2,500 acres identified for land swap for Mekedatu project: Karnataka CM

Press Trust of India
MANDYA

Karnataka Chief Minister D.K. Shivakumar on Saturday said 2,500 acres of land had been identified as alternative land, including forest land, to facilitate the Mekedatu balancing reservoir project across the Cauvery river.

The project, once implemented, would enable Karnataka to store 66 tmc of water and regulate its release during difficult periods, benefiting farmers in Mandya and other Cauvery basin areas, the Chief Minister said.

He said the Deputy Commissioner of Mandya district had been appointed chairman of the committee overseeing the process, and officials had already held meetings on providing alternative land to the Forest Department.



Cauvery river flows through a gorge at Mekedatu, near Kanakapura in Ramanagara district of Karnataka. K. MURALI KUMAR

"We have collectively decided to provide alternative land, including forest land, in lieu of the land required for the project. We have identified 2,500 acres so far and are in the process of identifying the remaining land," he said.

Multi-purpose project

Mekedatu is a multi-purpose project proposed by Karnataka, which involves building a balancing reservoir near Kanakapura in Bengaluru South district.

The project is aimed at ensuring drinking water to Bengaluru and neighbouring areas; it can also generate 400 MW power, according to officials.

Mr. Shivakumar said the State government would upload the details of the alternative land on the forest clearance portal and expected the necessary permissions to be granted thereafter. The government hopes to make progress by the next Budget, he added.

Tamil Nadu has raised apprehensions that the flow of Cauvery water into the State will be affected if the project takes shape.

GS 2: Polity & Governance

Key Pointers:

- What is the Mekedatu project?
- Course of Cauvery River
- What are the major inter-State issues involved?
- Article 262 of the constitution

Society must cultivate habit of inquiry: Justice Bhuyan

Supreme Court judge stresses scientific temper, says societies that fear questions become vulnerable to misinformation and authoritarianism; warns against 'us versus them' narratives

Krishnadas Rajagopal
NEW DELHI

Supreme Court judge Justice Ujjal Bhuyan said a society that accepts claims without evidence, fears questions and treats tradition as beyond question becomes vulnerable to misinformation, defenceless in the face of authoritarianism and fails to reform unjust practices.

Justice Bhuyan said building a scientific temper enshrined in Article 51A of the Constitution should not be confined to laboratories but extend to the capacity of youths and students to think rationally as members of a civil and political society.

Attitude of inquiry

"All that you need is the capacity to think rationally; what you say or think must be based on reason. It [scientific temper] is an attitude of inquiry and openness to examination. It cannot happen overnight. The germination has to take place in the university," Justice Bhuyan said in his address at the University of Science and Technology, Meghalaya on Saturday.



> All you need is the capacity to think rationally; what you say or think must be based on reason. It is an attitude of inquiry and openness to examination. It cannot happen overnight. The germination has to take place in the university
>
> **JUSTICE UJJAL BHUYAN**
> Supreme Court judge

The speech resonates after the nation saw widespread dissatisfaction among Gen Z over NEET 2026 paper leaks, student unrest in universities and a wave of agitations across premier institutions from IIT Bombay to multiple National Law Schools followed by a demand to restore student union elections at Jamia Millia Islamia. The judge said society should demand empirical evidence when public discourse relies on emotional resonance and unverified assertions. Students must acquire the habit of inquiry to see through misinformation.

"To inquire is to avoid accepting the very first explanation that comes our way; it tells us to look for reasons; and it trains the mind to search a little deeper than what appears at the surface. This is nothing else but the development of a scientific temper. This will protect the mind from prejudice and empower it to make independent thinking and choice possible," Justice Bhuyan said.

'Destructive tendency'

The judge pointed out how society is willingly or unwillingly getting drawn into a "false narrative; the binary of 'us' and 'they'". He termed this a destructive tendency.

Justice Bhuyan said the narrative must shift from 'us' and 'they' to the 'we' of the Preamble to the Constitution of India, which starts with the expression 'We, the People of India'.

"This Constitutional concept of 'we' enables diversity to coexist with unity. Its genius lies in the fact that it does not seek to efface the differences; rather, it seeks to restore unity without demanding uniformity. It does not require that our individual identities should get subsumed in the larger whole," Justice Bhuyan said.

GS 2: Polity

Key Pointers:

- Why is developing a habit of inquiry important for society?
- What is meant by scientific temper?
- Article 51A(h) of the constitution
- How does the 'us versus them' narrative threaten constitutional values?



Toshimitsu Motegi, S. Jaishankar, Marco Rubio and Penny Wong during the meeting of Foreign Ministers in Atlanta. ANI

Quad plans $85 mn in technical aid for access to trusted AI

Press Trust of India
WASHINGTON

Foreign Ministers of Quad grouping on Saturday expressed their intent to provide $85 million in technical assistance to expand access to trusted Artificial Intelligence across the Indo-Pacific even as the U.S. committed to provide $10 million for recycling critical minerals in India and ASEAN countries.

U.S. Secretary of State Marco Rubio hosted a meeting with External Affairs Minister S. Jaishankar, Japan's Foreign Minister Toshimitsu Motegi and Australian Foreign Minister Penny Wong on the sidelines of G20 Foreign Ministers' Meeting in Atlanta.

Participating in the Quad Foreign Ministers' Meeting, Mr. Jaishankar said he spoke about countering non-market practices and increased economic stresses in the Indo-Pacific. Mr. Jaishankar said he highlighted the importance of maintaining stability, driving prosperity and ensuring freedom of choice.

GS 2: International Relations

Key Pointers:

- What is QUAD?
- Why is trusted AI important for the Indo-Pacific?
- Why is critical mineral recycling important?

108 stupas in Bhutan will have India-linked Buddha relics

Rahul Karmakar
GELEPHU

Buddhist relics of Indian origin will be enshrined in most of the 108 *jangchub chortens* (stupas of enlightenment) that monks and volunteers are scheduled to build simultaneously along a 12 km stretch of the Mau Chhu River in the Bhutanese town of Gelephu on Sunday.

The event will mark the spiritual foundation of the Gelephu Mindfulness City (GMC), which Bhutan's King Jigme Khesar Namgyel Wangchuk envisions as a spirituality-driven global economic hub. About 240 km south-southeast of Bhutan's capital, Thimphu, the city borders Assam's Chirang district.

The Central Monastic Body of Bhutan, the country's principal institutional carrier of the Drukpa Kagyu lineage of Tibetan Buddhism, said that Buddhists in Malaysia, Singapore, Taiwan, Thailand, and Bhutan had donated hundreds of relics, mostly bones and hair.

"Malaysia sent three sets of 108 relics of the Buddha, enlightened saints and revered lamas. We received many from Thailand. Most of the relics were established as having been sourced from India," Choten Dorji, the Principal Secretary to one of the masters of the monastic body, said on Saturday.

The relics form part of the '*zung*', the living embodiment of the Buddha's enlightened body, speech and mind. The sacred components of the *zung* include *thangkhas* (traditional Tibetan Buddhist paintings on cotton or silk fabric), statues, precious stones, rolled mantra scrolls, or *dharanis*, and relics of enlightened beings.



All set: The podium set up for the Bhutan King's address during the ceremony. RAHUL KARMAKAR

The *jangchub chorten* commemorates the Buddha's attainment of enlightenment and symbolises the triumph of wisdom over ignorance. Once consecrated, a *chorten* is rendered equivalent to the living Buddha.

On February 26, King Wangchuk announced Project 108 at the GMC as a "test of national character", not merely an initiative to set a world record.

"It is an ambitious undertaking that demands courage, unity, and deep commitment. We must do it to prove to ourselves that, as we face the challenges ahead, there is no limit to what we can achieve when we stand together," he said.

Officials said that Project 108, involving 40,000 trained volunteers, was Bhutan's sacred gesture of peace in a world troubled by conflict.

Each *chorten* is estimated to cost $200,000, and individuals, families, communities, and institutions worldwide have contributed to the project.

According to the blueprint, each *chorten* will stand 15 metres tall, positioned 108 metres apart in a line along the Mau Chhu River, which runs through Gelephu.

Significance of '108'

Bhutan's spiritual leaders explained the rationale behind the number 108.

"In astronomy, the distance between the earth and the sun is approximately 108 times the sun's diameter and the distance between the earth and the moon is about 108 times the moon's diameter," a monk said.

"In some Tibetan Buddhist traditions, the Kangyur (principal collection of sacred Buddhist scriptures) is arranged in 108 volumes. Practitioners count 108 beads on a prayer mala, circumambulate sacred sites 108 times, and ring temple bells 108 times. In the Vajrayana Buddhist tradition, 108 symbolises spiritual completeness, cosmic balance, and the purification of karma," he said.

Project 108 also links to Hinduism. "Hindu tradition often speaks of 108 Upanishads (sacred philosophical texts). Many Hindu deities have 108 names. In yoga, the sun salutation is traditionally performed in cycles of 108," the monk said.

The date for executing Project 108 is significant, too. Bhutan observes November 1 as Lord Buddha's Descending Day and Mother's Day. Sunday also marks the 18th coronation anniversary of King Wangchuk, who reached Gelephu with his royal entourage on Saturday.

GS 2: International Relations

Key Pointers:

- India- Bhutan Relations
- What is Project 108 of Bhutan?
- What is the significance of Indian relics in the project?
- What is a Jangchub Chorten?

490 policemen awarded Grihmantri Dakshata Padak

Four hundred and ninety personnel from various States, Union Territories, Central Armed Police Forces (CAPFs) and Central Police Organisations (CPOs) were awarded the Kendriya Grihmantri Dakshata Padak on Saturday, the birth anniversary of Sardar Vallabhbhai Patel, a government statement said. The list also includes 14 officers from the CBI. The award was instituted through a Ministry of Home Affairs notification dated February 1, 2024. It is conferred on members of police forces, security organisations, intelligence wings, special branches of States and Union Territories, CAPFs, CPOs, the National Security Guard and Assam Rifles, it said. PTI

GS 2: Polity

Key Pointers:

- What is the Kendriya Grihmantri Dakshata Padak?
- Contributions of Sardar Vallabhbhai Patel

ISRO flew NVS-03 satellite with pyro valves open: chief

Press Trust of India
SRIHARIKOTA

ISRO chief V. Narayanan on Saturday said that in order to ensure mission reliability and bypass previous technical hurdles, the NVS-03 satellite was operated with "three pyro valves open".

Addressing the media at a post-launch press conference, Mr. Narayanan revealed that this bold technical decision was validated after rigorous vibration and shock testing by a national-level committee chaired by former ISRO chief Kiran Kumar.

Pyro valves are crucial in spacecraft propulsion, and it may be recalled that the NVS-02 (launched in 2025), the second spacecraft in the NVS series, was a failure.

A high-level panel, after thorough analysis, concluded that "the drive signal did not reach the pyro valve of the oxidiser line of the engine meant for orbit raising."

In February 2026, ISRO announced that the most likely cause was the disengagement of at least one contact (in each of the main and redundant paths) of the connector.

Against this background, Mr. Narayanan said that with four satellites, including NVS-01 now active in India's navigation satellite system, ISRO plans to launch NVS-04 in five months, and NVS-05 in 10 months to further bolster the constellation.

'Exceptional accuracy'

Mr. Narayanan highlighted the exceptional accuracy of the flight. "Against [the planned] perigee [the point in an orbit closest to Earth] of 170.36 km, we have got 170.31 kilometres," he said.

"Against [the planned] apogee [the point in an orbit farthest from Earth] of 37,247 kilometres, we achieved 38,080 kilometres," he noted. "This is one of the best accuracy of any of the launch vehicles in the world we can think of," he added.

The successful deployment has restored India's NavIC (Navigation with Indian Constellation) to its minimum operating configuration of four satellites, bolstering both strategic and civilian location services across the subcontinent.

The ISRO successfully placed NVS-03 into a highly precise orbit using the GSLV-F18 launch vehicle on Saturday.

AMRITA IAS
An Amrita Group Institution

GS 3: Science and Technology

Key Pointers:

- What are pyro valves and what is their function?
- What is NVS-03?
- What happened to NVS-02?
- What is NavIC?
- What are the major applications of NavIC?
- What are perigee and apogee?

AMRITA IAS

India's first fusion power company sets road map for a nuclear reactor

Jacob Koshy
NEW DELHI

If all goes to plan, India may see designs for the first privately-built tokamak, a nuclear reactor that uses fusion to produce energy, firmed up in 2027.

Bengaluru-based startup Pranos Fusion has built PRAGYA, a small doughnut-shaped tokamak, to test plasma control and superconducting magnets. This is a gateway to building PRANIK, a larger tokomak that will have plasma heated up to millions of degrees – more than the interior of the Sun – necessary to fuse hydrogen atoms and create energy.

"By 2027, we expect to finalise the blueprint for PRANIK and be on our way to building a practical reactor that can produce energy. To be able to actually produce electricity from fusion is a further step away," Shaurya Kaushal, co-founder and CEO of Pranos Fusion, said.



Fusion frontier: The Bengaluru-based startup has built a compact tokamak as a test bed for plasma control. SPECIAL ARRANGEMENT

Nuclear plants everywhere employ fission – a chain reaction involving uranium nuclei to produce heat that is used to generate electricity. Fusion, on the other hand, releases energy when light atomic nuclei merge, and usually involves joining two forms of hydrogen – deuterium and tritium – into helium and a fast neutron. However, this requires the fuel to be heated to around 100 million degrees Celsius, far hotter than any solid wall could withstand. In tokamaks, powerful magnets hold this superheated plasma away from the walls, keeping it hot enough for fusion to continue.

"Electricity from a fusion reactor is still far away and would be expensive now, however the need for any source of energy is only going to grow," co-founder Roshan George said.

"Fusion's advantage is that while [it's] nuclear power, it doesn't need radioactive material like uranium. India already produces plenty of deuterium. Fusion reactions are also not chain reactions, and therefore the risk of a runaway reaction [like in a fission reactor] is almost absent," Mr. George added.

The cost of a private tokamak depends on scale, Mr. Kaushal said. A compact research machine like PRAGYA is "a comparatively modest investment".

Pranos Fusion says compact machines, HTS (high-temperature superconducting) magnets, and India's manufacturing base can bring costs down substantially. It is backed by Ankur Capital, pi Ventures and Industrial47, and has raised $7.2 million.

GS 3: Science and Technology

Key Pointers:

- What is PRANIK?
- India's first privately built tokamak-based fusion reactor
- What is PRAGYA?
- What is nuclear fusion?
- What is a tokamak and how does it work?
- What is the significance of India's private-sector participation in fusion research?

Indian scientists find new gateway in plants' alarm system

Jacob Koshy

Researchers at the National Institute of Plant Genome Research (NIPGR), New Delhi, have identified a previously uncharacterised protein that helps a plant warn undamaged leaves when an insect attacks one.

The finding may have implications for designing chemicals to help plants fend off pest attacks.

Plants too don't like to be preyed upon by other insects or herbivores. They also can't flee and have no nervous system, yet a bite on one leaf can set off an alarm that reaches other leaves within minutes.

The prevailing view credits a family of cellular gateways, glutamate receptor-like channels (GLRs), that respond to the amino acid glutamate and relay the alarm.

The study, published in *Proceedings of the National Academy of Sciences*, points to another protein: CNGC13, which sits mainly in the xylem and phloem and lets calcium into cells as the damage signal passes along the plant.

"Our study identifies an important role for a calcium channel, CNGC13, in coordinating systemic calcium signalling during insect herbivory," Jyothilakshmi Vadassery, one of the study co-authors, said in a statement. "The findings provide new insights into how plants communicate danger signals across tissues."

Spreading the warning

At the site of attack, calcium, reactive oxygen species and hormones such as jasmonic acid switch on defence genes and reinforce cell walls, sealing the wound and blocking pathogens. If the damage is serious, hydraulic, electrical, calcium, and reactive oxygen signals carry the alert to distant tissue. Warned leaves can raise their glucosinolate levels and grow more leaf hairs, making them more resistant to herbivores.

Some plants also release airborne chemicals that warn nearby tissue and attract the insects' natural enemies, per a review in the journal *Frontiers in Plant Science*.

According to the new paper, insect pests cause roughly 20% of global annual crop losses, a figure projected to rise with warming, and crop protection still leans heavily on chemical insecticides. Learning how plants sense attack could point to crops that defend themselves better.

CNGC13 test

The authors say the speed and robustness of systemic responses to different kinds of damage suggested that other channels were involved. To establish the CNGC13 channel's role, researchers compared normal *Arabidopsis*, a small weed from the mustard family, with three mutant lines lacking CNGC13. Larvae of *Spodoptera litura*, which played the plant's attacker, gained significantly more weight on all three mutant lines. Restoring the gene in one line returned weight gain to normal, indicating the channel is needed for resistance.

GS 3: Science and Technology

Key Pointers:

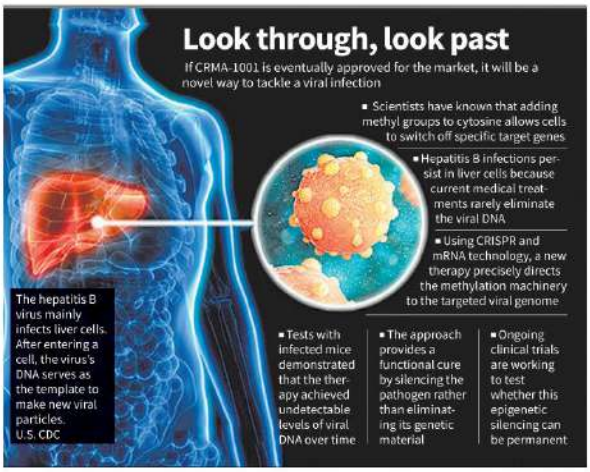
- How do plants communicate when attacked by insects?
- What is the role of CNGC13 in plant defence?
- How is CNGC13 different from the previously known GLR pathway?

Gene therapy aims for a cure by silencing hepatitis B DNA

An experimental therapy called CRMA-1001 is a remarkable development because, instead of targeting the virus directly, it silences the viral DNA; this is promising because treatments rarely eliminate the DNA, which allows the virus to rebound

Arun Panchapakesan

According to new work reported in *Nature Biomedical Engineering*, scientists have used epigenetic control to treat a hepatitis B infection. The development is remarkable because, instead of targeting the virus directly, the work silenced the viral DNA. This is promising because current treatments rarely eliminate the DNA, which allows the virus to rebound. By silencing this residue, the treatment could offer a path to a lasting functional cure for hepatitis B.



Virus in hiding

The hepatitis B virus mainly infects liver cells. After entering a cell, the virus's DNA serves as the template to make new viral particles. In many people, the immune system clears the infection, but if it does not, the viral DNA can persist for years or even decades in the host's liver.

In this time, the virus can remain silent, meaning the viral DNA is still present in the cell but its genes are not active to produce new viruses. This allows the virus to 'hide' from the immune system. Then, at a later point, the virus can activate again and produce new virus particles.

Studies have shown that one of the mechanisms by which the virus stays silent is by methylating cytosines.

DNA is segmented into genes, and each gene contains the information necessary to make a particular protein. These proteins essay their roles in the cells. Since every cell in the body has two copies – one from each parent – of all human DNA, all cells technically have the blueprint to make a whole organism. However, cells also have specialised functions: a brain cell does not need the genes for the proteins used to digest food.

One of DNA's four building blocks is cytosine. Cells can attach a chemical tag, like the methyl group ($-CH_3$), to cytosine to silence the corresponding gene. This prevents the cell's protein factory from reading the gene and the cell from making that protein. Problems in this epigenetic system can lead to diseases like cancers.

The new study has reported a new experimental therapy called CRMA-1001 that can reportedly silence the DNA of the hepatitis B virus by selectively methylating the virus's genome.

The study's authors combined two molecular components to achieve this, called a 'locator' and an 'effector'. The locator used the CRISPR-Cas9 gene-editing tool to find and bind to a specific DNA sequence: in this case, a sequence within the viral DNA. This allowed the CRISPR system to take the 'effector', the methylation machinery, to the correct location. The effector had proteins that could add methyl groups to nearby cytosines in the viral DNA and proteins that help switch off genes. Finally, the researchers packed the entire system and delivered it on an mRNA platform. Once a cell had read the instructions to make the required proteins, it degraded them, stopping the production of those proteins too.

The researchers gave mice infected with hepatitis B virus either a single dose of CRMA-1001 or three doses, one month apart, and regularly tested them for six months for the signs of infection. They reported that after one dose, the levels of several hepatitis B virus markers, including the viral DNA and two viral proteins called HBsAg and HBeAg, dropped significantly. When they tested the viral DNA, they found new methyl groups, suggesting the treatment was working as intended. The effect was even stronger after three doses: six months after the first dose, as many as 90% of the animals had less viral DNA than could be detected.

CRMA-1001 is not a cure in the traditional sense of the word. The hepatitis B virus DNA is still present in the liver cells. Instead, the study demonstrated a functional cure: when the virus is not necessarily eliminated but is kept so thoroughly suppressed that, for all intents and purposes, the patient has no active signs of disease. In this study, the team followed up with the mice for six months after treatment, and the researchers found sustained suppression of the virus in that period. However, the study did not establish whether the virus could eventually become active again after those six months, since the viral DNA was still present.

Further studies are needed to examine the long-term effects of CRMA-1001, including whether the silencing effect can persist over many years and whether the virus can ever become active again after treatment. An ongoing phase I/II clinical trial includes these among other questions. Nonetheless, CRMA-1001 represents a novel way to tackle a viral infection: instead of fighting the threat, the cell simply ignores it.

(Arun Panchapakesan is an assistant professor at the Y.R. Gaitonde Centre for AIDS Research and Education, Chennai)

GS 3: Science and Technology

Key Pointers:

- What causes Hepatitis B Disease?
- Why is Hepatitis B difficult to eliminate completely?
- What is epigenetic silencing?
- How does CRMA-1001 work?

Greener cities and bluer spaces for a healthier India



SPEAKING OF SCIENCE

D. Balasubramanian

Green trees and plants are vital for human health. In villages and farmlands, the uppermost parts of the tree provide a canopy, with roof-like branches, offering people a cooler and healthier environment. And the rivers, canals, ponds and pools offer people there a bluer environment.

Such rural areas thus offer their residents healthier environs. But when private enterprises and commercial agencies take away many acres of land in towns, suburban, and rural areas to build large multi-storied buildings and housing complexes, it results in further canopy loss. The State of Telangana has about 48% of the people living in urban areas, with more trees sacrificed, while farmlands and villages are left with fewer trees and less water for agriculture. This is also true of several other southern States.

The urban population across India is now 36%. UNICEF has pointed out that children's health is affected when green and blue spaces are disturbed. According to the National Family Health Survey, the infant mortality rate can be correlated to the greenness of the area; the lower the greenness, the higher the rate. In the green States of Kerala, Goa and Puducherry, the infant mortality rate is quite low, around eight per 1,000 births, while Uttar Pradesh and Rajasthan have higher rates, closer to thirty per 1,000 births.

In 2023, an international team of researchers pointed out in the journal *The Lancet* (vol. 8, issue 9, September 2023) that since a significant fraction of the human population now lives in urban areas, these people should also enjoy greater access to urban green and blue spaces, which could lead to improvements in public health. It will also promote environmental biodiversity and civic sense through parks, sports fields, higher physical activity, and camaraderie among the residents.



Shrinking spaces: UNICEF has pointed out that children's health is affected when green and blue spaces are disturbed. V. RAJU

A more recent paper by three Indian researchers in the *Indian Journal of Science and Research* (Pande et al; *Ind. J. Sci. Res.*, 5 (2), 2025) expanded on this theme and suggested a framework to achieve green infrastructure and urban sustainability. This involves greener urban areas, including more trees, parks, walkways, sports arenas, and swimming pools. These have now become part of the Indian government's Atal Mission for Rejuvenation and Urban Transformation (AMRUT).

In this connection, recently, an international group of epidemiologists analysed data from 57 countries. Their findings, published in *Proceedings of the National Academy of Sciences*, under the title 'Urban tree canopy fragmentation and child mortality in low- and middle-income countries' (*PNAS*, 123 (34) e2606669123, August 21, 2026), show how the loss of green and blue spaces through the loss of canopy can affect children's health by increasing climate stress, air pollution, anxiety, loss of playground space and infection by pests and microbes. These factors can also lead to low birthweight, psychological stress, congenital anomalies, and child mortality, notably under the age of five. The researchers collected data from 42 lakh children hailing from 57 low- and middle-income countries or regions where green and blue spaces are more prevalent, such as in West Sudan, the Punjab region in Pakistan, and the Ganga-Brahmaputra Delta in Bangladesh, and found that these regions have lower levels of under-five mortality than in the other countries studied.

According to the World Bank, India ranks as the fifth wealthiest nation in the world. Even as we aim to make India rank higher, let us ensure the country becomes greener and bluer.

dbala@hypei.org

GS 3: Environment

Key Pointers:

- What are green and blue spaces in urban areas?
- How do green and blue spaces improve human health?
- What is the relationship between urban greenness and child mortality?
- Nagar Van Yojana
- AMRUT Scheme
- National mission for a green India
- Mission LiFE
- Smart Cities Mission

Question Corner

Only change is constant

Have humans stopped evolving? If not, what traits are changing?
– Anand Songara, Indore

Humans are still evolving – through new mutations, natural selection, migration, and random chance.

Put one way, evolution can be discerned from changes in the frequencies of the genetic variants passed down through the generations. But this process is too slow to detect within a single human lifetime.

But one good example of something we know has changed is the ability of human adults to digest milk. Most mammals lose their ability to digest lactose after weaning, but in the last several millennia, genetic variants have allowed this ability to last longer in some human populations.

In an another example, humans have evolved through the way they resisted infectious diseases. In regions where malaria is endemic, people with one copy of the sickle-cell variant have some protection against severe malaria.

Overall, evolution has no predetermined direction, so it is hard to predict how humans will change in the coming millennia.

Readers may send their questions / answers to science@thehindu.co.in

GS 3: Science and Technology

Key Pointers:

- What are the major examples of ongoing human evolution?
- What are the major mechanisms of human evolution?

What do the new E100 vehicle rules mean?

What has changed? Should existing vehicles switch to E85 or E100? What are the concerns over ethanol blending?

Jagriti Chandra

The story so far:

The Ministry of Road Transport and Highways has amended the Central Motor Vehicles Rules, 1989, to permit the use of ethanol-based fuels containing up to 100% ethanol (E100) in vehicles. The move paves the way for flex-fuel (flexible fuel) vehicles, which can run on petrol, ethanol blends of varying proportions, or pure ethanol.

While petrol is refined from crude oil extracted from the earth, ethanol is a type of alcohol that can be produced by fermenting plant biomass (such as sugarcane, maize, or broken rice). The two fuels can be mixed.

What has the government changed?

One of the key changes is the inclusion of E100, or fuel comprising 100% ethanol, alongside E85 in several tables under Rule 115, which deals with emission standards and related requirements for motor vehicles. E85 is a fuel containing up to 85% ethanol, while E100 consists entirely of ethanol, subject to applicable fuel specifications. The amendments include an explanatory note stating that E85 or E100 may be used only in flex-fuel vehicles designed by original equipment manufacturers.

Should existing vehicles switch to E85 or E100?

No. In a press statement, the Ministry clarified that a vehicle's compatibility with E10 or E20 does not establish its suitability for E85. The notification does not require owners of existing vehicles to switch to E85 or modify their vehicles, either now or later. Motorists should check the fuel-compatibility sticker on their vehicle and follow the manufacturer's guidance in the owner's manual when choosing fuel at a filling station, the Ministry's statement added.

The notification does not require owners of existing vehicles to switch to E85 or modify their vehicles, either now or later

How will the amendments support the roll-out of E100 vehicles?

The amendments are expected to facilitate homologation, the official certification process through which authorised agencies, such as the Automotive Research Association of India, verify that vehicles and components comply with technical, safety, and environmental standards before they can be approved for sale or use on public roads. This will help secure type approvals for E100-powered vehicles, supporting their roll-out and wider consumer adoption. Corrections have also been incorporated into fuel classifications, including a reference to gasoline blended with 20% ethanol, or E20, in place of an earlier notation referring to E10.

What is the status of the Ethanol Blended Petrol Programme now?

India achieved its 20% ethanol-blending (E20) target in 2025, five years ahead of the original 2030 deadline set under the National Policy on Biofuels, 2018. From April 2026, all Bharat Stage-VI (BS-VI) vehicles are required to fully meet E20 emission standards, and all petrol sold across India is mandated to contain 20% ethanol (E20). The policy focus is now widening beyond E20: the government has enabled the regulatory pathway for E85 and E100 vehicles, though these will require compatible flex-fuel vehicles and dedicated dispensing infrastructure.

What are consumers' concerns?

The main concern is vehicle compatibility. Owners of older or non-E20-compliant vehicles question whether E20 could damage components, raise maintenance costs, or leave them without access to lower-ethanol petrol.

Consumers also question E20's effect on fuel economy. Ethanol has a lower energy density than petrol; while the government estimates a 3% decline in mileage, some consumers say the loss is greater. Dealers, meanwhile, warn that ethanol's affinity for water could raise contamination risks during the monsoon, strengthening the case for separate storage and dispensing systems for higher blends.

Users have also questioned why blending of ethanol has not reduced retail fuel prices. The government has responded by saying that procurement of raw materials such as maize at ₹71.86 per litre is higher than $70 per barrel of crude oil (or ₹37 to ₹40 per litre).

Experts argue that the focus on ethanol blending risks distracting from electrification, which they say offers a clearer long-term path to deep emissions cuts. "The future is electric. Other technologies are interim solutions. Electrification is cleaner, avoids the lifecycle emissions associated with ethanol production, and offers public health and climate benefits," said Amit Bhatt, managing director, International Council on Clean Transportation.

There are also concerns about the land and water required for large-scale ethanol production, the choice of crops used as feedstock, and the potential competition between fuel and food production.

GS 3: Economy

Key Pointers:

- What is a flex-fuel vehicle?
- Can existing petrol vehicles switch to E85 or E100?
- What is India's current ethanol-blending status?
- What are the major concerns associated with ethanol blending?

Why are social media takedowns in focus?

What triggered the latest wave of takedowns? How do the amended IT rules make takedowns faster? Are takedowns being driven by government orders? What can users do when their accounts get blocked?

Lavpreet Kaur

The story so far:

In recent weeks, social media users have reported a spate of posts, reels, and accounts being blocked or taken down across platforms, including Instagram, Facebook, and X. Screenshots shared online show notices stating, 'Your post is unavailable in India', while others say access to content has been restricted through an automated system implemented under India's Information Technology or IT (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021.

The restrictions have come amid protests against the Special Intensive Revision (SIR) of electoral rolls and demands for Chief Election Commissioner Gyanesh Kumar's resignation across the country. They have brought the government's content-blocking powers, shorter compliance deadlines for intermediaries, and role of platforms' own automated moderation systems into focus.

What triggered the latest wave of takedowns? What did the Ministry of Electronics and Information Technology (MeitY) advisory to Meta say?

The latest wave follows two advisories issued by MeitY on October 8 and 10, amid anti-CEC protests. The October 8 advisory was addressed to social media platforms to exercise "enhanced diligence" over content relating to ongoing public events, contextualise misleading material, and prioritise complaints from authorised government agencies. It urged platforms to curb "manipulated or out-of-context content" on top of AI-generated deepfakes that are already liable for takedown notices under the amendments to the IT (Intermediary Guidelines and Digital Media Ethics Code) Rules.

The October 10 advisory, issued by MeitY's Cyber Laws Division and addressed specifically to Meta, focused on how content was being distributed through feeds and recommendation systems. It said videos, images, statements, and graphics relating to public order and law-and-order situations were being prominently displayed and recommended to users. It advised Meta to identify and address content that could cause public disorder or incite violence or other unlawful activity; review its ranking and recommendation mechanisms; provide context for visuals whose authenticity, date, location, or circumstances were unclear; and ensure users were not disproportionately exposed to a single or limited set of narratives. It also asked Meta to cooperate with law-enforcement agencies within the timelines prescribed under the IT Rules.

The advisory called for immediate action and asked Meta to inform the Ministry of the measures taken. It also stated that lawful civic and public discourse should not be unnecessarily restricted.

Users can challenge restrictions imposed under Sections 69A and 79(3)(b) by questioning their legality, including through the courts where appropriate.

How do the amended IT Rules make takedowns faster?

The IT (Intermediary Guidelines and Digital Media Ethics Code) Amendment Rules, 2026 tightened intermediary obligations, particularly in relation to synthetically generated information, including realistic AI-generated or altered audio-visual material.

Under amended Rule 3(1)(d), an intermediary that receives actual knowledge through a court order or a reasoned intimation from an authorised government officer or agency must remove or disable access to the specified unlawful information within three hours, down from 36 hours under the earlier framework. The amendments also shortened grievance-redressal timelines and introduced additional requirements for identifying and labelling permitted synthetic content. The changes leave platforms with considerably less time to assess a notice, determine its scope, and act on it.

Which laws allow the authorities to seek takedowns, and what safeguards apply?

Three provisions are central to understanding the restrictions: Section 69A of the IT Act, 2000; Rule 3(1)(d) of the IT Rules, 2021; and Section 79(3)(b) of the Act. Although all three can be relevant to the removal of online material, they serve different legal purposes.

Section 69A empowers the Central government or an officer specifically authorised by it to direct the blocking of public access to online information on specified grounds, including the sovereignty and integrity of India, defence, security of the State, friendly relations with foreign States, public order, and preventing incitement to certain offences.

Rule 3(1)(d), meanwhile, sets out the obligations of intermediaries after they receive a court order or a qualifying intimation from a relevant authorised authority concerning specified unlawful information.

Section 79 provides intermediaries with conditional protection from liability for third-party content. Under Section 79(3)(b), such protection may be affected if an intermediary fails to act after receiving the legally required notification concerning unlawful information.

Are the takedowns being driven by government orders?

The number of takedown notices issued by the unit declined during October as automated takedowns rose, according to an official from the Delhi Police's Intelligence Fusion and Strategic Operations unit. The Delhi Police have issued around 300 takedown requests in the past three months, with most acted upon by the platforms, according to sources. Law-enforcement agencies identify posts through routine monitoring, assess their content, and provide reasons when seeking their removal.

"The recent takedowns are a direct consequence of the advisory issued to Meta. The advisory seems to have been incorporated into Meta's community standards, contributing to restrictions imposed under the company's own policies," advocate Rishav Ranjan said.

What recourse do users have when their posts or accounts are blocked?

Users can challenge restrictions imposed under Sections 69A and 79(3)(b) by questioning their legality, including through the courts where appropriate. However, where content is restricted under a platform's own community standards, users are expected to approach the platform's grievance officer first and, if dissatisfied with the decision, appeal to the government's Grievance Appellate Committee.

Legal experts said this shift towards platform-level enforcement had made it more difficult for users to obtain timely relief.

"Now, users do not have the remedy in constitutional courts as Meta has taken up the exercise," Mr. Ranjan said. "Writing to a grievance officer often results in an automated acknowledgement, which can then be taken to the committee. The user is then required to wait for 30 days for a result. This adds 60–90 days before the appeal results in a solution. Meanwhile, the user's account remains blocked, in some cases impacting their livelihood and credibility."



The logo of Meta seen at the entrance of the company's temporary stand ahead of the World Economic Forum in Davos, Switzerland in 2025. REUTERS

GS 2: Governance

Key Pointers:

- Rule 3(1)(d), IT Rules, 2021
- Section 69A, IT Act, 2000
- Section 79(3)(b), IT Act, 2000
- On what grounds can the government block online content under Section 69A?
- What is the difference between government-ordered blocking and platform-level moderation?
- What constitutional concerns arise from frequent content takedowns?

Why is the NVS-03 satellite launch significant?

What is NavIC? What is its operational status? What does the NVS-03 satellite, which was launched on board the GSLV on October 30, carry? What corrective measures is ISRO attempting? Did recent launch failures affect the NVS-03 mission?

Jacob Koshy

The story so far:

The Indian Space Research Organisation (ISRO) successfully launched the NVS-03 satellite from the Satish Dhawan Space Centre in Sriharikota on board the Geosynchronous Satellite Launch Vehicle (GSLV) on October 30. The launch will restore base-level functionality to India's indigenous 'GPS' system, called NavIC.

What is NavIC?

India launched the first-generation Indian Regional Navigation Satellite System (IRNSS) satellites between 2013 and 2018. They were designed to provide positioning, navigation and timing (PNT) services over India, to an area extending approximately 1,500 km beyond its boundaries. IRNSS was subsequently renamed NavIC, for 'Navigation with Indian Constellation'. Unlike the U.S. GPS, which has global coverage, NavIC was conceived as a regional system.

Satellite navigation systems generally provide two categories of signals: an open signal for civilian applications like navigation, transportation, disaster management, and telecommunications, and a restricted signal for authorised users, including the armed forces. The latter offers greater accuracy. For the armed forces, NavIC would offer a degree of operational independence.

However even with NVS-03, it will be a while before these loftier goals are realised.

NVS-03, followed by NVS-04 and NVS-05 — purportedly to be launched by December — are expected to help restore NavIC



The GSLV-F18 rocket carrying the NVS-03 satellite stands on the launch pad at the Satish Dhawan Space Centre ahead of liftoff, in Sriharikota. ANI

What is the operational status of NavIC?

Of the satellites launched under the original IRNSS programme, several have either been decommissioned, failed to reach their intended orbits, or have suffered failures of their onboard clocks. In July 2025, ISRO disclosed that five satellites were completely defunct, with all three clocks aboard each no longer functioning.

The situation deteriorated further in March, when the last functioning atomic clock aboard IRNSS-1F stopped working. The satellite, launched in 2016, had completed its designed mission life of 10 years three days prior. This left only three satellites able to provide PNT services. At least four are required for NavIC to function as intended.

There was also a setback in January 2025, when ISRO successfully placed the NVS-02 satellite in a geosynchronous transfer orbit, but the satellite's thrusters failed to move it into its intended final orbit.

What does NVS-03 carry?

NVS-03 is part of the second generation of satellites ISRO is developing to modernise NavIC. Each NVS satellite carries at least one indigenous rubidium atomic clock. Developed by the ISRO Space Applications Centre, these clocks are intended to replace the imported clocks made by Swiss company SpectraTime, used in the first generation IRNSS satellites.

The payload in Friday's launch consisted of imported and indigenous clocks, but ISRO has not shared more details.

Atomic clocks provide precise timing signals that allow receivers on the ground to calculate their position by measuring the time taken by signals to travel from satellites. Even a small timing error can translate into a significant positioning error.

What corrective measures is ISRO attempting?

NVS-01, launched in May 2023, was successfully placed in orbit and carries an indigenous rubidium atomic clock. NVS-02 was the second satellite in this series, but this mission's failure delayed subsequent launches. NVS-03, followed by NVS-04 and NVS-05 – purportedly to be launched by December – are expected to help restore NavIC.

ISRO's move towards indigenous clocks is also a corrective measure. It has also proposed increasing the number of clocks onboard each satellite to five, providing additional redundancy.

However, the indigenous clocks face procurement challenges. A March editorial in *The Hindu* argued that the transition to domestic manufacturing has not ensured a dependable supply of flight-ready equipment. ISRO also continues to function as both designer and operator of NavIC and, unlike the U.S. GPS Directorate or the European Union Agency for the Space Programme, lacks a dedicated counterpart to manage its navigation constellation.

Did recent launch failures affect the NVS-03 mission?

The NVS-03 launch comes against the backdrop of an unusually difficult period for ISRO. Two successive failures of the Polar Satellite Launch Vehicle (PSLV) forced the space agency to pause launches while a failure analysis committee investigated the causes.

The PSLV and GSLV are different rocket families but share aspects of their first-stage solid motor lineage, avionics, guidance systems, and manufacturing infrastructure. The government has said it has identified and resolved the causes of the failures but has declined to publish the committee's findings. ISRO has had only two successful launches this year, the other being the GSLV-F17 mission that launched the EOS-05 satellite.

The NVS-03 launch also departed from the usual spacecraft configuration, with ISRO having cleared a plan to fly it with its pyrotechnic valves already open, in a bid to avoid a recurrence of a problem that prevented NVS-02 from manoeuvring into its intended orbit.

GS 3: Science and Technology

Key Pointers:

- What is NavIC?
- What are the major applications of NavIC?
- Why is the NVS-03 launch significant?
- Why are atomic clocks important for navigation satellites?