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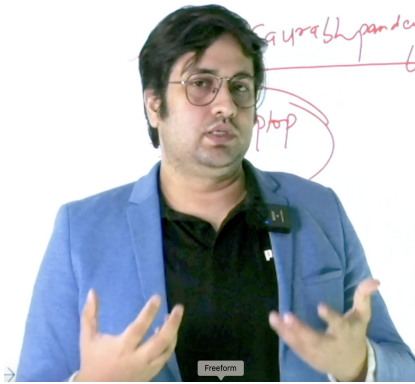
- → 75th Anniversary of the Indian Constitution
- Major Atmospheric Cherenkov Experiment (MACE) Telescope
- ISRO's Satellite Data Evaluation for Farm Fire Detection
- MAINS



By saurabh Pandey

THE HINDU

Target Mains -2025/26 -

Q Constitution is the living document which can be amended as per the need of the society . Explain

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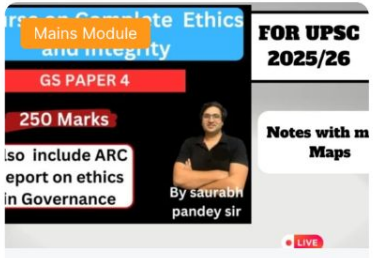

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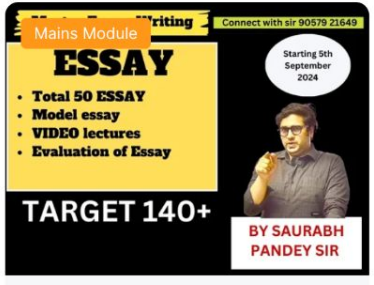

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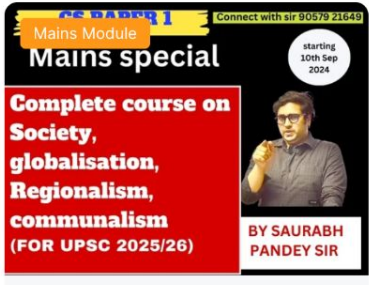

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‘Secular, socialist’ are an inalienable part of the Constitution, to stay in Preamble, orders SC

Krishnadas Rajagopal
NEW DELHI

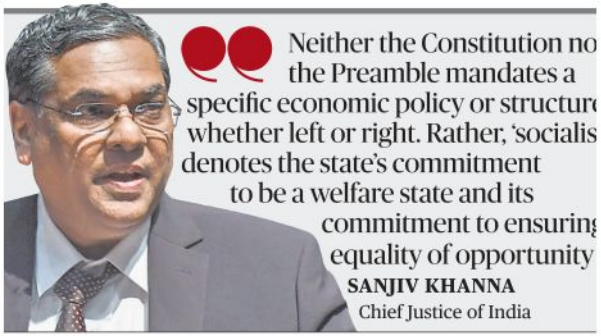
“The word ‘secular’ denotes a Republic that upholds equal respect for all religions. ‘Socialist’ represents a Republic dedicated to eliminating all forms of exploitation—whether social, political, or economic,” a Bench of Chief Justice Sanjiv Khanna and Justice Sanjay Kumar interpreted.

The order was based on a batch of petitions filed in 2020, challenging the validity of the inclusion of ‘socialist’ and ‘secular’ in the Preamble through the 42nd Constitution Amendment in 1976. The petitioners, who included BJP leader Subramanian Swamy, argued that the insertions made with retrospective effect, that is from the date of adoption of the Constitution by the Constituent Assembly on November 26, 1949, amounted to a fraud on the Constitution. Besides, they argued that the word ‘secular’ was deliberately eschewed by the Constituent Assembly and the word ‘socialist’ fettered the economic policy choice of the elected government, which represents the will of the people.

The apex court, in its seven-page order, said the case was not worth a detailed adjudication as the flaws in the petitioners’ arguments were manifest. Besides, the court found the motives of the petitions, filed nearly 44 years after such an insertion, “questionable”.

The court held that the Preamble was an inalienable part of the Constitution. Parliament had an unquestionable power to amend the Constitution under Article 368.

Its amending extended to the Preamble. The court



confirmed the retrospective amendment to the Preamble, saying the date of adoption would not curtail the power under Article 368.

The court explained that the Constitution was a ‘living document’, and open to changes according to the needs of the time.

Though the Constituent Assembly was not sure about what ‘secularism’ should entail in India, the court said, over time, the nation has developed its own interpretation of the term, which has become a basic feature of the Constitution.

“Over time, India has developed its own interpretation of secularism, wherein the State neither supports any religion nor penalises the profession and practice of any faith. This principle is enshrined in Articles 14, 15, and 16 of the Constitution, which prohibit discrimination against citizens on religious grounds while guaranteeing equal protection of laws and equal opportunity in public employment,” the Supreme Court observed.

The court said the Preamble’s original tenets of equality of status and opportunity, fraternity, dignity and liberty reflect the secular ethos of the Constitution.

The apex court clarified that ‘socialism’ in the Indian context meant the commitment to function as a welfare state.

“Neither the Constitution nor the Preamble mandates a specific economic policy or structure, whether left or right. Rather, ‘socialist’ denotes the state’s commitment to be a welfare state and its commitment to ensuring equality of opportunity. India has consistently embraced a mixed economy model, where the private sector has flourished, expanded, and grown over the years,” the apex court highlighted.

Topic →Supreme Court's Interpretation of Secularism and Socialism in India

Key Aspects of the Supreme Court's Ruling

🏛️ Secularism Defined: The term 'secular' in the Republic signifies equal respect for all religions, as interpreted by the Supreme Court.

⚖️ Socialism Explained: 'Socialist' refers to a commitment to eliminate all forms of exploitation—social, political, or economic.

📜 Constitutional Amendment Challenge: The Supreme Court addressed petitions from 2020 challenging the inclusion of 'socialist' and 'secular' in the Preamble via the 42nd Amendment in 1976.

⏳ Retrospective Effect Controversy: Petitioners argued that the amendments had retrospective effects, which they claimed was a fraud on the Constitution.

🏛️ Court's Ruling: The Supreme Court ruled that the Preamble is an inalienable part of the Constitution and that Parliament has the power to amend it under Article 368.

📈 Living Document: The Constitution is described as a 'living document' that can evolve with the needs of society over time.

🌍 Welfare State Commitment: The court clarified that 'socialism' in India signifies a commitment to being a welfare state, ensuring equality of opportunity without mandating a specific economic policy.

Summary: The Supreme Court upheld the inclusion of 'socialist' and 'secular' in the Constitution's Preamble, affirming the Parliament's power to amend it and defining these terms in the context of Indian governance.

The Constitution still thrives, let it show India the way

Shashi Tharoor

a fourth-term Indian National Congress Member of the Lok Sabha for Thiruvananthapuram, and the award-winning author of 26 books, including 'The Battle of Belonging: On Nationalism, Patriotism and What it Means to be Indian' (2021). He is a member of the Congress Working Committee

This month marks the 75th anniversary of the adoption by the Constituent Assembly of the draft Constitution of India, on November 26, 1949. The Union government has announced that it intends to commemorate this momentous occasion with a special joint sitting of Parliament. There are bound to be several self-congratulatory speeches, from all sides of our fractious political divide. But the speech that should haunt us all is that of the principal draftsman of the Constitution, B.R. Ambedkar, on the eve of the Constitution's adoption. On November 25, 1949, in his magisterial summation of the work of the Drafting Committee he chaired, and before commending its work to the Assembly, he pointedly observed: "however good a Constitution may be, it is sure to turn out bad because those who are called to work it, happen to be a bad lot. However bad a Constitution may be, it may turn out to be good if those who are called to work it, happen to be a good lot."

The working of the Constitution, Dr. Ambedkar pointed out, depended on how the people and the political parties applied it. The drafters had made provision for relatively easy amendment, so as to permit the document to keep up with the needs of the times. But the rest depended on the way successive generations of its custodians chose to implement it.

The lacunae that B.R. Ambedkar identified

Dr. Ambedkar highlighted the fact that "there is complete absence of two things in Indian society" – equality and fraternity. "On the 26th of January 1950," he declared, "we are going to enter into a life of contradictions. In politics we will have equality and in social and economic life we will have inequality. In politics we will be recognizing the principle of one man one vote and one vote one value. In our social and economic life, we shall, by reason of our social and economic structure, continue to deny the principle of one man one value. How long shall we continue to live this life of contradictions? How long shall we continue to deny equality in our social and economic life?"

In calling for a social and not merely political democracy to emerge from the Constitution, Dr. Ambedkar stressed the absence of fraternity as the second major ingredient that was missing in India. "Fraternity means a sense of common brotherhood of all Indians – of Indians being one people. It is the principle which gives unity and solidarity to social life." But thanks to the caste system – the entire structure of caste, he averred, was 'anti-national' – religious divisions and the absence of a common sense of nationhood among some Indians, fraternity had not yet been achieved. But it was indispensable, since liberty, equality and fraternity were all intertwined and could not flourish independently of one another. "Without equality," he pointed out, "liberty would produce the supremacy of the few over the many. Equality without liberty would kill individual initiative. Without fraternity, liberty would produce the supremacy of the few over the many. Without fraternity, liberty and equality could not become a natural course of things. It would require a constable to enforce them."

What has changed

Today, 75 years later, it is well worth asking what progress we have made to achieve the aims of the Constitution's drafters, and in particular to fill the lacunae that Dr. Ambedkar identified. Equality has advanced, no doubt, with the abolition of untouchability being accompanied by the world's oldest and farthest-reaching affirmative action programme, in the form of reservations, initially for Scheduled Castes and then for the Other Backward Classes (OBC). These reservations, which were initially intended to be temporary, have now been entrenched in our system and may be said to be politically unchallengeable. But the task of promoting social and economic equality, which Dr. Ambedkar pointed to, is far from complete. The clamour for further opportunities for those who believe that Indian society continues to deny them the equality of outcomes that the numbers warrant, continues to roil our politics. The escalating demand for a caste census is bound to have further implications for the evolution of India's constitutional practice.

As for fraternity, the mobilisation of votes in our contentious democracy in the name of caste, creed, region and language have ensured that the social and psychological sense of oneness that Dr. Ambedkar spoke about, is still, at best, a work in progress. But there is no doubt that the sense of nationhood that he felt had not yet come into existence has now become embedded across the country. One only needs to look at the crowds at a cricket match involving the Indian team, or the national outrage and mourning after an international conflict such as the Kargil war (1999) or the Galwan incident (2020), to be aware that there is a strong sense of nationhood despite the persistence of local or sectarian identities.

Yet, by reifying caste reservations, India has promoted equality but arguably undermined fraternity. Fraternity had a special place in Dr. Ambedkar's vision; the word was, in many ways, his distinctive contribution to India's constitutional discourse. It also had an economic dimension, with the implicit idea that the assets of the better-off would be used to uplift the untouchables and other unfortunates. Fraternity would both result from and lead to the erosion of social and caste hierarchies. But, as the sociologist Dipankar Gupta has argued, the extension of reservations to the OBCs saw caste as 'an important political resource to be plumbed in perpetuity'. Professor Gupta avers that this 'is not in the spirit of enlarging fraternity, as the Ambedkar proposals are'; while Dr. Ambedkar's ultimate aim was the annihilation of caste from Indian society, for Mandal, caste was not to be "removed", but to be "represented".' It entrenched caste rather than eliminating it from public life.

Highs and worrying lows

This debate may well go on. Still, we can be grateful that the ascent to power of the very elements of Indian politics who had initially rejected the Constitution has not resulted in its abandonment. There is a certain irony to a Bharatiya Janata Party government celebrating a document that its forebears in the Rashtriya Swayamsevak Sangh and the Jana Sangh had found "un-Indian" and devoid of soul. That soul has evolved over 75 years and 106 amendments, and the Constitution still thrives. But the hollowing out of many of the institutions created by the Constitution, the diminishing of Parliament, pressures on the judiciary and the undermining of the democratic spirit – leading to the V-Dem Institute labelling India as an "electoral autocracy", policed by the "constable" Dr. Ambedkar warned against – mean that much still remains to be done by its custodians.

"Independence," Dr. Ambedkar said in concluding his memorable speech, "is no doubt a matter of joy. But let us not forget that this independence has thrown on us great responsibilities. By independence, we have lost the excuse of blaming the British for anything going wrong. If hereafter things go wrong, we will have nobody to blame except ourselves." Seventy-five years later, let us vow to the reduce the number of things we need to blame ourselves for – and let the Constitution show us the way.

But a speech that should haunt all Indians is that of its principal draftsman on the eve of the Constitution's adoption — on people and political parties making it work

Topic → 75th Anniversary of the Indian Constitution

Key Highlights

📅 75th Anniversary: November 26, 2023, marks the 75th anniversary of the adoption of the Indian Constitution by the Constituent Assembly in 1949.
🏛️ Parliament Commemoration: The Union government plans a special joint sitting of Parliament to commemorate this significant occasion.
🗣️ B.R. Ambedkar's Warning: B.R. Ambedkar, the principal draftsman of the Constitution, cautioned that the effectiveness of a Constitution depends on the character of those who implement it.
⚖️ Call for Equality and Fraternity: Ambedkar highlighted the absence of equality and fraternity in Indian society, emphasizing the contradictions between political equality and social/economic inequality.

🤝 Need for Social Democracy: He advocated for a social democracy that encompasses fraternity, which he deemed essential for unity and solidarity among Indians.

🚫 Caste System's Impact: Ambedkar criticized the caste system and religious divisions as barriers to achieving fraternity and a sense of nationhood.

🔗 Interconnected Principles: He argued that liberty, equality, and fraternity are interdependent; without one, the others cannot thrive.

75 Years of Progress in India

Key Developments and Challenges

📜 75 Years of Progress: Reflects on advancements since the Constitution's drafting, focusing on equality and social justice.

✊ Abolition of Untouchability: A major achievement, bolstered by affirmative action like reservations for Scheduled Castes and Other Backward Classes (OBC).

🔄 Reservations as a Permanent Fixture: Initially temporary, caste-based reservations have become deeply rooted and politically unassailable in India.

📊 Demand for Caste Census: Rising calls for a caste census could influence India's constitutional practices and efforts toward social and economic equality.

🤝 Fraternity and National Identity: Despite a developing sense of nationhood, the ideal of fraternity, as envisioned by Dr. Ambedkar, is still evolving, often overshadowed by caste and regional identities.

⚖️ Caste as a Political Resource: Extending reservations to OBCs has entrenched caste in politics, opposing Ambedkar's vision of eradicating caste.

🏛️ Ambedkar's Vision vs. Current Reality: Contrasts Dr. Ambedkar's goal of eliminating caste with today's political landscape, where caste is represented rather than abolished.

📜 The Indian Constitution has survived despite initial rejection by some political elements, particularly the Bharatiya Janata Party's predecessors.
🎉 The Constitution has evolved over 75 years and undergone 106 amendments, indicating its adaptability and resilience.
⚖️ There are concerns about the erosion of constitutional institutions, including a diminishing Parliament and pressures on the judiciary.
🚨 The V-Dem Institute has classified India as an "electoral autocracy," highlighting issues with democratic governance.
🗣️ Dr. B.R. Ambedkar emphasized the responsibilities that come with independence, urging citizens to take accountability for the nation's issues.
🤝 The text calls for a collective commitment to uphold the Constitution and reduce self-blame for national problems.
🔍 The ongoing debate about the state of Indian democracy and the Constitution's role remains significant.

Summary: The Indian Constitution, despite historical rejection and current challenges, remains vital for democracy, urging citizens to take responsibility for governance

MACE in Ladakh opens its one-of-a-kind eye to cosmic gamma rays

MACE's main goal is to study gamma rays with more than 20 billion eV of energy; the telescope can examine gamma rays emitted from beyond the Milky Way; other potential targets include pulsars and blazars; it will also be used to explore a class of hypothetical dark-matter particles

Shreejaya Karantha

The blue spot at the centre of the red ring is an isolated neutron star in the Small Magellanic Cloud. Neutron stars are formed after heavy stars go supernova, in the process emitting gamma rays alongside radiation at other energies. ESA/NASA

The Major Atmospheric Cherenkov Experiment (MACE) telescope is a state-of-the-art ground-based gamma-ray telescope inaugurated in Hanle, Ladakh, on October 4. Located at around 4.3 km above sea level, it is the highest imaging Cherenkov telescope in the world. It boasts of a 21-metre-wide dish, the largest of its kind in Asia and second-largest in the world.

The facility was built by the Bhabha Atomic Research Centre, the Tata Institute of Fundamental Research, the Electronics Corporation of India Ltd., and the Indian Institute of Astrophysics.

Light comes in a wide range of wavelengths but humans can only see a small portion. In the electromagnetic spectrum, gamma rays have the shortest wavelength and the highest energy, with each light-particle possessing more than 100,000 electron volts. (Visible-light photons have around 1.63-3.26 eV each.)

A strange blue light

Gamma rays are produced by exotic energetic objects in the cosmos, including rapidly spinning pulsars, supernova explosions, hot whirlpools of matter around black holes, and gamma-ray bursts. Because of their high energy, gamma rays are a health hazard. They can damage living cells and may even trigger deleterious mutations in DNA. Fortunately, the earth's atmosphere blocks gamma rays from reaching the ground. Thus, astronomers who want to study objects that emit gamma rays prefer using space observatories – although there are indirect techniques to detect gamma rays with very high energies from the ground.

When a gamma ray from a cosmic source enters the atmosphere, it interacts with molecules in the air to produce a copious shower of electron-positron pairs. As these charged particles travel through the atmosphere at speeds greater than the speed of light in air, they emit a faint blue light, called Cherenkov radiation. This radiation has wavelengths typical of violet and blue light of the visible spectrum and of the ultraviolet wavelength range.

The light is emitted in about a fraction of a second, and the light particles spread out evenly over a vast region on the earth's surface. This region is a suitable place to locate a detector that can collect the photons and study them to indirectly understand the gamma rays. Instruments used for this kind of detection are called imaging atmospheric Cherenkov telescopes (IACTs). The MACE telescope is an IACT.

Strength in numbers

Every IACT has a light collector and a camera. The size of the light collector determines the minimum energy of gamma rays it can detect. MACE's light collector has 356 mirror panels. Each panel consists of four smaller mirrors arranged in a honeycomb structure. These honeycomb arrangements have been shown to be lighter yet more stable than solid mirrors because they reduce the empty space between segments and increase the total reflective area. The James Webb Space Telescope uses honeycomb-segmented mirrors for this reason.

To ensure it can detect gamma rays in the required energy range, MACE's construction and its geographical station were carefully planned. The high-altitude location puts the telescope above disturbances in the lower reaches of the troposphere. MACE is also not housed in a dome because of its large size, leaving its mirrors continuously exposed to the environment. Each mirror is coated with a thin layer of silicon dioxide for protection.

The mirrors are aligned to collect and focus the Cherenkov radiation into the high-resolution camera, which is made up of 1,088 photomultiplier tubes that detect the faint signals and amplify them. All the necessary electronic components for processing and recording data are placed within the camera, including a specialised device that continuously converts signals from photomultiplier tubes into digital data, allowing computers to perform real-time analysis.

The telescope has a moving weight of 180 tonnes. It stands on a base with six wheels that roll along a 27-metre-wide curved track. The drive system that moves the telescope uses an altitude-azimuth mount, meaning the telescope can shift its gaze both vertically and horizontally, to observe all patches of the sky.

MACE's main goal is to study gamma rays with more than 20 billion eV of energy. The telescope can examine high-energy gamma rays emitted from near black holes beyond the Milky Way and which are digesting large volumes of matter. Other potential astrophysical targets include gamma-ray pulsars, blazars, and gamma-ray bursts.

Gamma rays are produced by exotic energetic objects in the cosmos, including rapidly spinning pulsars, supernova explosions, hot whirlpools of matter around black holes, and gamma-ray bursts

One important goal is to find dark matter particles. Dark matter is a type of matter believed to make up more than 85% of the total mass in our universe. It is a fundamental part of the standard model of cosmology – but scientists don't know what subatomic particles it could be made of.

One of the proposed particle constituents of dark matter is weakly interacting massive particles (WIMPs). Scientists have predicted that these particles can produce high-energy gamma rays when they collide into and destroy each other.

These gamma rays could be produced in large galaxy clusters, small galaxies, and/or the centre of large galaxies, including the Milky Way.

India's MACE is the next step

Previous studies have shown that the MACE telescope can help find and measure the high-energy gamma rays produced by WIMPs. This will allow astronomers to learn more about dark matter and the behaviour of WIMPs. But just as likely, MACE could help verify whether WIMPs actually exist and make up dark matter or whether this hypothesis is flawed.

India has been active in gamma-ray astronomy for more than five decades now. The unveiling of the MACE telescope marked a significant step towards further technological and scientific advancements in the field. Most of MACE's subsystems were also built and designed within the country.

With its advanced capabilities, MACE could play an important role in addressing fundamental open questions in the field of high-energy astrophysics and particle physics, and pave the way for cutting-edge research.

(Shreejaya Karantha is a freelance science writer and a content writer and research specialist at The Secrets of The Universe. *shreejayakaranth@gmail.com)*

Topic → Major Atmospheric Cherenkov Experiment (MACE) Telescope

Overview

🌌 Inauguration and Location: The Major Atmospheric Cherenkov Experiment (MACE) telescope was inaugurated on October 4 in Hanle, Ladakh, at an altitude of 4.3 km, making it the highest imaging Cherenkov telescope in the world.

🛰️ Size and Design: MACE features a 21-metre-wide dish, which is the largest in Asia and the second-largest globally among its kind.

🏗️ Collaborative Construction: The telescope was built through a collaboration of several institutions, including the Bhabha Atomic Research Centre, Tata Institute of Fundamental Research, Electronics Corporation of India Ltd., and the Indian Institute of Astrophysics.

⚛️ Gamma Rays: Gamma rays, which have the shortest wavelength and highest energy in the electromagnetic spectrum, are produced by cosmic phenomena such as pulsars, supernovae, and black holes.

☢️ Health Hazards: Due to their high energy, gamma rays can damage living cells and potentially cause mutations in DNA, posing health risks.

🌍 Atmospheric Shielding: The Earth's atmosphere blocks gamma rays from reaching the surface, necessitating the use of space observatories or ground-based techniques like MACE for their study.

💡 Detection Mechanism: MACE operates as an imaging atmospheric Cherenkov telescope (IACT), detecting faint blue light (Cherenkov radiation) produced when gamma rays interact with atmospheric molecules.

Summary: MACE is a groundbreaking gamma-ray telescope in Ladakh, designed to study high-energy cosmic phenomena through innovative detection methods.

MACE Telescope: Unveiling the Mysteries of the Universe

MACE's Objective

The MACE telescope is designed to study gamma rays with energies exceeding 20 billion eV.
Focuses on high-energy emissions from various cosmic phenomena.

Astrophysical Targets

Investigates gamma rays from black holes, pulsars, blazars, and gamma-ray bursts.
Aims to enhance understanding of these celestial objects.

Dark Matter Research

A key goal is to identify dark matter particles, which make up over 85% of the universe's mass.
Dark matter's subatomic composition remains largely unknown.

⚛️ WIMPs

Weakly Interacting Massive Particles (WIMPs) are a proposed component of dark matter.
Predicted to generate high-energy gamma rays upon annihilation.

🌌 Potential Locations

Gamma rays from WIMPs may originate from:

- Large galaxy clusters
- Small galaxies
- Centers of large galaxies, including the Milky Way.

🇮🇳 India's Contribution

MACE signifies a major advancement in India's involvement in gamma-ray astronomy.
Most subsystems were developed domestically.

🔬 Future Implications

MACE's advanced capabilities could address critical questions in high-energy astrophysics and particle physics.
Potentially confirming or refuting the existence of WIMPs.

Summary: MACE is a groundbreaking telescope designed to study high-energy gamma rays and investigate dark matter, particularly WIMPs, contributing significantly to astrophysics and particle physics.

On stubble burning and satellite data

How are satellites used to the track farm fires resulting from the stubble burning in Punjab and Haryana? What are the satellites used and how effective are they? Have the farmers worked their way around the tracking methodology?

EXPLAINER

Vasudevan Mukunth

The story so far:

The air quality in the national capital has been struggling to recover from the lows to which it dropped right after Deepavali despite the implementation of GRAP stage IV measures, the active intervention of the Supreme Court, and stop-gap measures by the Delhi government. Many fingers are currently pointed at the farm fires in the surrounding States, where farmers are burning paddy stubble in time for the wheat-sowing season. While these fires are not solely responsible for Delhi's plight, a controversy over measuring their prevalence illustrates the amount of attention they are receiving.

How are the fires counted?

Farmers in Punjab and Haryana sow rice in the kharif season and harvest it in November, using the summer monsoons to quench the crop's high water demand. After the rice is harvested, they need to clear the leftover organic material – called paddy stubble – in order to make way for the next sowing season. For reasons of time and cost, they have traditionally preferred to burn the stubble. But thanks to the winds at this time of the year over the National Capital Region, the toxic particulate matter from the fires is floated to and hangs over New Delhi, dragging its air quality down.

Because of the large area over which farmers light the fires, officials have said satellites are the best way to track the fires. The Indian government currently procures this data from two NASA satellites called Aqua and Suomi-NPP.

NASA launched Aqua in 2002 and it is currently in the twilight stage of its designed lifespan. Its Moderate Resolution Imaging Spectroradiometer (MODIS) instrument was built to track changes in the lower atmosphere, especially over land, through time. MODIS's technical successor is the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument onboard Suomi-NPP, which NASA launched in 2011. Both satellites are part of NASA's 'Earth Observing System'.

Aqua's and Suomi-NPP's overpass at each location happens at 1:30 p.m. local time in the day and at 1:30 a.m. local time at night. Their MODIS and VIIRS instruments collect visible and infrared images of the earth at around these intervals and are capable of spotting fires and smoke in a small window centred on the overpass time. The Ozone Mapping and Profiler Suite onboard Suomi-NPP can also identify aerosol loads in the atmosphere, which is useful to track smoke from fires and their eventual contribution to air pollution.

What is the new controversy?

On October 2, a senior scientist at NASA's Goddard Space Flight Centre named Hiren Jethva wrote on X (Twitter) that there were 40% fewer farm fires than predicted in 2023 and expressed hope for the trend to continue this year. On October 24, Mr. Jethva wrote in the same thread that the number of fires in 2024 seemed to be the "lowest in [the] last decade", and added that either "ground efforts to curb residue-burning appear to be working or burning activities [are] taking place after satellite overpass time, but it needs ground-truthing".

His post implied farmers were burning paddy stubble after the Aqua and Suomi-NPP satellites had completed their overpass at around 1.30 pm.

Billowing trouble: Stubble being burnt at a paddy field on the outskirts of Amritsar in Punjab earlier this month. PTI

The next day Jethva followed up by comparing data from Aqua and Suomi-NPP with data from the GEO-KOMPSAT 2A satellite. South Korea launched this satellite, also called Cheollian 2A, in 2018 as a "dedicated geostationary weather satellite"; it's currently stationed at 128.2° E and has a planned mission life of at least a decade.

In the visuals Mr. Jethva collected and presented from the three satellites, the smoke cover over cropland in Punjab and Haryana seemed to thicken after Aqua and Suomi-NPP had completed their overpass, as if farmers were lighting more fires later in the day from before.

The senior scientist also wrote that the quantity of aerosols in the air was roughly the same as in previous years whereas it should have been lower given Aqua and Suomi-NPP indicated there were fewer fires.

Is the discrepancy real?

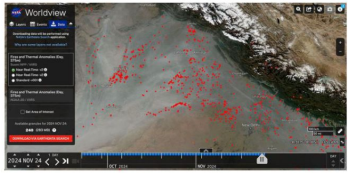
In 2020, the Indian government created the Commission for Air Quality Management in the NCR and Adjoining Areas (CAQM for short) by ordinance and a subsequent Act of Parliament in 2021. Its mandate was to study, identify, and resolve issues relevant to improving air quality in its jurisdiction.

On Saturday, *The Hindu* reported based on multiple sources and documents that the CAQM was aware farmers were burning paddy stubble after the NASA satellites had completed their overpass to avoid being detected. However the CAQM has continued to insist in the public that the number of farm fires has dropped, defending its conclusion in the face of contrary evidence by claiming it used different formulae.

That farmers were aware of the overpass timings is recorded in the minutes of a March 7, 2024, meeting, where director of Haryana Space Applications Centre Sultan Singh and National Remote Sensing Centre (NRSC) scientist Bhavana Sahay alleged as much. Farmers on the ground also told *The Hindu* a government official had asked them to light fires after 4 p.m.

(The alleged advice echoes Goodhart's law: "when a measure becomes a target, it ceases to be a good measure".)

The CAQM has also come under the



pump from a second angle: in affidavits to the Supreme Court, it has said the burnt area in Punjab shrunk 26.5% between 2022 and 2023 whereas data from the Government of Punjab and the Indian Agricultural Research Institute, which is funded by the Centre, says it increased 24% and 15% respectively.

How is the government responding?

The Centre had originally created the CAQM to replace the Environmental Pollution (Prevention and Control) Authority (EPCA), which the Supreme Court had created in 1998. EPCA was a non-statutory body and lacked the instruments to sanction non-compliant actors. CAQM was designed to have teeth in the 2021 Act – and which it has since been accused of not wielding.

The Supreme Court in particular has upbraided the CAQM for failing to mitigate air pollution resulting from the fires over the years. The body was expected to respond on November 25 to the Supreme Court to allegations that it was aware farmers were delaying burns to after the satellites' overpass.The Indian government is also on the back foot after Union Agriculture Minister Shivraj Singh Chouhan said on October 26 that the number of stubble-burning incidents have dropped this year.

But the CAQM has also maintained that its efforts have lowered the prevalence of fires by 71% in Punjab and 44% in Haryana between 2020 and 2024, and has objected to the idea of a group of retired judges overseeing the fight against stubble-burning.

The CAQM also said it wrote to the NRSC – a body under the Indian Space Research Organisation (ISRO) – asking it to develop a standard protocol to measure burnt area in January 2024. At present, burnt area data is available once every five days from the Sentinel II satellites of the European Space Agency.

Can Indian satellites help?

In an affidavit to the Supreme Court on November 21, the CAQM said ISRO plans to evaluate the usability of data from various satellites to identify farm fires. According to the affidavit, ISRO experts are of the view that data from INSAT-3DR (by India), GEO-KOMPSAT 2-AMI (South Korea), Meteosat-9, Feng Yun-4A/4B (China), and HIMAWARI-8 (Japan) cannot provide accurate fire counts – although their assessments will not be complete for at least another month.

The problem with INSAT-3DR is that its data is too coarse: of 1 km in visible and short-wave infrared radiation, of 4 km in middle and thermal infrared, and of 8 km for water vapour. In August 2021, ISRO had launched another satellite that could have been useful in this context, GISAT-1, but the GSLV-F10 mission carrying it failed after the rocket's upper stage failed to fire.

ISRO also operates the three RESOURCESAT satellites, launched in 2003, 2011, and 2016, with similar payloads. Those in RESOURCESAT 2A have better features, however. The Linear Imaging Self Scanner (LISS) cameras 3 and 4, both of which 'see' in visible and near-infrared radiation; LISS-4 has a spatial resolution of 5.8 m and LISS-3, of 23.5 m. The Advanced Wide Field Sensor (AWiFS) camera detects similar radiation at an even lower resolution of 56 m.

THE GIST

- Because of the large area over which farmers light the fires, officials have said satellites are the best way to track the fires. The Indian government currently procures this data from two NASA satellites called Aqua and Suomi-NPP.
- While satellite data showed that there was a reduction in farm fires, the smoke cover over cropland in Punjab and Haryana seemed to thicken after the satellites had completed their overpass and the quantity of aerosols in the air was roughly the same as in previous years
- The Commission for Air Quality Management in the NCR and Adjoining Areas was expected to respond on November 25 to the Supreme Court to allegations that it was aware farmers were delaying burns to after the satellites' overpass.

Topic → ISRO's Satellite Data Evaluation for Farm Fire Detection

Overview

📅 Date of Affidavit: The CAQM submitted an affidavit to the Supreme Court on November 21 regarding satellite data evaluation.

🛰️ Satellite Evaluation: ISRO plans to assess data from various satellites, including INSAT-3DR, GEO-KOMPSAT 2-AMI, Meteosat-9, Feng Yun-4A/4B, and HIMAWARI-8, to identify farm fires.

❌ Data Limitations: Experts believe that the mentioned satellites cannot provide accurate fire counts, with complete assessments expected in about a month.

📏 INSAT-3DR Resolution: The data from INSAT-3DR is considered too coarse, with varying resolutions from 1 km to 8 km depending on the type of radiation.

🚀 GISAT-1 Launch Failure: ISRO's GISAT-1 satellite, which could have been beneficial, failed to launch successfully in August 2021 due to a rocket malfunction.

🌍 RESOURCESAT Satellites: ISRO operates three RESOURCESAT satellites launched between 2003 and 2016, with RESOURCESAT 2A featuring improved capabilities.

📸 LISS Cameras: The RESOURCESAT 2A includes LISS-3 and LISS-4 cameras, which have spatial resolutions of 23.5 m and 5.8 m, respectively, and can detect visible and near-infrared radiation.

Summary: ISRO is evaluating satellite data for farm fire detection, but current satellites have limitations in accuracy and resolution, with a recent launch failure impacting potential advancements.

- Because of the large area over which farmers light the fires, o□icials have said satellites are the best way to track the fires.
- The Indian government currently procures this data from two NASA satellites called Aqua and Suomi-NPP.
- While satellite data showed that there was a reduction in farm fires, the smoke cover over cropland in Punjab and Haryana seemed to thicken after the satellites had completed their overpass and the quantity of aerosols in the air was roughly the same as in previous years

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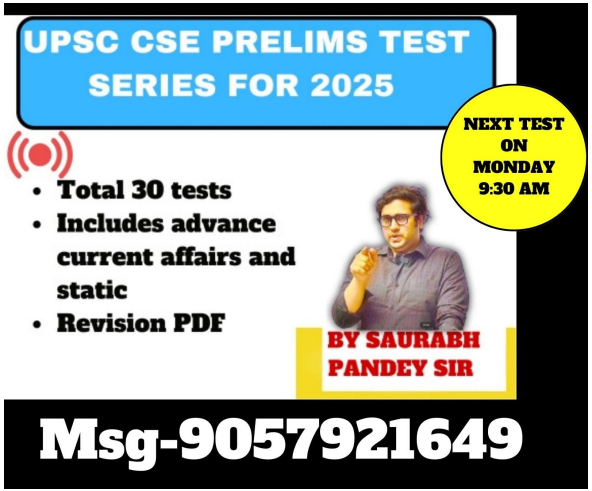
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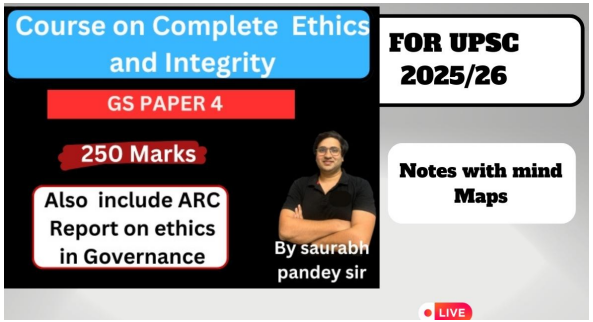
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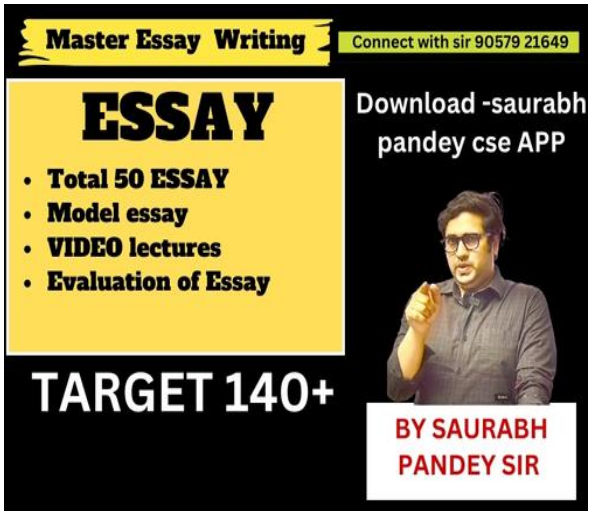
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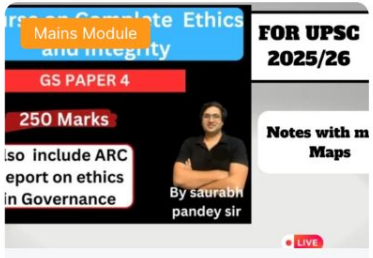

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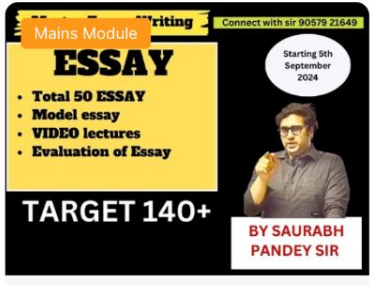

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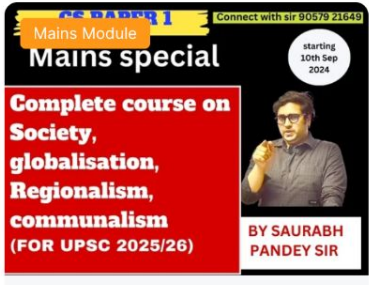

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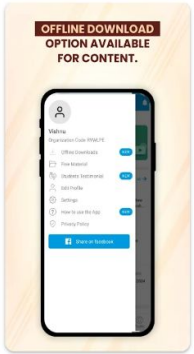

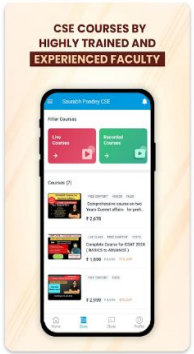

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