EDITORIAL HIGHLIGHTS

21-11-2026

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Three to tango

U.S., China, Russia must draw up a roadmap for talks on nuclear weapons

The first trilateral summit between the Presidents of China, the U.S. and Russia, held in Shenzhen on November 19, reflected both the changing global order and the leaders' shared desire to remain engaged with one another in an increasingly unpredictable world. For U.S. President Donald Trump, the summit was a platform where he could push for joint talks between the world's three largest nuclear powers on reducing nuclear warheads. After the New START treaty between the U.S. and Russia expired in February 2026, Moscow had signalled that it was ready for talks, but Mr. Trump wanted to involve China as well. For President Xi Jinping, the summit reinforced China's position as a peer competitor to the U.S. While Russia seeks to deepen partnership with China, the U.S. is looking to build strategic stability. And for Russian President Vladimir Putin, whom the West sought to isolate after he launched the invasion of Ukraine, the summit offered a seat at the high table. The decision to start trilateral talks on nuclear arms and the joint declaration, which stated that 'a nuclear war cannot be won and must never be fought', are steps in the right direction. But much will depend on what follows.

Many had compared the meet to the 1945 Yalta Conference, when Russian leader Joseph Stalin, U.S. President Franklin D. Roosevelt and British Prime Minister Winston Churchill met to discuss the future of post-War Europe. But Shenzhen was not a summit of the victors of a major war. This was more about three great powers setting terms of engagement in a changing world. The summit failed to achieve any breakthrough on any of the issues on the agenda – nuclear arms reduction, non-proliferation or the Ukraine war – or even offer a road map for the future. Moreover, it is not clear if the Shenzhen spirit could be sustained in the medium to long-term as another President in the U.S. could take a very different approach towards Russia and China. The three leaders have called for reform of the UN. While it is a welcome move, any attempt to reform the international system and institutions must also involve other powers, particularly rising middle powers such as India, South Africa and Brazil. But the Shenzhen framework could bring greater stability and predictability to great-power relations. This is important given that two of the Big Three are currently waging two separate wars. The leaders should draw up a clear road map for nuclear talks and other key issues outlined in the Shenzhen declaration, with realistic and achievable objectives. Otherwise, the summit would amount to little more than another diplomatic photo-op.

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India's civilisational gambit in China's backyard



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There are buildings which hold memories that run deeper than those of the people walking within them. The Purana Qila is one of them. The walls of the Purana Qila were built by Sher Shah Suri during the 16th century, and as per tradition and substantial archaeological evidence, the ancient city of Indraprastha can be found under it. And now, beginning November 20, the Ministers of culture of the Shanghai Cooperation Organisation (SCO), along with dialogue partners from over 25 countries, have gathered within the walls of the Purana Qila for the first Civilisational Dialogue Forum of the SCO. The idea was proposed by Prime Minister Narendra Modi during his visit to Tianjin in 2025, and is being conducted by the Ministry of Culture along with the Ministry of External Affairs.

If one wants to have a better sense of why India wants to host such a forum, one needs to realise that the term 'civilisation' has become a contested territory in international politics. In the two decades since the end of the Cold War, the West had a monopoly over the language of universal principles such as democracy, markets and human rights. While the language was meant to be universally applicable, it implicitly belonged to those who had written the textbooks.

Emerging powers while not rejecting the language, have relativised it. Beijing, for example, moved quickly to institutionalise it. Xi Jinping unveiled the Global Civilization Initiative in 2023. One year later, the UN General Assembly, on a Chinese initiative, designated June 10 as the International Day for Dialogue among Civilizations. In association with the 2023 initiative, China also organised a Ministerial-level meeting of the Global Civilizations Dialogue in July 2025, while the Nishan Forum on World Civilizations launched its 12th edition in September 2026 with the theme 'Civilization, Order, and Justice' at the birthplace of Confucius. Even the Internet conference at Wuzhen this month featured a sub-forum dedicated to civilisation. Clearly, China is not just experimenting in this area; it is developing a franchise which signals a much-recycled message – that modernity has many addresses.

India's rebranding within the SCO

India has viewed these developments with the look of a man who has found someone selling his family silver at the fair. After all, India has the better claim of being the centre of civilisation than many of the current claimants vying for the position. The conference in Delhi is India's attempt to set up its own stall in an organisation that has its secretariat in Beijing. It also fits a pattern of agenda-setting, with the AI Impact Summit earlier this year and the BRICS chairmanship now.

The behaviour of a great power is driven more by what it believes about itself than by what it states as its objective. There are three objectives of India here, and only one is explicitly stated: soft connectivity, which includes Buddhist circuits, Sufi lineages and the trade routes that ran from Taxila to Samarkand much before anyone drew maps.

The other objective is to achieve authorship within the SCO. India has never been a comfortable guest in the SCO household. It rejects the Belt and Road Initiative; has a dispute with Pakistan at almost every conference; and even though it has been trying to normalise ties with China since 2024, it cannot shake off the bitter taste of Galwan. A flagship project by India gives it something more valuable than just a veto – a brand name. It lets India highlight that the SCO is not just China's platform but one which India also helps shape.

The third goal, which is least discussed, is to establish that civilisational depth and democratic pluralism are not at odds. China's civilisational argument implies that ancient continuity justifies centralised order. India counters this by arguing that its continuity has been plural, argumentative and layered from the very beginning; proof can be found in the Purana Qila itself.

Moreover, this event is in complete conformity with India's foreign policy. But this can also be a weakness. Multi-alignment is not just non-alignment with a fresh coat of paint. It is the art of belonging to all relevant clubs without giving the key to any one of them. In September, India hosted the BRICS summit. On November 9, India and the European Union held their seventh Strategic Partnership Review in Delhi, just after concluding talks regarding India's membership in Horizon Europe, the EU's flagship research program. On November 17, India participated in the Quad Leaders' Summit in Manila.

The real currency of soft power

The West holds no rival meeting of civilisations. Nonetheless, a Huntingtonian frame of reference is increasingly creeping into Western debates on migration and identity, suggesting that the contrast is beginning to fade. By temperament, the West approaches diplomacy, not in civilisational terms, but in technological, commercial and regulatory ones. Rulebooks on AI, chips and carbon borders are its civilisational statements. India's counterweight to the SCO stage is therefore not a copycat event but one which moves on a parallel track: semiconductors with Brussels, supply chains with Washington and Tokyo, and maritime security through the Quad. Each track hedges the others.

China will also benefit from the Delhi forum. Every forum that sees the world in terms of civilisations strengthens China's argument that universal standards of conduct are simply a Western imposition. A Delhi forum, hosted by a democracy, makes that claim look less like China's self-serving argument and more like an Asian consensus. The risk is that Delhi's democratic legitimacy could become the wrapper for Beijing's content. China will bring its five thousand years of history, its Silk Route and finally, its claim to Buddhism, which matters for the succession of the Dalai Lama.

While it would flatter New Delhi to call this a clever move to outflank China, it would also be an undersell to call it mere pageantry. What is unfolding is a contest over words rather than territory. India can never out-spend China in Central Asia. But it can deny Beijing a monopoly over the term 'civilisation' in the diplomatic language of Eurasia. This may sound like a small objective, but it is a realistic one. And in statecraft, realistic aims usually succeed more often than grand ones. Agenda-setting, not attendance, is the real currency of soft power.

An inclusive alternative

States often become hostage to the language they choose. The civilisational argument carries a danger in that it is often seen by critics as a favourite alibi of authoritarian regimes. India must be careful not to lend its democratic credibility to a language that such regimes use to justify repression.

As the session unfolds, the effectiveness of the forum will not depend on its declarations, but on the nature of the Asia that India wants to build. Multipolarity does not mean inclusivity because rival claims of antiquity can breed more conflict.

New Delhi's success lies in constructing an Asian identity where China could participate without dominating, and India becomes the bridge between the Global South, the West and Central Asia.

Purana Qila is older than any dynasty that called it home. The lesson from this is that civilisations derive their strength from embracing and absorbing; not by claims that they are better than others. For Beijing, civilisation is not a shared inheritance but a claim of ownership. If India uses the forum to show the inclusive alternative, it will have won something that China cannot copy. If instead India uses the forum to prove that it is older than its competitors, it walks straight into Beijing's trap.

New Delhi's success lies in constructing an Asian identity where China could participate without dominating, and India becomes the bridge between the Global South, the West and Central Asia

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After Shenzhen: how India can forge a fourth pole



Raja Karthikeya

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After leaders of the U.S., China and Russia met for an unprecedented trilateral in Shenzhen on November 19, a Chinese proposal suggested that the new world order be called the "Shenzhen International System". Whether or not the name sticks, it's clear that these three nations now regard each other as the only powers that matter in the world.

For decades, whenever Indians spoke of the desirability of a "multipolar order", they implicitly assumed that India would be a pole. But nothing is pre-determined in history, and we cannot take it for granted that our rise is inevitable. India, which comprises one-sixth of humanity and is legatee to a rich civilisation, is certainly deserving of great power status. But this is a status that has to be achieved, and is not granted. India need not wait for others to recognise its worth. It also should not presume that its heritage privileges it to claim the role of a *Vishwaguru*. What India can be, however, is the friend that others are willing to be led by.

The question then is how. India's economic reality which is defined by unsatisfactory per capita income and deepening inequality will mean that it will take a long time for it to stake a claim as an economic power. And until the country achieves complete self-reliance in arms manufacturing, its military might will also remain incomplete. However, this does not mean that we've hit a dead-end. Just as we advanced the non-alignment movement, India can take creative pathways in forging a 'fourth pole'.

An action plan

First, India should lead in declaring that a truly multi-polar order won't be just "tri-polar"; there will be a "fourth pole". However, the fourth pole will be "not one country, but a collective of nations". It should be a collective that will not compromise on sovereignty; that will not give in to expansionism; and whose member nations are unwilling to adhere to decisions that they are not consulted on. India is after all not the only country that is striving for "strategic autonomy" in an uncertain world. From Tokyo to Taipei, from Rabat to Riyadh, from Kyiv to Berlin, from Yaounde to Manila, from Copenhagen to Brasilia – there now exist similar fears, hopes and a quest to secure peace while preserving sovereignty and independence of action. Securing such unity will be a test of India's statesmanship.

Groupings such as G20 and BRICS may be helpful in building networks of trust in an uncertain world but cannot replace the legitimacy of multilateral forums

Second, India needs to rewire its diplomacy to squarely address the conflicts in today's world that have consumed nearly half a million lives in the last five years alone, and which have rendered supply chains and capital markets vulnerable. Launching a "diplomacy of conscience", India should take a strong stand against mass civilian casualties including ethnic cleansing and crimes against humanity. An instance such as the 2024 ethnic cleansing in Nagorno-Karabakh should never be allowed to recur on our watch. The civil wars in Sudan and Yemen that are threatening regional stability are a concern for all.

India will need to position itself as a mediator and facilitator. The recent moves by New Delhi to mediate on Ukraine are welcome, but a "diplomacy of conscience" would require that the country puts the protection of civilians at the very heart of its mediation.

Enhancing the multilateral system

Third, groupings such as G20 and BRICS may be helpful in building networks of trust in an uncertain world but cannot replace the legitimacy of multilateral forums. India needs to rebuild its presence in the multilateral system. It can do so, for instance, by becoming the host country for significant UN and allied multilateral agencies. Embracing the spirit of multilateralism requires us to eschew short-term gains for long-term friendship. India is currently fighting for an elected Security Council seat for 2028-29 against Tajikistan (which is trying to enter the Council for the first time). India could consider the reputational benefits it will achieve among nations of the Global South by bowing out of the race this time in favour of Tajikistan.

Similarly, in the ongoing race for the election of the next UN Secretary-General, India could help rally the elected members of the Security Council around a candidate from Latin America, whose rightful turn it is for the post.

Fourth, the fourth pole of a new world order would need to step away from the cynical transactionalism of today's world and stem the irreverent dismantling of international law. India should lead the collective of nations in signing and ratifying key instruments of international law including human rights conventions such as the Convention Against Torture and the Refugee Convention.

Need to stand firm

Fifth, India cannot afford a post-Shenzhen world order in which the three "foremost nuclear-armed powers" – as the international media describes them – become the only powers to preserve their strategic weapons or become the sole arbiters of international security on the basis of their large arsenals. It should be conceivable for like-minded nuclear powers in the collective to devise common rules on strategic arsenal growth, and perhaps even create a joint nuclear umbrella.

A new world order is emerging, but nations that were not at Shenzhen need not resign themselves to taking orders. India can and should lead in making the fourth pole a reality.

Views are personal

GS 3: INDIAN ECONOMY
INDIAN EXPRESS PAGE: 12

Both government and industry have to catch up

PRIME MINISTER Narendra Modi has questioned India Inc for not passing on the benefits of improved ease of doing business and lower tax rates to the general public. Addressing FICCI, the PM said the government had been bold enough to raise income tax exemption to Rs 12 lakh per annum and cut the corporate tax rate from 30 per cent to 22 per cent. But, he lamented, Indian companies did not respond in the same spirit. "Did you increase the salaries of your employees? Did you increase the number of employees? No. The attitude remains: 'Modi *ji*, you do it, we will see,'" he said. He criticised industry for not planning and strategising for the long term, with a view to doing their bit towards making India a developed country by 2047. He pointed out that Indian firms do not make an effort to capture global markets by studying changing export demand trends nor do enough in terms of taking advantage of the several free trade agreements (FTAs) signed by the government.

This is not the first time the government has expressed its dissatisfaction over private investments not picking up and wages remaining stagnant. In September 2022, Finance Minister Nirmala Sitharaman had likened India Inc to Hanuman who is unaware of his own strength. She had complained that despite the government cutting tax rates and giving generous Production Linked Incentives, domestic firms chose to sit on the sidelines. Similarly, in the Economic Survey of 2025, the Chief Economic Advisor pointed out that while corporate profits were at a 15-year high, growth in wages hadn't kept pace. There are several reasons India Inc should reflect on how it can build on its productivity and efficiency to target newer markets and expand the business; how it can increase capacity, grow the topline and generate higher profits by taking advantage of the improved policy environment, lower tax rates or new FTAs.

It is also a fact, however, that firms are faced with weak consumer demand. The supply disruption during the pandemic, the Trump tariffs, and the different wars have kept the global economic environment uncertain over the last five years. But nobody knows this better than PM Modi, who as Gujarat chief minister cut red tape and went the extra mile to attract industry and investment. Both the Centre and states need to pursue deeper reforms and deregulation, provide certainty in policy, and create infrastructure to attract global capital. There is a lot of catching up to do.

GS 3: ENERGY & ENVIRONMENT
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The green transition is a strategic frontier



AJAI MALHOTRA

INDIAN STRATEGIC debate has long fixated on traditional power vectors such as troop movements, advanced fighter jet acquisition and strengthening blue-water naval capabilities. An equally consequential shift is unfolding: The transition from fossil fuels to clean energy is creating new centres of industrial and strategic power, with China at the forefront.

India's November 10 ban on exports of lithium-ion battery black mass, recovered from spent batteries and containing lithium, cobalt, nickel and manganese, is more than a recycling measure. It aims to retain it for domestic refining. Days earlier, the Union cabinet approved a Rs 2,884-crore scheme for four domestic lithium and nickel processing plants. Both decisions recognise that advantage will belong to countries able to turn critical minerals into the materials of the future.

China controls 82 per cent of global solar-module manufacturing capacity, 91 per cent of solar cells and 95 per cent of wafers, around 80 per cent of lithium-ion battery capacity and over 70 per cent of cobalt and lithium processing. This dominance reflects decades of state-directed industrial policy and extends to inverters, grid equipment and energy-storage systems. Beijing's proposed export curbs on advanced photovoltaic technologies, including silicon-wafer manufacturing, show how technology control becomes economic coercion.

Where does this leave India? Production Linked Incentive (PLI) schemes promote domestic solar-module and advanced chemistry cells, but its green transition remains structurally dependent on Chinese imports. Solar-module capacity far outstrips domestic solar-cell and wafer production. Its electric-vehicle and battery industries also depend on Chinese cells, components and critical-mineral processing. This vulnerability cannot be fixed by diplomacy alone. Neither Quad cooperation nor security ties with the US can substitute for domestic technological and manufacturing capabilities.

India must complement its traditional security approach with a proactive, state-backed industrial strategy. This does not mean autarky or manufacturing every component domestically. Strategic autonomy requires building capabilities in critical segments and diversifying supply sources. Action is needed on several fronts.

First, the PLI schemes are commendable but insufficient. Gaps persist in upstream production and domestic value addition, requiring sustained investment in chemistry, metallurgy and materials science. The new capital-support scheme targets these gaps; its success will depend on timely commissioning, mineral feedstock access and domestic technological expertise. Second, India's missions in the Global South must pursue long-term partnerships and investment and secure access to critical minerals. The National Critical Mineral Mission (2025) and Khanij Bidesh India Limited (KABIL) are important steps, though KABIL's five lithium brine blocks in Argentina remain at the exploration stage. From Chile and Argentina to the DRC, Indonesia, Zambia and Zimbabwe, resource-rich countries increasingly seek greater value from their minerals. India should partner in processing and manufacturing, not simply extract raw materials.

Third, India must pursue "technological multi-alignment", developing next-generation alternatives such as sodium-ion batteries, green hydrogen and solid-state batteries, alongside lithium-based ones. Technological leadership requires translating research into viable production at scale, backed by patient capital, industry-academia partnerships, skilled manpower and predictable domestic demand, including through public procurement. Fourth, India must scale up the recycling of batteries, solar panels and e-waste to recover critical minerals and build refining capacity. Finally, cooperation with technologically advanced partners on research, manufacturing and common standards shaping the rules governing green technologies is essential.

The Ukraine crisis showed how pipelines that brought prosperity to Western Europe became sources of vulnerability. Without a resilient cleantech ecosystem, India risks exchanging dependence on West Asian oil for a deeper dependence on Chinese supply chains. Sovereignty in the 21st century will not rest solely on military muscle. Loosening China's grip on the critical-mineral and clean-tech supply chains underpinning India's green transition is crucial to its strategic autonomy.

The writer is distinguished fellow emeritus, TERI, and a retired diplomat

India's green transition remains structurally dependent on Chinese imports. Its EV and battery industries also depend on Chinese cells, components and critical-mineral processing

GS 3: SCIENCE & TECHNOLOGY
INDIAN EXPRESS PAGE: 13



Anthropic shows that AI is about national power

SHOBHANKITA REDDY

ON NOVEMBER 19, Anthropic, the maker of Claude models, listed on Nasdaq in a record IPO that raised $81 billion at a valuation of about $1.5 trillion. While headlines will dwell on the numbers, two developments around the listing deserve attention. First, the timing. Just two weeks earlier, 56 per cent of surveyed voters post the US midterms said data centres were a crucial factor in their vote, with 76 per cent reporting that they would oppose a new buildout in their community. Anthropic has in the past committed to absorbing power price hikes and tried to quell apprehensions about environmental damage.

Second, in March, the US Department of War designated Anthropic a "supply-chain risk" — a label previously reserved for foreign adversaries — when it refused to blur its red lines, like the deployment of its models for mass domestic surveillance and fully autonomous weapons. The company still carries this label, but that doesn't seem to have affected its civilian prospects, as its filings indicate. Reportedly, several federal agencies are also working around the ban to test its models. The company, on its part, has since attempted to repair relations with the White House through closed-door diplomatic meetings. In June, it suspended the release of Fable and Mythos worldwide in an attempt to comply with the government's mandate to block foreign citizens from accessing these models.

Taken together, both developments show the same shift in technology geopolitics. Private technology firms and their national governments are becoming more closely aligned. We are now firmly in an era in which technology is treated as a pillar of national power. Governments are willing to step in and reshape private firms' interests and incentives. Meanwhile, firms are becoming geopolitical actors in their own right, absorbing the state's mandates and carrying its strategic priorities into global markets.

> Anthropic's revenue is growing fast, but still dwarfs the roughly $518 billion in compute the company has committed over the next decade. About 80 per cent is non-cancellable and payable regardless of usage

Anthropic's messaging reflects this. In its S-1 prospectus, it devoted roughly 90 pages to "risk factors", including doomsday warnings that its AI systems could pose "catastrophic or existential risks to humanity". Its CEO has gone further, likening the export of advanced AI chips to China to "selling nuclear weapons to North Korea". It has taken a hawkish stance on China. Presenting frontier AI as an existential threat and a national-security asset while positioning itself as the industry's responsible steward is self-serving at best. Given that these firms are so important and closely tied to the US administration, this posture could shape US policy towards export controls and have implications for the rest of the world, especially with the resignation of Jensen Huang, a key voice advocating for the sale of chips to China.

The pull towards the state is strongest for AI model companies because of a structural weakness in their business models. Anthropic's revenue is growing fast, but is still dwarfed by the roughly $518 billion in compute the company has committed over the next decade. About 80 per cent is non-cancellable and payable regardless of usage. Demand is far less certain, and many of its largest customers, who accounted for nearly a quarter of its 2025 revenue, have no long-term contracts. A firm with fragile financials is likely to find its interests drifting, almost naturally, towards those of the state, which can offer stable contracts, energy and permits, protection from rivals and a regulatory moat.

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GS 3: ENVIRONMENT & AGRICULTURE
INDIAN EXPRESS PAGE: 17

• ENVIRONMENT

Stubble burning: Farm fire count is not enough

Experts suggest that mapping burnt areas, rather than active fires alone, could help measure incidents of stubble burning more accurately



SOPHIYA MATHEW



A labourer burns paddy stubble in a field at a village in Patiala, Punjab. HARMEET SODHI

SATELLITES HAVE recorded 16,070 farm-fire incidents across northern India so far this *kharif* (monsoon) harvesting season. The actual scale of stubble burning, however, could be higher.

At a high-level inter-ministerial review last month, the Centre acknowledged gaps in satellite-based monitoring and directed district authorities to intensify ground patrols after 3 pm, when satellite observations are mostly unavailable. Meanwhile, there is still no consensus on a standardised method to measure the total area affected by stubble burning.

How fires are tracked

During the post-monsoon period, the narrow 10-to-20-day turnaround window (generally from October to mid-November) between paddy harvesting and wheat sowing prompts farmers to burn crop residue, severely degrading air quality across the Indo-Gangetic Plain. In peak season, stubble burning can contribute as much as more than 30% of Delhi's PM2.5, data by the Indian Institute of Tropical Meteorology (IITM) shows.

To monitor farm fires, India relies on daily thermal-anomaly observations (significant deviations in a particular area's average temperature) captured by sensors aboard polar-orbiting satellites such as Suomi-NPP, Aqua and Terra, operated by NASA and the US's National Oceanic and Atmospheric Administration. These satellites detect fires active only during fixed satellite overpass windows primarily between 10.30 am and 1.30 pm. So, fires lit in the late afternoon or evening hours risk going undetected.

For instance, the Suomi-NPP satellite, equipped with the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor, passes over the region at around 1.30 pm. Meanwhile, the Aqua satellite, carrying the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor, has seen its overpass shift from 1.30 pm to now around 4 pm, allowing it to capture some later fires.

The resultant data of fire counts is fed into estimates of emissions from crop-residue burning, which the IITM uses in air-quality assessments and forecasts for Delhi-NCR. So, their accuracy has implications not only for estimating the pollution burden but also over policy decisions — this includes the imposition of a Graded Response Action Plan, a set of progressively stricter emergency measures taken to control air pollution when air quality worsens.

What satellites miss

A November 2025 study by ISRO's Space Applications Centre, Ahmedabad, documented a shift in peak farm-burning activity towards late afternoon and evening hours in Punjab and Haryana.

Hiren Jethva, senior research scientist at Morgan State University and the NASA Goddard Space Flight Center, told *The Indian Express* that this shift meant that data from conventional polar-orbiting satellites was inadequate to map actual burning.

"Since most agencies rely on Suomi-NPP/VIIRS active fire detection products, the estimates of fire statistics derived from VIIRS is inadequate in capturing the near-totality of fire incidences in Punjab," Jethva said. Active fire detection products are datasets processed from the infrared imagery captured by sensors.

A 2019 study by researchers affiliated with Columbia University found that the MODIS active-fire product missed more than 90% of fires in northwest India, which it partly attributed to their small size and short duration, which could occur between satellite overpasses. Partial burning, common in parts of Haryana, posed another challenge owing to weaker thermal signals.

Using data from a South Korean satellite, Jethva in a 2026 study published in the journal *Remote Sensing* found a sharp spike in farm fires around and after 4 pm — a trend gradually building since 2022 and turning into a new fire regime since the last two years. The study found that aerosol pollution over the Indo-Gangetic Plain rose between 2022 and 2025, even as official satellite fire counts fell.

Another challenge remains cloud cover, which the Indian Agricultural Research Institute has routinely flagged as obstructing satellite observations.

Fewer fires, more burnt area

After the inter-ministerial review in October, the Centre asked District Collectors to undertake ground assessments and strengthen enforcement after 3 pm. Past assessments have underscored the need for both tools, rather than fire counts alone.

The non-profit IFOREST found that Haryana's recorded farm-fire incidents fell from 1,406 in 2024 to 662 in 2025, while its satellite-derived estimate of burnt area (BA) increased from 7,117 sq km to 8,812 sq km. In Punjab, incidents declined from 10,909 to 5,114 over the same period, but estimated BA fell by a much smaller proportion, from 23,262 sq km to 19,757 sq km.

Burnt-area mapping

While active-fire monitoring identifies thermal anomalies at the time of a satellite's observation, BA mapping detects changes to the land surface left behind after a fire. Stubble burning alters the way the ground reflects sunlight, so researchers compare satellite images taken before and after a suspected fire to identify changes.

Professor Emilio Chuvieco, a specialist in satellite remote sensing and wildfire monitoring at the University of Alcalá in Spain, said BA mapping provides a more accurate measure of the total land affected.

"Active fires are only detected at the satellite overpass, therefore small and/or lower intensity fires may be missed. BA signal is weaker but lasts longer," he said.

The European Space Agency's Sentinel-2 satellites, currently being used in BA mapping exercises for internal assessments in India, revisit an area every five days.

Yet identifying burnt agricultural land presents its own challenges. Chuvieco said that crop-residue fires are generally smaller and less intense than wildfires, making them difficult to detect for most sensors.

Also, harvesting causes changes to the land that can make it difficult for sensors to distinguish them from burnt patches.

The short interval between harvesting and the next sowing season adds to the difficulty. Burn scars can change as fields are cleared, ploughed or prepared for the next crop, while cloud cover and haze can reduce the availability of usable satellite images.

Chuvieco said satellite-derived BA maps are regularly compared with higher-resolution imagery to assess their accuracy.

How data is used

The data of farm fire counts is fed into estimates of emissions from stubble burning and then used to make air-quality assessments and forecasts for Delhi-NCR.

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Their accuracy impacts policy decisions, such as imposing a Graded Response Action Plan.