending rose by another \$90 billion. Some NATO allies are on track to reach the 5 per cent target in 2026, far ahead of schedule.

European security experts say the success of the Ankara Summit will rest not just on pushing NATO allies into spending more, but on directing spending into the right capabilities. NATO increasingly believes that Ukraine, which has demonstrated astounding capabilities in battlefield adaptation and innovation, provides the right blueprint for a more effective way to operate in a war fuelled by AI. Kyiv has demonstrated how to sense the domain, adapt cheap commercial tools, and iterate fast.

Ultimately, military advantage will be generated less by platforms and weapons and more by the ability to innovate, to produce, to sustain and to adapt faster than the adversary. Developing an agile defence industry will be the centrepiece of the Ankara Summit, with the entire day of July 7 being an industry forum.

The writer is a retired Army officer and journalist

- AI-enabled warfare and autonomous systems.
- Cyber security and critical infrastructure protection.
- Missile defence and logistics.
- Lessons from Ukraine's battlefield innovation.

Why It Matters

- Reflects NATO's transition from crisis management to high-intensity collective defence.
- Greater emphasis on technology-driven warfare, including drones, AI and electronic warfare.
- Increased burden-sharing among European allies.

Static Linkages

- Collective Defence vs Collective Security.
- Article 5 is the legal basis of NATO's mutual defence.
- Warsaw Pact (1955–1991) was NATO's Cold War rival.
- Defence expenditure is generally compared as % of GDP.
- Emerging military technologies:
 - Artificial Intelligence (AI)
 - Drones/UAVs
 - Cyber warfare
 - Electronic warfare
 - Autonomous weapon systems
- India follows Strategic Autonomy and is not a member of any military alliance.

Critical Analysis

Significance

- Strengthens deterrence against Russia.
- Promotes equitable burden-sharing.
- Enhances defence production and industrial resilience.
- Accelerates AI and drone integration into military operations.

Challenges

- High fiscal burden for European economies.
- Risk of prolonged arms race.
- Escalation of geopolitical tensions.
- Ethical concerns regarding AI-enabled warfare.
- Smaller NATO economies may struggle to achieve the 5% target.

Relevance for India

- Reinforces importance of indigenous defence manufacturing.
- Highlights growing role of AI, cyber security and drones in modern warfare.
- Demonstrates the importance of resilient defence supply chains.
- Provides lessons for military modernisation under Atmanirbhar Bharat.

Way Forward

- Prioritise capability-based defence planning over expenditure alone.
- Strengthen defence industrial ecosystems.
- Increase investments in AI, cyber security and autonomous technologies.
- Enhance interoperability through joint exercises and technology sharing.
- Balance military preparedness with diplomatic engagement to maintain regional stability.

KEY HIGHLIGHTS:

Context

- Leaders of the 32-member NATO met at the Ankara Summit (2026) amid the continuing Russia–Ukraine conflict and evolving European security concerns.
- The summit focused on implementing the 5% of GDP defence spending target by 2035, strengthening NATO's military capabilities, defence industrial base, and adoption of emerging technologies.

Key Points

NATO at a Glance

- Established: 1949
- Treaty: North Atlantic Treaty (Washington Treaty)
- Headquarters: Brussels, Belgium
- Members: 32
- Nature: Collective Defence Alliance

Article 5

- Provides for collective defence.
- An attack against one member is considered an attack against all.
- Invoked only once (after the 9/11 terrorist attacks).

Defence Spending Target

- 5% of GDP by 2035: Core military capabilities.
- 1.5%: Defence infrastructure, cyber security, logistics, industrial resilience and critical infrastructure.

Major Themes of Ankara Summit

- Collective defence against peer competitors.
- Defence industrial resilience.

It took a full-scale Russian invasion of Ukraine in 2022 to push NATO countries into adopting the new target of 5 per cent of GDP by 2035

Ethanol blending in fuel: Why road ahead is bumpy



ANIL SASI

MARUTISUZUKI'S advertising catchlines of the early 2000s, "kitna deri hai" and "petrol bhutana hi nahi bandha", were instant hits, distilling the Indian motorist's fascination with fuel efficiency. Decades earlier, Hem Honda had struck a similar chord with its "fill it, shut it, forget it" campaign, highlighting the efficiency of its four-stroke engines. It also buttressed the notion that thrift at the pump was the ultimate measure of automotive value.

That sentiment has proved resilient even as India's car market has upbilled to premium offerings. The calculus of mileage and the promise of frugal economy in a nation where mobility is expanding, but growth in disposable incomes remains patchy.

Ahead of schedule

That is where the government's new ethanol blending programme is running into opposition. Last year, India fully transitioned to 20% ethanol blending in petrol — five years ahead of the original target of 2030. E20 fuel — 80% petrol and 20% ethanol — is now the standard petrol variant available nationwide.

So, essentially, within three years, the average ethanol blending level in petrol doubled from the earlier 10% to 20% (this was originally slated to happen over eight years). For older vehicles and those certified for E20 petrol — 80 parts petrol and 10 parts ethanol — this transition came about rather quickly, without sufficient warnings of the consumer-end pitfalls. The experience left motorists, especially those owning older cars and two-wheelers, feeling somewhat short-changed.

Now, there are three problems with using a higher ethanol blend in petrol for engines not designed for these blends.

First, there is a substantial drop in fuel economy depending on when the car was manufactured.

Second, E20 fuel in internal combustion engine (ICE) vehicles, especially older ones, can damage parts, owing to factors like corrosion, given ethanol's hygroscopic nature (hygroscopy refers to the property of a substance to attract and hold water molecules from the surrounding environment, either through absorption or adsorption).

Third, vehicle owners in India cur-

For the Indian motorist, a mileage calculus matters most. But higher ethanol blending has other problems, and significant advantages, too

• ETHANOL: PHYSICS AND CHEMISTRY

ETHANOL CAN help reduce carbon dioxide emissions because it contains less carbon than petrol. Ethanol's chemical formula is C_2H_5OH , meaning each molecule contains two carbon atoms. Petrol is made up of hydrocarbons that typically contain 8 to 12 carbon atoms. As the share of ethanol in a fuel blend increases, the amount of carbon dioxide released when the fuel is burned is lower.

HOWEVER, ethanol has a lower calorific value than petrol. A litre of ethanol contains substantially less energy than a litre of petrol, resulting in roughly 32% lower mileage.

ETHANOL HAS a very high octane number. Octane number measures a fuel's resistance to premature combustion due to compression. Ethanol's Research Octane Number of



Union Minister Hardeep Puri launches a higher ethanol blend in New Delhi. AP

ETHANOL AND ethanol-based fuels

that there are no conclusive studies into the long-term impact blended fuel can have on non-compliant vehicles, but flagged that it could definitely have an impact on the engine's life, its various rubber parts, valves, and piston heads, among others.

It is the E25 transition that has hassled automakers at the moment, since this will require additional engineering and validation work around engine calibration, fuel-system durability, corrosion resistance, and material compatibility.

Consumer bears the brunt

This is just months after the government wrapped up the E20 transition. In all probability, the cost of vehicles will go up too, and the consumer will have to bear it. Not to mention the lower mileage, which a lot of customers are testifying to after the E20 to E25 shift.

According to sources in the government, the move towards blends higher than E20 is "not being pushed through in a hurry and there will be enough time given for vehicles and oil companies to gear up for this transition".

Why is the government pushing for blends beyond E20? The main reason is to lower India's dependence on fuel imports and aid domestic ethanol production.

There's a political angle too: the agricultural lobby, especially from Maharashtra and Uttar Pradesh, is pushing hard for ethanol blends to be hiked since farmers, such as those growing sugarcane, are sitting on significant overcapacity. For the oil marketing companies such as Indian Oil and Bharat Petroleum, there are challenges, but as they are mostly state-owned, they are unlikely to protest.

Now for adapting the existing set of vehicles to E25, car makers said they would have to run fresh tests to see what impact the higher ethanol blend will have on vehicles on the road. For new vehicles, the manufacturers will have to recalibrate and redo the certification and homologation for emissions, because all the vehicles that are selling now have been tested, certified, and homologated for emissions using E20.

Then, of course, there is the looming question: the impact on mileage. The problem here is that the brunt of the drop in fuel efficiency from the E20 to E25 transition was borne by the motorist. "In case of this new transition too, the consumer will likely end up bearing the brunt of any drop in fuel efficiency. For older vehicles, there is the added question over vehicle damage due to the high ethanol mix. That too is left to the consumer," a representative of an auto manufacturing association said.

more than commercial petrol.

Now, ARAI is a government body, and some of its predictions, including the fuel efficiency ratings that it offers "under standard test conditions", are different in real life driving conditions.

As far as vehicle degradation goes, manufacturers, on record, say they have not encountered any major issue with the E20 transition. Privately though, they admit to this being a concern when the blending levels increase further. Plus, the knock on the fuel economy is absolutely real. As fuel blends increase, this is only going to get worse.

There is a plan to go up from E20 to E25. Alongside that, there is a plan to introduce E85 fuel for flex-fuel vehicles. Even in a flex fuel vehicle, which is equipped to have higher ethanol blends, it's cheaper to run the standard E20 fuel than the proposed E85 because the difference between the price of the fuel normally and in the higher blend has to be more than the fuel efficiency loss of over 25%.

To start off with, E85 fuel will likely cost about Rs 20 per litre less than E20 petrol.

In private, vehicle makers also confide that the impact could be higher from E20 to E25 than it was for E20 to E25. This is especially true for older engines and the ones used in two-wheelers, where high-grade aluminium or steel casters are not used for the engine block. A senior technical expert at a major automaker told The Indian Express

Fuelling protests

Regular ICE cars running on higher ethanol blends, alongside the drop in mileage, are harder to start on winter mornings because ethanol burns at a higher temperature than petrol.

While a fuel with 10 per cent ethanol (E10) made little difference to a car's performance, anything above is said to impact operations. And the worsening of the performance does not exactly progress in a linear fashion as the blending increases.

Material damage

The government deputised The Automotive Research Association of India (ARAI) to study the impact of E20 fuel on the materials used in fuel-system components. An evaluation of eight metals, six elastomers, and four plastics used in various components was carried out through "systematic exercise of laboratory immersion". The study was conducted with E20 as test fuel and commercial petrol (Bharat Stage IV emission standard) as a baseline fuel (E30) for comparative assessment.

The ARAI study concluded that the impact of E20 on materials "was found to be insignificant based on the corrosion rates", with polychloroprene and fluorocarbon elastomers found to perform "similar or better" in most of the properties with E20. The impact of E20 on "tensile strength and volume change properties" was found to be

KEY HIGHLIGHTS:

Context of the News

- India has achieved the 20% Ethanol Blending (E20) target in petrol ahead of the original 2030 target.
- The Government is now examining the transition towards E25 and promoting E85 for flex-fuel vehicles.
- Automobile manufacturers have raised concerns regarding fuel efficiency, engine compatibility, certification costs, and impact on older vehicles.
- The policy is driven by India's objective of energy security, reduced crude oil imports, lower emissions, and enhanced farmer income.

Key Points

- E20: 20% Ethanol + 80% Petrol.
- E85: Up to 85% Ethanol; compatible only with Flex-Fuel Vehicles (FFVs).
- Implemented under the National Policy on Biofuels, 2018 (Amended 2022).
- Ethanol feedstocks include:
 - Sugarcane juice
 - B-heavy & C-heavy molasses
 - Damaged food grains
 - Surplus rice (approved by Government)
 - Maize
- Objectives:
 - Reduce crude oil imports.
 - Improve energy security.
 - Reduce greenhouse gas emissions.
 - Support farmers and sugar industry.
- Ethanol has lower calorific value than petrol, resulting in lower mileage.

Ethanol is hygroscopic, increasing moisture absorption and corrosion risk in non-compatible engines.

- Higher blends require:
 - Engine recalibration
 - Fresh emission certification
 - Homologation
 - Material compatibility testing

Static Linkages

- India imports over 85% of its crude oil requirement.
- Ethanol is a renewable biofuel.
- Flex-Fuel Vehicle (FFV): Vehicle capable of operating on petrol and high ethanol blends (up to E85).
- Second Generation (2G) Ethanol is produced from:
 - Paddy straw
 - Bagasse
 - Bamboo
 - Agricultural residues
- Biofuels support:
 - Circular Economy
 - Waste-to-Wealth
 - Sustainable Development Goals (SDGs 7, 12 & 13)

Critical Analysis

Positives

- Reduces crude oil import dependence.
- Enhances energy security.
- Lowers carbon emissions.
- Additional income source for farmers.
- Supports sugar and ethanol industries.
- Promotes renewable energy transition.

Challenges

- Lower fuel efficiency due to lower energy density.
- Potential engine damage in older vehicles.
- Increased vehicle manufacturing costs.
- Water-intensive sugarcane cultivation.
- Food vs Fuel concerns.
- Limited long-term evidence on E25 compatibility.
- Consumers bear higher operating costs.

Way Forward

- Gradual transition beyond E20.
- Expand 2G ethanol production from agricultural residues.
- Diversify feedstock towards maize and crop waste.
- Continue compatibility testing before higher blends.
- Promote flex-fuel and alternative fuel vehicles.
- Improve consumer awareness and fuel labelling.
- Balance energy security with food security and water sustainability.