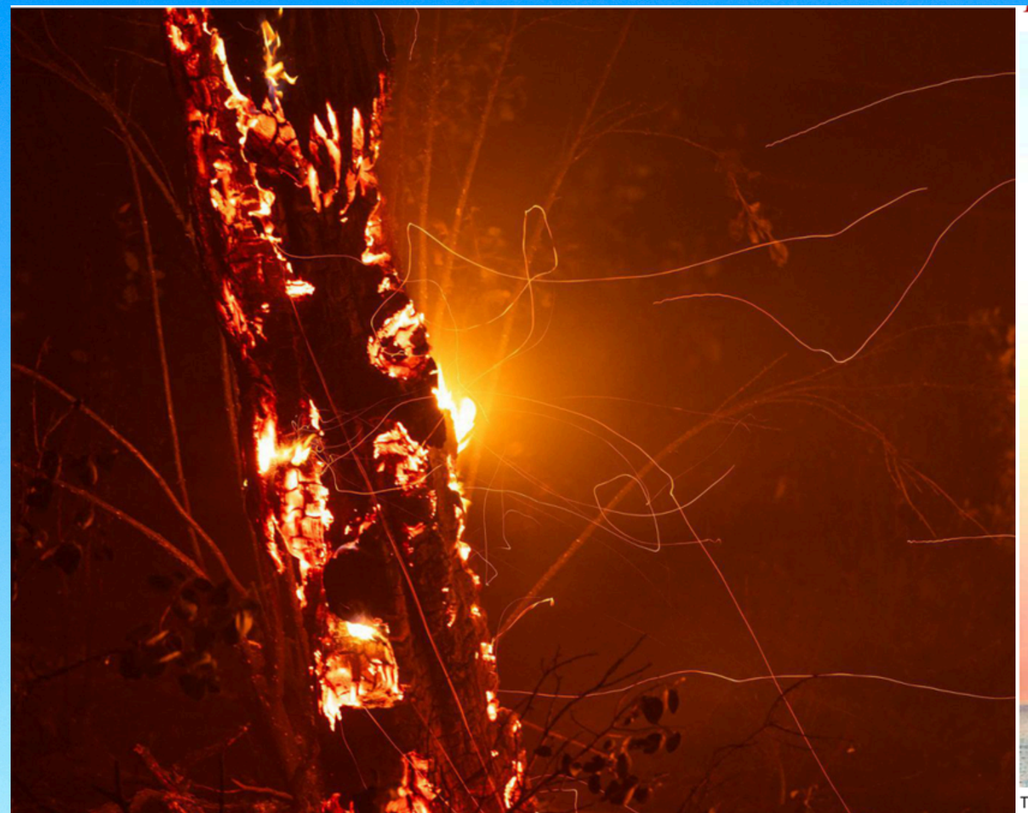
Monthly Current Affairs Compilation PDF JULY 2024

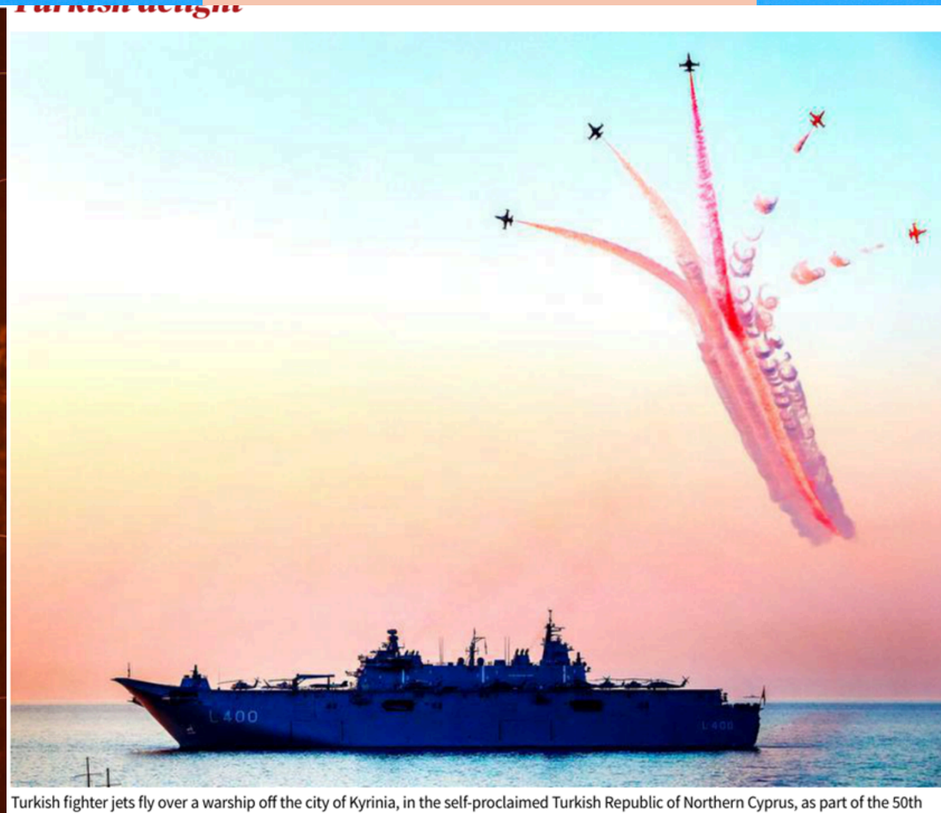
SAURABH PANDEY
CSE
(CIVIL SERVICES EXAMINATION)
FROM BASICS TO UPSC BRILLIANCE

UPSC CSE / Civil services exam

By Saurabh Pandey Sir

- CRISPR Fncas9
- The Mettur Dam
- The Clarion-Clipperton Zone
- Butterflies attract pollen





Turkish fighter jets fly over a warship off the city of Kyrinia, in the self-proclaimed Turkish Republic of Northern Cyprus, as part of the 50th

Topics

- Meningoencephalitis
- Coconut husk for supercapacitor
- Prosopagnosia
- Perpetual motion: cheating nature's laws
- Seine River
- M.K. Ranjitsinh and Ors. vs Union of India
- Should education be brought back to the State list?

By saurabh Pandey

THE HINDU

Topics-2

- Safeguard duty
- Freedom Edge.’
- Cryo-electron microscopy (cryo-EM)
- (AZD3152)
- Pesticide protection
- NTA Proposal
- What is the Teesta proposal?
- product and process patents.

By saurabh Pandey

THE HINDU

Meningoencephalitis due to amoebic infection claims two lives in Kerala

A.S. Jayanth
KOZHIKODE

Unhygienic and stagnant water resources and high temperatures may be worsening situation

Unhygienic and stagnant water resources and high temperatures could be the factors contributing to the recent unusual rise in the rare, but fatal primary amoebic meningoencephalitis cases in the State.

Three cases of the infection, including two deaths, have been reported in the last two months alone. While a five-year-old girl from Malappuram district died in May, a 13-year-old girl from Kannur district lost her life in June. Another 12-year-old boy from Kozhikode district is right now undergoing medical treatment at a private hospital. First detected in Alappuzha municipality in 2016, the inection was reported in Malappuram in 2019 and 2020, Kozhikode in 2020, Thrissur in 2022, and in Alappuzha in 2023.

"There has been a rise in such cases the world over. Warming of the atmosphere and stagnant and unhygienic water resources could be some of the conditions leading to it. This type of amoeba is found to be more active in warm water," M.P. Jayakrishnan, Additional Professor, Paediatrics, Government Medical College Hospital, Kozhikode, told *The Hindu* on Sunday.

Dr. Jayakrishnan was among those who treated the five-year-old girl from Malappuram and also suspected the possibility of the infection.

"Earlier, we used to have cases of bacterial meningitis among children. But, its instances have come down of late due to vaccination. The five-year-old girl had symptoms similar to that of bacterial meningitis. That was when we thought if it could be amoebic meningoencephalitis," he pointed out.

meningoencephalitis

- **Unhygienic and stagnant water resources and high temperatures could be the factors contributing to the recent unusual rise in the rare, but fatal primary amoebic meningoencephalitis cases in the State.**
- **The meninges are the layers of thin tissue that cover your brain. Meningitis is when these tissues become inflamed or infected.**
- **The problem is called encephalitis when your brain becomes inflamed or infected.**
- **If both the meninges and the brain are infected, the condition is called meningoencephalitis**

Causes

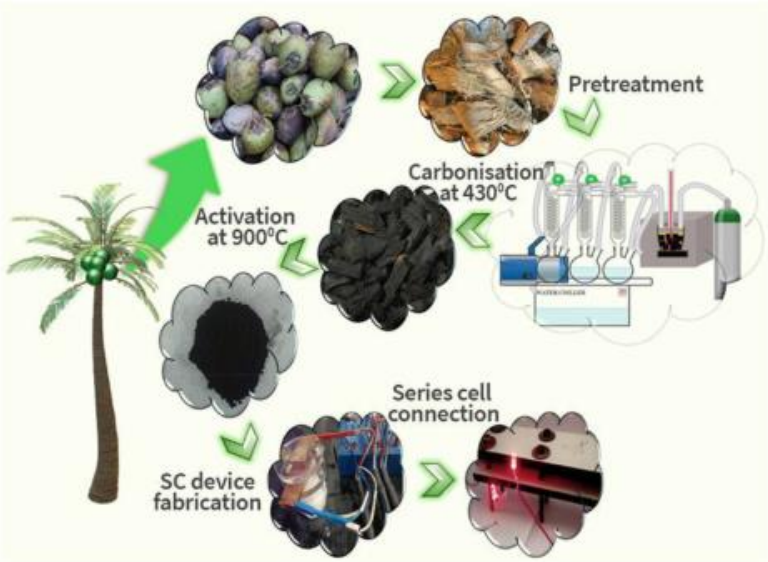
- **Infectious diseases, like viruses, bacteria, fungi and the amoeba Naegleria fowleri, are the main causes of meningoencephalitis.**
- **These infections can spread through air, water, food or close contact with somebody else who has them.**
- **Not everyone who gets these infections develops meningoencephalitis**

Carbon derived from coconut husks can power supercapacitors, find researchers

Sarath Babu George
THIRUVANANTHAPURAM

Researchers at the Government College for Women, Thiruvananthapuram, have devised a method to produce activated carbon, suitable for supercapacitor fabrication, from coconut husks, which are a major agricultural residue in Kerala.

The coconut husk bio-waste-derived activated carbon holds immense promise for sustainable and efficient green solutions for high-performance supercapacitors owing to its availability, low cost, and eco-friendly nature.



Schematic illustration of the synthesis of activated carbon.

Supercapacitors, with significantly higher capacitance and energy storage capacity than conventional capacitors, have emerged as a vital component in the quest for sustainable energy storage solutions. But, the search for an ideal supercapacitor electrode material has been a challenge.

The research team, led by Xavier T.S., Assistant Professor, Department of Physics, and including Merin Tomy, Ganesh S.G., Anu M.A., and Sreelakshmi S.R., found the prototype supercapacitors made of coconut husk-derived activated carbon to be four-times more efficient than the existing supercapacitors. The findings have been published in the American *Sustainable Resource Management Journal*.

The team had leveraged the innovative microwave-assisted method designed at the Centralised Common Instrumentation Facility (CCIF) at the college.

Coconut husk for supercapacitor

- **Researchers at the Government College for Women, Thiruvananthapuram, have devised a method to produce activated carbon, suitable for supercapacitor fabrication, from coconut husks, which are a major agricultural residue in Kerala.**
- **The coconut husk biowaste-derived activated carbon holds immense promise for sustainable and efficient green solutions for high-performance supercapacitors owing to its availability, low cost, and eco-friendly nature.**

- **Supercapacitors, with significantly higher capacitance and energy storage capacity than conventional capacitors, have emerged as a vital component in the quest for sustainable energy storage solutions.**
- **But, the search for an ideal supercapacitor electrode material has been a challenge.**

What is Capacitor ?

Capacitors are energy-storing devices available in many sizes and shapes. They consist of two plates of conducting material sandwiched between an insulator made of ceramic, film, glass or other materials, even air. The insulator is also known as a **dielectric**, and it boosts a capacitor's charging capacity. Capacitors are sometimes called **condensers** in the automotive, marine and aviation industries.

The internal plates are wired to two external terminals, which sometimes are long and thin and can resemble tiny metallic antennae or legs. These terminals can be plugged into a circuit.

Capacitors and batteries both **store energy**. While batteries release energy gradually, **capacitors discharge it quickly.**

Super capacitor

- Supercapacitors are electrochemical devices with following features:
  - High energy density.
  - High power density.
  - High capacitance.
  - Longer life.

- A supercapacitor or ultra capacitor is an electrochemical capacitor that has an unusually high energy density when compared to common capacitors. They are of particular interest in automotive applications for hybrid vehicles and as supplementary storage for battery electric vehicles.

Study finds gene mutation that turns familiar faces into strangers

Individuals with the misfortune of carrying the mutant gene took much longer than is socially acceptable to recognise people with whom they were expected to be familiar — such as spouses, siblings, and children — while they confused strangers with familiar people

D.P. Kasbekar

A simple joy, often taken for granted, is to unexpectedly run into a friend or a relative at a train station or market. Recognising a familiar face in an unfamiliar context or crowded place gives most of us unalloyed pleasure.

We should give thanks to our MCTP2 gene for this ability. According to research published in this month's issue of the journal *Genetics*, by researchers led by Ye Rao of Capital Medical University, Beijing, when this gene is mutated the ability to recognise faces is severely impaired.

Individuals with the misfortune of carrying the mutant gene took much longer than is socially acceptable to recognise people with whom they were expected to be familiar – such as spouses, siblings, and children – while they confused strangers with familiar people.

This disorder is called prosopagnosia, or face blindness. Its prevalence worldwide is estimated to be 1.8-2.9% in the general population. Prosopagnosia is one form of visual agnosia, or inability to identify everyday items just by looking at them.

The MCTP2 gene is thus the first found to be required for a higher form of visual social cognition in humans.

Face recognition and a gene

The researchers identified a family of 35 individuals spread across three generations. The members of its eldest generation were all older than 60 years. Nine members of the family had daily problems with recognising faces. They also performed very poorly on a standardised face recognition test. Another nine performed normally in the tests, yet they too had difficulty recognising faces.

The remaining 17 – including nine who married into the family – performed normally in the tests and had no difficulty recognising faces.

By charting the family tree, the researchers inferred that a great-grandparent of the eldest generation must have carried the mutation. The eldest members then passed on the mutation to their affected children and grandchildren.

Examining the genome of the affected family members revealed they had all inherited the same genome segment in one copy of their chromosome no. 15. Recall that we inherit two copies of each chromosome, one from each parent, and in this way each one of us possesses 23 pairs of chromosomes.

By sequencing the genomic DNA, the researchers found that the MCTP2 gene, located in this segment, had been altered by a mutation. As a result, one amino acid in the protein encoded by the MCTP2 gene had been replaced by another. The researchers didn't find this mutation in any of the hundreds of thousands of human genome sequences stored on different databases.

That is, the mutation was novel and private to this family.

Examining the genome of the affected family members revealed they had all inherited the same genome segment in one copy of their chromosome no. 15. STEWART MACLEAN/UNSPLASH

Validation from population studies

But how did the researchers conclude that face blindness was caused by precisely this mutation, and not by some other mutation in the candidate genome segment?

They came to their conclusion on the basis of a population screen. The researchers recruited a cohort of 2,904 individuals (743 male and 2161 female, all around 19 years of age) to answer an online questionnaire. The questionnaire incorporated elements of the face recognition test. Seventy-eight individuals scored very poorly: that is, their scores deviated by two standard deviations or more from the average score.

The researchers sequenced the genome of 75 of the poor scorers and found seven of them carried one of five other sequence alterations in the MCTP2 gene. This demonstrated that unrelated individuals who performed very poorly in face recognition tests were more likely to carry independent mutations in the MCTP2 gene compared to the general population.

> The MCTP2 gene is the first found to be required for a higher form of visual social cognition in humans

Additionally, the team found that the individuals' first-degree relatives, such as a parent, a child or a sibling, who shared their mutation also shared the facial recognition impairment.

These findings implicated the MCTP2 gene in face recognition.

As for the 68 others who did poorly on the test but had non-mutated MCTP2 genes: some of them might have had mutations in yet other genes for face recognition. Others might have suffered face recognition problems because of infection or injury. And still others might indeed have been false positives.

A questionnaire-based screen is unlikely to have been 100% specific for identifying individuals with face recognition deficits; for extraneous reasons, even 'normal' face recognisers might perform poorly on a questionnaire.

In the brain, the right middle fusiform gyrus, a.k.a. the fusiform face area (rFFA), is activated during facial recognition. When the researchers used functional magnetic resonance imaging to study individuals carrying the different MCTP2 mutations, they found abnormal responses in the rFFA.

When a glove becomes a puzzle

It is perplexing for most of us to imagine what it is to live with a visual agnosia. In his bestselling 1985 book *The Man Who Mistook His Wife for a Hat*, the gifted neurologist and writer Oliver Sacks (1933-2015) recounted case histories of some of his patients. Dr P. was a distinguished musician and teacher, and had a visual agnosia caused by a tumour in the brain.

When Dr P. was offered a glove and asked what it was, he described it as "a continuous surface infolded on itself, (with) five outpouchings..." He imagined it to be a change purse for coins. When asked to put on his shoe, he was unable to tell his foot from his shoe. He mistook water hydrants and parking metres on the street for children and patted them on the head. And he mistook his wife for a hat.

Baffled, Dr. Sacks wondered how a man such as this could function as a teacher at the Music School. Yet Dr. P. taught music until the last days of his life.

With the discovery of MCTP2's role, our helpless bewilderment regarding visual agnosia should give way to our first molecular glimpse of what actually might be happening in the troubled brain. Both Dr. Sacks and Dr. P. would have been pleased with this progress.

(D.P. Kasbekar is a retired scientist.)

THE GIST

Mutation of the MCTP2 causes prosopagnosia, or face blindness. Its prevalence worldwide is estimated to be 1.8-2.9%. Prosopagnosia is one form of visual agnosia, or inability to identify everyday items just by looking at them

Researchers demonstrated that unrelated individuals who performed poorly in face recognition tests were more likely to carry independent mutations in the MCTP2 gene. Their first-degree relatives who shared their mutation also shared the impairment

In the brain, the right middle fusiform gyrus is activated during facial recognition. When researchers used functional magnetic resonance imaging to study individuals carrying different MCTP2 mutations, they found abnormal responses in the gyrus

Prosopagnosia

- Mutation of the MCTP2 causes prosopagnosia, or face blindness. Its prevalence worldwide is estimated to be 1.8-2.9%.
- Prosopagnosia is one form of visual agnosia, or inability to identify everyday items just by looking at them
- Researchers demonstrated that unrelated individuals who performed poorly in face recognition tests were more likely to carry independent mutations in the MCTP2 gene.

- **Their first-degree relatives who shared their mutation also shared the impairment In the brain, the right middle fusiform gyrus is activated during facial recognition.**
- **When researchers used functional magnetic resonance imaging to study individuals carrying different MCTP2 mutations, they found abnormal responses in the gyrus**

WHAT IS IT?

Perpetual motion: cheating nature's laws

Karthik Vinod

Nothing lasts forever. This is good life advice, and it also happens to be an important feature of our physical universe.

Natural philosophers considered and discarded the idea of "perpetual motion" a long time ago. The basic premise of perpetual motion is that it should be possible to operate a system without supplying power to it. We know from daily experience that this can't be true: for example, your phone's battery will drop to zero if you use it without charging.

In physicists' parlance, perpetual motion violates the law of conservation of energy. The first and second laws of thermodynamics also stipulate that anything that offers power must also liberate heat. If there was an infinite power supply, there would also have to be an infinite heat liberator. There isn't.

But this simple explanation hasn't stopped some people from wondering whether perpetual motion machines might exist. A simple example is the dunking bird toy. It uses a temperature differential between the bird's top and bottom to move back and forth. Very simply speaking, when it moves forth, its beak dips into a glass of water that flows to the bird's bottom, and the weight causes the bird to move back.

A dunking bird toy uses a temperature differential between the top and bottom to move back and forth. ROBINLEICESTER (CC BY-SA 3.0)

The dunking bird toy can work like this for a long time, but it can't move perpetually: it will stop when the temperature differential between the bird's top and bottom vanishes.

(*Karthik Vinod is an intern with* The Hindu.)

For feedback and suggestions
for 'Science', please write to
science@thehindu.co.in
with the subject 'Daily page'

Perpetual motion: cheating nature's laws

- Nothing lasts forever. This is good life advice, and it also happens to be an important feature of our physical universe.
- Natural philosophers considered and discarded the idea of "perpetual motion" a long time ago.
- The basic premise of perpetual motion is that it should be possible to operate a system without supplying power to it.
- We know from daily experience that this can't be true: for example, your phone's battery will drop to zero if you use

- **In physicists’ parlance, perpetual motion violates the law of conservation of energy.**
- **The first and second laws of thermodynamics also stipulate that anything that offers power must also liberate heat.**
- **If there was an infinite power supply, there would also have to be an infinite heat liberator**

BIG SHOT

Water pollution levels in Paris's Seine river remain much higher than the level allowed for swimming, data showed on Friday. The numbers arrived just one month before the start of the Olympics, in which the capital's landmark waterway is meant to be one of the swimming venues. REUTERS

Seine River

- **Seine River, ancient Sequana, Second longest river in France.**
- **It rises on the Langres plateau, 18 mi (30 km) northwest of Dijon, and flows through Paris before emptying into the English Channel at Le Havre after a course of 485 mi (780 km). Its tributaries include the Marne and Oise rivers.**


PARIS
NANTES
LYON
BORDEAUX
AVIGNON
TOULOUSE


Cambrai
C. de la Somme
C. de St Quentin
Amiens
LE HAVRE
ROUEN
Noyon
C. de l'Oise à l'Aisne
Compiègne
Aisne
C. latéral à l'Aisne
Oise
LOWER SEINE
Pontoise
C. de l'Ourcq
Marne
Conflans
Mantes-la-Jolie
Meaux
PARIS
Melun


ENGLAND
London
Bruges
Lille
BELGIUM
Juno Beach
Gold Beach
Omaha Beach
Rouen
Paris
Les Andelys
Vernon
Le Pecq
SEINE
FRANCE
N
Cruise
High-Speed Train
Overnight

Court on climate right and how India can enforce it

Navroz K. Dubash

Senior Fellow at the Sustainable Futures Collaborative

Shibani Ghosh

Visiting Fellow at the Sustainable Futures Collaborative

Aditya Valiathan Pillai

Fellow at the Sustainable Futures Collaborative

Through its recent judgment in *M.K. Ranjitsinh and Ors. vs Union of India & Ors.*, the Supreme Court of India has dropped a large rock into the relatively placid waters of India's nascent climate change jurisprudence. It has read into the Constitution of India the right to 'be free from the adverse effects of climate change', identifying both the right to life and the right to equality as its sources. As a new government considers its imperatives and agenda, *Ranjitsinh* provides an intriguing opportunity to think through and possibly enact much more systematic governance around climate change.

A new right around climate

Scholars and legal practitioners are still unpacking the judgment. The issue before the Court was whether and how electricity transmission lines can be built through the habitat of the critically endangered Great Indian Bustard. The government claimed that a previous court order protecting the bird's habitat had affected the country's renewable energy potential. Modifying this order, the Court prioritised transmission infrastructure to enable accelerated development of renewable energy to address climate change. But the more seismic aspect of the judgment was the newly minted 'climate right' rooted in the constitutionally guaranteed right to life (Article 21) and right to equality (Article 14). Reading this right into the Constitution potentially opens the door to climate litigation, empowering citizens to demand from the government that this right be protected.

But the judgment also leaves unresolved questions. Does the Court overstate the large-scale clean energy agenda as the main pathway to avoiding climate harms and, correspondingly, understate climate adaptation and local environmental resilience? Just how will this right against the adverse effects of climate change be protected? And what might it mean for the agenda of the newly formed government? One way forward is the slow accretion of judicial decisions around this right. But another is new legislation to actively realise a right against the adverse effects of climate change.

The former approach, the proliferation of court-based action through enhanced litigation around climate claims, will likely lead, slowly and over time, to an incomplete patchwork of (judiciary-led) protections. As with many other well-meaning judicial orders directing the protection of fundamental rights, realising climate rights could become contingent on the passage of several subsequent policy actions. Moreover, a patchwork approach is less likely to chart an overarching framework to guide future policy.

Is the latter approach, climate legislation, then a preferred approach to protect climate rights? The judgment itself states that there is no 'umbrella legislation' in India that relates to climate change. And in so doing, seems to implicitly recognise the merits of an overarching, framework legislation. Drawing from the experience of other countries, framework legislation can bring several advantages. It can set the vision for engaging with climate change across sectors and regions, create necessary institutions and endow them with powers, and put in place processes for structured and deliberative governance in anticipation of and reaction to climate change.

Indian context is important

These are important advantages, and good reasons for India to consider climate legislation. But at the same time, it is essential that Indian climate legislation not blindly copy other countries, and is tailored to the Indian context.

Undoubtedly, India needs to transition to a low-carbon energy future, an imperative that is highlighted in the Ranjitsinh judgment. But this, by itself, is not nearly enough to enforce a right against the adverse effects of climate change. Climate legislation should also create a supportive regulatory environment for more sustainable cities, buildings, and transport networks. It should enable adaptation measures such as heat action plans sensitive to local context. It should provide mechanisms for shifting to more climate-resilient crops. It should protect key ecosystems such as mangroves that act as a buffer against extreme weather events. And, it should actively consider questions of social equity in how it achieves these tasks. In brief, it should provide a way of mainstreaming and internalising climate change considerations into how India develops. Nothing less is required to make progress toward avoiding the adverse effects of climate change.

But having a single, omnibus law that covers all these areas is not feasible, particularly in the face of an existing legal framework that legislates on most of these issues. It is impossible to anticipate upfront all the ways in which society can and should prepare for climate change. So, what is the way forward?

Here, there is scope to learn from international experience both what not to do and what directions to follow. Climate laws in many countries, often following the example of the United Kingdom, focus narrowly on regulating carbon emissions, for example, by setting regular five yearly national carbon budgets and then putting in place mechanisms to meet them. This sort of approach, which has unfortunately become somewhat of a template for countries to follow, is ill-suited to India.

Instead, because India is still developing, is highly vulnerable, and yet to build much of its infrastructure, what the country needs is a law that enables progress toward both low-carbon and climate resilient development. The distinction between a regulatory law, such as the U.K.'s, and an enabling one, like, for example in Kenya, is important to understand. A regulatory law focuses, in a narrow way, on emissions and how they can be limited. An enabling law can be written to stimulate development-focused decisions in a range of sectors across the economy – urban, agriculture, water, energy and so on – by systematically asking whether each decision moves the country closer to or further from low-carbon growth and climate resilience. Importantly, this approach emphasises adaptation as much as mitigation.

An enabling law is likely to be a more procedurally-oriented law, one that systematically creates the institutions, processes and standards for mainstreaming climate change across diverse ministries and different parts of society. For example, such a law would build in procedures to support knowledge-sharing, ensuring transparency and avenues for public participation and expert consultation, prompting meaningful setting (and revision) of targets and timelines and reporting against these.

The factor of federalism

There is another dimension essential for a climate law tailored to India: ensuring that the law works effectively within Indian federalism. Many areas relevant to climate action, from urban policy to agriculture and water fall under the authority of sub-national governments – States or local levels, and electricity also is a concurrent subject. An Indian climate law must simultaneously set a framework for coherent national action while decentralising sufficiently to empower States and local governments, and enable them with information and finance to take effective action.

Finally, the enabling role should ideally also extend beyond government. Business, civil society and communities, particularly those on the frontlines of climate impacts, have essential knowledge to bring to energy transition and resilience. Finding ways of enabling participation in decision making would enable all these sections of society to bring their knowledge to the table in addressing climate change. An effective Indian climate law based on enabling procedures would also provide opportunities for voice to diverse segments of society.

These broad ideas provide a set of principles for a climate law tailored to India, one that provides a basis for taking forward and fulfilling the promise of the Ranjitsinh judgment.

Because India is still developing, what the country needs is a law that enables progress toward low-carbon and climate-resilient development

M.K. Ranjitsinh and Ors. vs Union of India

- T hrough its recent judgment in M.K. Ranjitsinh and Ors. vs Union of India & Ors., the Supreme Court of India defines new climate change jurisprudence.
- It has read into the Constitution of India the right to ‘be free from the adverse effects of climate change’, identifying both the right to life and the right to equality as its sources.
- As a new government considers its imperatives and agenda, Ranjitsinh provides an intriguing opportunity to think through and possibly enact much more systematic governance around climate change

Should education be brought back to the State list?

When was the subject added to the concurrent list? How do other countries govern education?

Rangarajan. R

The story so far:

The NEET-UG exam has been embroiled in controversies over the award of grace marks, allegation of paper leaks and other irregularities. The government also cancelled the UGC-NET exam after it was held, while the CSIR-NET and NEET-PG exams have been postponed.

What is the historical background?

The Government of India Act, 1935 during the British rule created a federal structure for the first time in our polity. The legislative subjects were distributed between the federal legislature (present day Union) and provinces (present day States). Education which is an important public good was kept under the provincial list. After independence, this continued and education was part of the 'State list' under the distribution of powers.

However, during the Emergency, the Congress party constituted the Swaran Singh Committee to provide recommendations for amendments to the Constitution. One of the recommendations of this committee was to place 'education' in the concurrent list in order to evolve all-India policies on the subject. This was implemented through the 42nd constitutional amendment (1976) by shifting 'education' from the State list to the concurrent list. There was no detailed rationale that was provided for this switch and the amendment was ratified by various States without adequate debate.

The Janata Party government led by Morarji Desai that came to power after Emergency passed the 44th constitutional amendment (1978) to reverse many of the controversial changes made through the 42nd amendment. One of these amendments that was passed in the Lok Sabha but not in the Rajya Sabha was to bring back 'education' to the State list.

What are international practices?

In the U.S., State and local governments set the overall educational standards, mandate standardised tests and supervise colleges and universities. The federal education department's functions primarily include policies for financial aid, focussing on key educational issues and ensuring equal access. In Canada, education is completely managed by the provinces. In Germany, the constitution vests legislative powers for education with landers (equivalent of States). In South Africa, on the other hand, education is governed by two national departments for school and higher education. The provinces of the country have their own education departments for implementing policies of the national departments and dealing with local issues.

What can be the way forward?

The arguments in favour of 'education' in the concurrent list include a uniform education policy, improvement in standards and synergy between Centre and States. However, considering the vast diversity of the country, a 'one size fits all' approach is neither feasible nor desirable. Further, as per the report on 'Analysis of Budgeted expenditure on Education' prepared by the Ministry of Education in 2022, out of the total revenue expenditure by education departments in our country estimated at ₹6.25 lakh crore (2020-21), 15% is spent by the Centre while 85% is spent by the States. Even if expenditure by all other departments on education and training are considered, the share works out to 24% and 76% respectively.

The arguments against restoring 'education' to State list include corruption coupled with lack of professionalism. The recent issues surrounding the NEET and NTA have however displayed that centralisation does not necessarily mean that these issues would vanish.

Considering the need for autonomy in view of the lion's share of the expenditure being borne by the States, there needs to be a productive discussion towards moving 'education' back to the State list. This would enable them to frame tailor-made policies for syllabus, testing and admissions for higher education including professional courses like medicine and engineering. Regulatory mechanisms for higher education can continue to be governed by central institutions like the National Medical Commission, University Grants Commission and All India Council for Technical Education.

Rangarajan. R is a former IAS officer and author of 'Polity Simplified'. Views expressed are personal.

THE GIST

- The Government of India Act, 1935 during the British rule created a federal structure for the first time in our polity.
- During the Emergency, the Congress party constituted the Swaran Singh Committee to provide recommendations for amendments to the Constitution. One of the recommendations of this committee was to place 'education' in the concurrent list.
- Considering the need for autonomy in view of the lion's share of the expenditure being borne by the States, there needs to be a discussion towards moving 'education' back to the State list.

Should education be brought back to the State list?

What is the historical background?

- The Government of India Act, 1935 during the British rule created a federal structure for the first time in our polity.
- The legislative subjects were distributed between the federal legislature (present day Union) and provinces (present day States).
- Education which is an important public good was kept under the provincial list.
- After independence, this continued and education was part of the ‘State list’ under the distribution of powers.
- However, during the Emergency, the Congress party constituted the Swaran

- One of the recommendations of this committee was to place ‘education’ in the concurrent list in order to evolve all-India policies on the subject.
- This was implemented through the 42nd constitutional amendment (1976) by shifting ‘education’ from the State list to the concurrent list.
- There was no detailed rationale that was provided for this switch and the amendment was ratied by various States without adequate debate.

- **The Janata Party government led by Morarji Desai that came to power after Emergency passed the 44th constitutional amendment (1978) to reverse many of the controversial changes made through the 42nd amendment.**
- **One of these amendments that was passed in the Lok Sabha but not in the Rajya Sabha was to bring back ‘education’ to the State list**

What can be the way forward?

- **The arguments in favour of ‘education’ in the concurrent list include a uniform education policy, improvement in standards and synergy between Centre and States. However, considering the vast diversity of the country, a ‘one size fits all’ approach is neither feasible nor desirable.**

- The arguments against restoring ‘education’ to State list include corruption coupled with lack of professionalism.
- The recent issues surrounding the NEET and NTA have however displayed that centralisation does not necessarily mean that these issues would vanish.
- Considering the need for autonomy in view of the lion’s share of the expenditure being borne by the States, there needs to be a productive discussion towards moving ‘education’ back to the State list.

- **This would enable them to frame tailor-made policies for syllabus, testing and admissions for higher education including professional courses like medicine and engineering.**
- **Regulatory mechanisms for higher education can continue to be governed by central institutions I**

Indonesia to levy safeguard duties of 100% to 200%: Hasan

Protectionist move: The duties are aimed at protecting local industry, says Trade Minister Zulkifli Hasan. REUTERS

Reuters
JAKARTA

Indonesia will impose safeguard duties of 100% to 200% on imports ranging from footwear to ceramics, reviving a plan to protect domestic industries, the Trade Minister said.

The planned import duties average more than 100%, Trade Minister Zulkifli Hasan told reporters on Friday. "If we are flooded with (imported goods), our micro, small and medium enterprises could collapse."

Southeast Asia's biggest economy issued a regulation late last year to tighten monitoring for more than 3,000 imported goods, from food ingredients to electronics to chemicals.

Reverses regulation

However, the regulation was reversed after domestic industry said it hindered the flow of imported materials needed by domestic industry.

Duties will be imposed soon and could affect imports of footwear, clothing, textiles, cosmetics and ceramics, Mr. Zulkifli said.

The Indonesian Trade Safeguards Committee is investigating to determine duty rates, senior Trade Ministry official Budi Santoso said on Saturday.

Indonesia mainly imports apparel and clothing accessories from China, Vietnam and Bangladesh, data from the statistics bureau show.

Safeguard duty

- **A safeguard duty is a type of customs duty imposed by emergency action under the WTO Agreement on Safeguards.**
- **It is designed to prevent harm and injury to a domestic industry that would face intense competitive pressure from the continued importation of a particular good**

SEOUL

N. Korea condemns drills by U.S., Japan, South Korea as 'Asian NATO'

AP

North Korea denounced joint military drills by South Korea, Japan and the U.S., calling them an "Asian version of NATO" and warning of "fatal consequences". It comes a day after the allies wrapped up the exercises, dubbed "Freedom Edge", in missile and air defences, anti-submarine warfare and defensive cyber training. AFP

Freedom Edge.’

- joint military exercise by South Korea, Japan, and the United States held this month.
- In a statement, its state media said such drills show that the relationship among the three countries has developed into the Asian version of NATO. Earlier on Thursday, the three countries began large-scale joint military drills called ‘Freedom Edge.’
- The exercise involving navy destroyers, fighter jets, and the nuclear-powered U.S. aircraft carrier Theodore Roosevelt aimed at boosting defences against missiles, submarines, and air attacks.

Anti-measles antibody prevents viral fusion: study

Cryo-electron microscopy (cryo-EM) structures of an anti-measles antibody reveal its therapeutic potential by blocking the virus's fusion process, a new study reports. The work paves the way for the next generation of measles virus therapeutics and illuminates a mechanism that may be shared by antibodies against other viral pathogens. The structures generated by the researchers also revealed an important epitope that may provide a new druggable target for MeV as well as other paramyxoviruses like mumps.

Cryo-electron microscopy (cryo-EM)

- Cryo-electron microscopy (cryo-EM) structures of an anti-measles antibody reveal its therapeutic potential by blocking the virus's fusion process, a new study reports.
- The work paves the way for the next generation of measles virus therapeutics and illuminates a mechanism that may be shared by antibodies against other viral pathogens.
- The structures generated by the researchers also revealed an important epitope that may provide a new druggable target for MeV as well as other paramyxoviruses like mumps.

- **Cryo-EM is a version of electron microscopy that freezes many copies of a delicate sample into a glassy state and hits them with an electron beam. Electrons pass through the copies to create images into a high-res 3D model of the sample.**
- **Microscopy is the technical field of using microscopes to view samples & objects that cannot be seen with the unaided eye (objects that are not within the resolution range of the normal eye)**

Antibody shields hamsters from SARS-CoV-2 variants

Scientists show that a new antibody therapy for COVID-19 can neutralise the Omicron strain of SARS-CoV-2 in hamsters and is safe in humans, according to their research. The antibody (AZD3152) could provide an additional layer of protection to vulnerable groups at risk of severe COVID-19. The antibody binds to the back "left shoulder" of the receptor binding domain on the SARS-CoV-2 spike protein, and is designed to be more potent against emerging variants.

(AZD3152)

- The antibody (AZD3152) could provide an additional layer of protection to vulnerable groups at risk of severe COVID-19.
- The antibody binds to the back “left shoulder” of the receptor binding domain on the SARS-CoV-2 spike protein, and is designed to be more potent against emerging variants.

inStem's fabric offers protection from pesticides

R. Prasad

Researchers at the Institute for Stem Cell Science and Regenerative Medicine (inStem), in Bengaluru have developed an anti-insecticide fabric that effectively neutralises organophosphate-based pesticides. In an earlier work published about six years ago, the team had developed a gel for topical dermal application to deactivate the pesticides. But considering that compliance might be poor, the researchers looked at another alternative that is as effective in deactivating the insecticide but at the same time does not reduce compliance.

When esters present in organophosphate-based pesticides enter the body they bind and inhibit an enzyme (acetylcholinesterase or AChE) critical for neuromuscular function from working. Therefore, inhibition of this important enzyme is implicated in learning deficits, suffocation, paralysis, muscle weakness among others.

In a paper published recently in *Nature Communications*, the team led by Dr. Praveen Kumar Vemula from inStem coated the cotton fabric with small molecules, rendering the final product the ability to deactivate the insecticide. "The small molecules are covalently bonded with the cellulose of the fabric making the cloth not only breathable but also durable," says Dr. Vemula. The small molecules that are covalently bonded with the fabric are nucleophile in nature, and can detoxify the pesticides upon contact through nucleophile-mediated hydrolysis, says Dr. Vemula. "The fabric attacks the pesticide molecule and breaks it into non-toxic products. The pesticide is deactivated even before it reaches the skin surface," he says. The fabric with covalently-bonded small molecules was developed in collaboration with Sepio Health Pvt Ltd, a spin-off company from inStem.

Right way: The fabric deactivates the pesticide and breaks it down into non-toxic products. AP

"The fabric retains the anti-insecticide property even after washing 150 times." Though the reusability after 50 cycles was reported in the paper, the researchers continued the reusability testing and found the effectiveness to last up to 150 cycles of washing. "Unlike the gel, the reusability will make the fabric an affordable solution to prevent insecticide-induced toxicity to farmers. It will also increase compliance," he says.

According to Dr, Vemula, the small molecule-coated fabric does not act as a physical barrier to organophosphate-based insecticide. Instead, the fabric hydrolytically deactivates the insecticides, causing the prevention of insecticide-induced AChE inhibition.

To investigate the efficiency of the fabric containing the small molecules, the active AChE in the blood before and three days after exposure to the insecticide was measured in rats. While direct exposure or when normal cloth did little to halt the drop in active AChE in blood, no reduction in blood active AchE level was observed in the presence of the fabric coated with small molecules. Several organs from the exposed and unexposed rats were studied and compared, and the researchers found that the active AChE levels in the organs did not drop in the case of rats that were exposed to the insecticide in the presence of the fabric coated with small molecules. Also, while rats that were repeatedly and directly exposed to ethyl paraoxon (an activated organophosphate insecticide) or through the normal fabric died within four days, none of the rats exposed to the insecticide in the presence of the special fabric died.

Farmers get repeatedly exposed to the insecticide due to frequent usage, and this can cause chronic toxicity and severe adverse health effects. The animal study results show promise that the fabric containing the small molecules can prevent chronic toxicity in farmers, he says.

"The design of one nucleophile that can deactivate a wide range of organophosphates and carbamates was challenging. Subsequently, optimising the industry-friendly chemistry to covalently attach on the fabric was the key in developing anti-pesticide fabric," says Dr. Ketan Thorat, a former research student at inStem and coauthor of the paper.

Pesticide protection

- When esters present in organophosphate-based pesticides enter the body they bind and inhibit an enzyme (acetylcholinesterase or AChE) critical for neuromuscular function from working.
- Therefore, inhibition of this important enzyme is implicated in learning deficits, suffocation, paralysis, muscle weakness among others.

- researchers looked at another alternative that is as effective in deactivating the insecticide
- small molecule coated fabric does not act as a physical barrier to organophosphate-based insecticide. Instead, the fabric hydrolytically deactivates the insecticides, causing the prevention of insecticide-induced AChE inhibition.
- inStem’s fabric offers protection from pesticides

Why has the NTA failed to deliver?

How many examinations are under the charge of the National Testing Agency? Is it equipped to handle the large number of students and centres? What are the challenges? What are the loopholes in the system that can be manipulated by unscrupulous players?

Priscilla Jebaraj

The story so far:

The National Testing Agency (NTA) has come under intense fire over the past few weeks, with widespread allegations of cheating, paper leaks and other irregularities impacting flagship examinations such as the NEET (National Eligibility cum Entrance Test) for undergraduate medical college admissions and the UGC-NET for Ph.D and assistant professor appointments. The agency's director general, Subodh Kumar Singh, has been removed, the CBI is probing irregularities, and a high-level panel has been set up to create a roadmap for a systemic overhaul.

What is the NTA?

The NTA was set up in 2017 as a specialist, self-sustaining and autonomous organisation under the aegis of the Union Education Ministry. Its director general and governing body are appointed by the Union government. However, it is registered as a society and is a separate legal entity, which raises questions about the government's legal liability for the NTA's actions. Its main mandate is to conduct efficient, transparent and international standard tests to assess the competency of candidates for admission, and recruitment purposes. Soon after it was established, the NTA took over the conduct of major all-India examinations, such as the JEE for engineering college admissions, NEET-UG, and UGC-NET (both of which had previously been conducted by the Central Board for Secondary Education or CBSE), as well as the entrance tests for Jawaharlal Nehru University and Delhi University. The National Education Policy of 2020 envisaged a broader role, recommending that the NTA conduct an entrance or aptitude test for all universities across the country. In all, the NTA now has charge for more than 20 examinations.

Educationists propose broader pathways like equipping NTA better or dismantling the centralisation process

Outrage and uproar: Members of the Students' Federation of India staging a protest in Vijayawada on June 22. G.N. RAO

Why have there been so many problems?

One of the main problems is that the NTA was originally intended to conduct computer-based tests only. "This will ensure that high volume can be processed in a short period of time," says the agency's website, claiming that such online testing will "eliminate the possibility of leakage of questions and question papers, post-test malpractice of filling in the OMR sheets, late entry of students to cheat in the test, subjectivity errors on descriptive testing, etc…In a short period of three years, all the tests administered by NTA will be computer adaptive. This will completely eliminate the problem of cheating," it declares. Thus, when the NTA took over conduct of the UGC-NET examination from the CBSE six years ago, it was converted from a pen-and-paper examination to a computer-adaptive test. This year, however, for reasons that are unclear, UGC-NET shifted back to the pen-and-paper mode. The day after it was conducted for over 11 lakh aspirants, the government cancelled the examination, citing inputs from the cyber crime unit.

"Pen-and-paper is a heaven for scamsters," said one former official, noting that the printing process is particularly vulnerable to leaks. It is interesting that when the government announced fresh dates for UGC-NET 2024 to be held again, it also stipulated that it would be a computer-adaptive test this time.

However, when the conduct of NEET-UG was taken over by the NTA, the Health Ministry flatly refused to allow it to shift to a computer-based exam, citing concerns about students in rural areas who would not be prepared for an online exam, as well as Supreme Court rulings on how the examination should be conducted. Hence, the NTA has been forced to run a major examination in a mode that it was never intended to implement by design.

Officials and educationists note that the agency is severely understaffed for the role it is currently being asked to undertake. According to a senior official, the agency was set up with only about 25 permanent staff positions. A number of its functions have also been outsourced to technical partners from the very beginning. Given that NEET-UG alone had more than 23 lakh candidates writing the examination in almost 5,000 centres across the country and abroad, this has left the agency stretched thin, according to some officials. "The NTA was set up to be a lean, professional organisation. The more people, the higher risks. The NIC [National Informatics Centre] simply does not have the capacity or IT infrastructure needed, so it was always meant to engage third-party technical partners which have the robust cyber security expertise needed to run large-scale computer based examinations," said R. Subrahmanyam, former Higher Education Secretary who was in charge at the time the NTA was set up. However, some educationists have complained that engaging third-party players takes accountability out of the government's hands and leaves loopholes in the system which can be exploited by unscrupulous players.

Officials say the NTA has also failed to develop robust mechanisms needed to handle a large-scale pen-and-paper examination, including the setting of the question paper and its encryption, selection of external printing presses and exam centres, transportation to printing presses, storage and distribution to examinees at examination centres and then the collection and transportation of answer sheets to evaluation centres. Each of these is a stage where malpractice can occur without robust security mechanisms.

What is the way ahead?

The high-level panel headed by former ISRO chief K. Radhakrishnan has been given two months to recommend reforms in the examination process, improve data security protocols, and overhaul the NTA's functioning.

Educationists, however, propose starkly different pathways for the future. One option is to add manpower and infrastructure to the NTA to equip it to take on large-scale pen-and-paper examinations in an improvement to the CBSE system that preceded it. Those recommending this return to the past point out that pen-and-paper examinations are more equitable, especially for students in rural and remote areas with little access to technology.

Another option is to dismantle the centralisation process that seeks to move all testing in the country under the NTA. Some State governments, and professors from individual universities, notably JNU, have called for entrance tests for their institutions to be removed from the NTA and handed back to the institutions themselves, arguing that more decentralised structures are needed to meet the vastly differing needs of institutions.

However, others seek a more radical reform of the assessment system. They suggest systemic changes to remove the single, high-stakes entrance examination which results in extreme pressure on students, encourages an inequitable coaching industry, and incentivises malpractice. Instead, periodic assessments of knowledge, concept-based understanding, and aptitude can be conducted in the final years of school education as the precursor to the admission process, using online testing, and AI-based proctoring which can be overseen by the NTA.

What is the NTA?

- The NTA was set up in 2017 as a specialist, self-sustaining and autonomous organisation under the aegis of the Union Education Ministry.
- Its director general and governing body are appointed by the Union government. However, it is registered as a society and is a separate legal entity, which raises questions about the government's legal liability for the NTA's actions.
- Its main mandate is to conduct efficient, transparent and international standard tests to assess the competency of candidates for admission, and recruitment purposes.

- **One of the main problems is that the NTA was originally intended to conduct computer-based tests only.**
- **Officials and educationists note that the agency is severely understaffed for the role it is currently being asked to undertake.**

- **Officials say the NTA has also failed to develop robust mechanisms needed to handle a large-scale pen-and-paper examination, including the setting of the question paper and its encryption, selection of external printing presses and exam centres, transportation to printing presses, storage and distribution to examinees at examination centres and then the collection and transportation of answer sheets to evaluation centres.**

- **The high-level panel headed by former ISRO chief K. Radhakrishnan has been given two months to recommend reforms in the examination process, improve data security protocols, and overhaul the NTA’s functioning.**

What is holding up the Teesta treaty?

What has the Indian government told Bangladesh? What is the technical team going to look into? Why is Bengal Chief Minister protesting this development? What about the Ganga water sharing agreement? When does it come up for renewal? What is the state of both the rivers?

Shiv Sahay Singh

The story so far:

During the recent state visit of Sheikh Hasina, Prime Minister of Bangladesh, to India, Prime Minister Narendra Modi on June 22 said: "A technical team will soon visit Bangladesh to discuss conservation and management of the Teesta river in Bangladesh." The remark triggered fresh speculation about the Teesta water sharing treaty with Bangladesh, a key bilateral agreement that has been pending between the two countries for over a decade.

What is India's stand?

After Mr. Modi's comment, Foreign Secretary Vinay Kwatra told the media that the discussion "between the two leaders was less about water sharing per se, and more about the management of the water flows within Teesta". West Bengal Chief Minister Mamata Banerjee took issue with the Centre's stand. On June 24, she wrote a letter to Mr. Modi conveying her strong reservation that no discussion on the sharing of Teesta waters should be taken up with Bangladesh without the involvement of the State.

Why is Bengal upset?

Ms. Banerjee pointed out that if Teesta's water is shared with Bangladesh, lakhs of people in north Bengal will get severely impacted. This is not the first time she has voiced her opposition to the proposed water sharing agreement of India with Bangladesh. In July 2019, the Trinamool Congress chairperson admitted that Bangladesh is hurt because the Teesta waters could not be shared and added, "If I had the ability, I would have definitely shared Teesta waters with them." In 2017, the Chief Minister had also referred to an alternative proposal of sharing waters of the Torsa, Manshai, Sankosh and Dhansai rivers but not Teesta.

Bengal claims if Teesta water is shared with Bangladesh, lakhs of people in north Bengal will get severely impacted

Extreme weather: The flooded bank of the Teesta river following heavy downpour, in Siliguri, West Bengal, on June 14. PTI

In all, 54 rivers flow between India and Bangladesh and sharing of river waters has been a key bilateral issue. India and Bangladesh agreed on the sharing of waters of the Ganga in 1996 after the construction of the Farakka Barrage and by the 2010s the issue of sharing of the Teesta came up for negotiation. In 2011, during the United Progressive Alliance-II government, India and Bangladesh were close to signing an agreement on the Teesta but Ms. Banerjee walked out of the deal, and since then, the agreement has been pending.

What is the proposal?

In 2011, when the proposal for sharing Teesta water was drawn up, it was said India would get 42.5% and Bangladesh 37.5% of the river water from December to March.

A tributary of the Brahmaputra, the Teesta river originates from the Tso Lhamo Lake at an elevation of about 5,280 metres in north Sikkim. The river travels for about 150 km in Sikkim and 123 km in West Bengal, before entering Bangladesh from Mekhligunj in Cooch Behar district; it flows another 140 km in Bangladesh and joins the Bay of Bengal. Teesta is Bangladesh's fourth largest trans-boundary river and its floodplain covers an area of 2,750 square kilometres in Bangladesh. But 83% of the river's catchment area lies in India and the remaining 17% is in Bangladesh, supporting 8.5% of its population and 14% of its crop production.

What are the political considerations?

While the Awami League government in Bangladesh is facing questions from the Opposition about the delay in inking an agreement on the Teesta, the dams for hydro-electric power generation in Sikkim and the Teesta Barrage Project at Gazoldoba in West Bengal is making the flow of the river erratic in Bangladesh, leading to either floods or scarcity of water. The visit of a technical team from India to discuss conservation of the Teesta in Bangladesh also comes amid the backdrop of China proposing major dredging work on the river and building reservoirs and embankments in 2020. The Bangladesh government has put the proposal on hold for the past four years.

Soon after returning to Bangladesh, Prime Minister Hasina announced that her country would accept India's proposal to develop the Teesta River basin. Ms. Banerjee raised questions about the health of the Teesta river after the construction of a series of hydropower projects in Sikkim, deforestation in upper catchment areas and impact of climate change. She expressed surprise that no concrete steps have been taken by the Ministry of Jal Shakti to restore the river to its original form and health on the Indian side when a bilateral cooperation between India and Bangladesh for restoration of Teesta in Bangladesh is being proposed.

Environmental activists have also been raising questions on the ecological impact of hydro-electric projects on the river. In October 2023, a glacial lake outburst triggered floods in the Teesta basin that claimed hundred lives and destroyed the Teesta III hydroelectric dam.

Sharing of waters of transboundary rivers have been mandated by international laws including The Helsinki Rules on the Uses of the Waters of International Rivers in 1966. Article 253 of the Indian Constitution gives powers to the government to enter any transboundary river water-related treaty with a riparian state.

Why is Bengal talking about Ganga treaty?

The Ganga water sharing treaty with Bangladesh completes 30 years in 2026 and a renewal of the agreement is on the cards. The Trinamool Congress chairperson has pointed out that water sharing with Bangladesh has changed the Ganga's morphology and affected lakhs of people in West Bengal owing to river erosion.

"Lakhs of people have been displaced from their habitation rendering them homeless and also leading to their loss of livelihood. The reduced silt load in Hooghly has impeded the nourishment of the Sundarban delta," she wrote in the letter to the Prime Minister.

The Ganges-Brahmaputra Basin

What is the Teesta proposal?

- In 2011, when the proposal for sharing Teesta water was drawn up, it was said India would get 42.5% and Bangladesh 37.5% of the river water from December to March.
- A tributary of the Brahmaputra, the Teesta river originates from the Tso Lhamo Lake at an elevation of about 5,280 metres in north Sikkim.
- The river travels for about 150 km in Sikkim and 123 km in West Bengal, before entering Bangladesh from Mekhligunj in Cooch Behar district; it flows another 140 km in Bangladesh and joins the Bay of Bengal.

- **Teesta is Bangladesh’s fourth largest trans-boundary river and its floodplain covers an area of 2,750 square kilometres in Bangladesh.**
- **But 83% of the river’s catchment area lies in India and the remaining 17% is in Bangladesh, supporting 8.5% of its population and 14% of its crop production.**

Why is Bengal upset?

- Ms. Banerjee pointed out that if Teesta's water is shared with Bangladesh, lakhs of people in north Bengal will get severely impacted.
- This is not the first time she has voiced her opposition to the proposed water sharing agreement of India with Bangladesh

- **In all, 54 rivers flow between India and Bangladesh and sharing of river waters has been a key bilateral issue. India and Bangladesh agreed on the sharing of waters of the Ganga in 1996 after the construction of the Farakka Barrage and by the 2010s the issue of sharing of the Teesta came up for negotiation.**

Why is Bengal talking about Ganga treaty?

- The Ganga water sharing treaty with Bangladesh completes 30 years in 2026 and a renewal of the agreement is on the cards.
- The Trinamool Congress chairperson has pointed out that water sharing with Bangladesh has changed the Ganga's morphology and aected lakhs of people in West Bengal owing to river erosion.

What was the tussle over Covaxin IPR?

What are the rules for patenting the intellectual property rights of a vaccine? Why was the ICMR not included?

Jacob Koshy

The story so far:

The maker of the indigenous coronavirus vaccine, Covaxin, Bharat Biotech International Limited (BBIL), has admitted to an "inadvertent error" in patent filings to protect the vaccine's Intellectual Property Rights (IPR). One of India's leading biotechnology companies, it had failed to include scientists from the Indian Council of Medical Research (ICMR) as co-inventors in the *Covaxin* patent filings.

What kind of rights govern vaccine patents?

India's patent laws govern both product and process patents. Product patents grant an inventor a monopoly over, say, a drug. Process patents bar competitors from making a similar drug using the same sequence of steps. In response to queries from *The Hindu*, Bharat Biotech said it had patented the process, namely of making a batch of vaccines from the virus strains that were provided by the ICMR-NIV (National Institute of Virology). This is the lab that has expertise in extracting viruses from blood samples, identifying its characteristics, conducting various tests to gauge its infectiousness and qualify it in comparison to related strains. However, preparing a vaccine out of this at an industrial scale is beyond the capabilities of a lab and requires a different order of facilities that only established vaccine manufacturers have. Covaxin is an inactivated version of COVID-causing coronavirus; once injected into the body it coaxes it into producing antibodies that can potentially protect against severe disease from a coronavirus infection. To do this effectively, an "adjuvant' is added which increases the vaccine's potency. Vaccine makers may have their own ways of bringing all of these steps together and, given the competitive nature of the field, strive to ward off competitors from imitating these processes to gain a temporary monopoly in the market and rake profits.

Bharat Biotech International Limited had collaborated with the Indian Council of Medical Research-National Institute of Virology for all the steps in developing a vaccine

To be sure, while companies are free to file for a product or process patent in as many countries as they can afford, a patent is only granted after regulatory authorities grant them one or are convinced that this process is indeed novel or inventive. BBIL, as far is publicly known, hasn't yet been granted these patents.

What were the roles of BBIL and ICMR?

BBIL had collaborated with the ICMR-NIV for all the steps in developing a vaccine. The two organisations had signed an agreement that spelt out each entity's responsibilities. As ICMR is a public entity and because of the scale of the COVID crisis, there were Right To Information requests to make this agreement public. However, it was only in July 2021, that parts of the agreement were made public in Rajya Sabha.

Beyond transferring the strains and making vaccines, the agreement said, ICMR would also test these vaccines on animals – rodents to monkeys – and then on people to establish that the vaccine worked as intended. The ICMR also funded these clinical trials – ₹35 crore – and incurred costs in developing Covaxin. In return it was to get 5% of royalties that BBIL earned from the sale of Covaxin. Since the announcement of the BBIL and ICMR collaboration, it was generally accepted that both entities would contribute to the vaccine and would therefore hold "joint intellectual property rights," as was stated in Parliament.

However, BBIL first told *The Hindu* that it made a distinction between the rights governing the making of the vaccine and the rights over the data generated from clinical trials. The ICMR hadn't invested in the actual making of the vaccine and so wasn't included in patent applications. However, a day after the matter became public, BBIL said it had made a mistake, and that it would be making amends by filing fresh applications that listed ICMR personnel as inventors. It is unclear what prompted this.

Why does being cited as an inventor matter?

IPR is a vast, complex domain and spans the minutest parts of the product invention process. As the development of pharmaceutical products involves a wide range of expertise, it is hard for single firms or entities to develop everything in-house. Just like the BBIL-ICMR collaboration, companies may enter into several licensing agreements – BBIL for instance had a technology licensing agreement with Virovax for the adjuvant – with other companies. If a single product thus involves multiple entities and collaborators, being listed as an inventor has a bearing on the sharing of intellectual property rights, royalties and even determining how a product can be used. There is no field of human activity that is untouched by disputes over IPR. In patent filings, not listing out all the inventors – in the U.S especially – could even lead to patent applications being rejected.

- **T he maker of the indigenous coronavirus vaccine, Covaxin, Bharat Biotech International Limited (BBIL), has admitted to an “inadvertent error” in patent lings to protect the vaccine’s Intellectual Property Rights (IPR).**
- **One of India’s leading biotechnology companies, it had failed to include scientists from the Indian Council of Medical Research (ICMR) as co-inventors in the Covaxin patent lings.**

What kind of rights govern vaccine patents?

- India’s patent laws govern both product and process patents.
- Product patents grant an inventor a monopoly over, say, a drug. Process patents bar competitors from making a similar drug using the same sequence of steps. In response to queries from

Adjuvant

- An adjuvant is a substance that enhances the immune system's response to the presence of an antigen.
- They are commonly used to improve the effectiveness of a vaccine. Generally, they are injected alongside an antigen to help the immune system generate antibodies that fight the antigen.

- **The purpose of adding adjuvants into vaccines is to boost the immune system response and to allow for fewer doses or lesser quantities of the vaccine to be administered.**
- **Aluminum, one of the most commonly used adjuvants, was first discovered to have adjuvant properties back in 1926.**
- **Research has revealed that adjuvants are likely generating immuno-competent environments at the location of the vaccine injection through the activation of an innate immune response.**

New criminal laws in effect; amendments soon

Till the BNS gets a new section on sexual crimes against men and transgender persons, police can invoke allied charges such as wrongful confinement and physical hurt if they receive such complaints; Union government officials say the States are free to bring in their own amendments to some provisions of the BNSS that replace the Cr.PC.

Vijaita Singh
NEW DELHI

Crime and punishment

The new Bharatiya Nyaya Sanhita has 358 Sections against the 511 in the Indian Penal Code that it replaces. The Bharatiya Nagarik Suraksha Sanhita replaces the Code of Criminal Procedure, and the Bharatiya Sakshya Adhiniyam comes in place of the Indian Evidence Act

ISTOCKPHOTO

What is new?

- Provision for **Zero FIR** allowing filing of a first information report at any police station, regardless of jurisdiction
- **Online registration** of police complaints and mandatory videography of crime scenes for all heinous crimes
- A person can now report incidents by **electronic communication**, without the need to visit a police station
- Judgment in criminal cases has to come **within 45 days** of completion of the trial
- Provisions against false promise of marriage, gang rape of minors and **mob lynching**
- Statement of a woman rape victim will be recorded by a woman police officer **in the presence of her guardian or relative**
- Death sentence or life imprisonment for **gang rape of a minor**
- **Sedition** has been replaced with 'secession' or 'act against the country's sovereignty, unity and integrity'

As three new criminal laws come into effect across the country from Monday despite objections from States ruled by non-BJP parties, Union government officials said here on Sunday that the States were free to bring in their own amendments to some provisions of the Bharatiya Nagrik Suraksha Sanhita (BNSS) that replaces the Code of Criminal Procedure (Cr.PC.). The BNSS prescribes the procedure and conditions for arrest, bail, and custody, among other things.

The Bharatiya Nyaya Sanhita (BNS), which replaces the Indian Penal Code, 1860, may also be amended soon to incorporate a section on sexual crimes against men and transgender persons. A senior government official said that police officers were being asked to invoke other allied sections under the BNS, such as wrongful confinement and physical hurt, if they get such complaints, until an amendment is brought to correct this anomaly.

The Bharatiya Sakshya (BS), which replaces the Indian Evidence Act, 1872, is the third law which will come into force.

From 00:00 hours on July 1, more than 650 district courts and 16,000 police stations across the country will have no option but to migrate to the new system. Cognisable offences will be registered under Section 173 of the BNSS, instead of Section 154 of the Cr.PC.

The IPC and Cr.PC will run concurrently along with the new laws as several cases are still pending in courts and some crimes that took place before July 1 that are reported later will have to be registered under the IPC.

'Hand-holding done'

On June 21, West Bengal Chief Minister Mamata Banerjee wrote to Prime Minister Narendra Modi seeking deferment of the implementation of the laws passed by Parliament in December 2023.

However, a senior government official told *The Hindu* that training and hand-holding has been done for all States to help them adapt to the new system.

First information reports (FIRs) are filed through the Crime and Criminal Tracking Network Systems (CCTNS), a programme that functions under the National Crime Records Bureau. A significant upgrade to the CCTNS will help people file an e-FIR, without visiting a police station, and a zero FIR, which can be filed irrespective of the jurisdiction of the crime location.

The official said that changes have also been made to the CCTNS software to register FIRs in languages other than English and Hindi.

Electronic evidence

The BNSS mandates compulsory audio-video recording of search and seizure in each criminal case and mandatory forensic examination in all cases where an offence attracts punishment of seven years or more.

The recordings will have to be submitted before the court electronically "without delay."

Under Section 105 of the BNSS, the scope of audiovisual recording during search and seizure includes the process of preparing a list of seized items and the signature of witnesses.

While the Home Ministry is testing eSakshya (e-evidence), a mobile based application to help police record scene of crime, search and seizure in a criminal case and upload the file on the cloud-based platform, several States depending on their capacities have devised their own systems.

For instance, the Delhi Police have developed an e-pramaan application which will help investigating officials record a scene of crime and generate a hash value along with a certificate under Section 62 of Bharatiya Sakshya.

Officials pointed out that the security of the cloud-based system where the data will be stored will be of prime concern.

Link in description

Msg -9057921649

Download -
saurabh pandey
cse app

ATTENTION!! BATCH FOR 2025/26 LAUNCHED

connect with sir -9057921649

CURRENT AFFAIRS PLUS (FOR UPSC 2025)

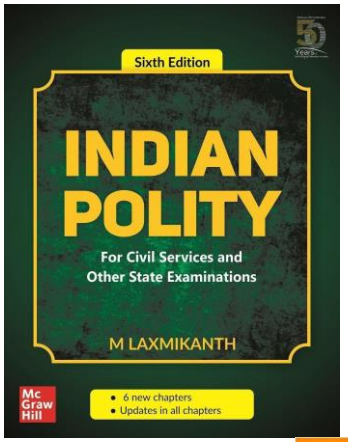
INCLUDES

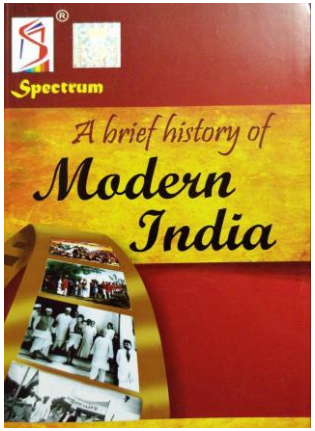
- PIB Analysis with pdf
- Down to earth
- physics.org
- science daily
- Major newspapers
- With practice test and Mains Mock

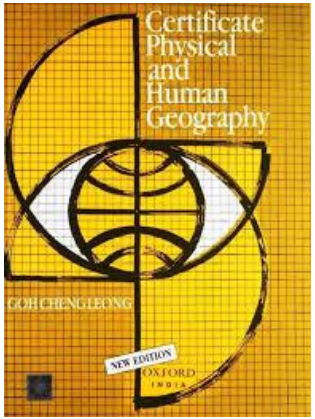
starting 1st may 2024

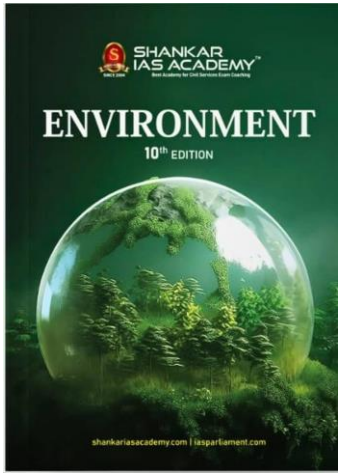
BY SAURABH PANDEY SIR

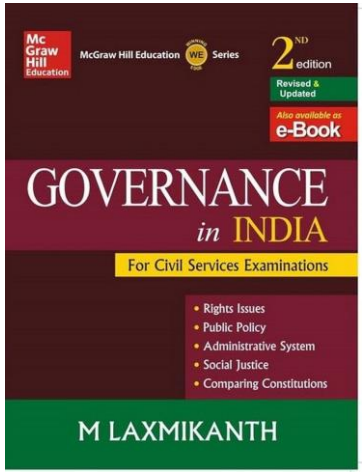
ALL Advance books for upsc IN ONE COURSE

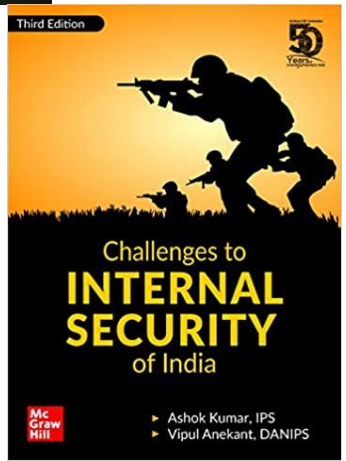


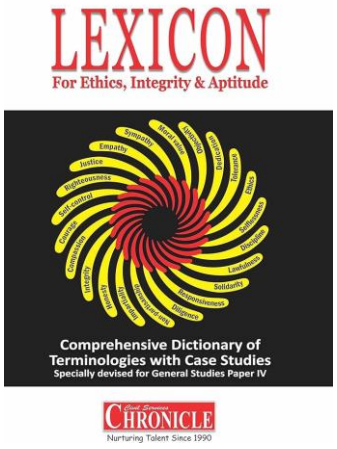










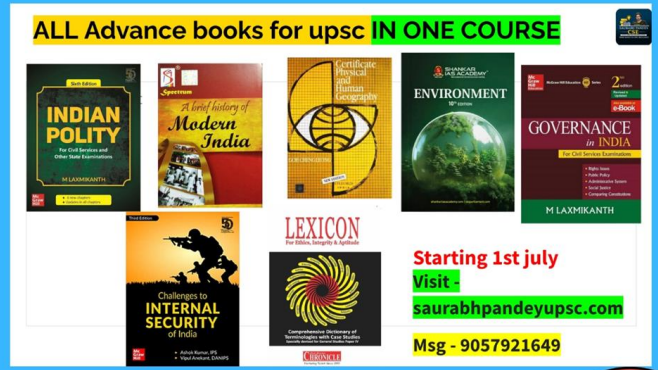


Starting 1st june

Visit - saurabhpandeyupsc.com

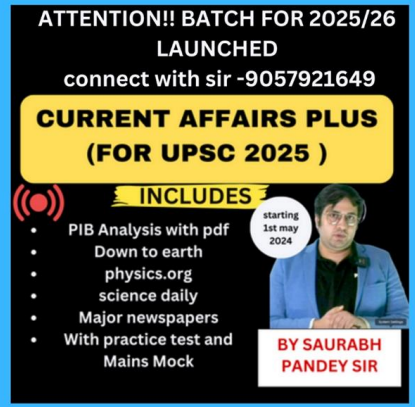
Msg - 9057921649

COMBO COURSE FOR UPSC 2025



+

Save Rs 1000/-



Topics

- Poliovirus
- How we grow taller at night ??
- How do tropical storms and hurricanes get their names?
- Why Hurricane Beryl unique ??
- AI and Digital jurisprudence
- The Access Network (AN) and the Core Network (CN)
- Mains

By saurabh Pandey

THE HINDU

Poliovirus

- In the mid-20th century, researchers widely believed the poliovirus could only be grown in cultures of nerve cells.
- This misconception was propagated by their inability to infect rhesus macaques by the oral route, and only by directly injecting the virus into the nervous system.
- At the time, they didn’t know the problem was with the poliovirus strains they were using.

- **The poliovirus has only one natural host — humans — and many of the early strains of the virus were isolated from humans and wouldn’t infect non-human primates.**
- **Since scientists kept passing the virus through the brain tissues of macaques, it adapted to that mode of infection.**
- **The inability to culture polio in non-nerve cells was a major roadblock to developing a polio vaccine.**

- . Since Africa was declared polio-free in August 2020, the wild poliovirus has been restricted to rural pockets of Afghanistan and Pakistan.
- But according to a recent report in Science, the virus is beginning to reappear in big cities in these two countries.
- This reemergence is a result of vaccine hesitancy due to misinformation, conflict, poverty, and limited access to these isolated regions.
- The WHO’s Global Polio Eradication Initiative is thus set to miss its deadline of eradicating polio by the end of 2024

Vaccine development

- Salk made the first successful vaccine using Enders' method to grow the virus.
- He inactivated the virus by treating it with formaldehyde, and injected it into his test subjects.
- The fragments of the inactivated virus were able to induce immunity
- Albert Sabin developed the OPV that contained live polio strains weakened by growing them in macaque cells.
- Since Sabin's vaccine contained live virus particles, it had to rely

- Occasionally, the weakened virus in the OPV would revert, and do the very job it was designed to prevent: cause polio.
- On the other hand, the IPV, while being a less potent vaccine, contained inactivated virus particles and carried no risk of causing vaccine-induced polio.
- The world has used both vaccines in the fight against polio.
- While some countries, such as Norway, Sweden, Finland, and Iceland, relied exclusively on the IPV, most countries have used a combination of the two.

- **The latter countries prefer the OPV for its superior protection and ease of administration.**
- **When the number of natural polio cases drops to zero, they switch to IPV for its enhanced safety**

QUESTION CORNER

How we grow taller at night

The Hindu Bureau

Q: Are we measurably taller in the morning than when we go to bed?

A1: We are all indeed taller in the morning. There are two components to this. In a growing child, the growth hormone is secreted in pulses overnight. This acts through several intermediary steps to cause lengthening of the bones at the end-plates (epiphyses). Accurate measurements of the forearm or lower leg using specialised apparatus or X-rays can record this night-time growth.

The most marked effect, however, which occurs even after growth has ceased, is caused by postural compression of the spine under the effect of gravity. This was recognised in mediaeval French folklore: it was common practice to apply for recruitment to the army first thing in the morning in order to appear taller. In 1724, Reverend Joseph Wasse from Aynho in Northamptonshire, U.K., measured a loss of up to 15 mm through the day. This was more marked in young and active labourers.

A2: Another factor concerns the inherent curvatures of the spinal column. This has a convexity backwards in the thoracic or chest region, called a kyphosis, and a concavity in the lumbar region or base of the back called a lordosis. These

A pencil illustration of the vertebral column and the spinal cord. H.G. WETSELAAR, UNIVERSITAIRE BIBLIOTHEKEN LEIDEN

curves vary with body weight and position. As a result, the spinal column tends to press downwards when in an upright position, altering these curvatures, and hence shortening the spinal length. When lying down, the reverse happens and the column lengthens again.

The combination of disc and curvature factors causes height change and is about 16 mm during the course of the day in the average adult.

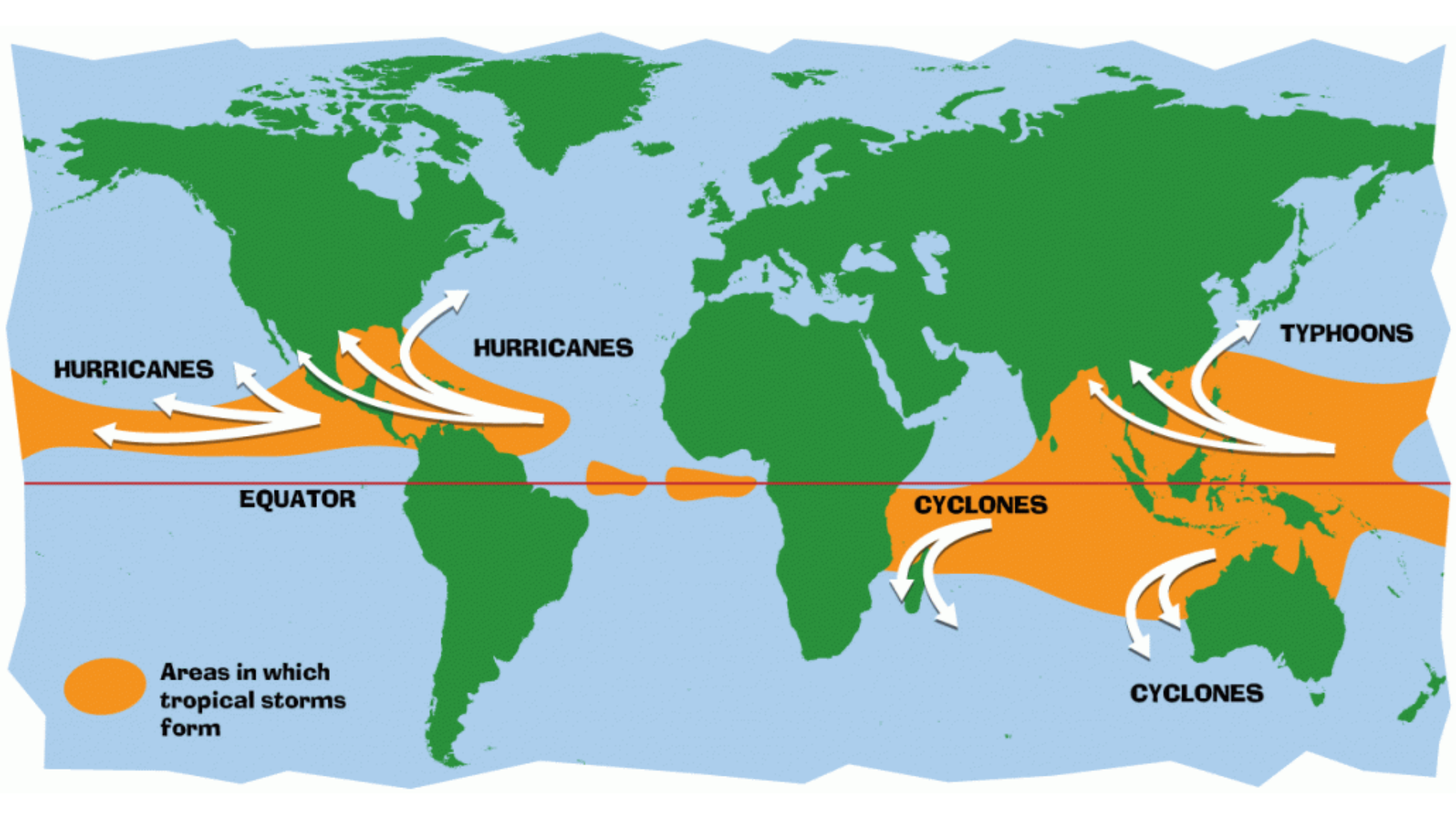
For feedback and suggestions for 'Science', please write to **science@thehindu.co.in** with the subject 'Daily page'

How we grow taller at night ??

- In a growing child, the growth hormone is secreted in pulses overnight.
- This acts through several intermediary steps to cause lengthening of the bones at the end-plates (epiphyses).
- Another factor concerns the inherent curvatures of the spinal column.
- This has a convexity backwards in the thoracic or chest region, called a kyphosis, and a concavity in the lumbar region or base of the back called a lordosis.
- These curves vary with body weight and position

BIG SHOT

A pier at high tide after the passage of Hurricane Beryl in Oistins near Bridgetown, Barbados, on Monday. Hurricane Beryl brought devastating winds and heavy rain to several Caribbean islands on the day as the earliest-ever Category 4 storm on record churned westward. AFP


HURRICANES
HURRICANES
TYPHOONS
EQUATOR
CYCLONES
CYCLONES
Areas in which tropical storms form

How do tropical storms and hurricanes get their names?

- **According to the World Meteorological Organization, there are six alphabetical lists of names for Atlantic storms and hurricanes that are rotated every six years. This means the 2024 list will be used again in 2030.**
- **The list, which is maintained by the WMO, covers only 21 letters of the alphabet, as "it is difficult to find six suitable names (one for each of the 6 rotating lists) starting with Q, U, X, Y and Z," per the WMO.**

- **The first storm of the season, which ends on Nov. 30, is given a name that begins with A, the second B, the third C and so on.**
- **The next storm or hurricane of the 2024 season will be called Debby, with the list ending in William.**
- **According to the WMO, assigning names to hurricanes and storms is done to make tracking and discussing specific storms more straightforward.**

- **“Naming also helps to avoid confusion among meteorologists, media, emergency management agencies and the public,”**
- **“Additionally, naming tropical cyclones can aid historical record-keeping and research on storm behaviour and impacts.**
- **A developing cyclone is named when it officially becomes a tropical storm, meaning it has sustained winds of at least 39 mph,**

- **A tropical storm becomes classified as a hurricane once maximum sustained winds reach 74 mph.**
- **The National Hurricane Center began keeping a list of names in 1953, per the WMO.**
- **Only female names were initially used before male names were introduced, alternating with the female ones, in 1979. The six current lists have been in rotation since then, with a few names having been retired and replaced.**
- **The decision to remove names is determined at a committee meeting.**

But what happens if the list of alphabetical names runs out?

- During a particularly active hurricane season, the WMO uses a supplemental list of names in lieu of the Greek alphabet, which was used until 2021.
- According to the WMO, extra names have only had to be used twice — in 2005 and 2020.

BIG SHOT

A pier at high tide after the passage of Hurricane Beryl in Oistins near Bridgetown, Barbados, on Monday. Hurricane Beryl brought devastating winds and heavy rain to several Caribbean islands on the day as the earliest-ever Category 4 storm on record churned westward. AFP

Hurricane wind scale: What 1 to 5 looks like

Category	Winds (MPH)
1	74 to 95
2	96 to 110
3	111 to 129
4	130 to 156
5	Over 157

NOTE Saffir-Sampson hurricane wind scale

Why Hurricane Berryl unique ??

- the hurricane became the earliest major hurricane in the Atlantic in 58 years, as well as the only hurricane in June to reach Category 4 intensity.
- Experts say the chart-topping hurricane forming so early into the season—which spans June to November—is due to climate change-linked rising ocean temperatures.
- Warm sea surface temperatures are conducive to providing the lower atmosphere the heat and moisture that fuel tropical storm systems.”

Polar Cyclone	Tropical Cyclone
Form in middle latitude belt of westerlies and move west to east	Form in belt of Tropical easterlies and move east to west
Active mainly in winter	Form in transition period i.e., transition summer to winter, winter to summer
Frontal in character	Non frontal vortex
Isobars are oval shaped	Isobars are circular in shape
Generally moderate pressure gradient	Steep to very steep pressure gradient
Strong winds are equator-ward and reach gale force of ≥39 mph	Strong winds are pole ward, exceed gale force, may reach hurricane force≥74 mph
Heavy rain near the center	Heavy rain in SE quadrant
Decay after occlusion	Rapidly weaken after striking coast due to land friction
Spiraling of wind may go upto 20 km	Spiraling of wind not beyond 14 km
No eye in the center	May develop an eye in the center
Not associated with tidal wave	Accompanied with tidal wave storm/surge
Less destructive in nature	Very destructive on sea and coast
Cannot become tropical cyclone	May become extra-tropical cyclone

Digital jurisprudence in India, in an AI era

Even though Generative AI (GAI) stands as a transformative force, wielding power to revolutionise society in ground-breaking ways, existing legal frameworks and judicial precedents that have been designed for a pre-AI world may struggle to effectively govern this rapidly-evolving technology.

Safe harbour and liability fixation

One of the most persistent and contentious issues in Internet governance has been the fixing of liability on "intermediaries" for content hosted by them. The landmark Shreya Singhal judgment addressed this by upholding Section 79 of the IT Act which grants intermediaries 'safe harbour' protection against hosting content, contingent upon meeting the due diligence requirements outlined in Section 3(1)(b) of the Information Technology (Intermediaries Guidelines) Rules. However, its application to Generative AI tools remains challenging.

There are contrasting views on the role of GAI tools. Some argue that they should be considered intermediaries since they are used almost like a search engine even though they do not host links to third-party websites. Others argue that they are mere "conduits" for user prompts, where altering the prompt leads to changes in output – essentially making the generated content akin to third-party speech, and, therefore, attracting lesser liability for the content generated.

In *Christian Louboutin Sas vs Nakul Bajaj and Ors* (2018), the Delhi High Court held that safe harbour protection applies solely to "passive" intermediaries, referring to entities functioning as mere conduits or passive transmitters of information. However, in the context of Large Language Models (LLMs), making a distinction between user-generated and platform-generated content is increasingly challenging. Additionally, liability in the case of AI chatbots arises once the information is reposted on other platforms by the user; mere response to a user prompt is not considered dissemination.

Generative AI outputs have already led to legal conflicts in various jurisdictions. In June 2023, a radio host in the United States filed a lawsuit against Open AI, alleging that Chat GPT had defamed him. The ambiguity in classifying GAI tools, whether as intermediaries, conduits, or active creators, will complicate the ability of courts to assign liability, particularly in user reposts.

Amar Patnaik

a former Member of Parliament (Rajya Sabha) from Odisha and now an advocate by profession. He was a former CAG bureaucrat

This rapidly-evolving technology does pose a challenge to existing legal frameworks and judicial precedents that have been designed for a pre-AI world

The copyright conundrum

Section 16 of Indian Copyright Act 1957 specifically provides that "no person" shall be entitled to protection of copyright except by the provisions of the Act. As in India, reluctance persists regarding the provisions of copyright protection to works generated by AI globally.

The critical questions are: should existing copyright provisions be revised to accommodate AI? If AI-generated works gain protection, would co-authorship with a human be mandatory? Should recognition extend to the user, the programme itself, and by extension, the programmer, or both? The 161st Parliamentary Standing Committee Report found that the Copyright Act of 1957 is "not well equipped to facilitate authorship and ownership by Artificial Intelligence".

Under current Indian law, a copyright owner can take legal action against anyone who infringes on his/her work with remedies such as injunctions and damages. However, the question of who is responsible for copyright infringement by AI tools remains unclear. As previously argued, classifying GAI tools, whether as intermediaries, conduits, or active creators, will complicate the courts' ability to assign liability. ChatGPT's 'Terms of Use' attempt to shift liability to the user for any illegal output. But the enforceability of such terms in India is uncertain.

The landmark K.S. Puttaswamy judgment (2017) by the Supreme Court of India established a strong foundation for privacy jurisprudence in the country, leading to the enactment of the Digital Personal Data Protection Act, 2023 (DPDP). While traditional data aggregators or consent managers raise privacy concerns during the collection and distribution of personal information, Generative AI introduces a new layer of complexity.

The DPDP Act introduces the "right to erasure" as well as "right to be forgotten". However, once a GAI model is trained on a dataset, it cannot truly "unlearn" the information it has already absorbed. This raises a critical question. How can individuals exercise control over their personal information when it is woven into the very fabric of a powerful AI model?

Steps to pursue

First, learning by doing. Consider granting GAI platforms temporary immunity from liability following a sandbox approach. This approach allows responsible development while gathering data to identify legal issues that could inform future laws and regulations.

Second, data rights and responsibilities. The process of data acquisition for GAI training requires an overhaul. Developers must prioritise legal compliance by ensuring proper licensing and compensation for the intellectual property used in training models. Solutions could include revenue-sharing or licensing agreements with data owners.

Third, licensing challenges. Licensing data for GAI is complex as web-data lacks a centralised licensing body similar to copyright societies in the music industry. A potential solution is the creation of centralised platforms, akin to stock photo websites such as Getty Images, which simplify licensing, streamline access to necessary data for developers and ensure data integrity against historical bias and discrimination.

The jurisprudence around Generative AI (GAI) is hazy and yet to be evolved. It demands a comprehensive re-evaluation of existing digital jurisprudence. A holistic, government-wide approach and judicious interpretations by the constitutional courts are essential to maximise the benefits of this powerful technology, but safeguarding individual rights and protecting them against unwelcome harm all the while.

The views expressed are personal

AI and Digital jurisprudence

- One of the most persistent and contentious issues in Internet governance has been the fixing of liability on “intermediaries” for content hosted by them.
- The landmark Shreya Singhal judgment addressed this by upholding Section 79 of the IT Act which grants intermediaries ‘safe harbour’ protection against hosting content, contingent upon meeting the due diligence requirements outlined in Section 3(1)(b) of the Information Technology (Intermediaries Guidelines) Rules.

- **However, its application to Generative AI tools remains challenging.**
- **There are contrasting views on the role of GAI tools.**
- **Some argue that they should be considered intermediaries since they are used almost like a search engine even though they do not host links to third-party websites.**

- **Others argue that they are mere “conduits” for user prompts, where altering the prompt leads to changes in output — essentially making the generated content akin to third-party speech, and, therefore, attracting lesser liability for the content generated.**
- **In Christian Louboutin Sas vs Nakul Bajaj and Ors (2018), the Delhi High Court held that safe harbour protection applies solely to “passive” intermediaries, referring to entities functioning as mere conduits or passive transmitters of information.**

- **However, in the context of Large Language Models (LLMs), making a distinction between user-generated and platform-generated content is increasingly challenging.**
- **Additionally, liability in the case of AI chatbots arises once the information is reposted on other platforms by the user; mere response to a user prompt is not considered dissemination.**

The copyright conundrum

- Section 16 of Indian Copyright Act 1957 specifically provides that “no person” shall be entitled to protection of copyright except by the provisions of the Act.
- As in India, reluctance persists regarding the provisions of copyright protection to works generated by AI globally.
- The critical questions are: should existing copyright provisions be revised to accommodate AI?
- If AI-generated works gain protection, would co-authorship with a human be mandatory? Should recognition extend to the user, the programme itself, and by extension, the programmer, or both?

- **The 161st Parliamentary Standing Committee Report found that the Copyright Act of 1957 is “not well equipped to facilitate authorship and ownership by Artificial Intelligence”.**
- **Under current Indian law, a copyright owner can take legal action against anyone who infringes on his/her work with remedies such as injunctions and damages.**
- **However, the question of who is responsible for copyright infringement by AI tools remains unclear.**

- The landmark K.S. Puttaswamy judgment (2017) by the Supreme Court of India established a strong foundation for privacy jurisprudence in the country, leading to the enactment of the Digital Personal Data Protection Act, 2023 (DPDP).
- Generative AI introduces a new layer of complexity.
- The DPDP Act introduces the “right to erasure“ as well as “right to be forgotten”.
- However, once a GAI model is trained on a dataset, it cannot truly “unlearn” the information it has already absorbed. This raises a critical question.
- How can individuals exercise control over their personal

Steps to pursue

- First, learning by doing. Consider granting GAI platforms temporary immunity from liability following a sandbox approach.
- Sandboxes allow AI technologies to be tested in a real-world setting under regulatory oversight. -
- This approach allows responsible development while gathering data to identify legal issues that could inform future laws and regulations.

- **Second, data rights and responsibilities. The process of data acquisition for GAI training requires an overhaul.**
- **Developers must prioritise legal compliance by ensuring proper licensing and compensation for the intellectual property used in training models. Solutions could include revenue-sharing or licensing agreements with data owners.**

- **Third, licensing challenges. Licensing data for GAI is complex as web-data lacks a centralised licensing body similar to copyright societies in the music industry.**
- **A potential solution is the creation of centralised platforms, akin to stock photo websites such as Getty Images, which simplify licensing, streamline access to necessary data for developers and ensure data integrity against historical bias and discrimination**

On improving rural mobile connectivity

Even though cellular networks seem omnipresent, their deployment and use vary significantly between urban and rural areas. According to the latest Telecom Subscription Data, urban tele-density in the country is 127% while rural tele-density is 58%

EXPLAINER

Pranav Jha

Mobile devices have become an integral part of our lives. We use them to communicate with our friends and family, conduct financial transactions through UPI, connect to the Internet, etc. The connectivity for these devices is enabled via a cellular (mobile) wireless network. A cellular network, such as a 5G network, includes a set of network equipment connected by communication links. They work together to move data between different devices and to other networks such as the Internet. A cellular network can be divided into two sub-networks: the Access Network (AN) and the Core Network (CN).

What are access and core networks?
The AN consists of base stations that provide wireless connectivity to mobile devices in a limited geographical area,

Connecting to the remote

The IEEE 2061-2024 standard defines a wireless network architecture for affordable broadband access in rural areas. It was approved on June 6 by the Institute of Electrical and Electronics Engineers (IEEE)

THE GIST

- An important factor impeding the deployment and/or use of cellular networks in rural areas is the relatively lower income of the people here. A big chunk of the rural population finds mobile services unaffordable.
- The IEEE-2061 standard proposes the use of a multi-hop wireless middle-mile network to extend connectivity to areas where optical-fibre links are not available.
- If adopted, IEEE 2061 can help provide affordable connectivity to rural populations. Its novel concepts, including the CN bypass, and integrated AN control may also pave the way towards a scalable mobile

The Access Network (AN) and the Core Network (C

- The connectivity for mobile devices is enabled via a cellular (mobile) wireless network.
- A cellular network, such as a 5G network, includes a set of network equipment connected by communication links.
- They work together to move data between different devices and to other networks such as the Internet
- . A cellular network can be divided into two sub-networks: the Access Network (AN) and the Core Network (CN)

What are access and core networks?

- The AN consists of base stations that provide wireless connectivity to mobile devices in a limited geographical area, called the coverage area.
- A network operator usually installs base stations across the length and breadth of the region to be covered.
- These stations can be seen in the form of towers with boxes with antennae on top.
- The CN of a cellular network has equipment that provides connectivity to other networks, such as the Internet.

- Unlike AN base stations, the CN operates in a central location, and possibly far from any of the base stations.
- The CN is linked to a base station by an optical FIbre link called the backhaul.
- Data from a user's device must pass through both a base station and the CN to reach its desired destination, such as the Internet or another user's device.
- Even if two users are nearby and are connected to the same or adjacent base stations, the data must pass through the central CN.
- The CN is essential to support user mobility, a key feature offered by cellular networks.

What impedes rural connectivity?

- According to the latest Telecom Subscription Data from the Telecom Regulatory Authority of India, urban tele-density in the country is 127% while rural tele-density is 58%.
- Put another way, on average, an urban user has one or more mobile connections (1.27) whereas only one out of two rural users (0.58) is connected. This data suggests an urban-rural digital divide.
- The situation in most other developing countries is similar or worse.

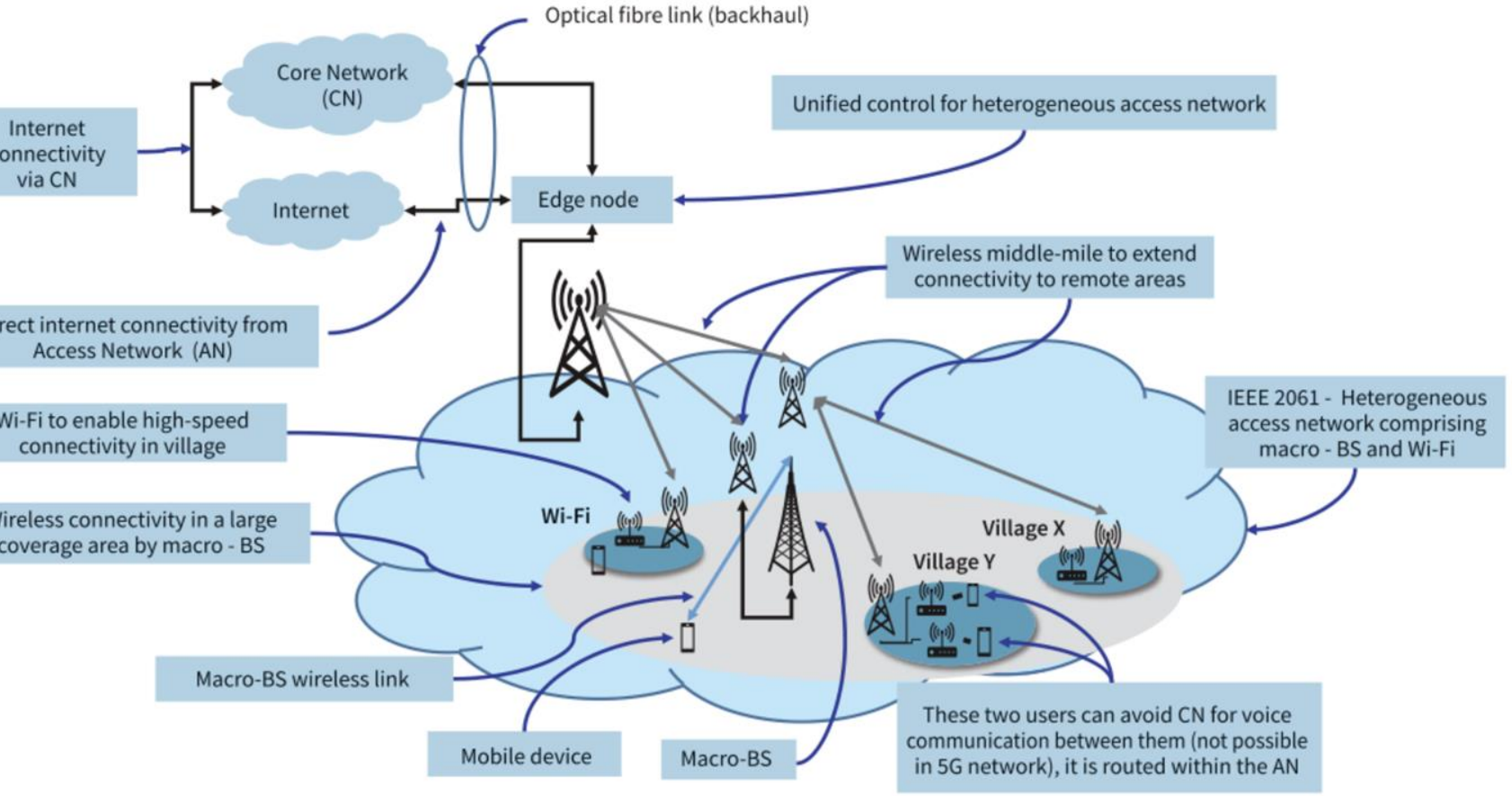
- An important factor impeding the deployment and/or use of cellular networks in rural areas is the relatively lower income of the people here.
- A big chunk of the rural population finds mobile services unaffordable.
- Other relevant characteristics of rural areas are lower population density, populations distributed in clusters (villages) often separated by vast empty spaces, and remoteness.
- Taking fibre infrastructure to a far-of village, say, in the Himalayas, to connect the base station there may neither be cost-effective nor

What is the IEEE 2061-2024 standard?

- The standard defines a wireless network architecture for affordable broadband access in rural areas.
- It was approved on June 6 by the Institute of Electrical and Electronics Engineers (IEEE).
- The IEEE-2061 network also includes a CN and AN similar to cellular networks.
- However, the IEEE-2061 AN is heterogenous wherein different types of base stations coexist: it includes base stations covering large coverage areas — called macro-BS — supplemented by small coverage area Wi-Fi.
- It is different from the 5G network, where the AN is homogeneous comprising base stations of the same type and typically smaller

- **The macro-BS in IEEE-2061 can be built with any cellular technology that can support a large coverage area.**
- **While the macro-BS provides large-area coverage but possibly lower data rate, Wi-Fi is deployed within villages to provide high-speed connectivity.**
- **A key capability of the system is that it allows a device to move from a Wi-Fi based connectivity to a macro-BS connectivity without any service disruption.**
- **This is enabled by an integrated AN control functionality in the IEEE-2061 network.**

E - 2061 Network (Frugal 5G network)



What is a middle-mile network?

- Further, the IEEE-2061 standard proposes the use of a multi-hop wireless middle-mile network to extend connectivity to areas where optical-fibre links are not available.
- A multi-hop wireless middle-mile provides cost-effective connectivity over long distances, eliminating the need for costly and difficult-to-deploy optical fibres.
- An IEEE-2061 network can flexibly use one or more technologies like satellites, or long-range Wi-Fi for the middle-mile.
- The IEEE-2061 AN also has a direct and alternate path to the Internet, unlike the (4G/5G) network, where Internet connectivity is possible only via the CN.

KEYWORD

How can state capacity be measured?

Prashanth Perumal

State capacity refers to the ability of any state to successfully deliver what are generally considered to be public goods and services to its citizens. State capacity is considered by many public policy experts to be the major factor that explains why some countries are rich or developed while other countries remain underdeveloped.

The most common way in which the capacity of a state to deliver on its commitments is measured is by the way of its ability to collect a sufficient amount of tax revenues. This is because any state requires tax revenues to deliver public goods and services. By this measure, countries with a higher tax to GDP ratio, which typically turn out to be rich countries, may be considered to possess greater state capacity than other countries with lower ability to generate tax revenues. Many also urge developing countries like India to boost their tax to GDP ratio so as to build state capacity.

Power in numbers

Public policy experts may also look into other indicators such as the number of people employed by a certain state to measure its capacity. So, for example, the number of police officials per capita could be seen as an indicator of the capacity of the state to maintain law and order. States with a very low number of police officials per capita, it is believed, may be unable to establish monopoly of violence in their territory, leading to instability that adversely affects their economy. Similarly, the number of courts and judges per capita can be seen as an indicator of how well a state can deliver justice to citizens.

Some critics, however, caution against the definition of state capacity in terms of the ability of a certain state to collect tax revenues or the number of staff it can hire to deliver essential public goods and services to its citizens. This is because more efficient states may be able to deliver essential public goods with lower taxes and fewer staff than less efficient ones. Critics, therefore, argue that the number of people employed by a certain state and the amount of taxes collected by it only reflect its size and not the state's effectiveness in delivering essential public goods and services.

Critics such as U.S. economist Bryan Caplan also point out that state capacity, as defined by the size of the state, is claimed by public policy experts to be the reason behind the success of certain countries without establishing the necessary causal link between the two. In other words, they argue that the success of rich countries is tautologically attributed to strong state capacity the same way that the failure of poor countries is attributed to weak state capacity. They point out that it could well be that strong economic growth allowed developed countries to fund states that are large in size; in that case, the economic success of the developed world cannot really be attributed to a larger state. A better way to measure state capacity, critics believe, is to gauge the ability of a certain state, regardless of its size as measured by its tax collections or headcount, to uphold the rule of law by delivering efficient justice to citizens.

Word of the day

Truculent: defiantly aggressive

Usage: It was a truculent speech against the new government.

Pronunciation: bit.ly/truculentpro

International Phonetic Alphabet: /ˈtʌkjʊlənt/

State Capacity

- State capacity refers to the ability of any state to successfully deliver what are generally considered to be public goods and services to its citizens.
- State capacity is considered by many public policy experts to be the major factor that explains why some countries are rich or developed while other countries remain underdeveloped.
- The most common way in which the capacity of a state to deliver on its commitments is measured is by the way of its ability to collect a sufficient amount of tax revenues.

- **This is because any state requires tax revenues to deliver public goods and services.**
- **By this measure, countries with a higher tax to GDP ratio, which typically turn out to be rich countries, may be considered to possess greater state capacity than other countries with lower ability to generate tax revenues.**
- **Many also urge developing countries like India to boost their tax to GDP ratio so as to build state capacity**

Scan - to get free content

Topics

- Gharial (Gavialis gangeticus)
- What is biodosimetry?
- Five-year climate agenda for India
- poliovirus
- Mains

By saurabh Pandey

THE HINDU

Brahmaputra's lone female gharial's long wait for a mate could end soon

Rahul Karmakar
GUWAHATI

A lone female gharial has temporarily overshadowed the one-horned rhino in the Kaziranga National Park and Tiger Reserve in eastern Assam.

Wildlife officials and specialists are not sure how this gharial came to inhabit a stretch of the Brahmaputra within the national park. But they are certain that the reptile, presumed to be an adult by its size, is the key to repopulating the river with gharials.

Distinguished from other crocodilians by its elongated snout, the gharial (*Gavialis gangeticus*) was believed to have been wiped out from the Brahmaputra river system during the 1950s, though there were claims of sightings in the 1990s. The female gharial was first spotted in 2021 within the Biswanath Wildlife Division of the 1,307.49-sq. km Kaziranga.

A comeback: Gharials were believed to have been wiped out from the Brahmaputra river system during 1950s. SPECIAL ARRANGEMENT

The gharial, now 2.55 metres in length, was recorded twice, 500 metres apart, in one of the three priority habits chosen during a 10-day survey of aquatic reptiles along the Brahmaputra in January.

Teams of the Turtle Survival Alliance Foundation India (TSAFI), an NGO specialising in reptiles, and the Assam Forest Department surveyed the Brahmaputra on a 160-km stretch from the Kaliabhomora bridge in the west to the Kamalabari Ghat in Majuli beyond the eastern edge of the Biswanath division.

The female gharial was found to be the only one of its kind moving between a "sandy shoreline" and a "sandbar with a shoreline water depth of 4.5 metres".

"We do not know much about gharials in the Brahmaputra but we do know that this female has been lonely for more than three years and is close to the size of an adult ready to breed," Sushmita Kar, TSAFI's project director in the northeast, told *The Hindu*.

One of the 10 recommendations in the report was the "high-priority" reintroduction of gharials in the Brahmaputra.

Kaziranga's Director Sonali Ghoshsaid the tiger reserve had the right conditions for a gharial breeding programme.

If the reintroduction proposal is approved, the reptiles are likely to be brought from the Kukrail gharial breeding centre near Lucknow.

Gharial (Gavialis gangeticus)

- **Distinguished from other crocodilians by its elongated snout, the gharial (Gavialis gangeticus) was believed to have been wiped out from the Brahmaputra river system during the 1950s, though there were claims of sightings in the 1990.**

- Gharials were once widely distributed in the large rivers that flow in the northern part of the Indian subcontinent.
- These included the Indus, Ganga, Brahmaputra and the Mahanadi-Brahmani-Baitrani river systems of India, Bhutan, Bangladesh, Nepal and Pakistan.
- They are also thought to have been found in the Irrawady River of Myanmar.
- Today, their major population occur in three tributaries of the Ganga River: the Chambal and the Girwa Rivers in India and the Rapti-Naryani River in Nepal.
- The Gharial reserves of India are located in three States – Uttar Pradesh, Madhya Pradesh and Rajasthan.

Conservation status:

IUCN : Critically Endangered

IWPA : Schedule I

CITES : Appendix I

Radiation biodosimetry: the ABCs of responding to a radiological event

The time required to report the dose is critical, treatments for radiation are more effective the earlier they are administered. It would therefore be beneficial for the assay to produce a same-day result. The team at Columbia is working to reduce assay time, on an HTS platform, to under 4 hours

Guy Garty
Venkatachalam P

After a large-scale radiological event, such as an Improvised Nuclear Device or reactor accident, it is important to identify those individuals who have received a significant dose of radiation and would benefit from one of the drugs that have been recently approved to treat radiation sickness. These drugs are most effective when administered within a few days of exposure. It is also critical to reassure those individuals who have not received a significant dose but are extremely concerned, preventing them from overwhelming hospitals. Thus, there will be a pressing need to assess, within a few days, the radiation doses received by tens or hundreds of thousands of individuals.

What is biodosimetry?

Biodosimetry allows one to determine the amount of radiation to which an individual was exposed based on changes in blood, urine, or hair. It would be particularly useful in a radiological event where the exposed individuals do not carry any personal radiation monitoring devices.

The gold standard biodosimetry assay is measurement of chromosome aberrations, in white blood cells. When irradiated, DNA in the blood cells gets broken and is repaired within a few hours. In some cases, there is an incorrect repair, joining fragments from different chromosomes, forming a 'DicentricChromosome (DC)' – a chromosome with two centromeres. Because a DC can only be formed by radiation, measuring these chromosomes is a specific and sensitive indicator of past radiation exposure. In order to measure DC, lymphocyte from the exposed individuals is cultured to begin division and then the chromosomes are spread on a slide and stained. The DC are then counted either while looking down a microscope directly or in images captured at high magnification. Due to the need for culturing the cells followed by the analysis of few hundred metaphases, the overall time taken to produce a result is about 2-3 days. Over the past decades, the Dicentric Chromosome Assay (DCA) has been successfully employed in many radiation accidents, where the number of exposed people is small. However, as implemented in a clinical cytogenetic lab, the DCA is too labour intensive to be practically applied in a larger event, with a throughput of a few tens of samples per day.

A second, slightly simpler, assay is the Cytokinesis Block Micronucleus Assay (CBMN), where the white blood cells are made to divide, but arrested before division is complete. This forms a cell with two nuclei. Following radiation exposure some DNA will be ejected during division forming a "micronucleus". This assay is slightly simpler to perform and score but overall time to answer is longer (~3 days), as it requires longer culturing of the cells.

Measurement on the phosphorylated form of specific histone protein, an inherent component of chromosomes known as the "gamma-H2AX' assay, has the potential to segregate the exposed from that of unexposed and those exposed to low dose versus high dose without culturing cells, within 6-8 hours of time. This assay needs to be performed within 24 hours owing to the kinetics of histone phosphorylation.

Dr. Guy Garty with Medical Students at the INDO-USA-Sparc Workshop at the Sri Ramachandra,Institute of Higher Education and Research in Porur. VELANKANNI RAJ B

Increasing throughput

The traditional approach to increasing the throughput of biodosimetry assays is to implement a lab network, where samples are shared between a dozen or more labs around the world, however this does not provide a sufficient increase in throughput to cope with a large radiological event.

Over the last 20 years the Center for Radiological Research at Columbia University has developed automatable versions of the major biodosimetry assays, performed in 96-well plates. The use of 96-well plates allows a significant increase in throughput as 96 samples are processed simultaneously.

The first iteration of the Rapid Automated Biodosimetry Tool (RABiT) used custom robotics to perform the CBMN assay with a target throughput of 6000 samples per day per machine. More recently we have implemented both the CBMN and DCA assays on several commercial High Throughput Screening (HTS) platforms, dubbed "RABiT-II". HTS systems use robotics, liquid handling devices and automated microscopes to quickly conduct millions of chemicals, genetic, or pharmacological tests. In the pharmaceutical industry, these systems leverage automation to quickly assay the biochemical activity of many drug-like compounds. In academia, the same systems are increasingly used to arrive at fundamental biological insights rather than drug candidates.

The broad deployment of HTS platforms would allow significantly increased throughput for performing biodosimetry, with each machine capable, in principle, of analyzing thousands of samples per day. A second major advantage is reliability. A commercial system with such diverse deployment capabilities undergoes rigorous quality control during development, manufacture and most importantly maintenance. Indeed, the quality of HTS data is very high and often better controlled than data generated by lower-throughput biological tests. Because these systems are in continuous operation, they also have a broad base of trained users and maintenance personnel ensuring successful operation during a crisis. This would obviously not be the case with a custom robotic system which would likely be in storage for years or decades before use.

> Biodosimetry allows one to determine the amount of radiation to which an individual was exposed based on changes in blood, urine, or hair. It would be useful in a radiological event where the exposed individuals do not carry any radiation monitoring devices

Reducing time to answer

Obviously, the time required to report the dose is critical, many of the treatments for radiation sickness are more effective the earlier they are administered. It would therefore be very beneficial for the assay to produce a same-day result. As they currently exist the DCA and CBMN assays cannot do this, as cells need to be cultured for 2-3 days. The DCA can be significantly accelerated by treating the cells with specific Kinases that cause the chromosomes to condense without the need for culturing. This Premature Chromosome Condensation (PCC) assay can potentially provide a same day dose estimate. The team at Columbia University is currently working to reduce assay time, when implemented on an HTS platform, to under 4h.

Logistics

The US Centers for Disease Control and Prevention (CDC) suggests establishing Community Reception Center (CRC) locations as quickly as possible in the aftermath of a large-scale radiological or nuclear incident, after which the public will be provided with information about CRC locations and will be provided with instructions regarding who should report to which CRC. The CRC itself will include several distinct areas in which persons will be screened for external contamination, decontaminated, if necessary, entered into the long-term tracking system, and discharged with appropriate instructions. In order to cope with the high number of individuals that need to be tested, the U.S. government envisages a two-tier triage scheme: a rapid Point-of-Care (POC) biodosimetry assay and a hospital- or lab-based biodosimetry assay.

The POC test will be administered at the CRC and is meant to provide a binary (exposed/not exposed) answer within 30 minutes but no dose estimate. One candidate POC assay is based on a protein signature using a lateral flow assay, like a Covid test. Individuals found to be unexposed using this test will be sent home (but may be asked to return for follow-up later).

Individuals found to be exposed, using the POC test, will be required to submit to a lab- or hospital-based test, such as DCA or CBMN, implemented ideally on a HTS platform. This test requires more time to perform but can determine dose with higher precision and can be used to assign individuals to treatment categories. For example, individuals who received lower doses would only need observation while a higher dose category would benefit from administration of one of the drugs that were recently approved by the FDA for mitigating radiation sickness. Individuals who have received even higher doses may benefit from a bone marrow transplant.

At a later stage, once all seriously injured individuals have been treated, this test can then be offered to the rest of the population to provide information on long term risks and to identify individuals requiring, for example, increased cancer screenings.

In conclusion, high throughput automated biodosimetry offers the opportunity to perform dose assessment on a large number of people in the event of a large-scale radiological or nuclear incident.

It fits well with the current operation concept, as a 2nd-tier triage separating exposed individuals into treatment categories and later for long-term epidemiological follow-up.

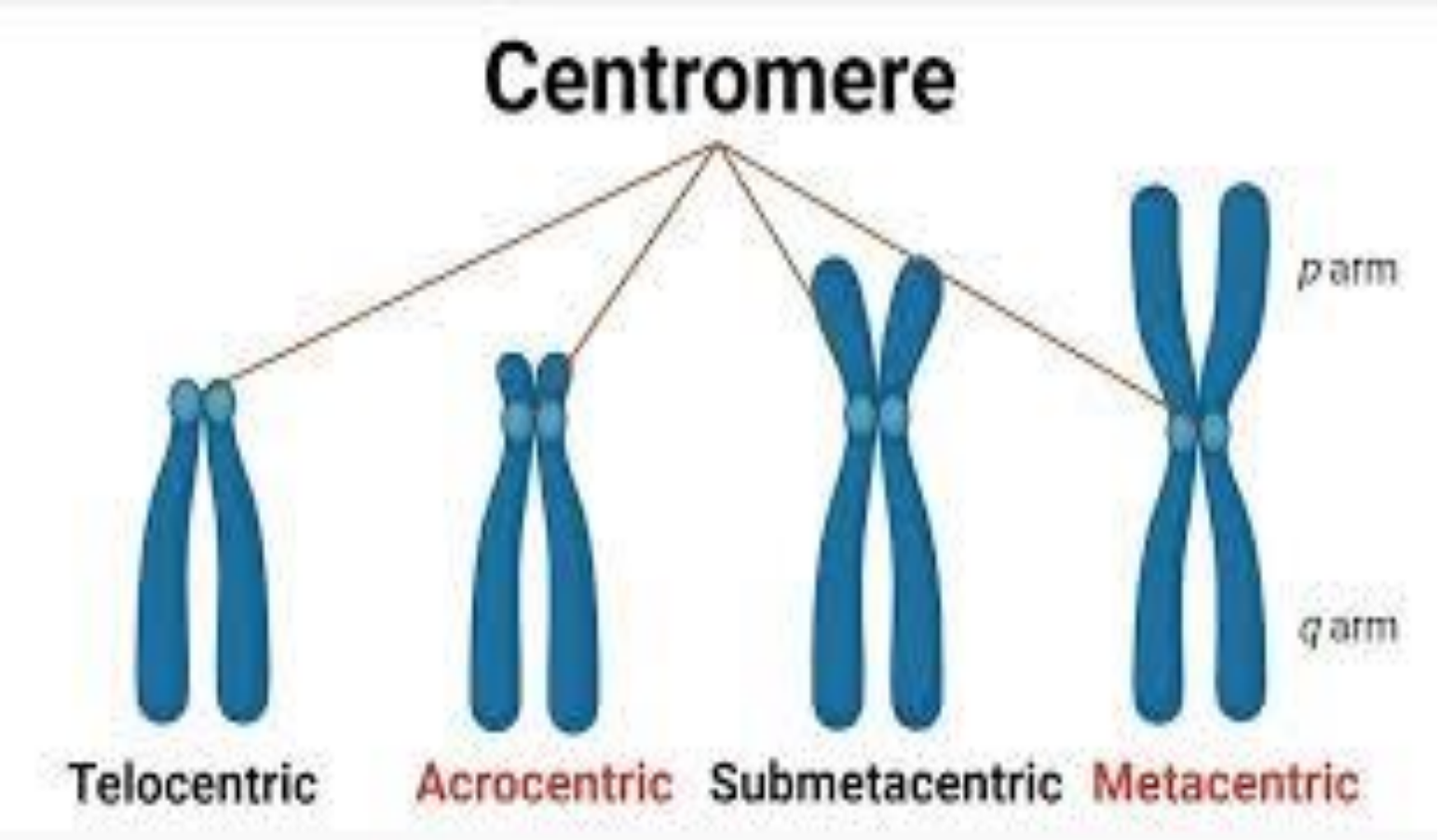
(Dr. Guy Garty is the Director, Radiological Research Accelerator Facility & Associate Professor of Radiation Oncology at CUMC, USA (email: gyg2101@cumc.columbia.edu)

& Dr. Venkatachalam P. is the Professor & Head with the department of Human Genetics & Associate Dean for Research, Sri Ramachandra Institute of Higher Education at Chennai, India(venkip@sriramachandra.edu.in).)

What is biodosimetry?

- Biodosimetry allows one to determine the amount of radiation to which an individual was exposed based on changes in blood, urine, or hair.
- It would be particularly useful in a radiological event where the exposed individuals do not carry any personal radiation monitoring devices.
- The gold standard biodosimetry assay is measurement of chromosome aberrations, in white blood cells.

- When irradiated, DNA in the blood cells gets broken and is repaired within a few hours.
- In some cases, there is an incorrect repair, joining fragments from different chromosomes, forming a ‘DicentricChromosome (DC)’ – a chromosome with two centromeres.
- Because a DC can only be formed by radiation, measuring these chromosomes is a specific and sensitive indicator of past radiation exposure


Centromere
p arm
q arm
Telocentric
Acrocentric
Submetacentric
Metacentric

The shape of a five-year climate agenda for India

As the new government settles in, what it does to scale up climate action will affect every Ministry, new and old, and every sector, big and small. Some of its choices would be pivotal to how India structures its economic path in a sustainable way, positions itself as the voice of the Global South at the right tables, and fights for climate finance and justice over the next five years.

India's transformation

Over the last decade, India has shown significant climate intent and progress on many fronts. It has moved on from being a hesitant participant reacting to developments in the global climate discourse to being a bold leader shaping narratives and institutions. First, it has laid the foundation for global institutions such as the International Solar Alliance, the Coalition for Disaster Resilient Infrastructure, and the Global Biofuels Alliance, as well as shaped the Green Development Pact under its G-20 presidency last year. Second, for the first time, India has started talking about bolder and more ambitious emission mitigation targets. The 2070 net-zero target and ambitious Nationally Determined Contributions (NDC) are milestones. With the net-zero announcement, India has acknowledged the criticality of absolute emission reductions over the near-term relative emissions-intensity-based targets. The net-zero goal has changed the debate domestically with various actors, policymakers and the private sector. Third, sustainability-linked domestic economic policies are no longer on the margins. The creation of an Indian emissions carbon trading scheme, an institution that should operate for at least 30-40 years, is a case in point.

In the next five years, the government must accelerate and show the world that economic development can be sustainable, too. India should follow the mantra of 'go higher, go wider, go deeper' to align its climate leadership with economic prowess.

Vaibhav Chaturvedi

a Senior Fellow at the Council on Energy, Environment and Water (CEEW) and leads its low carbon economy and carbon markets research

The new government should aim to take India's global climate leadership to the next level with a 'higher, wider, deeper' plan

A plan sheet for India

'Go higher' relates to India's global leadership. The country could, sooner or later, host important international climate summits. If it were to host the United Nations Conference of Parties in 2028, it would need to be as successful as the G-20 Presidency. In global negotiations, four years is not that far. Does India want 'the world agrees to no new investment in oil and gas after 2030' as part of the decision text? Does it want a big commitment on adaptation finance so that developing countries can shield themselves against increasing heatwaves, storms, floods and droughts? It takes at least four to five years to achieve consensus on contentious issues. Deciding on what could potentially be the big wins in 2028 and socialising these across countries to stitch alliances and allay concerns must start right away. Alongside, India should continue doubling down on the narrative of equity in international forums, and create leadership space for itself in global institutions that can deliver climate finance.

'Go wider' means India has to adopt and strongly communicate sectoral emission reduction targets that go beyond the power sector. India has achieved significant progress in the power sector and will continue to do so to keep pace with its international non-fossil share-related and domestic renewable energy capacity targets.

The next step is to broaden the target to other sectors. For instance, it could be related to the private mobility space, giving a clear target for zero-carbon two- and four-wheelers. This is not just an urban India project. It will help rural India become mobile, drive jobs in clean energy and sustainability, and promote economic growth. As the last decade has shown, credible policy goals have been powerful signals and forced relevant industries and stakeholders to act. The NDC for 2035, due to be submitted next year, can be an opportunity for going wider with India's energy transition targets.

State-level plans are important

Finally, going deeper implies that sub-national climate action and resilience must come to the fore in this term of the government. Some shoots of this are already visible. The Council on Energy, Environment and Water (CEEW) is working across many States in India to support their net-zero plans through long-term climate and energy modelling. For instance, we collaborated with Tamil Nadu and Bihar for their recently-released plans for a transition towards a net-zero future. The government should think about creating a Centre-State coordination group, incentivising State-level climate actions through the Sixteenth Finance Commission, promoting a deeper integration of scientific modelling capabilities in policymaking, and facilitating a unified data measurement, reporting and verification (MRV) architecture at the State level. Given India's federal structure, this recommendation does not mean centralising climate actions, but ensuring that State-level actions are better coordinated without compromising their autonomy. This is possible only if the process goes beyond States individually trying to understand and respond to the climate crisis, and the Centre comes in as an active facilitator.

The new government should aim to take India's global climate leadership to the next level in its new term. It should look ahead for at least the next four to five years, and not just a year at a time. On most international tables now, India has a seat. It must now demonstrate prowess.

The views expressed are personal

Five-year climate agenda for India

- First, it has laid the foundation for global institutions such as the International Solar Alliance, the Coalition for Disaster Resilient Infrastructure, and the Global Biofuels Alliance, as well as shaped the Green Development Pact under its G-20 presidency last year.
- Second, for the first time, India has started talking about bolder and more ambitious emission mitigation targets.
- The 2070 net-zero target and ambitious Nationally Determined Contributions (NDC) are milestones.

- **With the net-zero announcement, India has acknowledged the criticality of absolute emission reductions over the near-term relative emissions-intensity-based targets.**
- **The net-zero goal has changed the debate domestically with various actors, policymakers and the private sector.**
- **Third, sustainability-linked domestic economic policies are no longer on the margins.**

- **‘Go wider’ means India has to adopt and strongly communicate sectoral emission reduction targets that go beyond the power sector.**
- **India has achieved significant progress in the power sector and will continue to do so to keep pace with its international non-fossil share-related and domestic renewable energy capacity targets.**

- The next step is to broaden the target to other sectors.
- For instance, it could be related to the private mobility space, giving a clear target for zero-carbon two- and four-wheelers.
- This is not just an urban India project.
- It will help rural India become mobile, drive jobs in clean energy and sustainability, and promote economic growth

- **Finally, going deeper implies that sub-national climate action and resilience must come to the fore**

Grave concern

The risk of international spread of wild type-1 polio cases from Pakistan is great

The ambitious goal of eradicating wild-type poliovirus type-1 (WPV1) by 2026 appears to have become tougher. WPV1, which is endemic only in Pakistan and Afghanistan, is showing signs of a resurgence since 2023. With Afghanistan and Pakistan reporting six WPV1 cases each in 2023 – there were two cases in Afghanistan and 20 cases in Pakistan in 2022 – the total incidence of type-1 cases in both countries in 2023 might appear to have nearly halved. But with six cases in Afghanistan and five cases in Pakistan already this year, there appears to be an uptick. If this continues, the total cases being reported from the two countries might be close to or even surpass the 2022 numbers. The concern about WPV1 is not limited to the number of cases in children. The circulation of the virus in the environment is seen to be rising, and, most importantly, after a gap of two years, positive environmental samples have been increasingly collected in Pakistan, in 2023 and till early June this year, from cities which have been historical reservoirs for the virus. Last year, 125 positive environmental samples were collected from 28 districts in Pakistan. Of these, 119 belonged to a genetic cluster (YB3A), which suggests that these were imported from Afghanistan. By June 1 this year, there have been 153 positive environmental samples from 39 districts. As of April 8, 2024, 34 positive environmental samples were collected from Afghanistan.

According to the World Health Organization, the presence of positive environmental samples in "epidemiologically critical areas and historical reservoirs" such as Karachi, Quetta and the Peshawar-Khyber blocks in Pakistan, and Kandahar in Afghanistan, represents a significant risk to the gains made in the past. Rising positive environmental samples are a reflection of polio campaigns not really achieving their desired coverage; fake finger marking sans vaccination is a persisting problem. Though children in Pakistan's cities are largely immunised, there is a heightened risk of the virus striking any unvaccinated or not fully vaccinated children – in 2023, two of the six cases were from Karachi city. The situation in Pakistan appears worse than it is in Afghanistan with the actual spread of WPV1 seen "predominantly in Afghanistan in 2022 now being detected in Pakistan in 2023 and 2024". There is also the grave risk of international spread from Pakistan, particularly to Afghanistan. With over 0.5 million Afghan refugees forced to leave Pakistan, and an estimated 0.8 million to be evicted soon, there is an increased risk of cross-border spread of the virus. There is a large pool of unvaccinated and under-immunised children in southern Afghanistan, increasing the risk that returning refugees can pose.

poliovirus

- Poliovirus containment is focused on eradicated polioviruses. Wild poliovirus type 2 (WPV2) and wild poliovirus type 3 (WPV3) were declared eradicated in 2015 and 2019, respectively.
- There are three types of wild poliovirus (WPV): type 1, type 2, and type 3. People must protect themselves against all three types of the virus to prevent polio disease. Polio vaccination is the best protection.
- Type 2 wild poliovirus was declared eradicated in September 2015.
- The last detection was in India, 1999.
- Type 3 wild poliovirus was declared eradicated in October 2019. It was last detected in November 2012. Only type 1 wild poliovirus remains.

- There are two vaccines used to protect against polio disease: oral polio vaccine and inactivated poliovirus vaccine.
- After wild poliovirus type 2 was declared eradicated in 2015, the world switched from trivalent OPV to bivalent OPV. Bivalent OPV contains poliovirus type 1 and 3.
- This switch means that the bOPV used globally no longer protects against WPV2.

- In rare instances, the vaccine-virus may be able to circulate over time and mutate in communities with insufficient immunity or immunocompromised individuals.
- These mutated OPV strains can cause polio disease.
- They are called poliovirus variants or vaccine-derived polioviruses (VDPVs).

Inactivated poliovirus vaccine

- IPV protects people against all three types of poliovirus. IPV does not contain live virus and cannot cause disease. It protects people from polio disease but does not stop transmission of the virus.
- OPV can be used to contain a polio outbreak. Use of all OPV will stop when polio is eradicated globally. This will prevent re-establishment of transmission from VDPVs.

- Less than 1% of poliovirus infections result in paralysis.
- The virus is most often spread by the faecal-oral route.
- Poliovirus enters through the mouth and multiplies in the intestine. Infected individuals shed poliovirus into the environment for several weeks, where it can spread rapidly through a community, especially in areas of poor sanitation.
- The poliovirus consists of an RNA genome enclosed in a protein shell called a capsid.
- There are three serotypes of wild poliovirus type 1, type 2, and type 3 each with a slightly different capsid protein. Immunity to one serotype does not confer immunity to the other two.

- **T he ambitious goal of eradicating wildtype poliovirus type-1 (WPV1) by 2026 appears to have become tougher.**
- **WPV1, which is endemic only in Pakistan and Afghanistan, is showing signs of a resurgence since 2023. With Afghanistan and Pakistan reporting six WPV1 cases each in 2023 —**

ATTENTION!! BATCH FOR 2025/26 LAUNCHED

connect with sir -9057921649

CURRENT AFFAIRS PLUS (FOR UPSC 2025)

INCLUDES

- PIB Analysis with pdf
- Down to earth
- physics.org
- science daily
- Major newspapers
- With practice test and Mains Mock

starting 1st may 2024

BY SAURABH PANDEY SIR

MAINS GURUJI

Connect with sir 90579 21649

UPSC MAINS MENTORSHIP PROGRAM

starting 10th JULY 2024

Target 400 + in GS paper

How to approach Essay ??

Only for serious UPSC ASPIRANTS

Batch-1

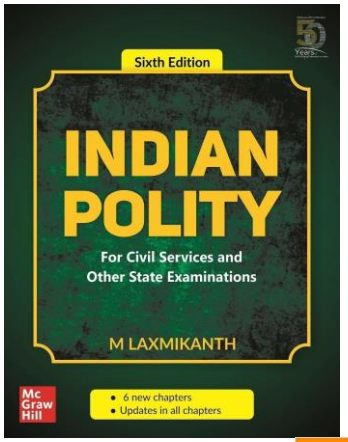
BY SAURABH PANDEY SIR

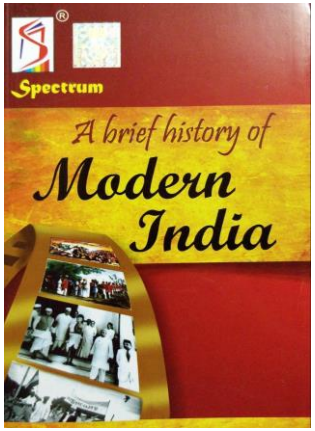
Link in description

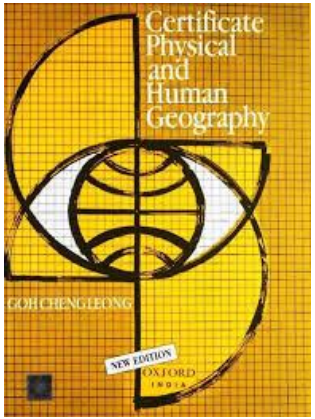
Msg -9057921649

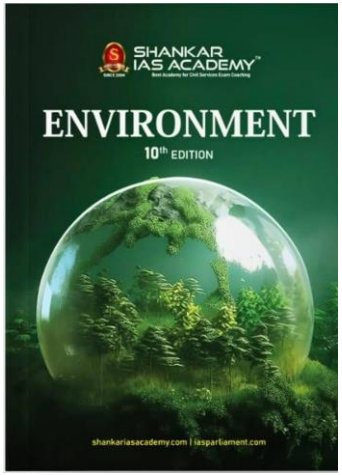
Download -
saurabh pandey
cse app

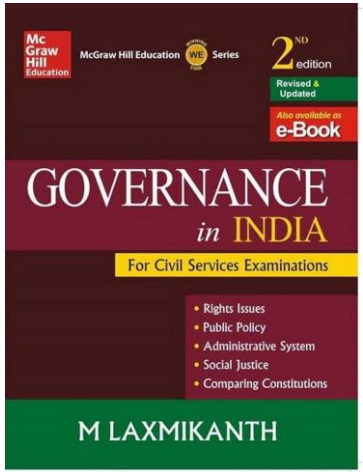
ALL Advance books for upsc IN ONE COURSE

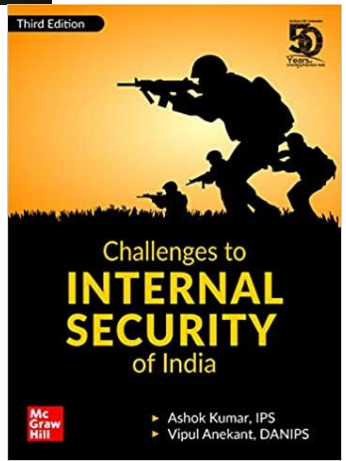


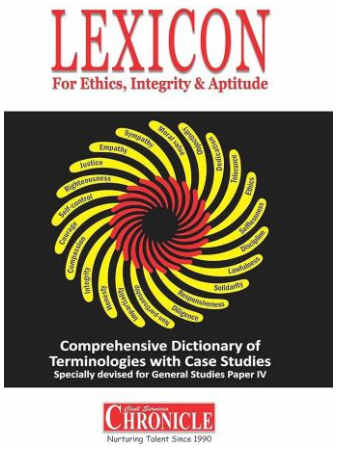










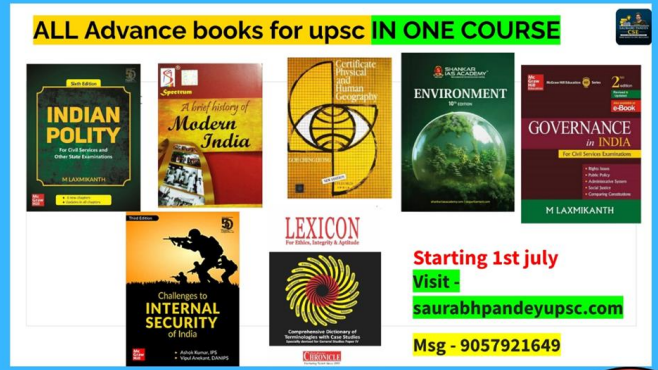


Starting 1st june

Visit - saurabhpandeyupsc.com

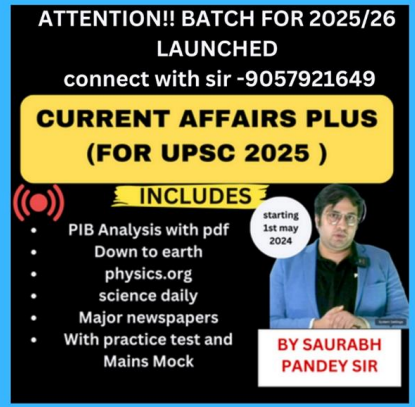
Msg - 9057921649

COMBO COURSE FOR UPSC 2025



+

Save Rs 1000/-



Scan - to get free content

Topics

- African Swine Fever (ASF)
- Freedom of religion
- Fight in myanmar
- United Nations High Commissioner for Refugees (UNHCR)
- Mount Etna & what is stratovolcano??
- Mains

By saurabh Pandey

THE HINDU

African Swine Fever cases reported at Kerala farm

The Hindu Bureau
THRISSUR

As many as 310 pigs at Madakkathara grama panchayat in Kerala's Thrissur are set to be culled after an outbreak of African Swine Fever was reported at a private farm in the 14th ward of the local body.

The highly contagious swine disease has been confirmed in the pigs at the farm in Veliyanthara.

Disinfection measures

The Thrissur Collector has directed the district animal husbandry officer to cull the pigs and bury them, according to an official release here on Friday.

A team consisting of doctors, livestock inspectors, and attendants will carry out the culling operations, and further primary disinfection measures will also be taken. The area within one-km radius of the affected farm has been declared disease-hit and the area within 10-km radius has been declared a disease surveillance area.

African Swine Fever (ASF)

- African Swine Fever (ASF) is a highly contagious and deadly swine disease that can affect both farm-raised and feral (wild) pigs.
- ASF doesn't infect people, but it is readily passed from one pig to another by direct contact with bodily fluids from an infected pig.
- The practice of feeding uncooked food waste (that has not been appropriately heat treated) to pigs can also result in transmission of the virus if the food waste being fed to pigs contains contaminated pork products.

African swine fever (ASF)

The virus is highly **resistant to low temperatures** and can survive for extended periods of time in the blood, feces and tissue of infected animals.

African swine fever can be transmitted through **direct contact** between sick and healthy animals. It can also be transmitted **indirectly** through feed containing meat from infected animals (the virus can remain infectious for 3 to 6 months in uncooked pork products); **biological vectors** such as ticks of the genus *Ornithodoros*; and contaminated **inanimate objects** (fomites) that can transmit the virus.

ASF is a **highly contagious,** transboundary viral disease (*Asfarviridae* family; *Asfivirus* genus).

Global alarms went off in August 2018, when an ASF outbreak was first reported in **China.** The disease swept through the entire Asian country and spread to **Mongolia, Vietnam, Cambodia and Hong Kong.**

It can affect both domestic and wild pigs (wild boars and peccaries). **It is harmless to humans.**

According to the OIE, **24%** of its member countries (48 out of 200) **have reported the disease** as present since 2016.

According to official data for this period, more than **2.5 million domestic pigs** have died or been killed— 67.6% of them in Asia over the past 10 months.

Between 2016 and May 2019, there were a total of **10,211 outbreaks in Africa, Europe and Asia.**

Typical clinical signs of ASF are similar to those of classical swine fever (which is endemic in several countries of the Americas); therefore, a **laboratory test** is required to distinguish them.

The **peracute** form of the virus causes sudden death with few signs.

Symptoms include **fever, loss of appetite,** low energy, abortion, internal hemorrhages, visible hemorrhages, and even death.

Spiritual orientation, religious practices and courts

Faizan Mustafa

the Vice-Chancellor of the Chanakya National Law University, Patna, Bihar

"What is religion to one is superstition to another," said Chief Justice Lathman of Australia in *Adelaide Company of Jehovah's Witnesses Inc vs Commonwealth* (1943). Religion has been at the centre of human societal existence since time immemorial. Man is incurably religious; Indians more so. Right now, we are in a rush hour of god with religiosity on the rise and spirituality on the decline.

In a significant yet controversial order in *P. Navin Kumar* (2024), by Justice G.R. Swaminathan of the Madras High Court, the religious practice of *angapradakshinam* has been allowed. The practice involves rolling over the banana leaves on which other devotees (in this instance) of Sri Sadasiva Brahmendral of Nerur village in Tamil Nadu had partaken food. The order overruled the 2015 order of Justice S. Manikumar.

In 2015, the petitioner had argued that the practice involved Dalits and non-Brahmins rolling over on left-over plantain leaves even though the district administration had disputed the allegation of caste discrimination. Justice Manikumar had relied on the Supreme Court of India's order, in *State of Karnataka and others vs Adivasi Budakattu Hitarakshana Vedike Karnataka and others* (in Special Leave Petition (C) No.33137 of 2014), where the top court had stayed a 500-year-old ritual on similar lines where mainly Dalits used to roll over the leaves. Justice Swaminathan refused to follow the 2015 order as temple trustees which used to organise the event were not made parties, and thus not heard. Moreover, not only Dalits but even others too rolled over the leaves and thus no caste discrimination was there.

Revival of a debate

The order has revived the debate on issues such as what is religion; how essential practices of any religion are to be determined, and how far the judiciary has been consistent in such determination. Justice Swaminathan, in a well-researched order, has cited all the important judgments of the Supreme Court to reach the conclusion that the petitioner, P. Navin Kumar – who has taken the vow of *angapradakshinam*, and is entitled to execute it as part of his freedom of religion under Article 25 and right to privacy under Article 21 and human dignity – is in no way undermined in such a practice. He even held that rolling over on used banana leaves is part of the freedom of movement under Article 19(1)(d).

Without any evidence being strictly examined, as was done in similar cases, Justice Swaminathan took judicial notice of the fact that *angapradakshinam* is an established religious practice. Thus, like other cases, no questions were being asked whether it is an essential and integral practice of the Hindu religion. Or whether it is a mandatory practice and not a mere superstitious practice. He has quoted the *Krishna Yajur Veda* and *Bhavishyapurana* which describe this practice as a noble act, but every noble act cannot get the high status of a mandatory act.

Judges should not become the clergy to determine theological issues; progressive India should not allow even an essential religious practice if it is contrary to constitutional ethos and values

The subject of essential practices

The framers of the Indian Constitution had subordinated the freedom of religion to all other fundamental rights. It has further been subjected to public order, health and morality, with additional powers being given to the state to bring in social reforms. The courts have further restricted the freedom to only the 'essential religious practices'. Accordingly such a plea was accepted in just seven out over 47 cases and that is why the latest pronouncement, by Justice Swaminathan needs critical evaluation. Is not the rolling over on used banana leaves with leftover food an unhygienic practice with the danger of health hazards? Can the right to privacy be claimed in respect of a public event such as an *angapradakshinam*?

Justice Swaminathan observed that privacy is not lost if an individual is in a public place. In an interesting analogy, the learned judge, in paragraph 21 of his judgment, held that 'If the right to privacy includes sexual and gender orientation, it certainly includes one's spiritual orientation also.' It is open to a person to express this orientation in the manner he deems fit subject to rights of others.

The leading Supreme Court judgment on the freedom of religion was *Sri Shirur Mutt* (1954) where the Court had observed that Article 25 guarantees freedom not only to entertain such religious belief as may be approved of by one's judgment and conscience, but also to exhibit his belief in such outward acts as he thinks proper.

The Court further held that religion does prescribe rituals, ceremonies and modes of worship which are regarded as an integral part of religion. The Court was categorical in saying that 'what constitutes the essential part of religion is primarily to be ascertained with reference to the doctrines of that religion itself'. In subsequent years, the Court became inconsistent in its determination of essential religious practices and moved away from looking at a particular religion to decide its essential practices and brought in its own rationality. Thus, a five-judge Bench in *The Durgah Committee, Ajmer* (1961) said that freedom of religion protects only essential and integral practices of a religion and does not extend to practices, though religious in character may have sprung from merely superstitious beliefs and be extraneous and unessential accretions to religion itself. Why was *angapradakshinam* not tested on this touchstone?

In *Gramsabha of Village Battis Shirala* (2014), a particular sect claimed the capturing and worship of a live cobra during *nagpanchnami* to be an essential part of its religion. They placed reliance on the text of *Shrinath Lilamrut* which prescribed such a practice. The court relied on the more general *Dharmashastra* text to rule that since there was no mention of capturing a live cobra, it could not be an essential practice of the petitioners' religion.

In *Mohammed Fasi* (1985), a Muslim police officer challenged a regulation in the Kerala High Court which did not permit him to grow a beard. It is disgusting to note that rather than looking at the question of the essentiality of a beard in Islam, the court rejected the petitioner's argument simply by relying on the irrelevant fact that certain Muslim dignitaries do not sport a beard and that the petitioner did not have a beard in previous years. Therefore, the court looked at empirical evidence of practice rather than religious texts. The court refused to permit the keeping of a beard by a policeman as it was merely a noble and pious act because it was based on sayings of Prophet (Hadith) and not made mandatory in the *Koran*. The *hijab* was similarly not found mandatory.

In *Acharya Jagdishwarananda Avadhuta* (2004), where the Calcutta High Court found that the *tandava* dance was an essential practice of the Ananda Margi faith, the Supreme Court overruled the High Court by looking at earlier judicial verdicts and not religious texts. Another strange reason provided was that the Ananda Margi faith had come into existence in 1955 and that the *tandava* dance was adopted only in 1966. Therefore, as the faith had existed without the practice, it could not be accepted as an essential feature of the faith. The approach seems to identify a religious practice as only an integral practice if it existed when the religion was founded. This logic would lead to an approach to religious practices that are frozen in time. By this logic no Jewish, Christian and Islamic practice can be protected if it was not considered integral by Moses, Jesus Christ and Muhammad, respectively, in their lifetime.

The 'essentiality test' reached absurd levels in *M. Ismail Faruqui* (1995) where the top court was dealing with the issue of the state acquiring the land over which the Babri Masjid once stood. The court held that while offering of prayers is an essential practice, the offering of such prayers in the mosque is not unless the place has a particular religious significance in itself. Everyone knows congregational prayer is central to Islam and that mosques are an essential means to achieve this objective. Yet, the mosque was not held essential.

The Constitution is supreme

This writer has consistently held the view in his articles that judges should not become the clergy to determine purely theological issues and that a progressive nation such as India should not allow even an essential religious practice if the same is contrary to constitutional ethos and values. It is the Constitution of India and not religions that should govern us. Only that much religious freedom can be granted as is permitted by the Constitution.

The views expressed are personal

Freedom of religion

- **The framers of the Indian Constitution had subordinated the freedom of religion to all other fundamental rights.**
- **It has further been subjected to public order, health and morality, with additional powers being given to the state to bring in social reforms.**
- **The courts have further restricted the freedom to only the ‘essential religious practices’.**

- **Justice Swaminathan observed that privacy is not lost if an individual is in a public place.**
- **In an interesting analogy, the learned judge, in paragraph 21 of his judgment, held that 'If the right to privacy includes sexual and gender orientation, it certainly includes one's spiritual orientation also.'**
- **It is open to a person to express this orientation in the manner he deems fit subject to rights of others.**

- **The leading Supreme Court judgment on the freedom of religion was Sri Shirur Mutt (1954) where the Court had observed that Article 25 guarantees freedom not only to entertain such religious belief as may be approved of by one’s judgment and conscience, but also to exhibit his belief in such outward acts as he thinks proper.**

- The Court further held that religion does prescribe rituals, ceremonies and modes of worship which are regarded as an integral part of religion.
- The Court was categorical in saying that ‘what constitutes the essential part of religion is primarily to be ascertained with reference to the doctrines of that religion itself’.
- a five-judge Bench in The Durgah Committee, Ajmer (1961) said that freedom of religion protects only essential and integral practices of a religion and does not extend to practices, though religious in character may have sprung from merely superstitious beliefs and be extraneous and unessential accretions to religion

Junta under pressure as fierce fighting breaks out in northeastern Myanmar

The latest battle brings an end to the Chinese-brokered ceasefire, putting pressure on the military regime as it faces attacks from resistance forces on multiple fronts in the country's civil war; there is no indication whether ethnic armed organisation, Arakan Army, has joined the fight in Shan State

Associated Press
BANGKOK

New fighting has broken out in northeastern Myanmar, bringing an end to a Chinese-brokered ceasefire and putting pressure on the military regime as it faces attacks from resistance forces on multiple fronts in the country's civil war.

The Ta'ang National Liberation Army, one of three powerful militias that launched a surprise joint offensive last October, renewed its attacks on regime positions last week in the northeastern Shan State, which borders China, Laos, and Thailand, and the neighbouring Mandalay region with the support of local forces there.

Since then, the Myanmar National Democratic Alliance Army has joined in, and by Friday, combined forces from the two allied militias had reportedly encircled the strategically important city of Lashio, the headquarters of the regime's northeastern military command.

Gaining ground: Members of the Mandalay People's Defence Force pose for a photograph with the group's flag in front of the captured police station in Madaya township in Myanmar. AP

'Safety of people'

This is the next phase of October's "1027" offensive, said Lway Yay Oo, spokesperson for the TNLA, which last week said the military provoked retaliation with artillery and airstrikes despite the ceasefire. "In phase two, our number one aim is the eradication of the military dictatorship, and number two is the protection and safety of local people," she said.

Thet Swe, a spokesperson for the military regime, which seized power from the elected government of Aung San Suu Kyi in February 2021, accused the militias of putting civilians in jeopardy by restarting the fighting. "As the TNLA are starting to violate the ceasefire, the Tatmadaw is protecting the lives and the property of the ethnic people," he said in an email, referring to the military by its Burmese name.

There was no indication that the third ethnic armed organisation that makes up the Three Brotherhood Alliance, the powerful Arakan Army, has joined in the renewed fighting in Shan state.

The TNLA claims to have already captured more than 30 army outposts, and to now control the western part of Mogok, whose ruby mines make it a lucrative target. There is also fighting for the town of Kyaukme, which sits at a highway crossroads, and Nawnghkio to the southwest, which leads toward the major military garrison town of Pyin Oo Lwin along the same highway.

"That's where you need to cut it off to prevent the military from sending reinforcements," said Morgan Michaels, a Singapore-based analyst with the International Institute of Strategic Studies who runs its Myanmar Conflict Map project.

In Mandalay, the region west of Shan, a local People's Defence Force – one of many armed resistance groups that have sprung up in support of the underground National Unity Government, which views itself as Myanmar's legitimate administration – joined the TNLA's offensive.

Osmond, a spokesperson for the Mandalay People's Defence Force who would only give his *nom de guerre* because of safety concerns, said his and other local resistance groups have seized nearly 20 military outposts.

The October offensive by the Three Brotherhood Alliance made rapid advances as the militias took large expanses of territory in the north and northeast, including multiple important border crossings with China and several major military bases.

Chinese ties

The alliance militias have close ties to China, and it's widely believed that the offensive had Beijing's tacit approval because of its growing dissatisfaction with the military regime's seeming indifference to the burgeoning drug trade along its border and the proliferation of centres in Myanmar at which cyberscams are run, with workers trafficked from China.

China then helped broker the ceasefire in January, bringing the major fighting in the northeast to an end.

With the renewed violence in the northeast, China's Foreign Ministry said it stood ready to again provide support for peace talks, but would not say whether it had been in direct contact with the Three Brotherhood Alliance or the military State Administration Council.

"China urges all parties in Myanmar to earnestly abide by the ceasefire agreement, exercise maximum restraint, disengage on the ground as soon as possible, and take practical and effective measures to ensure the tranquillity of the China-Myanmar border and the safety of Chinese personnel and projects," the Ministry said in a faxed reply to questions.

The Myanmar army doesn't appear to have been surprised by the TNLA attacks, with evidence that it mobilised forces and prepared defences as well as security checkpoints and patrols ahead of the renewed offensive, Mr. Michaels said.

"They didn't get caught completely off guard, although they've not been able to respond yet, there's been no counter-offensive," he said.

Objectives unclear

It is not yet clear what the TNLA's objectives are, and it could be that the group is just looking to expand gains and consolidate positions now while the military is stretched thin by fighting on several fronts, and before new batches of conscripts are trained for service.

Likewise, with the MNDAA, it is not clear whether it is planning to join the broader offensive or whether it intends to take encircled Lashio by force, lay siege to it, or simply tie up the troops now trapped there. The group did not respond to requests for comment.

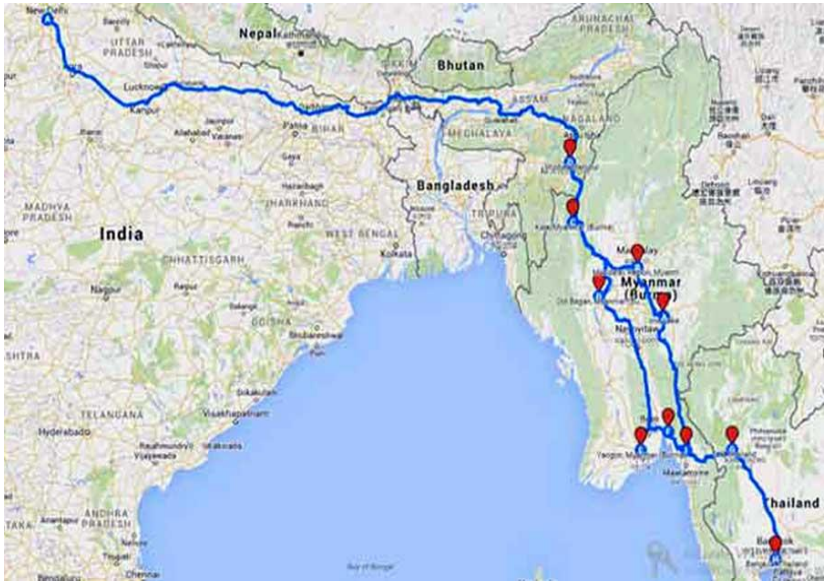
The Economist

Fight in myanmar

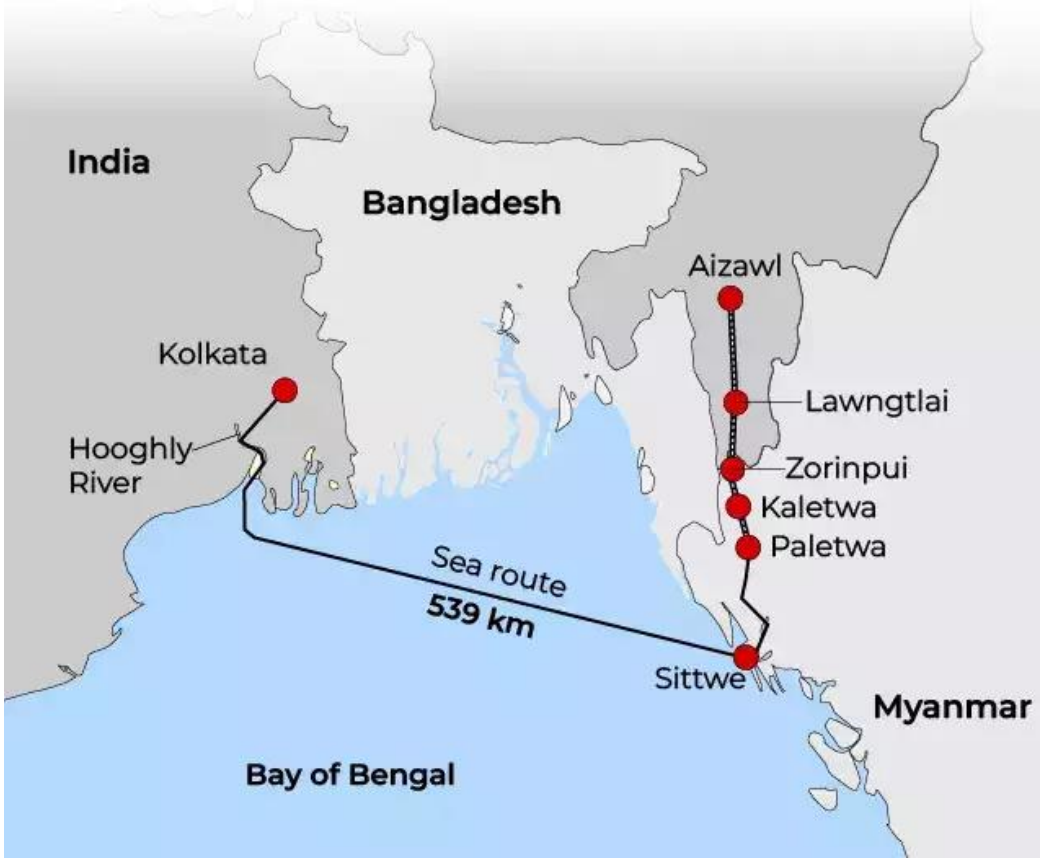
- New fighting has broken out in northeastern Myanmar, bringing an end to a Chinese-brokered ceasefire and putting pressure on the military regime as it faces attacks from resistance forces on multiple fronts in the country’s civil war.
- The Ta’ang National Liberation Army, one of three powerful militias that launched a surprise joint offensive last October, renewed its attacks on regime positions last week in the northeastern Shan State, which borders China, Laos, and Thailand, and the neighbouring Mandalay region with the

- **The alliance militias have close ties to China, and it’s widely believed that the offensive had Beijing’s tacit approval because of its growing dissatisfaction with the military regime’s seeming indifference to the burgeoning drug trade along its border and the proliferation of centres in Myanmar at which cyberscams are run, with workers trafficked from China.**
- **China then helped broker the ceasefire in January, bringing the major fighting in the northeast to an end**


Lhasa
BHUTAN
Chongqing
NEPAL
Kathmandu
Thimphu
Guiyang
Āgra
Kānpur
Lucknow
Patna
Kunming
BANGLADESH
Dhaka
Bhopāl
Jamshedpur
Khulna
Indore
Kolkata
Chittagong
Mandalay
Nāgpur
Hanoi
BURMA
(Myanmar)
LAOS
INDIA
Haiphon
Gulf of
Tonkin
Nay Pyi
Taw
Chiang
Mai
Vientiane
Vishākhapatnam
Rangoon
Vijayawāda
Bay of
Bengal
THAILAND
Bangkok
Bengaluru
(Bangalore)
Chennai
ANDAMAN
ISLANDS
(INDIA)
CAMBODIA
Coimbatore
Andaman
Phnom
Penh
Madurai



Kaladan Multi Modal Transit Transport Project



Laurence Hart, director of International Organization for Migration, speaks during a press conference in Geneva. AP

Migrants face abuse and violence crossing Africa, says UN report

Agence France-Presse
GENEVA

Refugees and migrants face extreme violence, abuse and exploitation on land routes crossing Africa to get to the Mediterranean, with far more believed to be dying there than at sea, a UN-backed report said on Friday.

Nearly 30,000 migrants have been declared dead or missing attempting to cross the Mediterranean to Europe in the past decade. But it could be even worse for those travelling through Africa to the coast, according to a report from United Nations agencies for refugees and migrants and the monitoring group Mixed Migration Centre.

Based on more than 31,000 interviews with refugees and migrants, the report found that 1,180 people were known to have died while crossing the Sahara Desert between January 2020 and May 2024. Five deaths a day are being recorded on the desert routes, Laurence Hart of the UN's International Organization for Migration said.

Those on the move face torture, kidnapping for ransom, people trafficking, sexual violence, robbery, arbitrary detention and collective expulsions, the report said. Despite the "unimaginable horrors", the report highlighted an increase in the number of people attempting the perilous land crossings.

The organisations stressed the urgent need to step up protection along the routes. "This is not to facilitate the movement of people," said Vincent Cochetel, UNHCR's special envoy for the central and western Mediterranean. "It is to find protection solutions to address the abuse and the violations they suffer."

United Nations High Commissioner for Refugees (UNHCR)

- The Office of the United Nations High Commissioner for Refugees (UNHCR) is a United Nations agency mandated to aid and protect refugees, forcibly displaced communities, and stateless people, and to assist in their voluntary repatriation, local integration or resettlement to a third country.
- It is headquartered in Geneva, Switzerland.

- UNHC was created in 1950 to address the refugee crisis that resulted from World War II.
- The 1951 Refugee Convention established the scope and legal framework of the agency's work, which initially focused on Europeans uprooted by the war.
- Commensurate with the 1967 Protocol to the Refugee Convention, which expanded the geographic and temporal scope of refugee assistance, UNHCR operated across the world, with the bulk of its activities in developing countries.

- In recognition of its work, UNHCR has won two Nobel Peace Prizes, in 1954 and 1981, and a Prince of Asturias Awards for International Cooperation in 1991.
- It is a member of the United Nations Development Group, a consortium of organizations dedicated to sustainable development.

Spitting fire

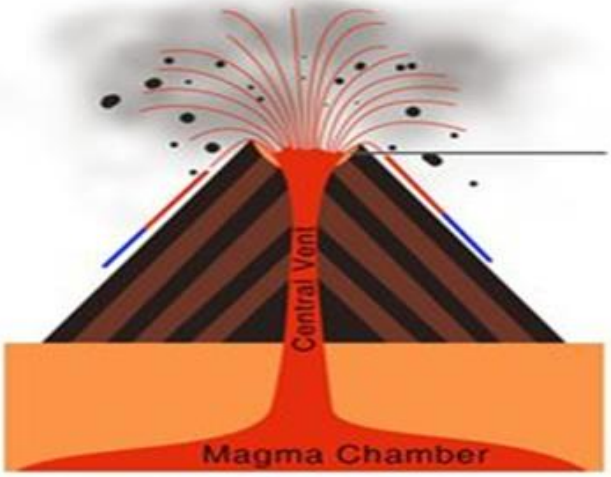
Spewing out: Craters erupt from Mount Etna, the largest active volcano in Europe, on Friday in Sicily, an island in Italy. Due to the eruption, the Catania airport announced its closure as ashes fell on the airspace and the surrounding area. AFP

Mount Etna

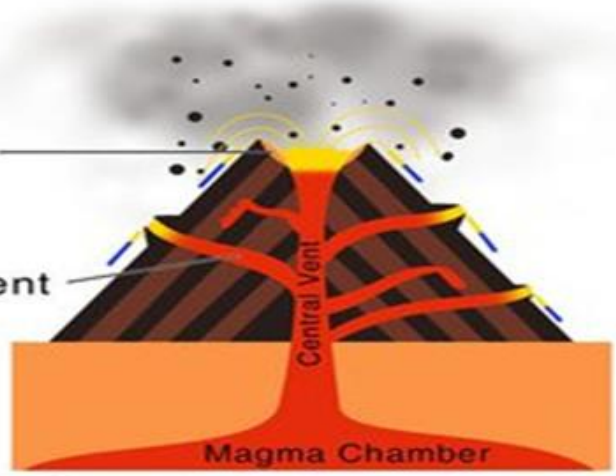
- Craters erupt from Mount Etna, the largest active volcano in Europe, in Sicily, an island in italy
- Mount Etna, active volcano on the east coast of Sicily.
- The name comes from the Greek Aitne, from *aithō*, “I burn.”
- Mount Etna is the highest active volcano in Europe, its topmost elevation being about 10,900 feet (3,320 metres).
- Like other active volcanoes, it varies in height, increasing from deposition during eruptions and decreasing from the periodic collapse of the crater’s rim.

Mount Etna is the highest Mediterranean island mountain and the most active stratovolcano in the world.

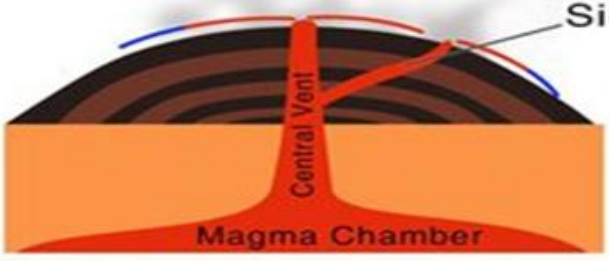
TYPES OF VOLCANOE



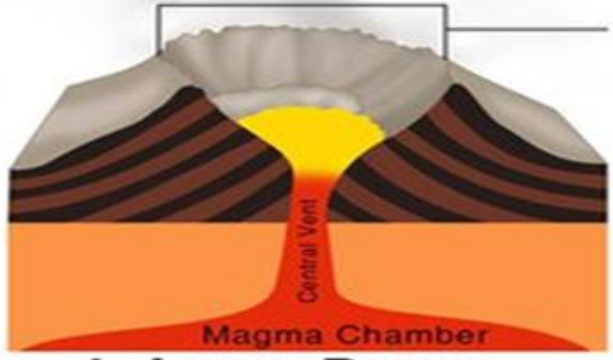
1. Cinder Cone Volcano



2. Composite Volcano

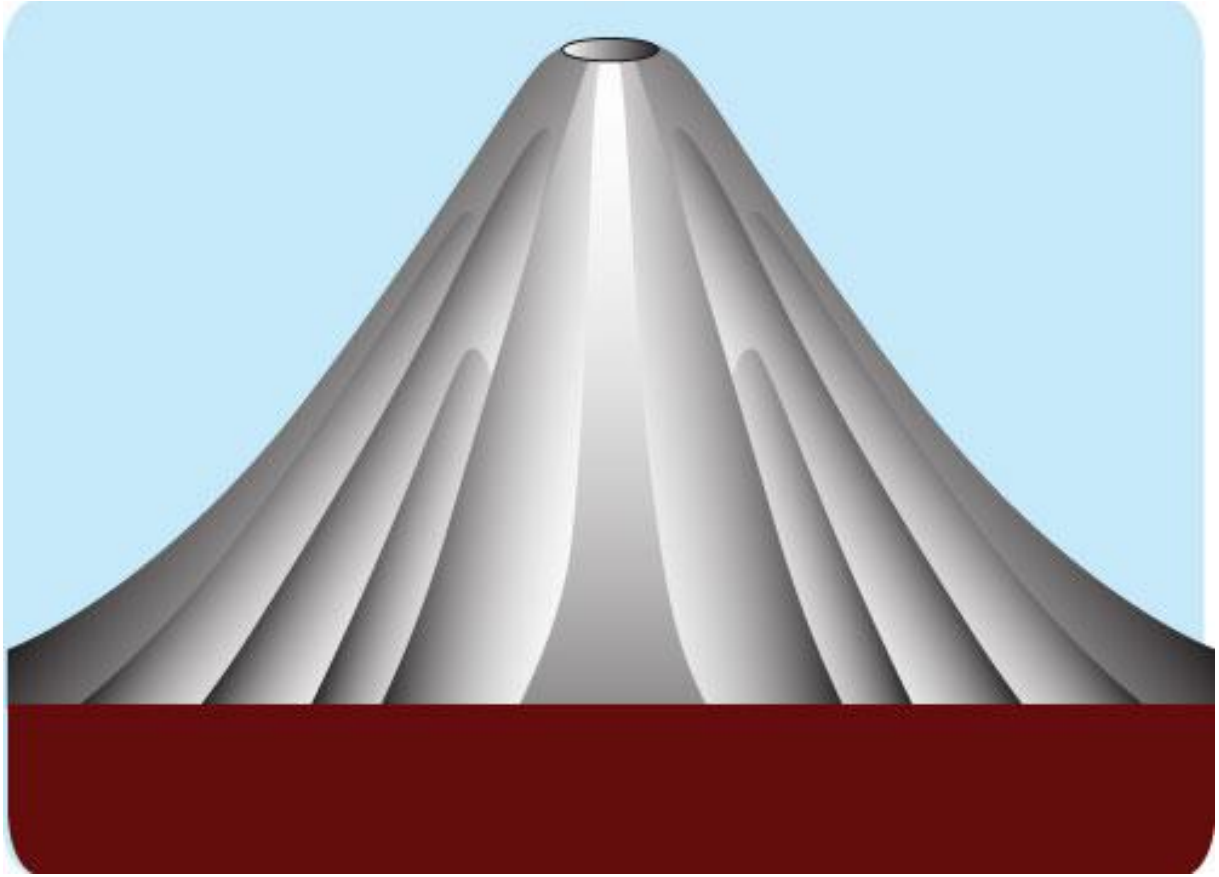


3. Shield Volcano



4. Lava Dome

- A stratovolcano, also known as a composite volcano, is a conical volcano built up by many layers of hardened lava and tephra
- Stratovolcano
- Stratovolcanoes have relatively steep sides and are more cone-shaped than shield volcanoes.
- They are formed from viscous, sticky lava that does not flow easily.
- The lava therefore builds up around the vent forming a volcano with steep sides. Stratovolcanoes are more likely to produce explosive eruptions due to gas building up in the viscous magma.



- **Andesite (named after the Andes Mountains), is perhaps the most common rock type of stratovolcanoes, but stratovolcanoes also erupt a wide range of different rocks in different tectonic settings.**

Topics

- Transferring of panchayat between states
- The green chromide
- Genome editing
- Sleeping beauty and transposon
- RNA Bridge
- Mains

By saurabh Pandey

THE HINDU

- Graphene
- Federal structure and special package
- M.K. Ranjitsinh and Others vs Union of India .
- Anusandhan National Research Foundation (ANRF) Bill
- Expunction power of parliament
- Denisovans
- Mains

By saurabh Pandey

THE HINDU

Naidu, Revanth agree on transfer of 5 panchayats from A.P. to Telangana

The process of re-merger is likely to take some time as the two States need to follow the procedures to get Andhra Pradesh Reorganisation Act, 2014, amended with the help of the Union government as Parliament had passed the legislation

M. Rajeev
HYDERABAD

The meeting of Telangana Chief Minister A. Revanth Reddy and his Andhra Pradesh counterpart, N. Chandrababu Naidu, on Saturday, the first such after four-and-a-half years, saw some crucial decisions being taken.

The transfer of five gram panchayats around the temple town of Bhadrachalam from Andhra Pradesh to Telangana was one of the issues in focus ahead of the much-awaited meeting. The two Chief Ministers reportedly reached a consensus on the re-merger of the gram panchayats with Telangana to remove the difficulties faced by residents in accessing medical and other services.

Chief Ministers A. Revanth Reddy and N. Chandrababu Naidu during their meeting on Saturday. X/@REVANTH_ANUMULA

The two governments are planning to expeditiously initiate steps in this regard. The process, however, is likely to take some time as the two States need to follow procedures for seeking an amendment to the Andhra Pradesh Reorganisation Act, 2014, by the Union government as the Act was passed by Parliament.

The gram panchayats of Etapaka, Gundala, Purushottapatnam, Kannaigudem and Pichukalapalem, along with seven mandals of Khammam district, were merged with Andhra Pradesh by the Modi government in its first term within days of the formation of Telangana. As a result, the endowment lands of Bhadrachalam temple located in these villages went to Andhra Pradesh, while the temple town remained in Telangana. Several representations were subsequently made for the re-merger of these villages with Telangana owing to the legal issues involved in the management of those temple lands.

This apart, people also face issues in accessing villages closer to Bhadrachalam, as they have to cross the Andhra Pradesh boundary and re-enter Telangana to reach them.

With consent obtained at the highest levels, officials of the two States have reportedly focused on the legal formalities required to be completed. Since this will need an amendment to the legislation passed by Parliament, the Telangana government will need to pass a resolution in the Assembly seeking the neighbouring State's cooperation in transferring these five panchayats to Telangana.

Once Andhra Pradesh gives its consent, the issue would reach the Centre for amending the Act.

Officials say that the Centre would not have any objection to the process and are hopeful that the amendment Bill would be introduced in Parliament.

Naidu, Revanth agree on transfer of 5 panchayats from A.P. to Telangana

- The two governments are planning to expeditiously initiate steps in this regard.
- The process, however, is likely to take some time as the two States need to follow procedures for seeking an amendment to the Andhra Pradesh Reorganisation Act, 2014, by the Union government as the Act was passed by Parliament

- With consent obtained at the highest levels, officials of the two States have reportedly focused on the legal formalities required to be completed.
- Since this will need an amendment to the legislation passed by Parliament, the Telangana government will need to pass a resolution in the Assembly seeking the neighbouring State's cooperation in transferring these five panchayats to Telangana.
- Once Andhra Pradesh gives its consent, the issue would reach the Centre for amending the Act.
- Officials say that the Centre would not have any objection to the process and are hopeful that the amendment Bill would be introduced in Parliament

Kerala varsity to launch genome editing mission to boost pearl spot production

K.A. Martin
KOCHI

Genome editing will help enhance breeding and seed production of pearl spots, says Kerala University of Fisheries. H. VIBHU

Pearl spot farmers in Kerala have for ages endured the drudgery of finding brood stocks in the wild, breeding them in vastly uncontrolled environments and releasing fingerlings into aquaculture ponds only to see the fish barely achieving body weight of 300 to 400 grams in a year.

That may soon be a thing of the past as the Kerala University of Fisheries and Ocean Studies (Kufos) prepares to launch a genome editing mission to see if the State fish can revolutionise aquaculture as genetically improved farmed tilapia (GIFT) did decades ago.

Genome editing will target the genetic make-up of the fish that inhibits a faster rate of growth. It will also help enhance breeding and seed production of pearl spots, said Kufos Vice-Chancellor Pradeep Kumar T.

Achieving higher body weight at an enhanced rate will be a great blessing for aqua farmers in the State because pearl spots fetch a premium in the market whereas tilapia does not. Pearl spots are sold in the retail market for about ₹650 to ₹700 a kg, while tilapia fetches between ₹250 and ₹300 a kg.

But, tilapia achieves a body weight of 600 to 700 grams in six months compared with 12 months needed for pearl spots to achieve 300 to 400 grams. According to data available for 2020, Kerala produces 2,000 tonnes of pearl spots annually against the market demand of 10,000 tonnes.

The green chromide

- The green chromide (*Etroplus suratensis*) is a species of cichlid fish that is native to fresh and brackish water habitats in some parts in India such as Kerala, Goa, Chilika Lake in Odisha and Sri Lanka.
- The species was first described by Marcus Elieser Bloch in 1790.
- This species and other members of the genus *Etroplus* are relatively closely related to the *Paretroplus* cichlids from Madagascar.
- Other common names include pearlspot cichlid, banded pearlspot, and striped chromide

- **The green chromide lives in brackish water habitat types, such as river deltas.**
- **It eats mainly aquatic plants, including filamentous algae and diatoms, but it consumes the occasional mollusk and other animal matter.**

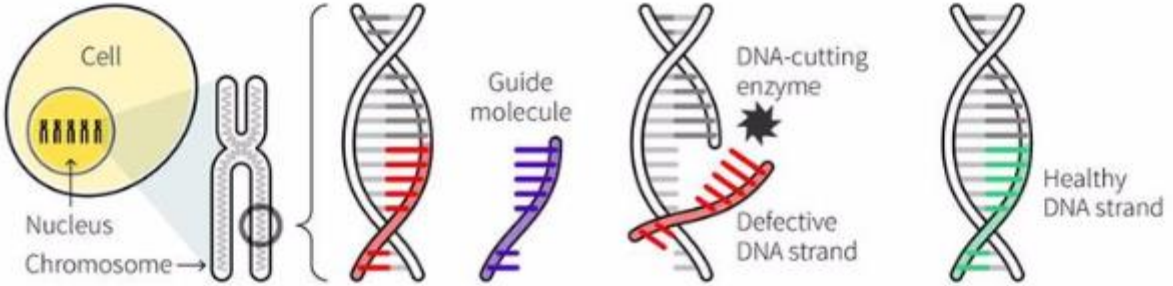
Why in News ??

- **Kerala varsity to launch genome editing mission to boost pearl spot production.**

DNA editing

A DNA editing technique, called CRISPR/Cas9, works like a biological version of a word-processing programme's "find and replace" function.

HOW THE TECHNIQUE WORKS



A cell is transfected with an enzyme complex containing:
- Guide molecule
- Healthy DNA copy
- DNA-cutting enzyme

A specially designed synthetic guide molecule finds the target DNA strand.

An enzyme cuts off the target DNA strand.

The defective DNA strand is replaced with a healthy copy.

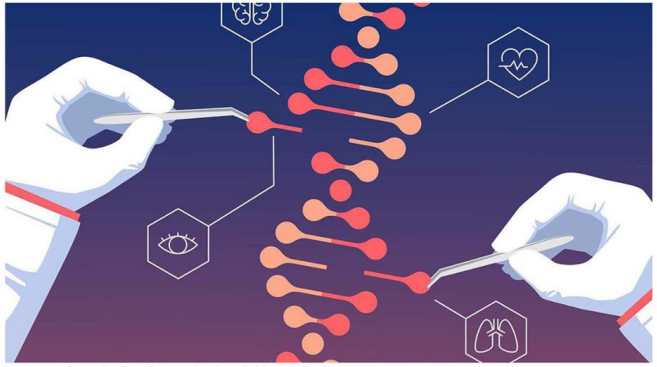
Sources: Reuters; Nature; Massachusetts Institute of Technology

New uses of Gene Editing

Jumping genes and RNA bridges promise to shake up biomedicine

The discovery of transposons revolutionised our understanding of genetics, in particular their role in enabling nature's wondrous diversity. Over the years, researchers have attempted to resurrect inactive transposons in animal genomes, hoping the results will be useful for genetic corrections to cure diseases

Sridhar Sivasubbu
Vinod Scaria



Transposons influence the effects of genes and are thus called the tools of evolution. GETTY IMAGES/ISTOCKPHOTO

THE GIST

Transposons influence the effects of genes by turning 'on' or 'off' their expression. They have the ability to rearrange the genome and thus enable nature's diversity

Researchers have reconstructed a transposon called 'sleeping beauty' using the genomes of a fish. It had been dormant for millions of years. A similar synthetic transposon may, in the future, allow us to turn off a problem gene or over-express another

A new RNA-guided gene editing system that uses bacterial transposons can treat a wide variety of genetic diseases: a functional copy of a gene can be replaced in a given genomic location. It may also be able to treat chromosomal inversions or deletions

The year was 1948. It had only been about half a century since scientists had rediscovered Gregor Mendel's work on inheritance in pea plants. This year, a scientist working on the genetics of the maize plant would challenge the then prevailing concept that genes are stable and arranged in an orderly manner on the chromosome. Barbara McClintock at the Carnegie Institution found that some genes were able to move around within the genome. These genes were called mobile elements or transposons.

Prof. McClintock also made another significant observation: depending on where the mobile elements were inserted, they had the ability to reversibly alter gene expression. She used corn kernels' colours as a surrogate to understand hereditary characteristics, and in this way figured out transposons moved about in the genome of the maize plant. She was awarded the Nobel Prize in Physiology or Medicine in 1983 for this work.

Between 1948 and 1983, researchers found transposons in an array of life-forms, including bacteriophages, bacteria, plants, worms, fruit flies, mosquitos, mice, and humans. They were nicknamed 'jumping genes'.

'Sleeping beauty' transposon

The discovery of transposons revolutionised our understanding of genetics, in particular their role in enabling nature's wondrous diversity. Transposons influence the effects of genes by turning "on" or "off" their expression using a variety of epigenetic mechanisms. They are thus rightly called the tools of evolution, for their ability to rearrange the genome and introduce changes.

More than 45% of the human genome consists of transposable elements. Just as they create diversity, they also create mutations in genes and lead to diseases. However, most of the transposons have themselves inherited mutations and have become inactive, and thus can't move around within the gnome.

Over the years, researchers have attempted to resurrect inactive transposons from the genomes of the animal kingdom, hoping that the results will be useful in biomedical applications like genetic correction to cure a disease or for gene therapy.

For example, in 1997, researchers studied the genomes of fish and reconstructed a transposon called "sleeping beauty" at the molecular level. This transposon became dormant in vertebrates millions of years ago. The researchers elegantly reprogrammed the synthetic avatar to work in human cells. In future, a similar synthetic transposon inspired by nature may be able to turn off a problem gene or over-express another to accentuate some desirable characteristic.

Researchers have already discovered several naturally occurring vertebrate transposons and continue to look for more.

RNA-guided transposons

On June 26, *Nature* published a paper by researchers at the University of California, Berkeley, and the Arc Institute in the U.S. describing a new RNA-guided gene editing system. This tool builds on an older discovery: that one of the genes in the IS110 family of bacterial transposons contains the instructions for cells to make an RNA molecule with two loops.

Scientists found this RNA could bind to two pieces of DNA, rather than the usual one piece, and form a bridge between them. This is a very useful ability.

In the new study, the researchers used the bridge RNA to edit the DNA. The two loops of the RNA can independently bind to two separate pieces of DNA. One of the loops identifies the target site in the genome that needs to be altered. The other loop specifies the DNA to be inserted in its place. Each loop is independently programmable, which means researchers can mix and match any target and donor DNA sequences of interest.

> Barbara McClintock at the Carnegie Institution found that some genes were able to move around within the genome. These genes were called mobile elements or transposons

In their paper, they reported that in *Escherichia coli* bacteria, the bridge RNA had more than 60% insertion efficiency (i.e. ability to introduce a desired gene) and a 94% specificity (ability to target the intended location on the genome).

Boon for synthetic biology

In a separate paper published on the same day, researchers from the University of Tokyo described the structural and molecular mechanisms of genome modification guided by bridge RNA. The researchers used cryo-electron microscopy to study the IS110 transposons. They found that it works as a dimer – a complex compound formed by bonding two copies of a simpler compound. One copy binds to the target DNA and the other binds to the donor DNA, bridged by the bridge RNA.

This alternative form of genome-editing has many advantages. CRISPR-mediated editing sometimes leaves small bits of nucleotides added/deleted during the repair process. DNA recombination mediated by bridge RNA on the other hand makes a clean cut, making the edit specific and tidy. Equally importantly, the latter can facilitate the addition, deletion or inversion of DNA sequences of virtually any length. Researchers can exploit this feature by inserting any desirable genetic cargo – such as a functional copy of a faulty, disease-causing gene – into any location on a genome.

Such an ability spells a big boon for synthetic biology, where entire sets of genes need to be inserted or removed from organisms. Similarly, the technique can be used to manage, or even treat, a wide variety of genetic diseases: a functional copy of a gene can be replaced in a given genomic location. Researchers may also be able to treat chromosomal inversions or deletions, which are currently beyond the reach of any of the editing tools we have.

As Prof. McClintock said in her Nobel Prize lecture in 1983: "Unquestionably we will emerge from this revolutionary period with modified views of components of cells and how they operate, but only, however, to await the emergence of the next revolutionary phase that again will bring startling changes in concepts."

(Sridhar Sivasubbu and Vinod Scaria are senior consultants at the Vishwanath Cancer Care Foundation and adjunct professors at IIT, Kanpur and the Dr. D.Y. Patil Medical College, Hospital and Research Center, Pune.)

‘sleeping beauty’

- Transposons influence the effects of genes by turning ‘on’ or ‘off’ their expression.
- They have the ability to rearrange the genome and thus enable nature’s diversity Researchers have reconstructed a transposon called ‘sleeping beauty’ using the genomes of a fish.
- It had been dormant for millions of years.
- A similar synthetic transposon may, in the future, allow us to turn off a problem gene or over-express another

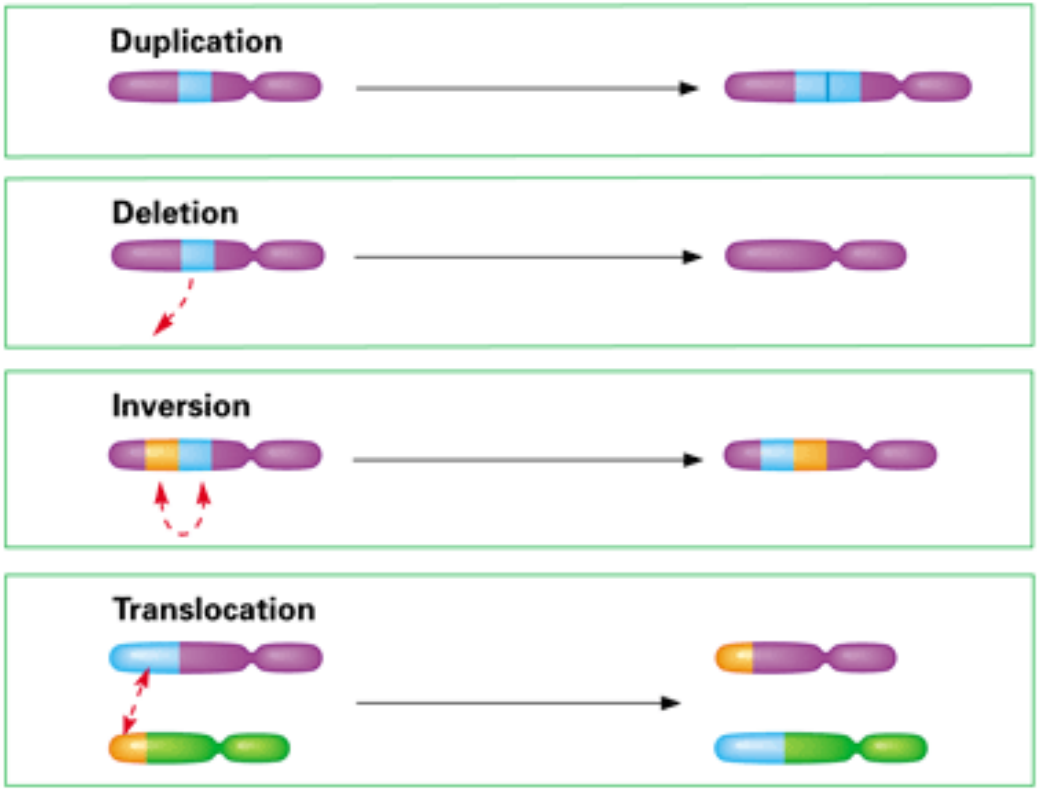
What are transposon ??

transposon, class of genetic elements that can “jump” to different locations within a genome.

Although these elements are frequently called “jumping genes,” they are always maintained in an integrated site in the genome. In addition, most transposons eventually become inactive and no longer move.

- A new RNA-guided gene editing system that uses bacterial transposons can treat a wide variety of genetic diseases: a functional copy of a gene can be replaced in a given genomic location.
- It may also be able to treat chromosomal inversions or deletions

Chromosome Aberration



RNA bridge

- Scientists found this RNA could bind to two pieces of DNA, rather than the usual one piece, and form a bridge between them.
- This is a very useful ability. In the new study, the researchers used the bridge RNA to edit the DNA.
- The two loops of the RNA can independently bind to two separate pieces of DNA.
- One of the loops identies the target site in the genome that needs to be altered.

- The other loop specifies the DNA to be inserted in its place.
- Each loop is independently programmable, which means researchers can mix and match any target and donor DNA sequences of interest.

WHAT IS IT?

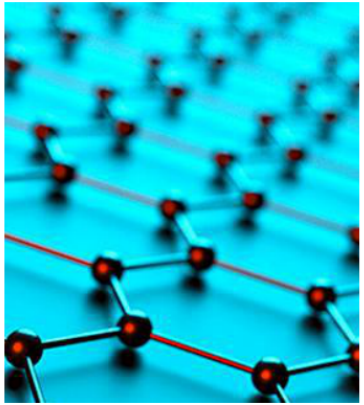
Graphene: a simple wonder

Karthik Vinod

When the same element is able to exist in different forms, the forms are called allotropes. Graphene, thus, is an allotrope of carbon, along with diamond and graphite. It consists of a single layer of carbon atoms that are linked to each other in a honeycomb pattern.
Graphene is among the most versatile materials known to humankind. As a nanomaterial, it is stronger than diamond, more conductive than silver, more elastic than rubber, and lighter than aluminium. Many people called it a "wonder material".

It is simple to make graphene: use scotch tape to peel away the lead of a pencil for a while. Under a microscope, you should be able to see graphene residue left on the tape.

However, scientists use more sophisticated techniques in laboratories, like chemical vapour deposition, to deposit graphene in order to make stronger car tires or when making chips to replace those made of silicon in smartphones. When graphene is mixed with concrete, the latter becomes 25% stronger and less carbon-intensive. Graphene also develops some unusual properties in a twisted bilayer form. In 2019, for example, physicists found that when one sheet of graphene is placed above another and rotated by 1.1 degrees relative to the bottom layer, the stack becomes a superconductor at low temperature.



Graphene is among the most versatile materials known to humankind. As a nanomaterial, it is stronger than diamond, more conductive than silver, more elastic than rubber, and lighter than aluminium. GETTY IMAGES/ISTOCKPHOTO

(Karthik Vinod is interning with The Hindu.*)*

For feedback and suggestions
for 'Science', please write to
science@thehindu.co.in
with the subject 'Daily page'

All about Graphene

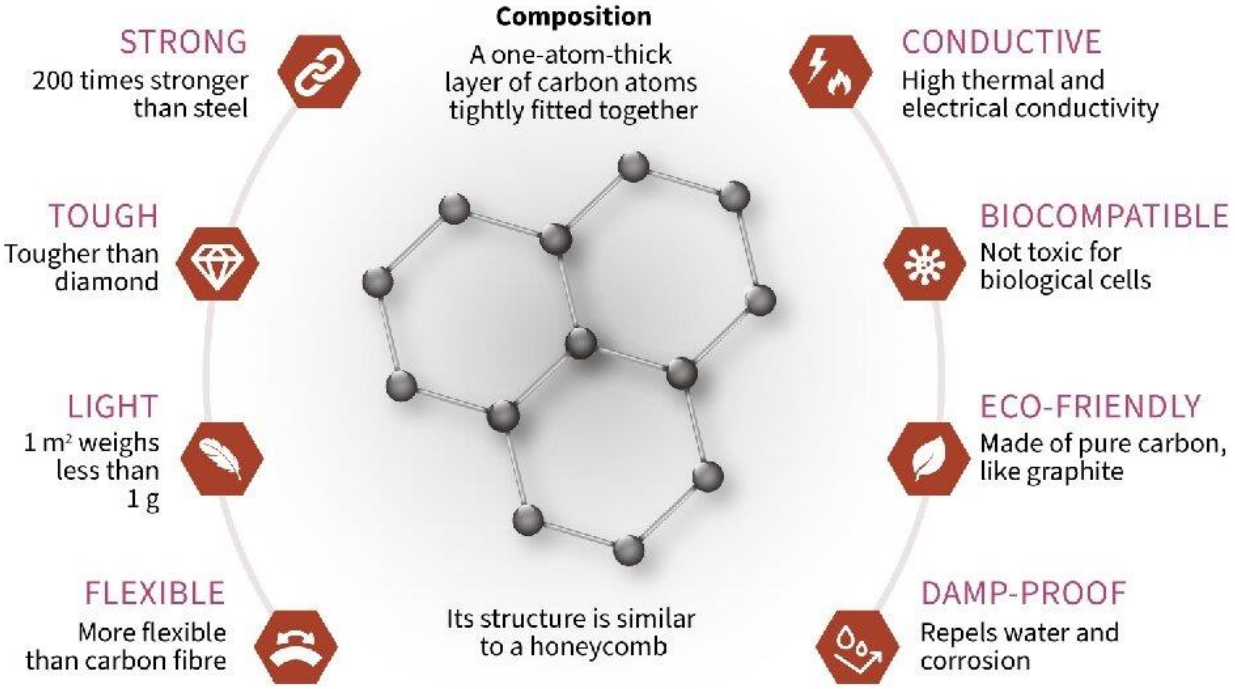
- When the same element is able to exist in different forms, the forms are called allotropes.
- Graphene, thus, is an allotrope of carbon, along with diamond and graphite. It consists of a single layer of carbon atoms that are linked to each other in a honeycomb pattern. Graphene is among the most versatile materials known to humankind.
- As a nanomaterial, it is stronger than diamond, more conductive than silver, more elastic than rubber, and lighter than aluminium.
- Many people called it a “wonder material”.
- It is simple to make graphene: use scotch tape to peel away the lead of a pencil for a while.

- Under a microscope, you should be able to see graphene residue left on the tape.
- However, scientists use more sophisticated techniques in laboratories, like chemical vapour deposition, to deposit graphene in order to make stronger car tires or when making chips to replace those made of silicon in smartphones.
- When graphene is mixed with concrete, the latter becomes 25% stronger and less carbon-intensive.

- **Graphene also develops some unusual properties in a twisted bilayer form.**
- **In 2019, for example, physicists found that when one sheet of graphene is placed above another and rotated by 1.1 degrees relative to the bottom layer, the stack becomes a superconductor at low temperature.**

Graphene, the material of the future

The so-called "God's material" is tipped to revolutionise electronics, the aerospace industry, energy and medicine



Fake news on graphene

- Is it a component of Covid-19 vaccines? NO
- Does it have natural magnetic properties? NO
- Does it become "active" with 5G technology? NO
- Does it affect neural functions? NO

Sources: graphenano.com, graphene flagship.eu

AFP

The problem of special packages

R. Mohan

a former Indian Revenue Service officer

Coalition politics is back at the Union level in a substantial way. The Bharatiya Janata Party is dependent on the Janata Dal (United) of Bihar and the Telugu Desam Party of Andhra Pradesh for its parliamentary majority. This is in contrast to 2014 and 2019, when *de facto* single-party governments came to office. With single-party majority becoming a thing of the past, demand for State-specific discretionary grants, or 'special packages', are back with a bang in public discussion.

The positive aspect of single-party dominance being tempered by the presence of coalition partners that can act as a check if unitary trends surge cannot be underestimated. Nevertheless, this is the time to test the hypothesis that when single-party dominance at the Union level fades, federal tendencies bloom and when a single-party majority under a strong leader at the Union level prevails, federal tendencies wilt.

If a healthy federal structure is to be nurtured, the fiscal boundaries, principles of assignment of taxes, and the basis for grants have to be transparent and objective. A federal setup can be asymmetric in a country that is characterised by linguistic, cultural, and economic diversity. But issues of asymmetry should be addressed by means of constitutional provisions that have both transparency and stability.

The Constitution has provisions that address the issues of specific States, or States that have a special status with regard to certain matters mentioned in the Constitution. These provisions are covered, for instance, in Articles 371A to H (Article 370 for the erstwhile State of Jammu and Kashmir, of course, is abrogated).

Purely discretionary

On the contrary, special packages are purely discretionary. They may be need-based, but the need is not the proximate reason for granting a special package, which is an additional grant under Article 282, which falls under 'Miscellaneous Financial Provisions'. More often than not, they are the result of the bargaining power of some State-level political parties that can tilt the scales of parliamentary majority. What does this augur for the health of our federal set-up?

That the outcome of an election can determine the fiscal distribution of national resources to a State or States goes against the grain of fiscal federalism (or, more correctly, of federal finance). Some States may be justified in their demands for funds, but allocation has to be through the mechanism of the Finance Commission. The Commission is constituted by the President every five years or earlier to make recommendations regarding the distribution of a share of taxes collected by the Union to the States, and how this is to be distributed among the States, as per Article 280; and disbursement of grants to States in need of assistance, as provided in Article 275. The 16th Finance Commission, which is already in existence, cannot be bypassed solely on account of partisan political exigencies.

When the same political party is in power at the Union and State levels, it is called a 'double-engine sarkar. The main engine has lost the power to run on its own and the owners of smaller engines that are needed to pull the train along are making their own demands. While individual States may well need special packages, process is of the utmost importance. How have these events impacted the political and fiscal relations between the Union and the States?

That the outcome of an election can determine the fiscal distribution of national resources to a State or States goes against the grain of fiscal federalism

Federal tendencies

The first issue here is the extent to which our polity is federal. The Constitution has been famously described as having a quasi-federal framework. C.H. Alexandrowicz, however, disputed this description in his work *Constitutional Developments in India* (1957), stating that in situations other than an Emergency, it assumes a federal character. The Supreme Court has made the succinct observation that our polity is amphibian – it can assume unitary and federal characters depending on whether or not there is an Emergency under Articles 352 and 356 in force (*State of Rajasthan and Others v Union of India*, 1977).

Be that as it may, it is often argued that the prevailing political environment crucially determines whether federal tendencies bloom or wilt. Keeping this proposition in mind, the hypothesis stated above can be put to test.

How fiscal distribution is done is cardinal in the test of whether or not federalism is strong. In the recent past, some States raised concerns about their share in the divisible pool of Union taxes facing a decline. Tax distribution is formula-based, and it is for the 16th Finance Commission to address this issue and undertake the delicate task of balancing the interests of the States *inter se*, and with those of the Centre.

The focus here is on grants, in the disbursement of which scope for discretion is wider. In our constitutional framework, the primary task of recommending grants to States in need of assistance is that of the Finance Commission, until Parliament makes legislation in this regard.

But the fact now is that the flow of discretionary grants to the States through Article 282 have far overtaken (by almost a factor of four) that of the grants recommended by the Finance Commissions. Acceding to demands for special packages which are raised by State-based parties, holding the key to parliamentary majority, will weaken the foundations of fiscal federalism, as it will result in diverting national resources away from other States, which too may have pressing needs. If this is allowed to happen, we will see the paradox of federal tendencies wilting instead of blooming when single-party dominance fades.

Federal structure and special package

- If a healthy federal structure is to be nurtured, the fiscal boundaries, principles of assignment of taxes, and the basis for grants have to be transparent and objective.
- A federal setup can be asymmetric in a country that is characterised by linguistic, cultural, and economic diversity.
- But issues of asymmetry should be addressed by means of constitutional provisions that have both transparency and stability.

- **The Constitution has provisions that address the issues of specific States, or States that have a special status with regard to certain matters mentioned in the Constitution.**
- **These provisions are covered, for instance, in Articles 371A to H (Article 370 for the erstwhile State of Jammu and Kashmir, of course, is abrogated).**

- , special packages are purely discretionary.
- They may be need-based, but the need is not the proximate reason for granting a special package, which is an additional grant under Article 282, which falls under ‘Miscellaneous Financial Provisions’.
- More often than not, they are the result of the bargaining power of some State-level political parties that can tilt the scales of parliamentary majority

- That the outcome of an election can determine the fiscal distribution of national resources to a State or States goes against the grain of fiscal federalism (or, more correctly, of federal finance).
- Some States may be justified in their demands for funds, but allocation has to be through the mechanism of the Finance Commission.

- The Commission is constituted by the President every five years or earlier to make recommendations regarding the distribution of a share of taxes collected by the Union to the States, and how this is to be distributed among the States, as per Article 280; and disbursement of grants to States in need of assistance, as provided in Article 275.
- The Supreme Court has made the succinct observation that our polity is amphibian — it can assume unitary and federal characters depending on whether or not there is an Emergency under Articles 352 and 356 in force (State of Rajasthan and

- How fiscal distribution is done is cardinal in the test of whether or not federalism is strong. In the recent past, some States raised concerns about their share in the divisible pool of Union taxes facing a decline.
- Tax distribution is formula-based, and it is for the 16th Finance Commission to address this issue and undertake the delicate task of balancing the interests of the States inter se, and with those of the Centre

- flow of discretionary grants to the States through Article 282 have far overtaken (by almost a factor of four) that of the grants recommended by the Finance Commissions.
- Acceding to demands for special packages which are raised by State-based parties, holding the key to parliamentary majority, will weaken the foundations of fiscal federalism, as it will result in diverting national resources away from other States, which too may have pressing needs

A law around low-carbon climate resilient development

Navroz K. Dubash
Senior Fellow at the Sustainable Futures Collaborative

Aditya Valiathan Pillai
Fellow at the Sustainable Futures Collaborative

Shibani Ghosh
Visiting Fellow at the Sustainable Futures Collaborative

In a landmark judgment, the Supreme Court of India recently recognised a right to be "free from the adverse impacts of climate change" in *M.K. Ranjitsinh and Others vs Union of India* – sourcing it from the right to life and the right to equality. In a previous article on this page in this daily, "Court on climate right and how India can enforce it" (July 1, 2024), we argued that while this is indeed an important step in establishing climate jurisprudence in India, it raises the very important question of just how this right will be protected.

Earlier, we had suggested that a patchwork of judicial interventions would fall short of the encompassing and systemic approach climate change requires. There is, therefore, a strong case for climate legislation, but only if it is tailored to the Indian context. Taking this issue forward provides an opportunity, but also a challenge, for the new government.

Law to inform development choices

Preparing India to reduce the risks of climate change and address its impacts requires nothing less than re-orienting development toward low-carbon and climate resilient futures. Any law that attempts to take this on must ensure these objectives are internalised in routine decision-making at all levels of development. Because climate change relentlessly targets the vulnerable, and because an energy transition must be just, it must be grounded in the imperative of advancing social justice.

While the concept of climate law is often associated with a top-down approach of setting and achieving targets, in a developing country, this approach is limited because addressing climate change is about more than limiting emissions.

Instead, it requires careful, ongoing, consideration of each developmental choice and its long-run synergies and tradeoffs with low-carbon and climate resilient futures. To achieve this, the substantive right of protection against adverse effects of climate change must be realised, in part, through well-defined procedures in law that are applicable across levels of government. Climate action is more credible when a well-designed institutional structure is strategising, prioritising, troubleshooting and evaluating policies behind the scenes.

Several countries (67 according to one estimate) have experimented with 'framework climate laws' that build governance capacity to address climate change. Umbrella laws that define government-wide goals and substantiate them with a set of processes and accountability measures are a known and increasingly popular way of bringing climate action to the heart of government.

However, these laws vary, and India's approach must be tailored to our context. Starting from a low base of per capita emissions – less than half the global average – India's emissions are still growing, and our objective should be to squeeze out as much development as possible from each ton of carbon and avoid locking-in to high carbon futures. Moreover, India is highly vulnerable to climate impacts, and climate resilience must be an essential element of the new law. In meeting both objectives, considerations of social equity must be central. Consequently, India's law must ensure development, but in a low-carbon direction while building resilience to ever more pervasive climate impacts.

What we arrive at, then, is a law that helps navigate developmental choices. It must create the basis for thoughtful decision-making toward achieving a low-carbon, resilient society. For example, since Indian cities are still growing and changing rapidly, what could low-carbon, climate resilient cities of the future look like? And what levers exist to shape those cities? How can city planning minimise the risk of floods and vulnerability to heatwaves? How should transport needs be met through technology shifts such as electric vehicle adoption and greater attention to public transport and lifestyle shifts?

Have a low carbon development body

A framework climate law should lay out an institutional structure capable of crafting viable answers to these questions. Our ongoing work at the Sustainable Futures Collaborative provides some suggestions. An immediate priority is to create a knowledge body in government capable of rigorously parsing policy options and the futures they might generate. We recommend an independent 'low-carbon development commission', staffed with experts and technical staff, which could offer both national and State governments practical ways of achieving low-carbon growth and resilience.

This body could also serve as a platform for deliberative decision-making. Vulnerable communities and those that may lose from technological change need to be systematically consulted. Hearing their concerns and incorporating some of their ideas could lead to longer-lasting policy outcomes. An example is South Africa's Presidential Climate Commission, which is tasked with charting a course toward just transition based on inputs and representations from stakeholders.

Effective climate governance also requires the ability to set directions, make strategic choices, and encourage the consideration of low carbon choices and climate change impacts within line ministries. Accordingly, the law could create a high-level strategic body, which we label a 'climate cabinet', a core group of Ministers plus representation from Chief Ministers of States, tasked with driving strategy through government. Across the world, climate policy is often defeated by siloed decision-making. This is one way of fixing it.

A whole-of-government approach will also require dedicated coordination mechanisms for implementation. The Ministry of Environment, Forest and Climate Change should continue to play a central role, but it needs to be complemented by higher-level coordination. Here, the pre-existing Executive Committee on Climate Change (made up of senior bureaucrats from multiple Ministries), provides a useful template but only if it is reinvigorated with clearly specified legal powers and duties.

Engagement with the federal structure

Not least, the law must pay attention to India's federal structure. Many areas crucial to reducing emissions and improving resilience – electricity, agriculture, water, health and soil – are wholly or partially the preserve of State and local governments. When a climate impact is felt, it is felt first, and most viscerally, at local levels.

Any institutional structure or regulatory instrument created to protect the Court's newly established climate right must meaningfully engage with subnational governments. First, the law must establish a channel for subnational governments to access national scientific capacity, potentially through the low-carbon development commission as an intermediary, as a step toward solving the pervasive problem of insufficient local climate scientific capacity.

Second, it could articulate ways of financing local action, for example by requiring centrally-sponsored schemes to be more aligned with climate goals or by requiring national departments to climate tag expenditure towards local climate resilience.

Third, the law could establish coordination mechanisms that allow the Centre and States to consult on major climate decisions. It could also require the Centre and States to put out periodically updated medium-term climate plans built around unified goals. To enable development of State-specific solutions, States could also build complementary institutions to those at the Centre, providing knowledge, strategy-setting, deliberation and coordination functions.

The framework law proposed here – one that enables and catalyses action across national Ministries and the federal structure – cannot be the only legal tool in the country's regulatory arsenal. Complementary sectoral laws and amendments may be required, but they would be informed by the approach laid out by the framework law.

The Court's historical pronouncement in *M.K. Ranjitsinh* opens the door to legal and governance changes that make possible an actionable right against the adverse effects of climate change. But to realise this promise, this open door has to actually be used to pass a climate law that is well suited to the Indian context, that steers Indian development choices toward a low-carbon and climate resilient future, and that also advances justice.

The 'M.K. Ranjitsinh' judgment must be used to pass a climate law that is well suited to the Indian context

M.K. Ranjitsinh and Others vs Union of India

- I n a landmark judgment, the Supreme Court of India recently recognised a right to be “free from the adverse impacts of climate change” in M.K. Ranjitsinh and Others vs Union of India — sourcing it from the right to life and the right to equality.
- In a previous article on this page in this daily, “Court on climate right and how India can enforce it” (July 1, 2024), we argued that while this is indeed an important step in establishing climate jurisprudence in India, it raises the very important question of just how this right will be protected.

- **The Court’s historical pronouncement in M.K. Ranjitsinh opens the door to legal and governance changes that make possible an actionable right against the adverse effects of climate change.**
- **But to realise this promise, this open door has to actually be used to pass a climate law that is well suited to the Indian context, that steers Indian development choices toward a low-carbon and climate resilient future, and that also advances justice.**

The ANRF plan has got off on the wrong foot

In 2023, both Houses of Parliament passed the Anusandhan National Research Foundation (ANRF) Bill, marking a historic start to an initiative to seed, grow, and facilitate research in India, especially in India's universities and colleges.

The 2019 National Research Foundation (NRF) project report explicitly mentioned that "growing outstanding research cells already existing at State Universities" is one of the ANRF's top priority. The scientific community welcomed the Bill and was hoping that the ANRF would provide much-needed breathing space for Indian academia for research free from the bureaucracy, in addition to providing a funding boost and a chance to work together with industry partners.

Lack of industry representation

Nearly a year later and the ANRF has got off on the wrong foot. Recently, it announced a 15-member Governing Board and a 16-member Executive Council, which lack representation from organisations the ANRF envisioned aiding and facilitating.

For example, the ANRF aims to strengthen the research infrastructure of universities. Even acknowledging that more than 95% of students attend State universities and colleges in India, the board and the executive council do not have any members from Central or State universities or colleges. In addition to the Principal Scientific Adviser, they are represented by people who are usually in any high-powered committees of the Government of India – Secretaries from all science departments (Department of Science and Technology (DST), Department of Biotechnology (DBT), Department of Scientific and Industrial Research (DSIR), earth sciences, agriculture, health research, atomic energy, new and renewable energy, electronics and information technology), higher education and defence research and development, directors of the Indian Institute of Science and Tata Institute of Fundamental Research, the Chair of the Indian Council of Historical Research, a Princeton mathematics professor, a science administrator and former Director of the United States National Science Foundation from Brown University and a Silicon Valley serial entrepreneur.

Binay Panda

Professor at the Jawaharlal Nehru University

The composition of the Anusandhan National Research Foundation's governing board and executive council shows that it could become just another government department

However, the board and the council need representatives who understand the bottlenecks in the current system, especially in the university system, and know how to get things done on the ground rather than being in an advisory role.

Most importantly, the ANRF needs to avoid the confusion that can arise from multiple committees. Therefore, creating a single committee to formulate and implement strategies on the ground is crucial. This emphasis on ground-level knowledge and experience among the committee members should reassure the research community and stakeholders that the ANRF's decision-making process will be informed, competent, and timely.

The lack of adequate industry representation and diversity is one of the most glaring omissions from the current board and council, especially when the ANRF plans to raise more than 70% of its funding from non-government sources and industry. The sole industry representative, Romesh T. Wadhwani, is an Indian-American businessman based in Silicon Valley, U.S., and the sole woman representative is the Secretary of the DSIR. There is no representation from Indian industry or any entrepreneurs from the country or eminent academics from the Central and State universities on the committee.

R&D underfunding

India underfunds research and development. In addition to increasing the research and development budget to 4% of GDP, a significant overhaul of the current funding system is required to boost research and to make innovation coming out of Indian organisations globally competitive. To achieve this, the ANRF must: be adequately staffed; implement a robust grant management system; have an internal standard peer-review system with an incentive for reviewers; ensure timely disbursal of research grants and student fellowships with a quick turn-around time (less than six months) between application and fund disbursal; have a system free from bureaucratic hurdles both at the funding body and at grantee institutions; provide flexibility of spending money without following the government's stringent general financial rules (GFR), and permit purchases without going through the Government e-marketplace (GeM) portal.

The ANRF must function unlike any other current government science department, It should have more diverse representations of practising natural and social scientists from the university system, with more women and young entrepreneurs in its committee. Additionally, the future chief executive officer of the ANRF must have a background in both industry and academia, and be someone who can raise money for the ANRF and understand the global innovation ecosystem. A complete overhaul is required for the ANRF to avoid becoming like any other government department and to bridge research and teaching in our universities.

Anusandhan National Research Foundation (ANRF) Bill

- In 2023, both Houses of Parliament passed the Anusandhan National Research Foundation (ANRF) Bill, marking a historic start to an initiative to seed, grow, and facilitate research in India, especially in India's universities and colleges.
- The 2019 National Research Foundation (NRF) project report explicitly mentioned that "growing outstanding research cells already existing at State Universities" is one of the ANRF's top priority.

- **The Anusandhan National Research Foundation Bill, 2023 was introduced in Sabha on August 4, 2023.**
- **It repeals the Science and Engineering Research Board Act, 2008 and dissolves the Science and Engineering Research Board set up under it.**
- **The Bill provides for establishing the Anusandhan National Research Foundation (NRF).**
- **Functions of NRF: NRF will be the apex body in the country to provide strategic direction for research, innovation, and entrepreneurship in the fields of: (i) natural sciences including mathematics, (ii) engineering and technology, (iii) environmental and earth sciences, (iv) health and agriculture, and (v) scientific and technological interfaces of humanities and social sciences.**

- **Key functions of NRF include: (i) preparing short-term, medium-term, and long-term roadmaps and formulating programs for research and development (R&D), (ii) facilitating and financing the growth of R&D and related infrastructure in universities, colleges, and research institutions, (iii) providing grants for research proposals, (iv) supporting translation of research into capital intensive technology, (v) encouraging international collaboration, (vi) encouraging investments in the Foundation by private and public sector entities, and (vii) undertaking annual survey of scientific research, outcomes, and spending.**

- **Funds for NRF: The Foundation will be financed through: (i) grants and loans from the central government, (ii) donations to the fund, (iii) income from investments of the amounts received by the Foundation, and (iv) all amounts with the Fund for Science and Engineering Research set up under the 2008 Act.**
- **Governing Board: NRF will have a Governing Board headed by the Prime Minister of India. The Board will provide strategic direction to the Foundation and monitor the implementation. Other members of the Board are: (i) the Union Ministers of Science and Technology, Education as Vice Presidents, (ii) the Principal Scientific Advisor as Member Secretary, and (iii) Secretaries to the Departments of Science and Technology, Biotechnology, and Scientific and Industrial Research.**

- **Executive Council: The Foundation will have an Executive Council to undertake implementation.**
- **The functions of the Executive Council include: (i) considering applications for the grant of financial assistance, (ii) prescribing regulations regarding applications for financial assistance, requirements for extension of assistance, and grounds for revocation of assistance, and (iii) preparing budget of the Foundation and maintaining its accounts.**
- **The Council will have the power to authorise an officer to visit the applicants for grants and verify the accuracy of submissions made by them.**
- **The Principal Scientific Advisor will be the chairperson of the Council.**

On expunction powers in Parliament

Why did the Opposition engage in a war of words with the government over expunging certain remarks? What is the process to expunge remarks in Parliament? Can a member of the Lok Sabha direct a remark against a Minister? What do the various rules state?

EXPLAINER

Sumeda

The story so far:

The first special session of the 18th Lok Sabha witnessed heated discussions, with the Opposition clashing with the government over a range of issues, ultimately concluding with a war of words over the expunction of the remarks of the leaders of Opposition in both Houses. Rajya Sabha Chairman Jagdeep Dhankhar removed portions of Leader of Opposition (LoP) Mallikarjun Kharge's speech, which was critical of Prime Minister Narendra Modi and the Rashtriya Swayamsevak Sangh. Meanwhile, in the Lower House, parts of Rahul Gandhi's remarks on the PM and the BJP were expunged from the records on the orders of Speaker Om Birla, sparking allegations of different yardsticks being applied for different MPs.

War of words: Leader Of Opposition in Rajya Sabha Mallikarjun Kharge speaks in the House. ANI

When are remarks expunged?

Parliament maintains a verbatim record of everything that is spoken and takes place during proceedings. While Article 105 of the Constitution confers certain privileges and freedom of speech in Parliament on MPs, it is subject to other provisions of the Constitution and the rules of the House. On the orders of the presiding officer, that is, the Chairman in the Upper House and the Speaker in the Lower House, words, phrases and expressions which are deemed "defamatory, indecent, unparliamentary or undignified" are deleted or expunged from records. For this purpose, the Lok Sabha Secretariat maintains a comprehensive list of 'unparliamentary' words and expressions.

The rules of parliamentary etiquette, which are laid out to ensure discipline and decorum in the Rajya Sabha, say, "When the Chair holds that a particular word or expression is unparliamentary, it should be immediately withdrawn without any attempt to raise any debate over it. Words or expressions held to be unparliamentary and ordered to be expunged by the Chair are omitted from the printed debates."

There have been recorded instances where the scope of expunction has been broadened. Speakers, at their discretion, have ordered the expunction of words deemed prejudicial to national interest or detrimental to maintaining friendly relations with a foreign State, derogatory to dignitaries, likely to offend national sentiments or affect the religious susceptibilities of a section of community, likely to discredit the Army, not in good taste or otherwise objectionable or likely to bring the House into ridicule or lower the dignity of the Chair, the House or the members, authors M. N. Kaul and S. L. Shakdher note in their book *Practice and Procedure of Parliament*. For instance, Prime Minister Jawaharlal Nehru once objected when a member referred to the President of Pakistan while asking a supplementary question about the international situation. Mr. Nehru said it would "not be proper" for the Head of a foreign state to be mentioned in the language the member had used. The objectionable words were then expunged.

Members must withdraw objectionable remarks deemed irrelevant to the debate upon the Chair's request and failure to comply may lead to expunction. Similarly, quoting from an unreferenced document or speaking after being asked to desist can result in an expunction.

What about remarks against an MP?

If an MP makes an allegation against their colleague or an outsider, Rule 353 of the Lok Sabha outlines the procedural framework to be followed. "The Rule does not prohibit the making of any allegation. The only requirement is advance notice, on receipt of which the Minister concerned will conduct an inquiry into the allegation and come up with the facts when the MP makes the allegation in the House," former Lok Sabha Secretary General P.D.T. Achary says. If the allegation is neither defamatory nor incriminatory, the above rule would not apply, he adds.

"The rule does not obviously apply to an allegation against a Minister in the government. Since the Council of Ministers is accountable to Parliament, the Members of the House have the right to question Ministers and make imputations against their conduct as Ministers," Mr. Achary adds.

How do officers expunge remarks?

The Chairman and Speaker are vested with the power to order the expunction of remarks under Rule 261, and Rule 380 and 381 of the Rules of Procedure of the Rajya Sabha and Lok Sabha, respectively.

Rule 261 states, "If the Chairman is of opinion that a word or words have or have been used in debate which is or are defamatory or indecent or unparliamentary or undignified, he may in his discretion, order that such word or words be expunged from the proceedings of the Council." The Lower House has a similar provision.

The expunged portions are marked by asterisks with an explanatory footnote stating 'expunged as ordered by the Chair.' If the Chair directs that nothing will go on record during a member's speech or interruption, footnote 'not recorded' is inserted. A comprehensive list of words and phrases is circulated to media outlets at the end of the day's proceedings. Once expunged, these words or phrases cease to exist on the official record. However, the relevance of the practice of expunging remarks has lately come into question, in a digital age where expunged content remains accessible due to the live telecast of proceedings and wider circulation of screenshots and videos on social media.

THE GIST

- Rajya Sabha Chairman Jagdeep Dhankhar removed portions of Mallikarjun Kharge's speech, which was critical of Prime Minister Narendra Modi and the RSS. Meanwhile, in the Lower House, parts of Rahul Gandhi's remarks on the PM and the BJP were expunged from the records on the orders of Speaker Om Birla.
- The Chairman and Speaker are vested with the power to order the expunction of remarks under Rule 261, and Rule 380 and 381 of the Rules of Procedure of the Rajya Sabha and Lok Sabha, respectively.
- However, the relevance of the practice of expunging remarks has lately come into question, in a digital age where expunged content remains accessible due to the live telecast of proceedings and wider circulation of screenshots and videos on social media.

When are remarks expunged?

- Parliament maintains a verbatim record of everything that is spoken and takes place during proceedings.
- While Article 105 of the Constitution confers certain privileges and freedom of speech in Parliament on MPs, it is subject to other provisions of the Constitution and the rules of the House.
- On the orders of the presiding officer, that is, the Chairman in the Upper House and the Speaker in the Lower House, words, phrases and expressions which are deemed “defamatory, indecent, unparliamentary or undignified” are deleted or expunged from records.

- For this purpose, the Lok Sabha Secretariat maintains a comprehensive list of ‘unparliamentary’ words and expressions.
- The rules of parliamentary etiquette, which are laid out to ensure discipline and decorum in the Rajya Sabha, say, “When the Chair holds that a particular word or expression is unparliamentary, it should be immediately withdrawn without any attempt to raise any debate over it.
- Words or expressions held to be unparliamentary and ordered to be expunged by the Chair are omitted from the printed debates.”

- **There have been recorded instances where the scope of expunction has been broadened.**
- **Speakers, at their discretion, have ordered the expunction of words deemed prejudicial to national interest or detrimental to maintaining friendly relations with a foreign State, derogatory to dignitaries, likely to offend national sentiments or affect the religious susceptibilities of a section of community, likely to discredit the Army, not in good taste or otherwise objectionable or likely to bring the House into ridicule or lower the dignity of the Chair, the House or the members, authors M. N. Kaul and S. L. Shakdher note in their book Practice and Procedure of Parliament**

What about remarks against an MP?

- If an MP makes an allegation against their colleague or an outsider, Rule 353 of the Lok Sabha outlines the procedural framework to be followed. “The Rule does not prohibit the making of any allegation.
- The only requirement is advance notice, on receipt of which the Minister concerned will conduct an inquiry into the allegation and come up with the facts when the MP makes the allegation in the House,

- **“The rule does not obviously apply to an allegation against a Minister in the government. Since the Council of Ministers is accountable to Parliament, the Members of the House have the right to question Ministers and make imputations against their conduct as Ministers.**

How do officers expunge remarks?

- The Chairman and Speaker are vested with the power to order the expunction of remarks under Rule 261, and Rule 380 and 381 of the Rules of Procedure of the Rajya Sabha and Lok Sabha, respectively.
- Rule 261 states, “If the Chairman is of opinion that a word or words have or have been used in debate which is or are defamatory or indecent or unparliamentary or undignified, he may in his discretion, order that such word or words be expunged from the proceedings of the Council.”
- The Lower House has a similar provision.

- **The expunged portions are marked by asterisks with an explanatory footnote stating ‘expunged as ordered by the Chair.’**
- **If the Chair directs that nothing will go on record during a member’s speech or interruption, footnote ‘not recorded’ is inserted.**
- **A comprehensive list of words and phrases is circulated to media outlets at the end of the day’s proceedings. Once expunged, these words or phrases cease to exist on the official record.**
- **However, the relevance of the practice of expunging remarks has lately come into question, in a digital age where expunged content remains accessible due to the live telecast of proceedings and wider circulation of screenshots and videos on social media.**

Vadhavan, a global port in the making

Global ambitions: JNPA and MMB will develop the port at an estimated cost of ₹76,220 crore. JNPA WEBSITE

Rajesh Menon

Container ships today handle almost 16% of the world's maritime trade — from 37 million 20-foot equivalent units (TEUs) in 1980, the volume of containerised trade surged to 850 million TEUs by 2023. Gearing up to handle the massive quantities of containers, ports around the world have bulked up infrastructure and transformed into mega ports. In 2021-22, Shanghai port led by handling 44 million TEUs, followed by Singapore with 37 million TEUs.

Clearly, Chinese ports have the edge, cumulatively handling 250 million TEUs, against which India's 20 million TEUs pales in comparison. While India's share of containerised trade is increasing alongside global growth, it continues to grapple with shortfalls in productivity, turnaround of ships, utilisation of berths and technology enablement.

Private investors

India's 7,517-km coastline extends across nine States and four Union territories.

In recent years, the government has initiated policy measures to attract private investments in the ports sector, including allowing 100 % foreign direct investment (FDI). Currently, the country has 76 functional ports — 12 major and 64 non-major — and nine more under development. The total cargo handling capacity countrywide is about 2,700 million tonne per annum (MTPA) with 60-65% on an average.

The growing Indian economy and trade, wherein 95% of export-import cargo volume is shipped, necessitates an expanded port capacity. Further, as ship sizes continue to increase, we need ports that can accommodate them. Our ports with high-volume cargo handling capacity have an average of 8-12 m draft. Bigger vessels require at least 12-20 m draft. This will also enable big mother vessels to call at our ports, helping reduce logistic costs and avert the need for transshipment.

New development

In this context, the approval for the setting up of an all-weather, deepwater mega port at Vadhavan, near Dahanu, in Palghar district of Maharashtra, assumes importance. A special purpose vehicle (SPV) created by Jawaharlal Nehru Port Authority (JNPA) and Maharashtra Maritime Board (MMB) with a shareholding of 74% and 26%, respectively, will develop the port at an estimated cost of ₹76,220 crore.

The port will have nine container terminals, each 1,000 m long; four multipurpose berths, including a coastal berth, four liquid cargo berths, a berth for roll-on, roll-off or Ro-Ro ships, and a Coast Guard berth. The 20-m draft, capable of berthing large vessels, will be created through reclamation of 1,448 hectare from the sea. The plan is to create a cumulative cargo handling capacity of 298 MTPA, including around 23.2 million TEUs of container-handling capacity.

The port will cater to hinterland industrial areas in Maharashtra, south and north Gujarat, Rajasthan, National Capital Region, Madhya Pradesh, Chhattisgarh, and other central and north Indian States.

(The writer is a maritime expert)

Vadhavan port project

- The Indian government recently approved a significant project that could prove pivotal for the country's commerce and economy. Named the 'Vadhavan Port Project,' it is estimated to cost approximately Rs 76,220 crores.
- Located in Palghar district, Maharashtra, Vadhavan Port will be a modern, all-weather deep-water port. The total project cost, including land acquisition, is Rs 76,220 crores.
- The Vadhavan Port Project proposes to develop a greenfield deep-draft port in Maharashtra's Vadhavan.
- The objective is to construct a state-of-the-art container port that will elevate India's maritime trade to new heights.

Why is this Port Project Important?

- The significance of this project lies in its potential to redefine India's maritime trade. Designed to accommodate large container ships, Vadhavan Port aims to handle a cumulative capacity of 298 million metric tons (MMT) of cargo annually, including approximately 23.2 million Twenty-Foot Equivalent Units (TEUs) of containers. This will position it among Asia's largest ports.
- It will be an integral part of the India-Middle East-Europe Corridor (IMEC), empowering India to compete in global trade and bolstering the country's economic development.

How to manage 'brain-eating amoeba' cases

What are the symptoms of the rare and fatal disease of primary amoebic meningoencephalitis?

A.S. Jayanth

The story so far:

There have been four cases, including three deaths, of the rare, but fatal primary amoebic meningoencephalitis (PAM) in Kerala in the last two months. A 14-year-old boy from Thikkodi in Kozhikode district tested positive for the infection on July 5. He is undergoing medical treatment now and his condition is reported to be stable.

Where have the fatalities occurred?

There have been three deaths so far – E.P. Mridul, 12, from Feroke in Kozhikode district, died at a private hospital in Kozhikode city on July 3. V. Fadshina, 13, of Kannur, succumbed to it at a private hospital in the city on June 12. Fadva, 5, of Munniyur in Malappuram, died at the Government Medical College Hospital, Kozhikode, on May 20.

What is PAM?

Primary amoebic meningoencephalitis or PAM is caused by Naegleria fowleri, an amoeba that thrives in warm freshwater lakes, ponds and rivers. It can also survive in poorly maintained swimming pools in rare cases. As it can infect the brain and destroy the tissues there, this one-celled organism is also called 'brain-eating amoeba'. These infections, though rare, are fatal and 97% of the patients don't survive. The infection happens when people go for a swim in lakes, ponds or rivers, during the summer. Experts say that it could occur if the atmospheric temperature is high and water levels are low. The amoeba enters the body through the nose and reaches the brain. It destroys brain tissues and causes their swelling. In recent cases, children have been found to be more vulnerable to it. The infection does not spread from people to people. Swallowing water containing the amoeba does not lead to it either.

Primary amoebic meningoencephalitis is caused by Naegleria fowleri, an amoeba that thrives in freshwater lakes, ponds and rivers

What are the symptoms of PAM?

According to the Centers for Disease Control and Prevention (CDC) in the U.S., headache, fever, nausea, and vomiting are its early symptoms. The disease, however, can progress rapidly. Stiff neck, confusion, lack of attention to people and surroundings, loss of balance, and hallucinations are the later symptoms. It usually leads to coma and death after five days, says the CDC. Most people die within one to 18 days.

Experts point out that warming of the atmosphere and stagnant and unhygienic water resources could be some of the conditions leading to the infection. This type of amoeba is found to be more active in warm water.

How is it diagnosed and treated?

The infection can be diagnosed through PCR tests of the cerebrospinal fluid. However, as PAM is a rare condition, detection can sometimes be hard. In Kozhikode, doctors at the Government Medical College Hospital suspected its possibility in the five-year-old girl from Malappuram after she exhibited symptoms similar to that of bacterial meningitis, whose instances have come down in recent times, mainly due to vaccination. There are no standard treatment methods available and the doctors are following the guidelines of the CDC for now. According to sources, the State Health department has procured miltefosine, a broad-spectrum anti-microbial drug, from Germany for the treatment of infected persons. Paediatricians say that Azithromycin and Amphotericin B, some of the other medicines suggested, are available.

Has it been reported in Kerala before?

First detected in the Alappuzha municipality in 2016, it was reported in Malappuram in 2019 and 2020, Kozhikode in 2020, Thrissur in 2022, and again in Alappuzha in 2023. Health Minister Veena George convened a meeting on July 1 to take stock of the situation and it was decided to formulate special guidelines for the treatment.

Health officials have said that there is a chance of the amoeba entering the brain through the holes in a layer that separates the nose and the brain or through possible holes in the ear drum. So, children having infections in their ear have been advised against taking baths in ponds or in stagnated water resources. Diving too should be avoided. Those running water theme parks and swimming pools have been asked to chlorinate the water there at regular intervals. Kerala Chief Minister Pinarayi Vijayan convened another meeting on July 5 and issued directions to keep water resources clean. Children have been asked to use swimming nose clips to prevent the infection.

What can be done to reduce the risk?

Holding the nose or wearing a nose clip while jumping or diving into fresh water are some of the steps suggested to avoid the infection. The head should be kept high while entering warm water. Steer clear from digging in shallow waters, say experts. Distilled or boiled water should be used for clearing nasal passages.

What is PAM ??

- **Primary amoebic meningoencephalitis or PAM is caused by Naegleria fowleri, an amoeba that thrives in warm freshwater lakes, ponds and rivers.**
- **It can also survive in poorly maintained swimming pools in rare cases.**
- **As it can infect the brain and destroy the tissues there, this one-celled organism is also called ‘brain-eating amoeba’.**
- **These infections, though rare, are fatal and 97% of the patients don’t survive.**

- The infection happens when people go for a swim in lakes, ponds or rivers, during the summer.
- Experts say that it could occur if the atmospheric temperature is high and water levels are low.
- The amoeba enters the body through the nose and reaches the brain. It destroys brain tissues and causes their swelling. In recent cases, children have been found to be more vulnerable to it.
- The infection does not spread from people to people. Swallowing water containing the amoeba does not lead to it either

Extinct humans occupied the Tibetan plateau 1,60,000 years ago

The Hindu Bureau

Bone remains found in a Tibetan cave 3,280 metres above sea level indicate an ancient group of humans survived here for many millennia, according to a new study published in the journal *Nature*.

The Denisovans are an extinct species of ancient human that lived at the same time and in the same places as Neanderthals and Homo sapiens. Only a handful of Denisovan remains have ever been discovered by archaeologists. Little is known about the group, including when they became extinct, but evidence exists to suggest they interbred with both Neanderthals and Homo sapiens.

The scientists identified one rib bone as belonging to a new Denisovan individual.

The layer where the rib was found was dated to between 48,000 and 32,000 years ago, implying that this Denisovan individual lived at a time when modern humans were dispersing across the Eurasian continent. The results indicate that Denisovans lived through two cold periods, but also during a warmer interglacial period between the Middle and Late Pleistocene eras.

The research team studied more than 2,500 bones from the Baishiya Karst Cave on the high-altitude Tibetan Plateau, one of the only two places where Denisovans are known to have lived.

Their new analysis has identified a new Denisovan fossil and shed light on the species' ability to survive in fluctuating climatic conditions – including the ice age – on the Tibetan plateau from around 200,000 to 40,000 years ago.

Bone remains from Baishya Karst Cave were broken into numerous fragments preventing identification. The team used a novel scientific method that exploits differences in bone collagen between animals to determine which species the bone remains came from.

The research team determined that most of the bones were from blue sheep, known as the bharal, as well as wild yaks, equids, the extinct woolly rhino, and the spotted hyena. The researchers also identified bone fragments from small mammals, such as marmots, and birds.

The team was able to identify that Denisovans hunted, butchered and ate a range of animal species.

Detailed analysis of the fragmented bone surfaces shows the Denisovans removed meat and bone marrow from the bones, but also indicate the humans used them as raw material to produce tools.

Denisovans

- The Denisovans are an extinct species of ancient human that lived at the same time and in the same places as Neanderthals and Homo sapiens.
- Only a handful of Denisovan remains have ever been discovered by archaeologists.
- Little is known about the group, including when they became extinct, but evidence exists to suggest they interbred with both Neanderthals and Homo sapiens.
- The scientists identified one rib bone as belonging to a new Denisovan individual

- **Their new analysis has identified a new Denisovan fossil and shed light on the species' ability to survive in fluctuating climatic conditions — including the ice age — on the Tibetan plateau from around 200,000 to 40,000 years ago**

- **Baishiya Karst Cave is a high-altitude paleoanthropological site and a Tibetan Buddhist sanctuary located on the northeastern edge of the Tibetan Plateau in Xiahe County, Gansu, China.**
- **This karst cave is the site of the discovery of the earliest hominin fossil found on the Tibetan Plateau, the Xiahe mandible**

Topics

- “nitrogen vacancy” centre.
- Nociceptor cells
- World oldest cave painting
- Vaccine development
- rDNA Vaccine
- Bharatiya Nagarik Suraksha Sanhita (BNSS)
- The Delhi Preservation of Trees Act (DPTA), 1994
- What is regenerative braking?
- The Reciprocal Access Agreement
- Dongting Lake
- Mains

By saurabh Pandey

THE HINDU

Hurdles in importing diamonds pose a quantum block to research ambition

Jacob Koshy
NEW DELHI

The Customs Department's decision on who can and cannot import diamonds is taking some of the lustre off the National Quantum Mission (NQM), a ₹6,000-crore initiative, which may help India take the lead in the emerging field of quantum technologies.

Quantum technology is a broad term applicable to multiple avenues of research. It hinges on being able to exploit the "quantum-mechanical" properties of matter inside the atom and develop entirely new kinds of computers, sensors and encryption systems that, proponents say, will make our existing devices primitive in comparison.

However, this also means that much knowledge on harnessing quantum technology is still being unearthed and requires trained scientists conducting intricate experiments on many things, including diamonds.

Unlike gemoloigists, quantum researchers focus on the 'defects' of the diamonds.

While gemologists may be concerned with the cut, clarity, colour and carats of diamonds, quantum researchers are interested in their "defects". It is the unique arrangement of carbon atoms in a diamond which gives it the properties of hardness, electrical conductivity and manipulation of light. However, the atomic structure of some diamonds sometimes have two missing carbon atoms. They are substituted by a nitrogen atom as well as a "hole" or what is called a "nitrogen-vacancy" centre.

These "centres' are sensitive to the slightest variations in magnetic fields and thereby open vistas of investigation. An electron at such a centre can be individually tweaked and made to behave like a qubit. Qubits – analogous to the bits and bytes of classical computers – are the logic states of quantum computers and in theory allow calculations, beyond the capacity of existing supercomputers, to be done in a trice.

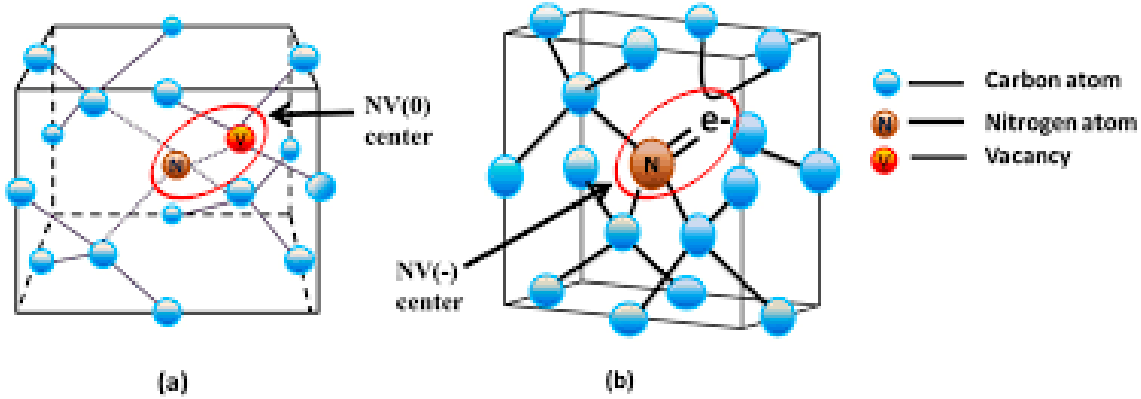
Researchers can also use lasers at room temperatures to manipulate these centres. However, unlike the diamonds in jewellery shops, scientists prefer their diamonds grown in a lab, customised with the 'defects' of their choice.

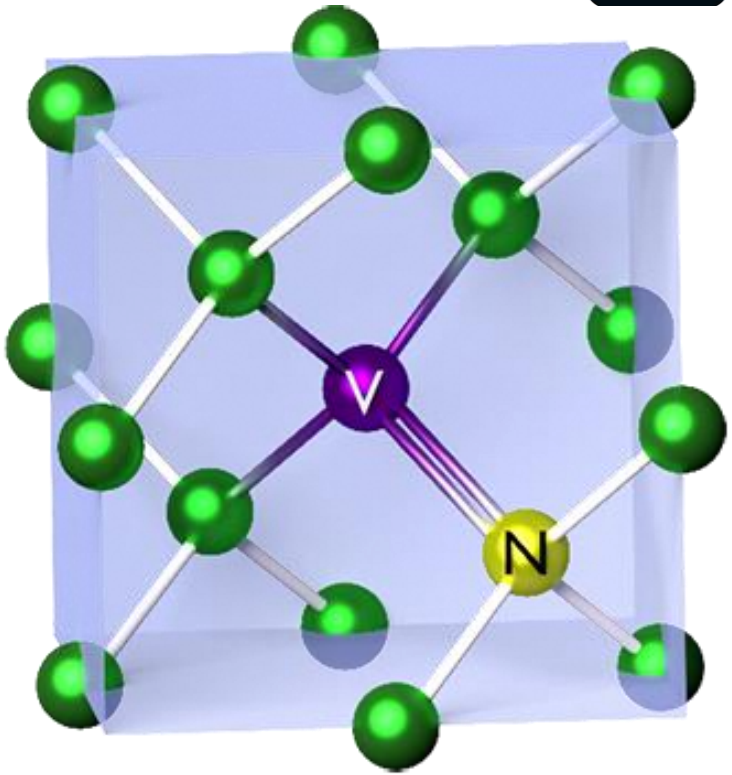
In the Union Budget 2023, Finance Minister Nirmala Sitharaman announced a scheme to promote research and development of lab-grown diamonds. India, despite being a formidable industry in cutting and polishing diamonds, has only just begun manufacturing them. Indian diamantaires are not yet equipped to make diamonds with quantum-research-ready "defects". And this is a problem for scientists.

The Science and Technology Ministry has announced plans to make quantum computers of 50 to 1,000 qubits by the decade-end. But, quantum computers globally are far from being useful devices because maintaining electrons – like in the 'defect diamonds' – in their qubit like states is a daunting challenge.

“nitrogen vacancy” centre.

- quantum researchers are interested in their “defects”.
- It is the unique arrangement of carbon atoms in a diamond which gives it the properties of hardness, electrical conductivity and manipulation of light.
- However, the atomic structure of some diamonds sometimes have two missing carbon atoms.
- They are substituted by a nitrogen atom as well as a “hole” or what is called a “nitrogenvacancy” centre.
- These “centres’ are sensitive to the slightest variations in magnetic Fields and thereby open vistas of investigation.


NV(0)
center
NV(-)
center
e-
N
V
Carbon atom
Nitrogen atom
Vacancy
(a)
(b)


V
N

- **An electron at such a centre can be individually tweaked and made to behave like a qubit.**
- **Qubits — analogous to the bits and bytes of classical computers — are the logic states of quantum computers and in theory allow calculations, beyond the capacity of existing supercomputers, to be done in a trice.**

केन्द्रीय बजट
UNION BUDGET 2020

Budget 2020 announced Rs 8,000 crore over the next 5-yrs in the National Mission on Quantum technology and its applications

- The areas of focus for the NM-QTA Mission will be in fundamental science, translation, technology development and towards addressing issues concerning national priorities
- The mission can help prepare next generation skilled manpower, boost translational research and also encourage entrepreneurship and start-up ecosystem development.
- Quantum principles will be used for engineering solutions to extremely complex problems in computing, communications, sensing, chemistry, cryptography, imaging and mechanics

- Their applications which will be boosted include those in aero-space engineering, numerical weather predictions, simulations, securing the communications & financial transactions, cyber security, advanced manufacturing, health, agriculture, education
- It can bring India in the list of few countries with an edge in this emerging field will have a greater advantage in garnaring multifold economic growth and dominent leadership role

Pain-sensing cells are either male or female, finds study

To understand sexual dimorphism in nociceptor sensitisation, researchers investigated how easily pain receptors in the dorsal root ganglion could be excited. They took samples from three male and female mice, two macaque monkeys, and donor nerve cells from four men and three women

Sanjukta Mondal

You finally got your hands on a new novel you've been wanting to read. You're turning the crisp paper of the pages when suddenly you get a paper cut. Pain erupts on your finger. A discomfiting sensation surges through your entire body yelling out, "Brain, we have a problem!"

This unwanted yet necessary sensory experience most living beings share is pain. It is an essential component of our body's warning system that directs our attention to potential external or internal harm.

The International Association for the Study of Pain defines pain as, "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."

The way people perceive pain is highly personal and subjective in nature. In fact, scientists have suspected for some time now that the perception of pain might be sexually dimorphic: that is, different between (biological) men and women. But the particulars have been a mystery.

A study led by University of Arizona Health Sciences researchers, recently published in the journal *Brain*, demonstrated for the first time functional sexual dimorphism in nociceptors, the nerve cells responsible for perceiving pain.

Pain is an essential component of our body's warning system that directs our attention to potential external or internal harm. GETTY IMAGES/ISTOCKPHOTO

Why do we perceive pain?

Nociceptor cells have bare nerve endings, and they are found across our skin, bones, joints, and muscles. The receptors detect extreme pressure, temperature, and chemical signals released by the body when it is injured, turn them into electrical signals, and relay them to the brain via the spinal cord. The brain finally reads the message and *perceives* pain.

In the new study, the researchers investigated how the nociceptors first light up. "Activation of nociceptors likely produces the same perception of pain in men and women. What is different is how the nociceptors are activated.

"While the nociceptors are normally activated by high-intensity stimuli, under some circumstances the threshold for their activation may be decreased, allowing low intensity and normally physiological stimuli to activate them and produce pain," Frank Porreca, associate head of the Department of Pharmacology, University of Arizona Health Sciences Center, told this author in an email.

The nociceptor response threshold

Previous studies have reported that the nociceptor response threshold in females is lower than that in males. One possible biological mechanism underlying this difference could be peripheral nociceptor sensitisation: a phenomenon in which the threshold for pain is lowered by external factors, causing the receptors to respond to stimuli that they'd otherwise ignore. But researchers still needed to know how this variation in sensitisation arises.

To understand sexual dimorphism in nociceptors sensitisation, the research team investigated how easily pain receptors in the dorsal root ganglion – a cluster of nerve cells located near the spinal cord – could be excited. They collected the samples from three male and female mice, two macaque monkeys (one of each sex), and donor nerve cells from four men and three women.

Dr. Porecca's lab has been exploring the relationship between sleep and chronic pain. In an April 2022 study, the team found that prolactin, a hormone responsible for the growth of breast tissue, also selectively promoted pain responses in female rodents.

Later, the researchers found receptors for prolactin were expressed more in female-specific pain disorders such as endometriosis.

Their studies of sleep and chronic pain also established that orexin B, a neurotransmitter that regulates wakefulness, produced sensitisation in male rodents but not female rodents.

'Differentially sensitised'

In the new study, the researchers studied how prolactin and orexin-B affect nociceptor activation thresholds in the nerve cell samples they had. They cultured the nerve cells overnight in the presence of mouse prolactin for the mice and human prolactin for both the monkey and the human samples. For orexin-B, they applied the neurotransmitter to cultured nerve cells of all three species.

In the mice cohort, a technique to separate and identify proteins revealed prolactin had increased the firing-up of nociceptors in females and orexin-B had done the same thing in males. Immunohistochemistry analyses of monkeys and humans also revealed similar effects.

The team's observations here were consistent with the older findings. "Our paper showed that nociceptors from male and female animals or humans can be differentially 'sensitised', i.e., have a lowering of their activation threshold," Dr. Porecca, the corresponding author of this study, said.

> Scientists have suspected for some time now that the perception of pain might be sexually dimorphic: that is, different between men and women. But the particulars have been a mystery

The devil's in the differences

When doctors prescribe medicine to help manage pain, they typically overlook the sex of the patient. In fact, other than certain female-specific hormonal therapies, health workers generally treat pain the same way among both men and women – even though we also know the rate at which different pain conditions occur differs between the sexes.

For example, pain arising from conditions not linked to visible tissue damage, such as irritable bowel syndrome, migraines, and painful bladder syndrome, is more common in women, alongside female-specific issues such as endometriosis and dysmenorrhea.

On the other hand, cluster headaches and gout are more common in men, together with male-specific ailments like prostatitis.

Unravelling the different mechanisms that drive nociceptor sensitisation and activation will bring us a step closer to understanding qualitative sex differences in pain perception, which in turn is essential to designing precise and sex-specific pain therapies.

"We studied multiple species because we were aware of some data in rodents and human cells of differential expression of the transcript for proteins, and we didn't know if this could translate into functional differences in sensitisation or activation," Dr. Porecca said.

Dr. Porecca said the widespread existence of these mechanisms across species suggests they're evolutionarily relevant.

In addition, the activation or sensitisation interfering ability of these mechanisms holds the potential to be exploited for the development of highly targeted therapeutics.

The study presents a unique concept: nociceptors are either male or female. The researchers expect their findings to have two implications for medical research.

First, it will encourage medical practitioners to factor in the sex of a patient when making decisions about pain therapies.

Second, in clinical trials of therapies with new pain treatment mechanisms, researchers will have to be more careful about the number of men and women in the trial so that they might be alerted to effects that may only occur in one sex.

Dr. Porecca also said it might be time to revisit some 'failed' clinical trials to check if there might have been a sex-specific effect to a drug.

(Sanjukta Mondal is a chemist-turned-science writer with experience in writing popular science articles and scripts for STEM YouTube channels.)

Nociceptor cells

- Nociceptor cells have bare nerve endings, and they are found across our skin, bones, joints, and muscles.
- The receptors detect extreme pressure, temperature, and chemical signals released by the body when it is injured, turn them into electrical signals, and relay them to the brain via the spinal cord.
- The brain finally reads the message and perceives pain.

- **nociceptor sensitisation: a phenomenon in which the threshold for pain is lowered by external factors, causing the receptors to respond to stimuli that they'd otherwise ignore.**
- **dorsal root ganglion — a cluster of nerve cells located near the spinal cord**
- **orexin B, a neurotransmitter that regulates wakefulness, produced sensitisation in male rodents but not female rodents.**
- **The study presents a unique concept: nociceptors are either male or female.**

A painting created at least 51,200 years ago in the limestone cave of Leang Karampuang in the Maros-Pangkep region of the Indonesian island of Sulawesi portrays three human-like figures interacting with a wild pig, in this undated handout image. REUTERS

World's oldest cave painting was created at least 51,000 years ago

Reuters

On the ceiling of a limestone cave on the Indonesian island of Sulawesi, scientists have discovered artwork depicting three human-like figures interacting with a wild pig in what they have determined is the world's oldest-known confidently dated cave painting – created at least 51,200 years ago.

The researchers used a new scientific approach to determine the minimum age of the newly disclosed painting inside the Leang Karampuang cave in the Maros-Pangkep region of South Sulawesi province by using a laser to date a type of crystal called calcium carbonate that formed naturally on top of the painting.

"The method is a significant improvement over other methods and should revolutionize rock art dating worldwide," said Maxime Aubert, a specialist in archaeological science at Griffith University in Australia and one of the leaders of the research published on Wednesday in the journal *Nature*.

The scene, dominated by a representation of a pig measuring 92 cm by 38 cm that is standing upright along with three smaller human-like figures, is painted in a single shade of dark red pigment. There are other images of pigs in the cave as well.

The researchers interpreted the

Researchers used a laser to date a type of crystal called calcium carbonate that formed naturally on top of the painting

painting as a narrative scene, which they said would make it the oldest-known evidence of storytelling in art.

"The three human-like figures and the pig figure were clearly not depicted in isolation in separate parts of the rock art panel," said Griffith University archeologist Adam Brumm, another of the study leaders.

"Rather, the juxtaposition of the figures - how they are positioned in relation to each other - and the manner in which they are interacting were clearly deliberate, and it conveys an unmistakable sense of action. There is something happening between these figures. A story is being told. Obviously, we don't know what that story was," Brumm added.

The researchers used the same dating method to reassess the age of another Sulawesi cave painting from a site called Leang Bulu' Sipong 4, also depicting a narrative scene, this time depicting apparent part-human, part-animal figures hunting pigs and dwarf buffalo. It turned out to be at least 48,000 years old, upwards of 4,000 years earlier than previously thought.

"We, as humans, define ourselves as a species that tells stories, and these are the oldest evidence of us doing that," Aubert said.

In the Leang Karampuang painting, the interaction between the human-like figures and the pig, a species still inhabiting the island, is somewhat cryptic.

"Two of these figures are holding objects of some kind, and at least one figure seems to be reaching towards the pig's face. Another figure is positioned directly above the pig's head in an upside

World oldest cave painting

- On the ceiling of a limestone cave on the Indonesian island of Sulawesi, scientists have discovered artwork depicting three human-like figures interacting with a wild pig in what they have determined is the world's oldest-known condently dated cave painting — created at least 51,200 years ago.

- **The researchers used a new scientic approach to determine the minimum age of the newly disclosed painting inside the Leang Karampuang cave in the Maros-Pangkep region of South Sulawesi province by using a laser to date a type of crystal called calcium carbonate that formed naturally on top of the painting.**

Indigenous HPV vaccine, the rhetoric and the reality

P. Omkar Nadh

a Research Fellow at the University of Queensland, Australia

Y. Madhavi

former Chief Scientist, Council of Scientific and Industrial Research-National Institute of Science Communication and Information Resources (CSIR-NISCAIR), New Delhi

India's public health sphere was subject recently to a one-sided discourse on how vaccination against the human papilloma virus (HPV) prevents cervical cancer and consequent death. Interestingly, it is not proven beyond doubt that HPV causes cervical cancer, as only a couple of strains out of 200 strains that infect humans are somehow 'associated' with 'precancerous lesions'. Most of the women who die of cervical cancer are HPV positive, but most of the men and women who are HPV positive do not get virus-induced cancer, let alone die due to it.

The Population Based Cancer Registries (PBCR) of India and the International Agency for Research on Cancer (IARC) have acknowledged the declining trends of cervical cancer prevalence in India and the globe, regardless of vaccine coverage or efficacy. Therefore, the timing of the overzealous push for 'universal' vaccination of girls against HPV does serious injustice to the more justifiable 'selective' vaccination of high-risk groups, considering its sexual transmission, unlike air-borne, water-borne or contagious diseases. An extremely important western assumption behind targeting pre-puberty girls for this vaccine is that teenage girls indulging in promiscuous physical relations and becoming carriers of the virus are a huge risk factor for the entire adult population. This is a huge moral conundrum in Indian society and even reeks of patriarchy, as men can be carriers too.

The path of vaccine manufacture

But this article focuses on the questionable timing, promotion and pricing of indigenous HPV vaccines, assuming some high-risk populations need it. The Serum Institute of India (SII) developed 'Cervavac' and promoted it as an indigenous and affordable vaccine. It is pertinent to ask why it took nearly two decades for the 'indigenous'vaccine after the introduction of a patented HPV vaccine in the United States, Australia and elsewhere in the Global North. Cervavac uses similar techniques, deploying virus-like particles (VLPs) produced using recombinant deoxyribose nucleic acid (rDNA) techniques to generate an immune response against HPV infections. The vaccine against cervical cancer is only the second rDNA vaccine in the world using the techniques of the early 1970s, the first being the vaccine against Hepatitis-B.

Prior to the development of rDNA methods, vaccine manufacture was largely a charitable or public sector enterprise with universal sharing of strains/techniques and little or no place for patenting of vaccines. The whole scenario changed with the amendment of the U.S. Patent Act in the 1980s allowing the patenting of genetically modified organisms (GMOs) and life processes, and the introduction of Bayh-Dole Act to legalise publicly funded scientists setting up companies. With the eventual globalisation of U.S. patent laws through the World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) since 1995, vaccine development and innovation changed drastically.

India's push for vaccination of girls against HPV raises questions on its timing, promotion and pricing

Vaccine innovation underwent significant changes in terms of its organisation, patenting strategies and even distribution practices in academia and industry. An important element of this 'value addition' is legalisation of the conversion of public 'research' into private 'development' and its monopolisation by patenting. This facilitated the change of hands in vaccine development and production from the public to private sector the world over, aided by the politics of liberalisation and globalisation. This was elaborated by William Muraskin in his book, *The Politics of International Health: The Children's Vaccine Initiative and the Struggle to Develop Vaccines for the Third World*, and, more recently, in a collection edited by Stuart Blume and Baptiste Baylac-Paouly, titled *Immunization and States: The Politics of Making Vaccine*, that included the Indian scenario. Developed under these new innovation conditions was the first vaccine for cervical cancer marketed as Gardasil by Merck and Cervarix by Glaxo Smithkline, globally.

Impact on India

These developments impacted the Indian pharmaceutical and biotech industry in general and vaccine development in particular. Earlier, the Indian Patent Act (1970) abolished patenting products and allowed only processes, that too excluding agricultural and biological patents. This enabled the growth of domestic industries to become the pharmacy of the world within two decades. They manufactured low-cost generic drugs and vaccines, often within a couple of years after they were introduced in the global north. The first rDNA vaccine produced in India for hepatitis-B not only entered the market within five years under the process patent but also dropped the price to an order of magnitude cheaper than in the global north.

On the other hand, under the current product patent regime, a locally made DNA vaccine against cervical cancer had to wait for two decades till the expiry of the product patents before its indigenous 'generic' version was made available. The expiry of key patents of the HPV vaccine was recently reported by the World Health Organization and a highly cited article published in *Nature Biotechnology*.

While multinational patent monopolies largely explain the delay in developing a local vaccine, what still remains unexplained is the exorbitant current market price of Cervavac. Prior to the domestically manufactured vaccine, two prominent multinational vaccines (Gardasil and Cervarix) were sold in India for ₹4,000 a dose. Even at about half that price, a domestically manufactured vaccine in the private market remains largely unaffordable, keeping the vaccine out of reach for a large section of the target population. What is even more worrisome is the unreasonable pricing strategy itself, as the price does not truly reflect the production costs. First, Indian industry is well equipped infrastructurally to make rDNA products at scale, particularly vaccines. Second, Cervavac development was funded heavily, which included nearly $7 million by the Bill & Melinda Gates Foundation (BMGF) under its Grand Challenges Fund. Third, the infrastructure used in producing Cervavac was also a part of the production facility for the Covishield vaccine, built with significant support from the Indian government's Department of Biotechnology.

Such a shared use of resources must have reduced the actual input costs to enable more affordable pricing, thus raising doubts on the pricing strategy of the SII. It seems to be designed to capitalise on high-margins even at low trade volumes, rather than using economies of scale and low margin pricing to boost volume trade. This is essential for public health, as high population coverage is crucial for the success of any vaccine.

Competing vaccines are scant

Another serious concern is the unavailability of other competing vaccines from domestic players, which could have put downward pressure on the current price of Cervavac. This is surprising given the fact that at least four different vaccine candidates were in the pipeline since 2010 from other domestic players. Shantha Biotechnics, Hyderabad, which produced a rDNA Hepatitis-B vaccine at a cheaper price pledged to bring an affordable HPV vaccine to the market by 2015, after it acquired licences from the National Institutes of Health and Johns Hopkins University in the U.S. This may have collapsed after Shanta was acquired by Sanofi Pasteur, Paris, which itself was associated with Merck's Gardasil in several ways. Nonetheless, Shantha Biotechnics, Indian Immunologicals, and Bharat Biotech, Hyderabad, and Zydus Cadila, Ahmedabad have all announced their HPV vaccines in the pipeline around the same period. Their unavailability despite the expiry of the earlier patent barrier is a matter of concern.

The Cervavac vaccine is currently recommended universally under the government vaccination programme for girls between the ages of nine to 26 at a price of ₹500 for two doses, which is expensive even for the government. For those millions who are left out of the government coverage, the retail price of Cervavac will shoot up four-fold to ₹2,000, in a country that has low insurance penetration and catastrophically huge out-of-pocket health expenditures. Therefore, even as the need for universal HPV vaccination to prevent cervical cancer remains an unresolved doubt, the lack of competition and opaque pricing merits investigation in the larger public interest.

The views expressed are personal

Vaccine development

- The whole scenario changed with the amendment of the U.S. Patent Act in the 1980s allowing the patenting of genetically modied organisms (GMOs) and life processes, and the introduction of Bayh-Dole Act to legalise publicly funded scientists setting up companies.
- With the eventual globalisation of U.S. patent laws through the World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) since 1995, vaccine development and innovation changed drastically.
- Vaccine innovation underwent signicant changes in terms of its organisation, patenting strategies and even distribution practices in academic and industry

- **An important element of this ‘value addition’ is legalisation of the conversion of public ‘research’ into private ‘development’ and its monopolisation by patenting.**
- **This facilitated the change of hands in vaccine development and production from the public to private sector the world over, aided by the politics of liberalisation and globalisation.**

- Earlier, the Indian Patent Act (1970) abolished patenting products and allowed only processes, that too excluding agricultural and biological patents.
- This enabled the growth of domestic industries to become the pharmacy of the world within two decades.
- They manufactured low-cost generic drugs and vaccines, often within a couple of years after they were introduced in the global north.

- The first rDNA vaccine produced in India for hepatitis-B not only entered the market within five years under the process patent but also dropped the price to an order of magnitude cheaper than in the global north.
- On the other hand, under the current product patent regime, a locally made DNA vaccine against cervical cancer had to wait for two decades till the expiry of the product patents before its indigenous ‘generic’ version was made available

Patents	Significance	India	Most other nations
Process	Any new invention in process or improvement in existing process	Applicable	Applicable
Product	Entirely new discovery	Applicable	Applicable
	Discovery of new use for known substance	Not Applicable as per section 3(d)	Applicable
	Discovery of new form of old substance with no enhancement of the known efficacy	Not Applicable as per section 3(d)	Applicable
	Mere discovery of a new property of known substance	Not Applicable as per section 3(d)	Applicable

HPV

- HPV, or human papillomavirus, is a common virus that can cause cancers later in life.
- Human papillomavirus infection (HPV infection) is caused by a DNA virus from the *Papillomaviridae* family
- Many HPV infections cause no symptoms and 90% resolve spontaneously within two years.

What is rDNA Vaccine ??

- In recombinant DNA vaccines, the antigens are not directly injected into the body.
- Instead the rDNA containing the gene for coding the antigen in a vector is incorporated into the body.
- The gene produces antigens inside the body and the immune responses are elicited for that antigen.
- Then the memory of the antigen is retained by the immune system.

What are new provisions for police officers?

With the new criminal laws coming into effect, how have basic duties of police officers changed? What are some of the changed provisions with respect to arrests of elderly and infirm people? What about preserving electronic evidence? How can electronic evidence be stored?

EXPLAINER

R.K. Vij

The story so far:

The new criminal laws have become effective from July 1. SOPs have been issued by the Bureau of Police Research and Development (BPRD) to guide police officers in implementing the new provisions.

What are rules for registering FIRs?

The officer in-charge of a police station cannot refuse to register an FIR on the basis of lack of jurisdiction or disputed jurisdiction. He is legally bound to register (popularly known as a zero FIR) and transfer such a case to the respective police station. Though this practice was followed earlier too, the Bharatiya Nagarik Suraksha Sanhita (BNSS) now has a direct provision under Section 173; non-registration of FIRs may attract penal action under various sections.

Additionally, while information can be given orally or in writing as before, it may also be given by electronic means which is to be taken on record by the officer in-charge if it is signed within three days by the person giving it. While no one can stop a police officer from enquiring into the information immediately if it is of a sensitive nature, the electronic mode by which information may be given must be decided by the agencies, such as the Crime and Criminal Tracking Network and Systems (CCTNS) portal, the police website or officially published email IDs.

What about videography?

The BNSS mandates videography during a search conducted by the police under Section 185; of the scene of crime (Section 176); and of the process of conducting a search of a place or taking possession of any property (Section 105). Since these are mandatory provisions, any negligence on the part of the police may benefit the accused persons. Therefore, investigating officers (IOs) must be provided electronic devices and proper training to discharge such functions.

GETTY IMAGES

A cloud-based mobile app, 'eSakshya' has been designed by the National Informatics Centre for enforcement agencies, which allows capturing multiple photos and videos. The photographs of witnesses and selfies of IOs may be captured using this app. Each item is geo-tagged and time-stamped to ensure the integrity of data. Since eSakshya is an initiative under the Inter-operable Criminal Justice System (ICJS), this data will be available to other agencies such as the judiciary, prosecution and cyber forensic experts.

What about provisions of arrest?

Information about arrested persons is to be mandatorily displayed in police stations. Section 37 of the BNSS requires a police officer in every police station, not below the rank of Assistant Sub-Inspector, to be responsible for maintaining and prominently displaying information about the arrested persons. Therefore, boards (including in digital mode) containing names, addresses and the nature of the offence must be put up outside police stations and district control rooms.

Some restriction has been imposed on the arrest of frail or sick and elderly persons. Section 35(7) states that the permission of an officer not below the rank of DySP is mandatory for arresting a person charged with an offence punishable for imprisonment of less than three years if such person is infirm or is above 60 years of age. Similarly, though the law now provides for the use of handcuffs in certain cases, the IOs must use them cautiously. The Supreme Court has laid down that handcuffing may be done only when there is a possibility of escaping from custody or causing harm to himself or others.

What about timelines?

In case of medical examination of a victim of rape, the registered medical practitioner is mandated under Section 184 (6) of the BNSS to forward the medical report to the IO within seven days, who shall forward it to the magistrate concerned. Therefore, doctors must be sensitised about the new law. The investigation of POCSO cases is required to be completed within two months of recording the information of the offence. Earlier, this time limit was only for rape cases under the Indian Penal Code.

A new provision under Section 193(3)(h) requires the IO to maintain the sequence of custody of an electronic device. Though maintaining a chain of custody is important for every seizure, emphasis is laid on electronic devices because they are sensitive pieces of evidence and more vulnerable to tampering. While every police officer is required to upgrade his skills about maintaining integrity of electronic records, the task of the (cyber) expert is likely to increase with many of the mandatory provisions coming into effect.

This sub-section also imposes a duty to inform the progress of the investigation within 90 days to the informant or victim.

Section 113 introduced in the Bharatiya Nyaya Sanhita (BNS) defines what is a 'terrorist act' and imposes the duty on an officer, not below the rank of Superintendent of Police (SP), to decide whether to register a case under this Section or the UAPA. Since, no guidelines are given to exercise this discretion, the SP may inter-alia consider factors such as whether the terrorist organisation is notified under the UAPA, approximate time needed to complete investigation, the rank of the IO and the level of scrutiny required, and how dangerous the accused person is.

R.K. Vij is a former Indian Police Service officer. Views are personal.

THE GIST

- The officer in-charge of a police station cannot refuse to register an FIR on the basis of lack of jurisdiction or disputed jurisdiction. He is legally bound to register (popularly known as a zero FIR) and transfer such a case to the respective police station.
- Section 37 of the BNSS requires a police officer in every police station, not below the rank of Assistant Sub-Inspector, to be responsible for maintaining and prominently displaying information about the arrested persons.
- A new provision under Section 193(3)(h) requires the IO to maintain the sequence of custody of an electronic device. Though maintaining a chain of custody is important for every seizure, emphasis is laid on electronic devices because they are sensitive pieces of evidence and more vulnerable to tampering.

What are rules for registering FIRs?

- The officer in-charge of a police station cannot refuse to register an FIR on the basis of lack of jurisdiction or disputed jurisdiction.
- He is legally bound to register (popularly known as a zero FIR) and transfer such a case to the respective police station.
- Though this practice was followed earlier too, the Bharatiya Nagarik Suraksha Sanhita (BNSS) now has a direct provision under Section 173; non-registration of FIRs may attract penal action under various sections

What about videography?

- **The BNSS mandates videography during a search conducted by the police under Section 185; of the scene of crime (Section 176); and of the process of conducting a search of a place or taking possession of any property (Section 105).**
- **A cloud-based mobile app, ‘eSakshya’ has been designed by the National Informatics Centre for enforcement agencies, which allows capturing multiple photos and videos.**

What about provisions of arrest?

- Information about arrested persons is to be mandatorily displayed in police stations.
- Section 37 of the BNSS requires a police officer in every police station, not below the rank of Assistant Sub-Inspector, to be responsible for maintaining and prominently displaying information about the arrested persons.
- Therefore, boards (including in digital mode) containing names, addresses and the nature of the offence must be put up outside police stations and district control rooms

- **Section 35(7) states that the permission of an officer not below the rank of DySP is mandatory for arresting a person charged with an offence punishable for imprisonment of less than three years if such person is inform or is above 60 years of age.**
- **Similarly, though the law now provides for the use of handcuffs in certain cases, the IOs must use them cautiously**

- new provision under Section 193(3)(h) requires the IO to maintain the sequence of custody of an electronic device.
- Though maintaining a chain of custody is important for every seizure, emphasis is laid on electronic devices because they are sensitive pieces of evidence and more vulnerable to tampering.

- **Section 113 introduced in the Bharatiya Nyaya Sanhita (BNS) defines what is a ‘terrorist act’ and imposes the duty on an officer, not below the rank of Superintendent of Police (SP), to decide whether to register a case under this Section or the UAPA**

What are the laws preventing tree felling in Delhi?

What is the extent of the national capital's green cover? What does Delhi Preservation of Trees Act mandate?

Kartikey Singh

The story so far:

On June 26, a Vacation Bench of the Supreme Court (SC) directed the Delhi government and Delhi Development Authority (DDA) to take effective steps to enhance the national capital's green cover amidst the extreme heat wave.

What is the extent of the green cover?

According to the 'India State of Forest Report 2021' (ISFR) published by the Forest Survey of India (FSI), Delhi has the largest forest cover among seven major megacities, with 195 sq. km, followed by Mumbai (110.77 sq. km) and Bengaluru (89.02 sq. km). Delhi's forest cover constitutes 13.15% of its geographical area, while its tree cover spans 147 sq. km (9.91%). Despite extensive urban development, the city's overall green cover (forest and tree cover) has increased from 151 sq. km (10.2%) in 2001 to 342 sq. km (23.6%) in 2021.

What about their protection?

The Delhi Preservation of Trees Act (DPTA), 1994 provides legal protection to trees in the national capital against actions that could harm their growth or regeneration. According to Section 2 (h) of the Act, "to fell a tree" includes severing the trunk from the roots, uprooting, bulldozing, cutting, girdling, lopping, pollarding, applying arboricides, burning, or any other damaging method. Under Section 8, no tree or forest produce can be removed on any land without prior permission from the 'Tree Officer', even on privately owned property. The 'Tree Officer' may grant permission after inspection and must respond within 60 days. Any person violating this Act may face imprisonment for up to one year, a fine up to ₹1,000, or both. Furthermore, the Act outlines a 'Tree Authority' tasked with conducting tree censuses, managing nurseries, and reviewing government and private construction proposals, among other responsibilities. In addition, Delhi's Tree Transplantation Policy, 2020 mandates that 80% of identified trees slated for felling must be transplanted. However, an affidavit submitted by the government to the Delhi High Court in 2022 disclosed that out of the 16,461 transplanted trees since the policy's notification, only 33.33% had survived.

What is the case against the DDA?

The apex court is hearing a contempt petition against DDA's Vice Chairman Subhashish Panda for the felling of about 1,100 trees, in violation of the SC's orders, for road expansion in the ridge area, which falls under the eco-sensitive zone around Asola-Bhati Wildlife Sanctuary. On March 4, the DDA submitted an application to the SC seeking permission to cut trees for the construction of the Gaushala Road. However, the court directed the DDA to re-examine the proposal with the help of field experts. During the proceedings, an affidavit from the DDA's Vice Chairman revealed that tree felling had already begun on February 16 and continued for ten days. So, by February 26, all intended trees were cut down even before the application reached the SC. This material fact was not disclosed when the court heard the application on March 4. Despite knowing no trees could be touched without the court's sanction, the DDA misled the court and acted in bad faith by seeking permission only after the tree felling work. While probing deeper to set accountability, the Bench pulled up DDA for not providing records of the Delhi LG's (Chairman of the DDA) February 3 visit to the site, which allegedly led to the tree felling order. The Delhi government was also reprimanded for usurping the Tree Officer's authority in granting permission.

The apex court has halted the DDA's work and directed a team from the FSI to assess the number of trees cut and the environmental damage.

What next for Delhi?

Amid an extreme heatwave, rampant tree felling in the world's second most populous city will only worsen hardships. Urban forests act as carbon sinks, absorbing emissions and filtering pollutants, essential for cities like Delhi with persistently unhealthy air quality indices. Trees reduce the urban heat island effect by lowering temperatures through shading and evapotranspiration. Among other reforms, the government should consider increasing the penalty from ₹1,000 to ₹5,000 under the DPTA, 1994, aligning it with current realities.

Kartikey Singh reads law at RGNUL.

THE GIST

- The Delhi Preservation of Trees Act (DPTA), 1994 provides legal protection to trees in the national capital against actions that could harm their growth or regeneration.
- Delhi's forest cover constitutes 13.15% of its geographical area, while its tree cover spans 147 sq. km (9.91%).
- Amid an extreme heatwave, rampant tree felling in the world's second most populous city will only worsen hardships faced by the people.

The Delhi Preservation of Trees Act (DPTA), 1994

- The Delhi Preservation of Trees Act (DPTA), 1994 provides legal protection to trees in the national capital against actions that could harm their growth or regeneration.
- Delhi's forest cover constitutes 13.15% of its geographical area, while its tree cover spans 147 sq. km (9.91%).
- Amid an extreme heatwave, rampant tree felling in the world's second most populous city will only worsen hardships faced by the people.

Looking forward: On the occasion of World Environment Day, a new fleet of 175 Electric Vehicle (EV) Airport Taxis were introduced on June 5 in Bengaluru.

In an electric vehicle, what is regenerative braking?

Regenerative braking is a system designed to convert the kinetic energy of the wheels to a form that can be stored and used for other purposes. Here the motor operates as a generator, turning mechanical energy back to electrical energy

Vasudevan Mukunth

The impulse to be sustainable – driven by the incessant pressure to lower our emissions – often manifests as lowering consumption and increasing reuse alongside reforms like tweaking consumer behaviour. Electric vehicles are the site of many of these changes, aided by state-led incentives and subsidies. Regenerative braking is an important mechanism in these vehicles that increases their energy use efficiency.

What is braking?

Braking is the mechanism by which an automotive vehicle in motion slows down. A vehicle moving faster has more kinetic energy than a vehicle moving slower, so the process of braking removes (mostly) kinetic energy from the vehicle. The law of energy conservation means this removed energy has to go somewhere.

For example, the disc brake is one type of mechanical brake: it works by pressing brake pads against a disc attached to spinning wheels, and uses friction to convert some of the wheels' kinetic energy into heat. This is why the discs of disc brakes have holes cut into them, to dissipate heat better.

Another type is the induction brake, often used in trains: a magnet induces circular electric currents in a spinning wheel (made of a conducting material, like metal). These currents produce their own magnetic field, which opposes that of the external magnet. The opposition acts like a drag on the wheel and forces it to slow down. In terms of energy: the metal resists the flow of the circular currents and dissipates heat.

What is regenerative braking?

Regenerative braking is a brake system designed to convert the kinetic energy of the wheels to a form that can be stored and used for other purposes. As such, it creates a process in which at least part of the energy delivered to the vehicle's wheels can be recovered in a situation when the vehicle doesn't need it.

Regenerative braking is one type of dynamic braking. In an electric vehicle, of the types becoming common on Indian roads, a battery onboard the vehicle draws electric power from the grid and stores it. When the vehicle moves, the battery powers an electric motor that propels the vehicle, converting electrical to mechanical energy. This motor is called the traction motor.

During regenerative braking, the motor operates as a generator, turning mechanical energy back to electrical energy. In the vehicle, this means an electric current will be produced as the vehicle brakes, which is stored separately in a battery. In some other vehicles, especially trains, the current is fed back into the traction motor. The other type of dynamic braking is rheostatic braking, where the current is sent to an array of resistors that dissipate the electrical energy as heat. It is often necessary for a vehicle to have both regenerative and rheostatic braking in case the electrical energy recovered can't be stored or used right away.

How does motor become a generator?

A motor has two essential parts: a rotor (the thing that rotates) and a stator (the thing that's stationary). In a rudimentary design, the stator consists of permanent magnets or electromagnets while the rotor consists of current-carrying wires coiled around in loops. The stator surrounds the rotor.

When a charged particle, like an electron, moves inside a magnetic field, the field exerts a force on the particle called the Lorentz force. Whether the force will push or pull the wire in which the electron is moving depends on the direction of the electric current.

This is when the coiling helps. The current at the coil's two ends moves in opposite directions, so the magnetic fields imposed by the stator will push on one end of the coil and pull on the other. And these opposing forces will continue to act on the two sides of the rotor until the voltage across the wire is constant. Thus, a motor converts electrical energy to rotary motion.

In a generator, mechanical energy from an external source can be fed to the rotor to induce a current in the stator. Simply speaking, by switching the traction motor between these two configurations, an electric (or hybrid) vehicle can implement regenerative braking.

Does regenerative braking have downsides?

While it is a simple energy recovery mechanism, regenerative braking has some downsides. For example, it alone often doesn't suffice to bring an electric vehicle to a halt.

It has to be used together with a conventional system that dissipates some of the kinetic energy as heat.

Such a system is also required to prevent vehicles from backsliding downhill, which many regenerative brakes won't prevent.

Another example is that the amount of energy a regenerative brake can recover drops as the vehicle's velocity drops as well. This said, a regenerative brake can be beneficial for an electric vehicle's energy-use efficiency in stop-start traffic.

Are there other ways to recover energy?

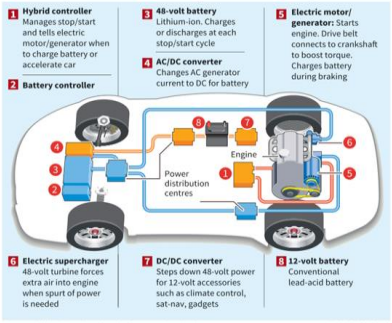
The design of a regenerative brake depends on the energy form to which the mechanical energy from the wheels is to be converted. An electric vehicle funnels it into a generator and obtains a current, which is stored in a battery or a supercapacitor. Similarly, the mechanical energy can be used to increase the angular momentum of a rotating flywheel. Flywheels are especially useful because they can receive energy much faster than other such systems.

For every unit increase in speed, they also store exponentially more energy. Engineers have been able to build flywheels with carbon-composites that, in a vacuum, can spin at up to 50,000 rpm. The flywheel can be linked to a reciprocating engine to manage or augment its output, like in Formula One racing, or to a gyroscope to help submarines and satellites navigate.

Recovered kinetic energy can also be fed to a pump that compresses air, which can be useful to start internal combustion engines.

The mechanics of brake energy generation

Regenerative braking is a type of dynamic braking. Here the motor operates as a generator, turning mechanical energy back to electrical energy. In the vehicle, this means an electric current will be produced as the vehicle brakes, which is stored in a battery



Sources: Delph Automotive, Ricardo, European Commission

What is regenerative braking?

- Regenerative braking is a brake system designed to convert the kinetic energy of the wheels to a form that can be stored and used for other purposes.
- As such, it creates a process in which at least part of the energy delivered to the vehicle's wheels can be recovered in a situation when the vehicle doesn't need it.
- Regenerative braking is one type of dynamic braking. In an electric vehicle, of the types becoming common on Indian roads, a battery onboard the vehicle draws electric power from the grid and stores it.

- When the vehicle moves, the battery powers an electric motor that propels the vehicle, converting electrical to mechanical energy.
- This motor is called the traction motor.
- During regenerative braking, the motor operates as a generator, turning mechanical energy back to electrical energy.
- In the vehicle, this means an electric current will be produced as the vehicle brakes, which is stored separately in a battery.

- In some other vehicles, especially trains, the current is fed back into the traction motor.
- The other type of dynamic braking is rheostatic braking, where the current is sent to an array of resistors that dissipate the electrical energy as heat.
- It is often necessary for a vehicle to have both regenerative and rheostatic braking in case the electrical energy recovered can’t be stored or used right away.

Japan and Philippines sign defence agreements

Associated Press
MANILA

Japan and the Philippines signed a key defence pact on Monday allowing the deployment of Japanese forces for joint drills in the Southeast Asian nation that came under brutal Japanese occupation in the Second World War but is now building an alliance with Tokyo as both face an increasingly assertive China.

The Reciprocal Access Agreement, which similarly allows Filipino forces to enter Japan for joint combat training, was signed by Philippine Defence Secretary Gilberto Teodoro and Japanese Foreign Minister Yoko Kamikawa in a Manila ceremony witnessed by President Ferdinand Marcos Jr.

It would take effect after ratification by the countries' legislatures, Philippine and Japanese officials said.

Ms. Kamikawa called the signing of the agreement "a groundbreaking achievement" that should further boost defence cooperation between the countries.

The officials on both sides "expressed serious concern over the dangerous and escalatory actions by China" in Second Thomas Shoal, the scene of a recent confrontation between China and the Philippines in the South China Sea.

The busy sea passage is a key global trade route which has been claimed virtually in its entirety by China but also contested in part by the Philippines, Vietnam, Malaysia, Brunei and Taiwan.

The Reciprocal Access Agreement

- Japan and the Philippines signed a key defence pact allowing the deployment of Japanese forces for joint drills in the Southeast Asian nation that came under brutal Japanese occupation in the Second World War but is now building an alliance with Tokyo as both face an increasingly assertive China.
- The Reciprocal Access Agreement, which similarly allows Filipino forces to enter Japan for joint combat training


Norwegian Sea
(Russia)
ARCTIC CIRCLE
Ostrova Anzhu (Russia)
worldatlas
Russian Federation
Ural Mts
European Russia
Bering Sea
Alaska
60° N
180°
Lake Baykal
Ostrov Sakhalin (Russia)
Sea of Okhotsk
Kamchatka Peninsula
Aleutian Islands
EUROPE
Aral Sea
Kazakhstan
Mongolia
North Korea
Caspian Sea
Black Sea
Uzbekistan
Sea of Japan (East Sea)
Kuril Islands (Russia)
45° N
INTERNATIONAL DATE LINE
MONDAY
SUNDAY
Turkey
Lebanon
Turkmenistan
Kyrgyzstan
Tajikistan
ASIA
Syria
MIDDLE EAST
Israel
Iraq
Persian Gulf
Iran
Afghanistan
INDIA
China
Yellow Sea
Japan
Pacific Ocean
Bhutan
South Korea
Jordan
Kuwait
Qatar
Bahrain
Pakistan
Bangladesh
Hong Kong (China)
East China Sea
Ryukyu Islands (Japan)
Bonin Islands (Japan)
30° N
Gulf of Tonkin
Macau (China)
India
TROPIC OF CANCER
Saudi Arabia
U.A.E
Oman
Gulf of Oman
Red Sea
Laccadive Sea
Burma
Laos
Hainan (China)
Taiwan
Okinawa (Japan)
Volcano Islands (Japan)
Bay of Bengal
Thailand
Vietnam
Philippines
Yemen
Arabian Sea
Andaman and Nicobar Islands (India)
SOUTHEAST ASIA
South China Sea
15° N
Gulf of Aden
Lakshadweep Islands (India)
Philippine Sea
Brunei
AFRICA
Socotra (Yemen)
Sri Lanka
Phuket (Thailand)
Andaman Sea
Cambodia
Sulu Sea
Malaysia
Celebes Sea
Gulf of Thailand
New Guinea (Indonesia)
Maldives
EQUATOR
0°
EQUATOR
0°
Borneo (Indo.)
Singapore
Java Sea
Sumatra (Indo.)
Indonesia
Banda Sea
British Indian Ocean Territory (UK)
Indian Ocean
Java (Indo.)
Bali (Indo.)
Flores Sea
Arafura Sea
OCEANIA
East Timor
Savu Sea
150° E
15° S
15° S
1000 mi

Under water

All hands on deck: Rescue workers riding a boat past an inundated house on Sunday during flooding caused by a dam breach in Dongting lake in China's Hunan province. The breach occurred on Friday, inundating farmland and forcing nearly 6,000 people to evacuate. AFP

Dongting Lake

- Dongting Lake is a large, shallow lake in northeastern Hunan Province, China.
- It is a flood basin of the Yangtze River, so its volume depends on the season.
- The provinces of Hubei and Hunan are named after their location relative to the lake: *Hubei* means "North of the Lake" and *Hunan*, "South of the Lake".
- Dongting Lake is famous in Chinese culture as the place of origin of dragon boat racing

ATTENTION!! BATCH FOR 2025/26 LAUNCHED

connect with sir -9057921649

CURRENT AFFAIRS PLUS (FOR UPSC 2025)

INCLUDES

- PIB Analysis with pdf
- Down to earth
- physics.org
- science daily
- Major newspapers
- With practice test and Mains Mock

starting 1st may 2024

BY SAURABH PANDEY SIR

MAINS GURUJI

Connect with sir 90579 21649

UPSC MAINS MENTORSHIP PROGRAM

starting 10th JULY 2024

Target 400 + in GS paper

How to approach Essay ??

Only for serious UPSC ASPIRANTS

Batch-1

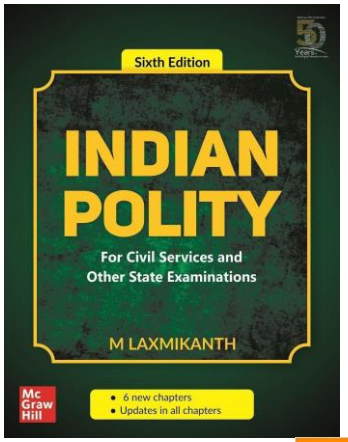
BY SAURABH PANDEY SIR

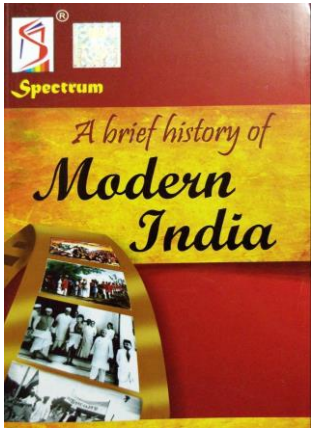
Link in description

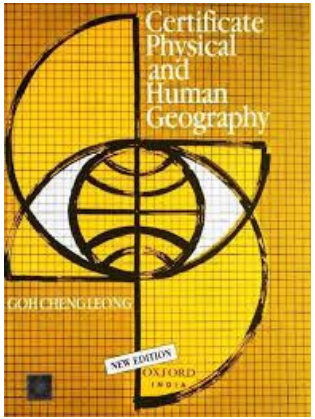
Msg -9057921649

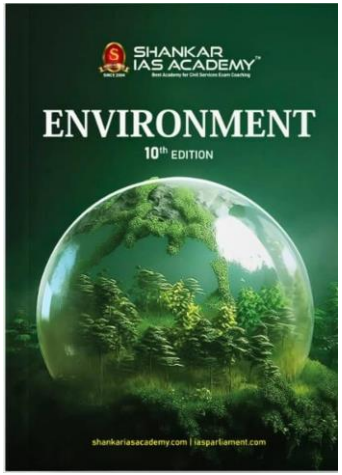
Download -
saurabh pandey
cse app

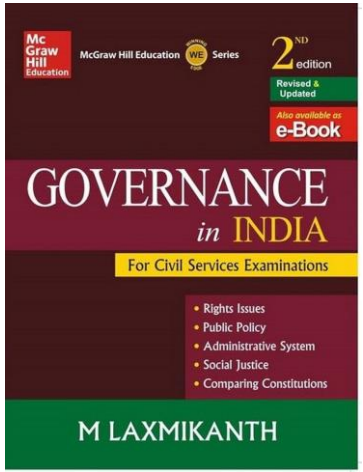
ALL Advance books for upsc IN ONE COURSE

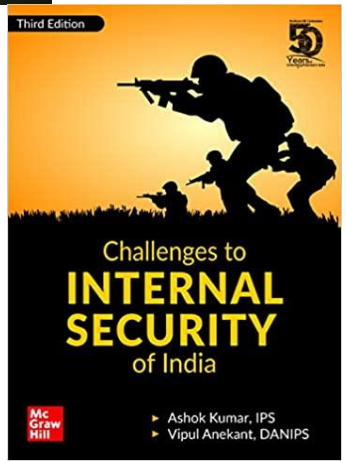


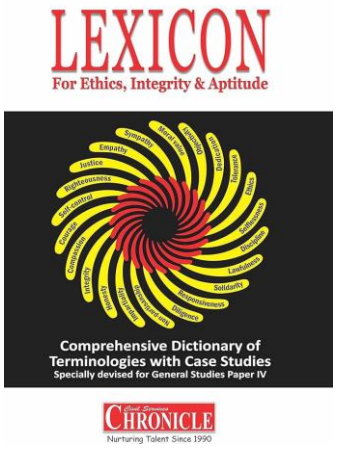










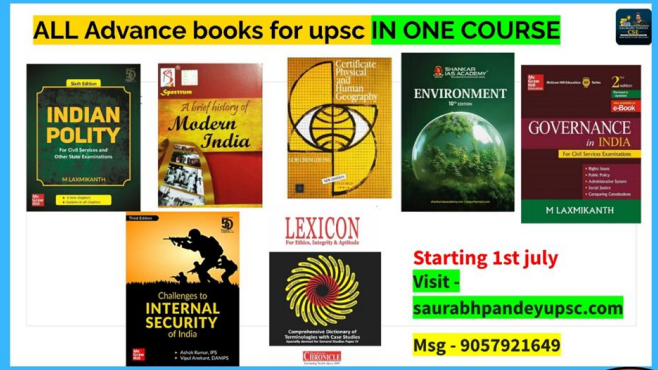


Starting 1st june

Visit - saurabhpandeyupsc.com

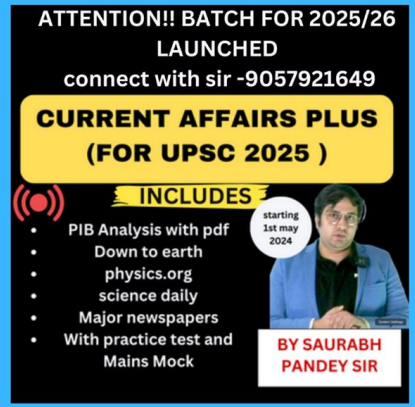
Msg - 9057921649

COMBO COURSE FOR UPSC 2025



+

Save Rs 1000/-



Scan - to get free content

Topics

- Mineral nanoparticles from water
- India’s Manufacturing sector - key points
- Digital Competition Law (CDCL)
- María Elena Solar Power Plant
- About ECOWAS
- What is iCET??
- Mains

By saurabh Pandey

THE HINDU

‘Outstanding work’: IIT-M team makes mineral nanoparticles with water

In an important finding independent scientists called a ‘striking and non-intuitive result’, researchers used really small water droplets to blow up minerals suspended in them into nanoparticles. The underlying science has implications for many things from the origin of life to replenishing soils for farming

Karthik Vinod

B.K. Spoorthi, who just completed her PhD at IIT Madras, observing an experiment in progress. IIT MADRAS

THE GIST

- Water molecules of microdroplets since they have so little room and are packed closely together are more eager to participate in chemical reactions. This isn't possible with water molecules in bulk
- The ability to create nanoparticles could be useful to the study of proto-cells, the precursors to cells as we know them today. Microdroplets could mimic proto-cells by by being little compartments in which biochemical reactions play out
- Plants absorb silica in the form of nanoparticles to help them become taller. Supplying soil with silica nanoparticles could have a positive impact on agriculture. This research provides ‘a way to convert unproductive soil, unproductive fields or even desertified areas into productive areas’

Water drops are ubiquitous around us and come in different sizes. They can be as large as a raindrop or as small as aerosol particles released from a spray can.

They can be even smaller – invisible to the naked eye – when they come as microdroplets. The latter are just a thousandth the size of a typical raindrop.

“We think that droplets are very tiny, and they are not important enough,” Thalappil Pradeep, a chemist at IIT Madras, told *The Hindu*.

But they can pack a punch.

Dr. Pradeep led a study recently published in the journal *Science* that showed microdroplets of water can break minerals down into nanoparticles. The team involved researchers from IIT Madras and the Jawaharlal Nehru Centre for Advanced Studies, Bengaluru.

“This outstanding work adds significantly to the growing body of evidence that water droplets enable chemical transformations that bulk water does not make possible,” Richard Zare, a chemist at Stanford University who wasn’t involved in the study, told *The Hindu*.

Eccentricity of water microdroplets

In a bucket of water, water molecules at the surface can participate more easily in chemical reactions than those in the bulk. But even at the surface, they’ll need to be supplied with some energy before they can participate. The water molecules of microdroplets do one better: because they have so little room and are packed closely together, they’re more eager to participate in chemical reactions.

The water in microdroplets thus engages more readily in exotic chemical reactions that also proceed faster, up to a million-times in some cases. This isn’t possible with water molecules in bulk.

For the same reason, microdroplets are also good carriers of electric charge. Dr. Pradeep said they’re easy to encounter in this form. Go to the beach, and close to the shore, microdroplets from the spray of water could carry an excess of ions from the salt in the water and settle on your skin, he said.

A microdroplet can also become electrically charged in other ways. For example, when a larger droplet loses some water by evaporation and shrinks, the water molecules left behind are pushed closer together, and establish (weak) hydrogen bonds between themselves. This often results in a water molecule shedding one of its hydrogen atoms and becomes a negatively charged hydroxyl ion (OH^-). The freed H^+ is essentially a proton.

This process happens in bulk water as well – but because each molecule is surrounded by other water molecules, the protons can’t move around much. In microdroplets, the protons easily reach the surface, rendering the surface more acidic and creating fertile ground for chemical reactions.

Researchers have shown that amino acids use free protons on their surfaces as an intermediary to form peptide linkages.

The new study reported microdroplets have yet another ability.

An explosive experiment

Dr. Pradeep & co. were interested in whether water microdroplets could break bonds in crystals like silica (SiO_2) and alumina (Al_2O_3) to create nanometre-sized pieces.

Spoorthi Bhat, then a PhD student under Dr. Pradeep and one of the paper’s coauthors, set up an experiment to confirm this hypothesis in crystals of quartz (silica), ruby, and fused alumina.

She pressed a battery terminal against the outside of a capillary tube. The terminal delivered a few thousand volts to mineral microparticles suspended in water inside the tube. The voltage elongated the suspension, squeezing it out of one end, and sending it flying through the air as a mist of microdroplets. They were still airborne when, in just 10 milliseconds, the mineral microparticles broke up into nanoparticles.

> Water drops can be invisible to the naked eye when they come as microdroplets. The latter are just a thousandth the size of a typical raindrop

The researchers had a few ideas about what could have caused this break up. The free protons could have squeezed themselves into crystal layers, which they scraped the mineral off from within if supplied some energy. The study suggests the electric fields produced by the charged surface could have provided this energy.

Surface tension – the force that keeps droplets spherical – could have been involved as well. In the experiment, a contest between surface tension, which is attractive, and like charges on the surface repelling each other could have set off shockwaves that blew up the microdroplets.

“This is a striking and non-intuitive result,” Shashi Thutupalli, a biophysicist at the National Centre for Biological Sciences, Bengaluru, who was not involved in the study, said to *The Hindu*. “It seems quite plausible that the high electric field within the droplets could cause the particle breakup.”

He added that the findings could be useful to the study of proto-cells, the precursors to cells as we know them today. Scientists are interested in proto-cells because they could have played an important part in the processes that first created life on the earth. “For me personally, the relevance of these results to the context of the origins of life is very exciting.”

He said the microdroplets could mimic proto-cells by being little compartments in which biochemical reactions play out.

Making a green paradise

The formation of nanoparticles from microparticles, Dr. Pradeep said, is “related to the origin of life, the problem of agriculture, ... to issues as large as water itself. Another problem as big as water is food. It is in this context that soil is probably an interesting thing.”

Silica makes up half of sand. Plants absorb silica in the form of nanoparticles to help them become taller. The rice crop usually has high levels of silica.

Supplying soil with silica nanoparticles could thus have a positive impact on agriculture. “Here is a way to convert unproductive soil, unproductive fields or even desertified areas into productive areas,” Dr. Pradeep said.

He implored scientists to investigate whether water microdroplets react with minerals to form nanoparticles as part of atmospheric processes, in the form of ‘microdroplet showers’. Dr. Pradeep was optimistic they do.

(Karthik Vinod is a freelance science journalist and co-founder of Ed Publica. He has masters’ degrees in astrophysics and science, technology and society.)

Mineral nanoparticles from water

- In a bucket of water, water molecules at the surface can participate more easily in chemical reactions than those in the bulk.
- But even at the surface, they'll need to be supplied with some energy before they can participate.
- The water molecules of microdroplets do one better: because they have so little room and are packed closely together, they're more eager to participate in chemical reactions.
- microdroplets are also good carriers of electric charge

- A microdroplet can also become electrically charged in other ways.
- For example, when a larger droplet loses some water by evaporation and shrinks, the water molecules left behind are pushed closer together, and establish (weak) hydrogen bonds between themselves.
- This often results in a water molecule shedding one of its hydrogen atoms and becomes a negatively charged hydroxyl ion (OH-).

- The free protons could have squeezed themselves into crystal layers, which they scraped the mineral of•from within if supplied some energy.
- The study suggests the electric Fields produced by the charged surface could have provided this energy.
- Surface tension — the force that keeps droplets spherical — could have been involved as well.

- **Plants absorb silica in the form of nanoparticles to help them become taller. Supplying soil with silica nanoparticles could have a positive impact on agriculture.**
- **This research provides ‘a way to convert unproductive soil, unproductive fields or even desertified areas into productive areas’**

- **Silica makes up half of sand. Plants absorb silica in the form of nanoparticles to help them become taller.**
- **The rice crop usually has high levels of silica. Supplying soil with silica nanoparticles could thus have a positive impact on agriculture.**
- **“Here is a way to convert unproductive soil, unproductive fields or even desertified areas into productive areas**

The shape of manufacturing 3.0 for Modi 3.0

Prime Minister Narendra Modi has formed the government, albeit now as head of a coalition in his third term. The new government must redouble its efforts on economic reforms, particularly related to manufacturing. India's continued urbanisation will see hundreds of millions of agriculture workers relocate to cities to find formal employment in the coming decades. A failure to generate low-skilled employment could push staggering stress on India's governance structures. Success in manufacturing will not only help India's domestic trade and employment goals but also expand resources for national security – which is good for American interests, too.

Richard Rossow

holds the Chair in United States-India Policy Studies at the Center for Strategic and International Studies (CSIS). He has worked on India's commercial reforms for over 25 years in a variety of private sector capacities

Manufacturing base must improve

When the Modi government first took office in 2014, the government committed to increase manufacturing as a percent of gross domestic product (GDP) from 15% up to 25% by 2025. The writer can point to some significant economic reforms that should have helped this target become a reality, most notably the approval of the Goods and Services Tax (GST) in 2017, which largely unified India's State-level tax codes.

However, as World Bank data indicates, manufacturing is in relative decline, making up only 13% of the GDP in 2022. This compares unfavourably to markets such as Vietnam (25%), Bangladesh (22%), Malaysia (23%), Indonesia (18%), Mexico (21%), and, of course, China (28%).

India has powerful domestic compulsions to improve its manufacturing base. First, India has a massive employment-creation requirement. About half of Indian labour remains mired in low-productivity agriculture. If India's attempts to enact major farming reforms are successful, there could be a fast, massive transition of employment out of agriculture. These workers are ill-suited for India's highly successful skilled services sector.

A second reason behind India's desire to boost manufacturing is the nation's goods trade deficit. Despite a perception that India is "anti-trade", India had a little over $1 trillion in goods trade in the last 12 months – and a $250 billion deficit during that period. While hydrocarbon imports account for over one-quarter of India's imports, manufactured goods such as electronics are a substantial import component. When looking at trade more broadly, India enjoys a large surplus in services trade – about $160 billion surplus in the last 12 months on $518 billion in total services trade. But, again, even though the services sector creates substantial economic output, it employs relatively few workers.

The United States has a stake in ensuring India's success in having a robust manufacturing base

The United States has a stake in India's success in building a robust manufacturing base for two reasons. First, improvements to India's industrial base will have direct and indirect effects on India's ability to underwrite its emerging role in regional security which is increasingly important given China's rising aggression. Second, some amount of manufacturing will not come back onshore. Having this manufacturing based in friendly countries improves the viability of U.S. supply chains. India's ability to achieve greater success in manufacturing will require far more moving parts than what the central government in Delhi controls. Most factors of production such as electric power, water, sanitation, labour regulations, land acquisition rules, and environment regulations are primarily controlled by India's State governments. This is where the new Indian government needs to provide a much higher degree of policy attention.

States and their business environments

The Modi government's early attempts to stoke States into competition with each other have fallen by the wayside. The rankings of States' business environments called the "Business Reforms Action Plan (BRAP)", has not been updated since the COVID-19 pandemic, and was anyway considered weak as it focused on States' self-reporting on their local business practices which was often at odds with actual investor experiences. The central government's plan to help craft model industry laws for States to consider has been underwhelming.

The Bharatiya Janata Party (BJP) controls almost half of India's States. Most of the remaining States are controlled by India's numerous regional parties, with varying levels of cooperation and friction with the central government. Getting more States to focus on thoughtful, transparent industrial policies is a difficult task and will require an improved toolkit of sticks and carrots. The government should also consider putting stronger emphasis on job-creating manufacturing sectors such as textiles, paper mills, and furniture, instead of pushing almost exclusively for investments in capital-intensive sectors such as semiconductors and robotics.

Go beyond Delhi-Mumbai-Bengaluru circuit

The U.S. can play a modest but meaningful role in improving the business attractiveness of Indian States. This may include expanding engagement with Indian States to provide direct guidance on effective economic governance, and to improve pathways for potential investors to engage with State governments. Senior U.S. officials visiting India must commit to going beyond Delhi-Mumbai-Bengaluru and engaging a wider set of large States on the importance and opportunity from the current evolution of global supply chains.

India's national election provided an opportunity to assess and redirect policy. But India's core needs behind the current manufacturing push – jobs, trade, and security – will not change. The size of the market and current growth rates are quite attractive to investors. But more work needs to be done, especially at the State level in India, for "Make in India" to further accelerate.

India’s Manufacturing sector -key points

- First, India has a massive employment-creation requirement. About half of Indian labour remains mired in low-productivity agriculture.
- If India’s attempts to enact major farming reforms are successful, there could be a fast, massive transition of employment out of agriculture
- A second reason behind India’s desire to boost manufacturing is the nation’s goods trade deficit.

- The United States has a stake in India’s success in building a robust manufacturing base for two reasons.
- First, improvements to India’s industrial base will have direct and indirect effects on India’s ability to underwrite its emerging role in regional security which is increasingly important given China’s rising aggression.
- Second, some amount of manufacturing will not come back onshore.
- Having this manufacturing based in friendly countries improves the viability of U.S. supply chains.

What is the draft Digital Competition Bill?

How is an ex-post framework different from an ex-ante framework? Why does the draft Bill encourage an ex-ante competition regulation? What framework does the European Union follow? What are systemically significant digital enterprises?

EXPLAINER

Trishee Goyal

The story so far:

In February 2023, the Ministry of Corporate Affairs (MCA) constituted a Committee on Digital Competition Law (CDCL) to examine the need for a separate law on competition in digital markets. The CDCL deliberated on the issue for a year and came to the conclusion that there was a need to supplement the current ex-post framework under the Competition Act, 2002 with an ex-ante framework. It laid out this ex-ante framework in the draft Digital Competition Bill.

What is an ex-ante framework?

The Competition Act, 2002 is the primary legislation concerned for preventing practices that have an adverse effect on competition. It establishes the Competition Commission of India (CCI) as the national competition regulator. As with competition law in all other jurisdictions, the Competition Act, 2002 is based on an ex-post framework. This means that the CCI can use its powers of enforcement only after the anti-competitive conduct has occurred.

In the case of digital markets, the CDCL has advocated for an ex-ante competition regulation. This means that they want the CCI's enforcement powers to be supplemented such that it allows it to pre-empt and prevent digital enterprises from indulging in anti-competitive conduct in the first place.

Ex-ante competition regulation is unusual. The European Union is the only jurisdiction where a comprehensive ex-ante competition framework, under the Digital Markets Act, is currently in force. The CDCL agrees with this approach because of the unique characteristics of digital markets. First, digital enterprises enjoy economies of scale and economies of scope, that is, reduction in cost of production per unit as the number of units increase and reduction in total costs of production with increase in number of services respectively. This propels them to grow rather quickly as compared to players in the traditional market. Second, this growth is aided by network effects – utility of the digital services increases with the increase in the number of users.

ISTOCKPHOTO

In this context, given that markets can tip relatively quickly and irreversibly in favour of the incumbents, it was found that the extant framework provided for a time consuming process, allowing offending actors to escape timely scrutiny. Therefore, the CDCL has advocated for preventative obligations to supplement the ex-post facto enforcement framework.

What is the draft's basic framework?

The draft Bill follows the template of the EU's Digital Markets Act. It does not intend to regulate all digital enterprises, and places obligations only on those that are "dominant" in digital market segments. At present, the draft Bill identifies ten 'core digital services' such as online search engines, social networking services, video sharing platform services etc. The draft Bill prescribes certain quantitative standards for the CCI to identify dominance of digital enterprises. These are based on the 'significant financial strength' test which looks at financial parameters and 'significant spread' test based on the number of users in India. Even if the digital enterprise does not meet quantitative standards, the CCI may designate an entity as a "systemically significant digital enterprise (SSDE)" based on qualitative standards.

The primary obligation of SSDEs is to not indulge in anti-competitive practices. These require the SSDE to operate in a fair, non-discriminatory and transparent manner with its users. The draft Bill prohibits SSDEs from favouring its own products on its platform over those of third parties (self-preferencing); restricting availability of third party applications and not allowing users to change default settings; restricting businesses users of the service from directly communicating with their end users (anti-steering) and tying or bundling of non-essential services to the service being demanded by the user. SSDEs also cannot cross utilise user data collected from the core digital service for another service and non-public data of users cannot be used to give unfair advantage to the SSDE's own service.

What has been the response?

The overriding sentiment towards the draft Bill has been one of opposition. First, there is considerable scepticism on how well an ex-ante model of regulation will work. This stems in part from the fact that it seems to be transposed from the EU to India without taking into account differentiating factors between the two jurisdictions and the lack of evidence of it actually working well there. This is compounded by concerns of its potential negative effects on investments for start-ups in India and that they might be deterred to scale up to prevent meeting quantitative thresholds. Studies have also shown that restrictions on tying and bundling and data usage would negatively impact MSMEs that have come to rely significantly on big tech to reduce operational costs and enhance customer outreach.

Interestingly, a group of Indian start-ups have supported the draft Bill arguing that it would address concerns against monopolistic practices by big tech. However, they have argued for a revision of financial and user based thresholds citing concerns that it may lead to domestic start-ups being brought within the regulatory net.

The writer is a technology policy consultant.

THE GIST

- In February 2023, the Ministry of Corporate Affairs (MCA) constituted a Committee on Digital Competition Law (CDCL) to examine the need for a separate law on competition in digital markets.
- In the case of digital markets, the CDCL has advocated for an ex-ante competition regulation. This means that they want the CCI's enforcement powers to be supplemented such that it allows it to pre-empt and prevent digital enterprises from indulging in anti-competitive conduct in the first place.
- The overriding sentiment towards the draft Bill has been one of opposition. First, there is considerable scepticism on how well an ex-ante model of regulation will work. This stems in part from the fact that it seems to be transposed from the EU to India without taking into account differentiating factors between the two jurisdictions.

Digital Competition Law (CDCL)

- **the Ministry of Corporate Affairs (MCA) constituted a Committee on Digital Competition Law (CDCL) to examine the need for a separate law on competition in digital markets.**

What is an ex-ante framework?

- **The Competition Act, 2002 is the primary legislation concerned for preventing practices that have an adverse eect on competition.**
- **It establishes the Competition Commission of India (CCI) as the national competition regulator. As with competition law in all other jurisdictions, the Competition Act, 2002 is based on an ex-post framework.**
- **This means that the CCI can use its powers of enforcement only after the anti-competitive conduct has occurred. In the case of digital markets, the CDCL has advocated for an ex-ante competition regulation.**

- **This means that they want the CCI's enforcement powers to be supplemented such that it allows it to pre-empt and prevent digital enterprises from indulging in anti-competitive conduct in the first place.**
- **Ex-ante competition regulation is unusual.The term ex-ante (sometimes written ex ante or exante) is a phrase meaning "before the event".**
- **The European Union is the only jurisdiction where a comprehensive ex-ante competition framework, under the Digital Markets Act, is currently in force.**

- **The CDCL agrees with this approach because of the unique characteristics of digital markets.**
- **First, digital enterprises enjoy economies of scale and economies of scope, that is, reduction in cost of production per unit as the number of units increase and reduction in total costs of production with increase in number of services respectively**

What is the draft's basic framework?

- The draft Bill follows the template of the EU's Digital Markets Act.
- It does not intend to regulate all digital enterprises, and places obligations only on those that are "dominant" in digital market segments.
- At present, the draft Bill identifies ten 'core digital services' such as online search engines, social networking services, video sharing platform services etc.

- **The draft Bill prescribes certain quantitative standards for the CCI to identify dominance of digital enterprises.**
- **These are based on the ‘significant financial strength’ test which looks at financial parameters and ‘significant spread’ test based on the number of users in India.**

- **Even if the digital enterprise does not meet quantitative standards, the CCI may designate an entity as a “systemically significant digital enterprise (SSDE)” based on qualitative standards.**
- **The primary obligation of SSDEs is to not indulge in anti-competitive practices.**
- **These require the SSDE to operate in a fair, non-discriminatory and transparent manner with its users.**

- **The draft Bill prohibits SSDEs from favouring its own products on its platform over those of third parties (self-preferencing); restricting availability of third party applications and not allowing users to change default settings; restricting businesses users of the service from directly communicating with their end users (anti-steering) and tying or bundling of non-essential services to the service being demanded by the user.**

- **SSDEs also cannot cross utilise user data collected from the core digital service for another service and non-public data of users cannot be used to give unfair advantage to the SSDE’s own service**

Harnessing solar power

Expansive potential: Aerial view of CEME1 solar plant, near the town of Maria Elena, Antofagasta region, Chile. Chile opened its largest solar plant with 8,82,720 photovoltaic panels deployed on an area equivalent to 370 football fields, a new symbol in the expansion of green energy developed by the country. It is supplied by solar radiation from the Atacama Desert, the driest in the world. AFP

María Elena Solar Power Plant

- **María Elena Solar Power Plant is a concentrated solar power plant with a molten-salt technology system that is currently under construction in the commune of María Elena in the Antofagasta Region of Chilé.**

Mali reiterates that exit from regional bloc is irreversible

Agence France-Presse
DAKAR

Mali's Foreign Minister Abdoulaye Diop has reiterated the irreversible exit of his country, Burkina Faso and Niger from the Economic Community of West African States (ECOWAS), despite reconciliatory efforts from the bloc.

The military leaders of Niger, Mali and Burkina Faso broke away from regional grouping ECOWAS earlier this year and formed a confederation of their own on Saturday.

ECOWAS heads of state met in Abuja a day later and appointed the Presidents of Senegal and Togo as mediators of dialogue with the three Sahel states.

Mr. Diop said Mali remained open to cooperation with ECOWAS during an appearance late on Monday on state broadcaster ORTM.

Mali's seat remain empty during the ECOWAS summit in Nigeria on Sunday. REUTERS

But he spoke out against the possible introduction of visas for nationals of the three countries travelling within ECOWAS.

The three countries' decision to leave the bloc was fuelled in part by their accusation that France was manipulating ECOWAS and not providing enough support for anti-jihadist efforts.

"Our heads of state were very clear in Niamey when they said the withdrawal of the three countries from ECOWAS is irrevocable and was done without delay, and from now on we must stop looking in the rear-view mirror", Mr. Diop said on Monday.

'Open to cooperation'

Mali remains "open to working with our neighbours and other organisations with which we share this space", he added.

Mr. Diop said the creation of a confederation was only one stage of the process, adding that "the vision is to work towards a federation of the three states".

The military leaders of Niger, Mali and Burkina Faso broke away from regional grouping ECOWAS earlier this year and formed a confederation of their own .

About ECOWAS

The Heads of State and Government of fifteen West African Countries established the Economic Community of West African States (ECOWAS) when they signed the ECOWAS Treaty on the 28th of May 1975 in Lagos, Nigeria.

The Treaty of Lagos was signed by the 15 Heads of State and government of Benin, Burkina Faso, Côte d'Ivoire,

- **The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sierra Leone, Sénégal and Togo, with its stated mission to promote economic integration across the region.**
- **The Senegalese President was represented by the Minister for Foreign Affairs. Cabo Verde joined the union in 1977.**
- **The only Arabic-speaking Member Mauritania withdrew in December 2000. Mauritania recently signed a new associate-membership agreement in August 2017**

- **The Authority of Heads of State and Government of the Economic Community of West African States (ECOWAS) held its 65th Ordinary Session in Abuja, Nigeria, today July 7, 2024**

The innate limitations in executing iCET

Rahul Bedi

writes on defence and security issues

Despite the seemingly successful talks between National Security Adviser Ajit Doval and his U.S. counterpart Jake Sullivan in June, to make progress on the bilateral Initiative on Critical and Emerging Technologies (iCET), structural challenges endure in its execution.

Local industry officials and military analysts maintain that these impediments pertain primarily to the autonomy of U.S. defence companies with regard to transferring technology, which have been developed at immense cost at Washington's behest with many companies zealously guarding their intellectual property rights (IPR) over it. Additionally, the U.S.'s strict export control laws in this regard, controlled by its defence industrial complex, were loath to sharing military technologies via joint ventures, however meaningful they might be to Washington's wider strategic interests.

For now, the iCET's defence component is focused on India locally manufacturing General Electric GE F-414INS6 after burning turbofan engines to power the under-development Tejas Mk-II light combat aircraft and locally assembling 31 armed MQ-9 armed Reaper/ Predator-B unmanned aerial vehicles (UAVs), under acquisition for all three services, for around $3 billion.

Limitations

Official sources claimed negotiations had been concluded for GE to transfer around 80% technology to Hindustan Aeronautics Limited to produce the F-414 engines, but not critical know-how related to forging metallurgy discs for the power packs turbines. Technology transfer from General Atomics Aeronautical Systems to assemble the MQ-9s reportedly stands at around 10-15%, and includes establishing a domestic maintenance, repair and overhaul (MRO) facility for the UAVs. Alongside, directly acquiring, licence-building and co-developing the General Dynamics Land Systems Stryker Infantry Combat Vehicle for the Indian Army, under iCET patronage, is under negotiation.

Impediments pertain primarily to the autonomy of U.S. defence companies with regard to transferring technology

But innate limitations in all these ventures persist.

Military analyst Abhijit Singh said that the U.S. government does not presume to act on behalf of its defence companies that own the IPRs for their sundry wares. Besides, U.S. defence vendors, he cautioned, were answerable to their shareholders, whose motivations were largely commercially driven. This, in turn, could adversely impact the quantum of technology they were willing to transfer.

It was precisely these mercantile considerations, weighed down by cumbersome bureaucracies, that led to the failure of the 2012 Defence Technology and Trade Initiative (DTTI) between India and the U.S., and on whose ashes the iCET emerged in June 2023, albeit with a more ambitious remit.

The DTTI flopped due to technology transfer issues. The iCET emerged enabled, in turn, by an alphabet soup of organisations including INDUS-X (India-U.S. Defense Acceleration Ecosystem), Joint IMPACT (INDUS-X Mutual Promotion Advanced Collaborative Technologies) 1.0, IMPACT 2.0 and ADDD (Advanced Domains Defense Dialogue).

Exercising 'jugaad'

Meanwhile, a cross-section of domestic defence industry officials averred that one strategy to ensure iCETs attainment, and that of related projects, centred on the U.S. permitting the Indian military to exercise the *jugaad* or innovative option on its U.S. platforms such as attack and heavy-lift helicopters, heavy transport aircraft, and naval surveillance aircraft it had acquired. After all, this resourceful *jugaad* recourse had provided India's military with user flexibility, by ably rendering imported platforms serviceable in climatic extremes and assorted terrain. Through trial and error over decades, the services had elevated *jugaad* to sophisticated levels to ensure that foreign weapon systems performed over their declared potential. For instance, *jugaad* had rendered the fleet of Chetak's and Cheetah's, principally French-origin Alouette III's and SA-315B Lama's, capable of operating to heights over 14,000 feet in the Siachen glacier region, a feat their original equipment manufacturers had never deemed possible.

But the complex set of 'enabling' protocols that India had executed with the U.S. ahead of acquiring all the aforementioned assets simply foreclosed the possibility of pursuing the established, and at times, essential *jugaad* route. Besides, most of these acquisitions effected via the Foreign Military Sales or FMS route were concluded under the stricter 'Golden Sentry' end-use monitoring programme which completely disallows *jugaad*.

The iCET also appears to be part of the U.S.'s overall policy, outlined in a recent Senate Foreign Relations Committee report, which urged President Joseph Biden to address the ticklish issue of India's close strategic ties with Moscow and particularly its dependency on Russian arms. The implicit suggestion in the February 2023 report was that India should now begin sourcing its future military kit from Washington, conceivably via the iCET route.

Hopefully, the iCET will not fall prey to Augustine's Laws, the tongue-in-cheek aphorisms immortalised by Norman Augustine, an Under Secretary of the U.S. Army. One Law states that the more time both sides spend talking about what they had been doing, the less time they had to spend doing what they were talking about. And eventually they (could) end up spending more and more time talking about less and less, until finally they spent all their time talking about nothing.

What is iCET??

What is iCET?

- **The Initiative on Critical and Emerging Technologies is a framework agreed upon by India and the U.S. for cooperation on critical and emerging technologies in areas including artificial intelligence, quantum computing, semiconductors and wireless telecommunication.**

- **It was launched in January 2023 to strengthen their strategic partnership and drive technology and defence cooperation.**
- **Mr. Modi and Mr. Biden first announced the framework on the sidelines of the Quad meeting in Tokyo in May 2022.**
- **“The United States and India affirm that the ways in which technology is designed, developed, governed, and used should be shaped by our shared democratic values and respect for universal human rights**

What are the focus areas of the initiative?

- **Primarily, the iCET seeks to position New Delhi and Washington D.C. as “trusted technology partners” to build supply chains and support the coproduction and codevelopment of item**

- **Key takeaways include setting up a research agency partnership to drive collaboration in areas like AI; developing a new defence industrial cooperation roadmap to accelerate technological cooperation for joint development and production; developing common standards in AI;**
- **developing a roadmap to accelerate defence technological cooperation and ‘innovation bridge’ to connect defence startups;**

- **supporting the development of a semiconductor ecosystem; strengthening cooperation on human spaceflight; advancing cooperation on development in 5G and 6G; and adopting OpenRAN network technology in India.**

- , a new initiative to advance cutting edge technology cooperation, known as the India U.S. Defence Acceleration Ecosystem (INDUSX), is set to be launched during the visit.
- India and the U.S. have also concluded a roadmap for ‘Defence Industrial Cooperation’ to guide the policy direction for the next few years.

- **The two countries have also established a Strategic Trade Dialogue to remove regulatory “barriers” and review existing export control norms to take forward strategic technology and trade collaborations envisaged under iCET**

Topics

- Zika virus
- What is scientific deep drilling?
- Dengue virus
- Caste census
- Star tortoise
- Mains

By saurabh Pandey

THE HINDU

Zika virus: the need to improve surveillance and vector control

Zubeda Hamid

The Zika virus is making the news once again. At least 15 cases, including eight pregnant women, of Zika have been discovered so far in Pune, Maharashtra. In Karnataka, a 74-year-old who had Zika has died. State Health Department officials say the death was caused by other factors. Another suspected case in Karnataka is being investigated as well.

The Pune Municipal Corporation has said it has stepped up surveillance; the Karnataka Health Department has released guidelines on the virus for the public, and both States have urged members of the public to ensure there are no mosquito-breeding sites at their homes.

Meanwhile, the Union Health Ministry has issued an advisory to States to be vigilant; screen pregnant women, and strengthen entomological surveillance and intensify vector-control activities.

The Indian Council of Medical Research (ICMR) has asked States not only to increase testing for Zika but also to test patients with chikungunya and dengue-like symptoms who test negative for these infections for Zika, as per a news report.

As the monsoon continues over large parts of the country, creating ideal breeding grounds for mosquitoes, and with cases of dengue spiking as well, State administrations and members of the public need to step up mosquito-control measures to prevent transmission of diseases.

Here's a quick FAQ on Zika:

What is Zika virus?

As per the World Health Organization (WHO), Zika virus is a mosquito-borne virus first identified in Uganda in 1947 in a Rhesus macaque monkey, followed by evidence of infection and disease in humans in other African countries in the 1950s. Zika virus occurs through the bite of infected Aedes mosquitoes, mainly Aedes aegypti, which also transmits dengue and chikungunya. The Aedes mosquitoes usually bite during the day. Sexual transmission, transmission from mother to foetus and transfusions of blood and blood products are other routes of transmission.

Mosquitoes carry dengue, yellow fever, chikungunya and Zika. AP

How it manifests?

Most people infected with the Zika virus do not develop symptoms, the WHO says. Among those who do, they typically start 3-14 days after infection and are generally mild, including rash, fever, conjunctivitis, muscle and joint pain, and headache, which usually last for 2-7 days.

How is it diagnosed?

Zika virus may be suspected based on symptoms or the fact that the person is living in or visiting areas where Zika transmission has occurred. A diagnosis can only be given after a laboratory test. A recent report in *The Hindu* pointed to gaps in the tracking and surveillance of the virus, highlighting the fact that in March 2023, the Central Drugs Standard Control Organisation (CDSCO), India's apex agency for diagnostic approvals, confirmed that there was no approved diagnostic test for Zika. This limitation, the report said, hinders the country's ability to diagnose Zika. At present, samples are generally sent to a few select labs, including the National Institute of Virology, for confirmation. The NIV, a media report indicates, is flooded with samples, leading to delays in the issuing of reports.

What are the ill effects?

Zika virus infection during pregnancy, the WHO says, can cause infants to be born with microcephaly and other congenital malformations and can also cause preterm births and miscarriage. Microcephaly is a condition in which an infant's head is smaller than what is typical for their age and can be caused by the brain not developing properly. An estimated 5-15% of infants born to women infected with Zika virus during pregnancy have evidence of Zika-related complications, as per the WHO. Zika virus infection is also associated with Guillain-Barré syndrome, neuropathy, and myelitis in adults and children. Guillain-Barré syndrome is a rare condition that causes a person's immune system attacks the peripheral nerves.

Is there a vaccine?

No vaccine is as yet available for the prevention or treatment of Zika virus infection, the WHO says. The development of a Zika vaccine remains an active area of research.

A few studies have shown promising results. In India for instance, several companies are attempting to make a vaccine. In a study published in 2017, Bharat Biotech's "killed Zika virus vaccine" which uses an African strain showed 100% efficacy against mortality and disease in animal studies. Indian Immunologicals Limited, a wholly-owned subsidiary of the National Dairy Development Board said earlier this year that it was also working on developing a vaccine.

(zubeda.h@thehindu.co.in)

What is Zika virus?

- As per the World Health Organization (WHO), Zika virus is a mosquito-borne virus rst identied in Uganda in 1947 in a Rhesus macaque monkey, followed by evidence of infection and disease in humans in other African countries in the 1950s.
- Zika virus occurs through the bite of infected Aedes mosquitoes,mainly Aedes aegypti, which also transmits dengue and chikungunya.

- **The Aedes mosquitoes usually bite during the day.**
- **Sexual transmission, transmission from mother to foetus and transfusions of blood and blood products are other routes of transmission**

- **No vaccine is as yet available for the prevention or treatment of Zika virus infection, the WHO says. The development of a Zika vaccine remains an active area of research.**

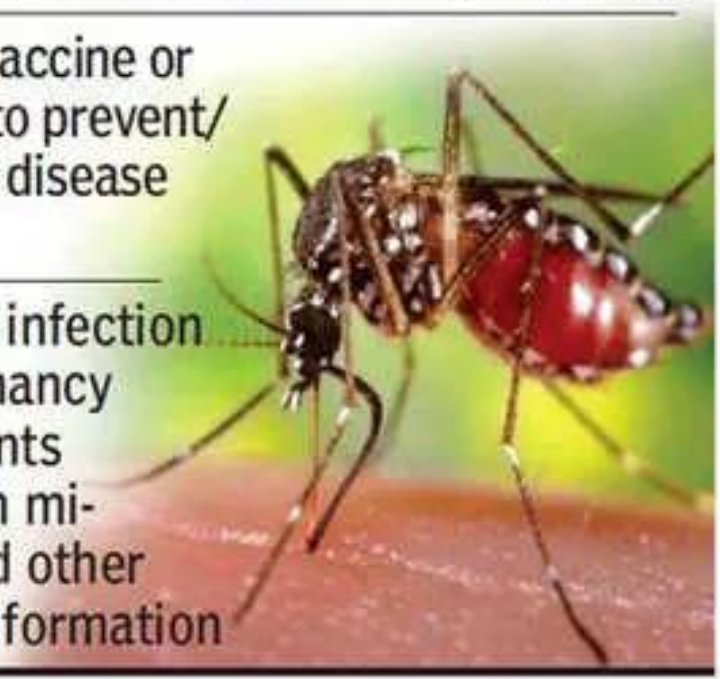
ALL ABOUT ZIKA VIRUS DISEASE

Zika virus disease is an emerging viral disease transmitted through the bite of an infected Aedes mosquito

Symptoms

- Most of those infected with Zika virus disease either remain asymptomatic or show mild symptoms of fever, rash, conjunctivitis, body ache, joint pain
- Severe forms of disease requiring hospitalization is uncommon and fatalities are rare

- There is no vaccine or drug available to prevent/ treat Zika virus disease at present
- Zika virus infection during pregnancy can cause infants to be born with microcephaly and other congenital malformation



Why is India drilling a 6-km deep hole in Maharashtra?

The Borehole Geophysics Research Laboratory (BGRL) in Karad, Maharashtra, is a specialised institute mandated to execute India's scientific deep-drilling programme. Under BGRL, the aim is to drill the earth's crust and conduct scientific observations to help expand our understanding of reservoir-triggered earthquakes in the Koyna-Warna region

P DIVE: At the deep-drilling site in Koyna region, Maharashtra, the towering drilling rig is seen surrounded by associated equipment, an onsite mud logging unit, gas analysis lab, and a geological studies lab. MOES IGRI.

Bhavya Khanna
Sukanta Roy
M. Ravichandran

Scientists don't yet have a way to predict when and where an earthquake will occur. We know powerful earthquakes at the boundaries of tectonic plates, which measure more than 7.5 on the Richter scale, are almost certainly associated with a severe loss of infrastructure and life. In the ocean, these geological events trigger tsunamis. However, more minor earthquakes that occur in a plate's interior are more challenging to predict because they occur at the least expected sites and could strike densely populated habitats. This is why scientific deep drilling is an indispensable tool for progress in the earth sciences.

What is scientific deep drilling?

Scientific deep-drilling is the enterprise of strategically digging boreholes to analyse deeper parts of the earth's crust. It offers opportunities and access to study earthquakes and expands our understanding of the planet's history, rock types, energy resources, life forms, climate change patterns, and more.

The Borehole Geophysics Research Laboratory (BGRL) in Karad, Maharashtra, is a specialised institute under the Ministry of Earth Sciences mandated to execute India's sole scientific deep-drilling programme. Under BGRL, the aim is to drill the earth's crust to a depth of 6 km and conduct studies to help expand the understanding of reservoir-triggered earthquakes in the Koyna-Warna region of Maharashtra.

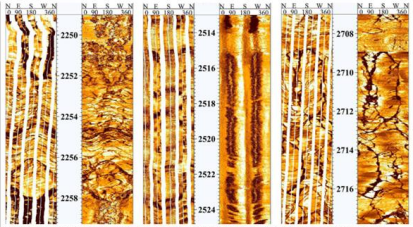
This region has been experiencing frequent earthquakes since the Shivaji Sagar Lake, or the Koyna Dam, was impounded in 1962. BGRL's 3-km-deep pilot borehole in Koyna is complete; the Ministry of Earth Sciences is committed to reaching a depth of 6 km.

Benefits of a deep-drilling mission

Earthquakes are challenging to study. Surface-level observations can't make complete sense of them. The recurrent earthquakes in Koyna are synchronous with the dam's loading and unloading during the monsoon and post-monsoon periods, offering an opportunity to widen our understanding of earthquakes.

However, making observations inside the earth is a different ball game. Scientifically drilled boreholes can be a hub of direct, *unique in situ* experiments and observations and monitor a region's fault lines and seismic behaviour. They also provide exact and fundamental knowledge of the composition of the earth's crust, structure, and processes, and help validate models based on surface studies. Thus, it can inform a range of societal problems related to geohazards and geo-resources.

Investing in scientific deep-drilling can also help expand scientific know-how and technological innovation, especially in seismology (the study of earthquakes). It can also spur the development of tools and equipment for drilling, observation, data analysis, sensors, etc.



High-resolution images (electrical and acoustic) of the borehole wall at a depth of 2,248-2,718 m in the Koyna pilot borehole showing the presence of fault-fracture zones and rock-deformation features in detail. MOES IGRI.

Challenges of scientific deep drilling

Scientific deep drilling is the best tool to study the earth's interior. Other ways include geophysical measurements of seismic wave speed, gravitational and magnetic fields, and electrical conductivity from the near surface. Scientists can also examine crust fragments brought from deep underground to the surface.

But scientific deep-drilling remains the most reliable method because it helps get direct (*in situ*) and near-source measurements. Researchers can also capture rock and sediment cores aligned with the earth's timeline from within the borehole. It is also labour- and capital-intensive. The earth's interior is a hot, dark, high-pressure region that hinders long and continuous operations.

Even with these challenges, however, scientific pursuits are important. Expanding earth-science research, especially of solid earth, is crucial. Aside from earthquakes, this is because many surface phenomena – the composition of water and air, their availability, and the resulting interactions with climate-affected phenomena – are linked to what happens inside the earth's crust.

What is the drilling technique?

The Koyna pilot borehole is about 0.45 m wide (at the surface) and roughly 3 km deep. It employs a unique drilling strategy – a hybrid of mud rotary drilling and air hammering.

In rotary drilling, a rotating drilling rod made of steel is attached to a diamond-embedded drill bit at the bottom. As it penetrates the crust, it generates considerable heat due to friction, so drilling mud is flushed through the rod into the borehole to cool the drill bit. In addition to being a coolant and a lubricant, the drilling mud helps bring rock cuttings up from the borehole.

A ring-shaped space separates the drilling rod and borehole wall. The debris moves out from the space due to the pressure of the drilling mud pumped from the top through the drilling rod. The deeper the borehole, the more pressure is required to bring up the debris from this space.

Air hammering pushes highly compressed air through the drilling rod to deepen the borehole and flush the cuttings out.

Deep-drilling operations at Koyna use a rig capable of both techniques. The decision to use each technique at a particular point is based on the rock type, presence of highly fractured rock, water inflow zones, and the need to collect core samples, among others.

Decisions of this kind are dynamic. Operators used the mud rotary technique to acquire cores because it allowed us to capture long, intact cylindrical sections. Where operators used air-hammering, the team collected rock chips for studies of rock properties.

The operators also have to circulate the drilling mud while making downhole measurements of physical and chemical properties of the borehole environment using temperature, density, electrical conductivity, sonic velocity, rock porosity, and radioactivity probes – while installing steel pipes to secure the borehole's sides.

When the borehole depth increases beyond 3 km and strikes for 6 km, the entire rig will have to be updated with exponentially enhanced capacity. In addition, increasing the depth to 6 km heightens the complexities of drilling through fractured rocks in the Koyna seismic zone and the possibility of drill rods and sensors getting stuck.

Troubleshooting also becomes more complicated because of limited access to equipment deeper down the hole. Rocks at these depths are softer so drilling mud is lost. Further, a 4-in wide and 9-metre-long granite core can weigh up to 200 kg, and lifting it up by more than 3 km is technically exacting. Operators will also encounter fault lines and fracture zones more often, through which water could enter the borehole and stall drilling.

If any of the above situations arise and troubleshooting fails, we may have to abandon the borehole. Another challenge is to steer the borehole at the desired inclination from the top, using vertically controlled actions. This requires drill motors, imaging tools, and monitoring devices that can be 'tuned' every minute. The planning and execution of deep-drilling are thus dynamic and must be foolproof. Human resources are also a challenge. The process needs highly skilled technical personnel for continuous on-site engagement for 6-8 months at a time in harsh weather; this was the case for the 3 km pilot borehole. For a 6 km borehole, continuous drilling will last at least 12-14 months.

What have scientists found?

The pilot drilling mission was a success and has yielded significant new information about the subsurface geological environment. For one, it revealed 1.2-km thick, 65 million-year-old Deccan trap lava flows, and below them 2,500-2,700-million-year-old granitic basement rocks. Downhole measurements of core samples and conditions from a depth of 3 km have also provided new information about the physical and mechanical properties of rocks, the chemical and isotopic composition of formation fluids and gases, temperature and stress regimes, and fracture orientations.

We also captured high-resolution images of the borehole wall using acoustic and micro-resistivity techniques. They can be used to validate data extracted from other cores worldwide. The team at Koyna also conducted hydraulic fracturing experiments to directly measure the rocks' stress regimes. We expect data from these experiments to be useful for many years, especially to understand the reasons for recurrent earthquakes in specific geographies. By integrating various datasets and using advanced analysis, the team could also detect buried fault zones and study their properties. One significant finding was the presence of water down to 3 km! It was found to be meteoric or rain-fed, implying deep percolation and circulation are possible. Another key finding was that the Koyna region is critically stressed, even small stress perturbations could cause the rock to fail and potentially trigger frequent, small-magnitude earthquakes in the region.

> Earthquakes that occur in a plate's interior are challenging to predict because they occur at the least expected sites and could strike densely populated habitats

What next?

The pilot data will inform future drilling. Modelling experiments suggest the temperature at 6 km could be 180-210 degrees C. Drilling equipment, downhole data acquisition systems, and sensors for long-term placement at depth need to be designed accordingly. The Koyna data and samples will also facilitate new experiments. More than 20 research groups nationwide are already studying the Koyna samples. One is examining the gauge from fault zones to understand the frictional properties of rocks in quake-prone regions. Another is characterising microbes on these rocks to understand life forms that thrive in hot, dark, nutrient-poor environments. Their findings could potentially yield new molecules and clues to improve industrial processes.

Members of the international geological research community have also sought access to core samples for projects in emerging fields such as carbon capture and storage in the deep Deccan traps. In sum, the Koyna exercise is establishing a firm footing in scientific deep-drilling for India. Its lessons will inform future deep-drilling experiments and expand academic knowledge in multiple ways.

(Bhavya Khanna is a Scientist D, Communication in Science, at the Ministry of Earth Sciences (MoES); Sukanta Roy is a Scientist G and Head of Borehole Geophysics Research Laboratory, Karad, under MoES; and M. Ravichandran is the Secretary to the Government of India, MoES.)

Read the article in full online
Visit bit.ly/deepdrillingprogramme

What is scientific deep drilling?

- Scientific deep-drilling is the enterprise of strategically digging boreholes to analyse deeper parts of the earth's crust.
- It offers opportunities and access to study earthquakes and expands our understanding of the planet's history, rock types, energy resources, life forms, climate change patterns, and more.
- The Borehole Geophysics Research Laboratory (BGRL) in Karad, Maharashtra, is a specialised institute under the Ministry of Earth Sciences mandated to execute India's sole scientic deep-drilling programme.

- **Under BGRL, the aim is to drill the earth's crust to a depth of 6 km and conduct studies to help expand the understanding of reservoir-triggered earthquakes in the Koyna-Warna region of Maharashtra.**
- **This region has been experiencing frequent earthquakes since the Shivaji Sagar Lake, or the Koyna Dam, was impounded in 1962.**
- **BGRL's 3-km-deep pilot borehole in Koyna is complete; the Ministry of Earth Sciences is committed to reaching a depth of 6 km**

- **Benefits of a deep-drilling mission Earthquakes are challenging to study.**
- **Surface-level observations can’t make complete sense of them.**
- **The recurrent earthquakes in Koyna are synchronous with the dam’s loading and unloading during the monsoon and post-monsoon periods, offering an opportunity to widen our understanding of earthquakes.**
- **However, making observations inside the earth is a different ball game.**

- **Scientifically drilled boreholes can be a hub of direct, unique in situ experiments and observations and monitor a region’s fault lines and seismic behaviour.**
- **They also provide exact and fundamental knowledge of the composition of the earth’s crust, structure, and processes, and help validate models based on surface studies.**
- **Thus, it can inform a range of societal problems related to geohazards and geo-resources.**

Why are dengue cases on the rise worldwide?

Are urbanisation and climate change fuelling dengue spread in the world?

Serena Josephine M.

The story so far:

Dengue cases have surged in India, with Karnataka, Kerala, and Tamil Nadu seeing significant increases. According to data published by the National Centre for Vector Borne Diseases Control, as of April 30, India recorded 19,447 cases and 16 deaths, with Kerala and Tamil Nadu leading in numbers. Karnataka, initially reporting 2,503 cases, has now recorded 7,840 cases and seven deaths as of July 10, with 293 new cases reported on that day alone.

What is the global situation of dengue?

According to the World Health Organization (WHO), as of April 30, over 7.6 million cases of dengue were reported in 2024. This included 3.4 million confirmed cases, over 16,000 severe cases and over 3,000 deaths. In an update on the global scenario on May 30, it said that 90 countries have known active dengue transmission, adding that "not all of which have been captured in formal reporting".

The WHO noted that at least five countries, including India, were grappling with the onset of monsoon season, which created suitable conditions for the breeding and survival of Aedes mosquito. Urbanisation and population movements have also played a pivotal role in the increasing burden in the region.

Dengue is endemic in more than 100 countries in the WHO regions of Africa, the Americas, the Eastern Mediterranean, South-East Asia and Western Pacific. The Americas, South-East Asia and Western Pacific regions were the most seriously affected, with Asia accounting for around 70% of the global disease burden. However, it also noted that dengue is spreading to new areas in Europe, the Eastern Mediterranean and South America.

How does dengue spread and how is it treated?

Dengue virus is transmitted to humans through the bite of infected mosquitoes, with the primary vector that transmits the disease being Aedes aegypti. While cases are mostly asymptomatic or mild, some may develop severe dengue that could include shock, severe bleeding or organ impairment. According to the National Guidelines for Clinical Management of Dengue Fever, dengue presents as an acute febrile illness lasting two to seven days, characterised by symptoms such as headache, retro-orbital pain, myalgia, arthralgia, rash, and hemorrhagic manifestations. In those without any warning signs or complications, dengue is managed through symptomatic and supportive treatment.

What are the emerging patterns in dengue?

Researchers and public health experts have been closely monitoring the emerging patterns in dengue.

According to the WHO, factors contributing to the increasing risk of dengue epidemics include the changing distribution of the Aedes aegypti vector, urbanisation, and human activities that create conducive environments for vector-host interaction, and climate change-induced shifts in weather patterns.

In the article 'Prevention and Control Strategies to Counter the Dengue Cyclical Trend in Tamil Nadu', published in the Tamil Nadu Journal of Public Health and Medical Research, public health officials said that the first epidemic of clinical dengue-like illness was recorded in erstwhile Madras in 1780. Dengue virus was isolated in India during 1945 for the first time. The first evidence of the occurrence of dengue fever in the country was reported in 1956 from Vellore district in the State, they said.

They said the infection has spread to all geographic regions due to rapid increase in urbanisation, expanding travel patterns and climatic changes.

Tamil Nadu, they said, has witnessed outbreaks of dengue infection once every five years in the past decade with the last outbreak occurring in 2017.

The State's Director of Public Health and Preventive Medicine T. S. Selvavinayagam pointed out seasonal variation every five years, probably due to the building up of susceptible populations. "We are seeing cases throughout the year. There are more cases in a short time if control measures are not taken on time. As for Tamil Nadu, we expect cases to rise in the coming months. Surveillance and immediate response are critical. Along with this, community empowerment and education is needed," he said.

THE GIST

- Dengue cases have surged in Karnataka, Kerala, and Tamil Nadu, with significant increases reported
- Dengue is endemic in over 100 countries, with the Americas, Southeast Asia, and the Western Pacific regions most affected.
- Factors contributing to dengue epidemics include changing mosquito distribution, urbanisation, human activities, and climate change.

- **The WHO noted that at least five countries, including India, were grappling with the onset of monsoon season, which created suitable conditions for the breeding and survival of Aedes mosquito.**
- **Urbanisation and population movements have also played a pivotal role in the increasing burden in the region.**
- **Dengue is endemic in more than 100 countries in the WHO regions of Africa, the Americas, the Eastern Mediterranean, South-East Asia and Western Pacific.**

- The Americas, South-East Asia and Western Pacific regions were the most seriously affected, with Asia accounting for around 70% of the global disease burden.
- However, it also noted that dengue is spreading to new areas in Europe, the Eastern Mediterranean and South America.

How does dengue spread and how is it treated?

- Dengue virus is transmitted to humans through the bite of infected mosquitoes, with the primary vector that transmits the disease being Aedes aegypti

According to the WHO, factors contributing to the increasing risk of dengue epidemics include the changing distribution of the Aedes aegypti vector, urbanisation, and human activities that create conducive environments for vector-host interaction, and climate change-induced shifts in weather patterns.

The case for a caste Census

The Census Act, 1948 should be amended to make enumeration by caste mandatory, instead of leaving it to the whims of the Union executive. Such data can be collected as part of the regular Census, with a few pertinent queries added to the questionnaire

FULL CONTEXT

K. Ashok Vardhan Shetty

Peter Drucker famously said, "Only what gets measured gets managed." The problems of social groups that have been historically discriminated against (be it by caste, race, religion, gender, disability etc.) cannot be resolved without collecting data group-identity wise. Doing so is not a capitulation to identity politics but a vital step towards informed policy making and inclusive development.

For instance, Germany's census does not enumerate people by race. This has worked to the disadvantage of its Black people who started a private, country-wide, online survey called Afrozensus in 2020. Its results showed that anti-Black racism is widespread and institutionally entrenched in Germany.

Applying Cicero's test of *cui bono* (who benefits?), it can be said that the demand for enumeration generally emanates from the victims of discrimination and is resisted by vested interests.

Why a caste Census?

A caste Census is crucial for four reasons – one, it is a social imperative. Caste continues to be a foundational social construct in India. Only about 5% of Indian marriages were inter-caste as of 2011-12. The use of caste surnames and caste marks is still widespread. Residential segregation by caste persists. Choices of candidates for elections and ministers for Cabinets continue to be dictated by caste considerations.

Two, it is a legal imperative. Constitutionally-mandated policies of social justice which include reservations in electoral constituencies, education and public employment cannot be pursued effectively without detailed caste-wise data. Even though the Constitution uses the word class instead of caste, various rulings of the Supreme Court have held caste as a 'relevant criterion', 'sole criterion' or 'dominant criterion' for defining a backward class, and have demanded detailed caste-wise data for upholding reservation policies.

Three, it is an administrative imperative. Detailed caste-wise data is necessary to avoid/correct wrongful inclusions of undeserving castes and exclusions of deserving castes, and to guard against a few dominant castes in a reserved category crowding out others. It is also needed for sub-categorising castes within a reserved category and to determine the income/wealth criterion for the creamy layer.

Four, it is a moral imperative. The absence of detailed caste-wise data has helped a coterie of elites, among upper castes and dominant Other Backward Classes (OBCs), to corner a disproportionate share of the nation's assets, incomes, and positions of power.

Censuses in British India between 1881 and 1931 enumerated all castes. In the first Census conducted after Independence in 1951, the Government of India (GOI) ordered that caste should not be enumerated. However, an exception was made for Scheduled Castes (SCs) and Scheduled Tribes (STs) which have been enumerated in every Census since 1951. In 1961, the GOI advised States to conduct their own surveys and draw up State-specific OBC lists if they so desired. There was no reservation for OBCs in the Centre and its undertakings then.

The arguments against caste Census

There are multiple views against the caste Census. These include:-

Number game: Supporters celebrate the release of Bihar's caste Census report, in Patna, in 2023. PTI

First, that it is socially divisive. India's social divisions predate Census efforts by nearly 3,000 years. The Census counts of the SCs and STs since 1951 have not led to any conflicts among these castes or tribes. Further, India's Census enumerates religion, language, and region which are as divisive as caste, if not more. Casteism will not wither away by not counting caste in the Census, any more than communalism, and regionalism will disappear by not enumerating religion, language and region.

Second, that it is an administrative nightmare. Unlike race which is a fuzzy concept, but is still enumerated in many countries such as the U.S., there is little or no ambiguity about anyone's caste. The GOI has been able to smoothly enumerate 1,234 castes in the SC category and 698 tribes in the ST category. Therefore, it is difficult to understand why the enumeration of the 4,000-odd other castes, most of which are State-specific, should pose an intractable problem.

Third, that it would fuel demands for increased reservations. On the contrary, the availability of caste-wise Census data would help curb arbitrary demands from caste groups and capricious decision-making by governments. Policy makers would be able to objectively debate and address the claims of, say, the Marathas, Patidars, Jats, or any other groups for reservations. But governments prefer fuzzy data because it gives them the latitude to implement reservations arbitrarily for electoral considerations.

The case for OBC inclusion in Census

Like the SCs and STs, the Constitution permits reservation for the OBCs in education (Article 15(4)) and public employment (Article 16(4)). After the implementation of the Mandal Commission recommendations, the OBCs enjoy reservations in the Central government and its undertakings as well. In the *Indra Sawhney* case (1992), the Supreme Court ruled that the OBC list, based on the 1931 Census, should be revised periodically.

The OBCs do not have reservation in electoral constituencies for MPs and MLAs like the SCs and the STs. But after the 72nd and 74th amendments (1993), the Constitution provides for reservations in electoral constituencies in panchayats and municipalities not only for SCs and STs but also for OBCs (Articles 243D(6) and 243T(6)). For this, caste-wise, area-wise Census data of the OBCs is essential. Therefore, the GOI should have enumerated the OBCs at least in the 2001 Census. But it did not.

Whenever States like Uttar Pradesh, Madhya Pradesh, Gujarat, Maharashtra, Karnataka, Odisha and Jharkhand tried to implement reservations for the OBCs in elections to local bodies, the High Courts and the Supreme Court stayed the same, on the ground that there was no caste-wise data of OBCs. While one arm of the State – the judiciary –demands caste-wise data to uphold reservations, another – the executive – has avoided enumerating the very same data.

However, the 10% reservation for economically weaker sections (EWS) among those other than the OBCs, SCs and STs (effectively, the upper castes) was upheld by the Supreme Court in 2022 despite the absence of any supporting empirical data. In view of the EWS reservation, the Census should now enumerate all castes including the upper castes as it did till 1931.

While Census is a Union subject, the Collection of Statistics Act, 2008 empowers States and even local bodies to gather the necessary statistics. So, individual States can always do Caste surveys like Karnataka (2015) and Bihar (2023) did. But Census data carries more authority and is less contested. The government's reluctance to enumerate caste as part of the Census is legally indefensible and administratively unwise.

How an attempt at caste Census failed

After considerable lobbying by OBC leaders, in 2010, the Parliament passed a unanimous resolution (with both Congress and BJP on board) calling for caste to be enumerated as part of the 2011 Census. As per the 1931 Census when caste was last enumerated, there were 4,147 castes in India apart from the depressed classes/untouchables (as they were called then). Unfortunately, the Socio Economic and Caste Census (SECC)-2011 was poorly designed and executed, throwing up a ludicrous figure of 46 lakh castes and the results were never released.

The SECC-2011's failure was because of the fact that it was not conducted under the Census Act, 1948 as the Act was not amended to include caste as a parameter. It was conducted through the Union Ministries of Rural Development and Urban Development which did not have prior experience of conducting sociological/anthropological surveys. Additionally, the questionnaire was poorly designed and asked open-ended questions about caste. The enumerators couldn't distinguish between genuine castes, alternative caste names, larger caste groups, sub-castes, surnames, clan names, gotras, etc. In contrast, the Bihar government's Caste Survey in 2023, provided enumerators the list of 214 caste names specific to Bihar, with the 215th category labelled "Other Castes" and came up with better results.

Despite the unanimous Parliamentary resolution of 2010, the Central government announced in 2021 that it would not enumerate caste as part of the next Census. It reiterated this stand before the Supreme Court in a case filed by the Maharashtra government seeking a direction to the Centre to enumerate OBCs in the 2021 Census. The Supreme Court judgment dismissing the Maharashtra government's plea in December 2021 is questionable, considering its own past rulings.

What is the way forward?

Learning from the SECC-2011 failures, the Census Act, 1948 should be amended to make enumeration by caste mandatory instead of leaving it to the whims of the Union executive. Caste should be enumerated as part of the regular Census by the Census Commissioner only, with a few pertinent questions added to the questionnaire. Additionally, the government should enlist sociological/anthropological experts to draw up a draft list of castes specific to each State, publish the draft list online, inviting suggestions and comments from the public before finalising it, and give only that list to the enumerators. The questionnaire should be so designed as to ask the names of the sub-caste, caste, larger caste group, and the caste surname of the respondent. Internet-enabled hand-held devices preloaded with these details and limiting the enumerator's role to one of choosing the correct option will make the task easy and foolproof.

Interested States must move the apex Court to review its 2021 judgment. It is farcical to implement OBC reservation based on 1931 Census data and EWS reservation with no empirical data. The next Census must enumerate caste.

The writer is former IAS officer of Tamil Nadu cadre and former Vice Chancellor, Indian Maritime University, Chennai.

THE GIST

- The problems of social groups that have been historically discriminated against (be it by caste, race, religion, gender, disability etc.) cannot be resolved without collecting data group-identity wise.
- The availability of caste-wise Census data would help curb arbitrary demands from caste groups and capricious decision-making by governments. Policy makers would be able to objectively debate and address the claims of, say, the Marathas, Patidars, Jats, or any other groups for reservations.
- The government should enlist sociological/anthropological experts to draw up a draft list of castes (together with alternative caste names and the names of sub-castes and larger caste groups) specific to each State, publish the draft list online, inviting suggestions and comments from the public before finalising it, and give only that list to the enumerators.

Why a caste Census?

- A caste Census is crucial for four reasons — one, it is a social imperative. Caste continues to be a foundational social construct in India. Only about 5% of Indian marriages were inter-caste as of 2011-12.
- The use of caste surnames and caste marks is still widespread. Residential segregation by caste persists.
- Choices of candidates for elections and ministers for Cabinets continue to be dictated by caste considerations.

- Two, it is a legal imperative.
- Constitutionally-mandated policies of social justice which include reservations in electoral constituencies, education and public employment cannot be pursued effectively without detailed caste-wise data.
- Even though the Constitution uses the word class instead of caste, various rulings of the Supreme Court have held caste as a ‘relevant criterion’, ‘sole criterion’ or ‘dominant criterion’ for defining a backward class, and have demanded detailed caste-wise data for upholding reservation policies.

- **Three, it is an administrative imperative.**
- **Detailed caste-wise data is necessary to avoid/correct wrongful inclusions of undeserving castes and exclusions of deserving castes, and to guard against a few dominant castes in a reserved category crowding out others.**
- **It is also needed for sub-categorising castes within a reserved category and to determine the income/wealth criterion for the creamy layer.**

- Four, it is a moral imperative.
- The absence of detailed caste-wise data has helped a coterie of elites, among upper castes and dominant Other Backward Classes (OBCs), to corner a disproportionate share of the nation’s assets, incomes, and positions of power.
- Censuses in British India between 1881 and 1931 enumerated all castes.
- In the first Census conducted after Independence in 1951, the Government of India (GOI) ordered that caste should not be enumerated.
- However, an exception was made for Scheduled Castes (SCs) and Scheduled Tribes (STs) which have been enumerated in every Census

The arguments against caste Census

- There are multiple views against the caste Census.
- These include:- First, that it is socially divisive. India’s social divisions predate Census efforts by nearly 3,000 years.
- The Census counts of the SCs and STs since 1951 have not led to any conflicts among these castes or tribes.
- Further, India’s Census enumerates religion, language, and region which are as divisive as caste, if not more.

- **Second, that it is an administrative nightmare.**
- **Third, that it would fuel demands for increased reservations.**

- **The problems of social groups that have been historically discriminated against (be it by caste, race, religion, gender, disability etc.) cannot be resolved without collecting data group-identity wise.**
- **The availability of caste-wise Census data would help curb arbitrary demands from caste groups and capricious decision-making by governments.**
- **Policy makers would be able to objectively debate and address the claims of, say, the Marathas, Patidars, Jats, or any other groups for reservations.**

- **The government should enlist sociological/anthropological experts to draw up a draft list of castes (together with alternative caste names and the names of sub-castes and larger caste groups) specific to each State, publish the draft list online, inviting suggestions and comments from the public before finalising it, and give only that list to the enumerators.**

Saving the 'stars'

Indian star tortoises that were rescued during a raid on a house in Ampang in Malaysia's Selangor State. Malaysian authorities arrested six members of an international crime ring known as the "Ninja Turtle Gang" and seized about 200 smuggled tortoises and turtles. AFP

Indian star tortoise (*Geochelone elegans*)

- The Indian star tortoise (*Geochelone elegans*) is a threatened tortoise species native to India, Pakistan and Sri Lanka where it inhabits dry areas and scrub forest.
- It has been listed as Vulnerable on the IUCN Red List since 2016, as the population is thought to comprise more than 10,000 individuals, but with a declining trend. It is threatened by habitat loss and poaching for the illegal wildlife trade.

- It was upgraded to **CITES Appendix I** in 2019 by full consensus among all member states, giving it the highest level of international protection from commercial trade.
- Conservation group **TRAFFIC** found 6,040 were seized globally that were intended to be sold in the pet trade.
- Currently they are commonly bred in many countries to be sold as pets.

Topics

- Almatti Dam
- Wolbachia bacteria
- Tra gene
- palimpsest.
- Two galaxies merging
- Supreme court on CBI Jurisdiction
- The SC ruling on portrayal of disability in films

By Saurabh Pandey

THE HINDU

Topics

- Why are critical minerals important?
- Air pollution harms pollinators more than pests,
- Indian Neutrino observatory
- New particle formation
- Island syndrome
- Monoclonal antibodies
- Mains

By saurabh Pandey

THE HINDU

Farmers, officials in Andhra Pradesh hopeful as water storage rises in Almatti Dam

G.V.R. Subba Rao
VIJAYAWADA

Rainfall in the catchment areas of the Krishna river has kindled the hopes of Water Resources Department (WRD) officials and farmers alike.

The water levels at the Almatti Dam in Karnataka are rising with considerable inflows of 23,678 cusecs as of July 13.

The water stored in the dam is 92.17 tmcft as against its total capacity of 129.72 tmcft. The full reservoir level is 1,705 ft.

The Narayanapur reservoir's storage was 25.5 tmcft. The two major reservoirs have 117.67 tmcft of water currently, as against 40.21 tmcft during the corresponding period last year. The Andhra Pradesh government has released 1,500 cusecs of Krishna water from the eastern delta regulator on the Prakasam barrage last Wednesday.

Full flow: A view of the Lal Bahadur Shashtri reservoir in Almatti over the Krishna river. FILE PHOTO

To meet different needs

First, the water will be utilised to meet the drinking water needs in 11 Assembly constituencies and then will be used to cater to the Kharif crops. The farmers have taken up seedbeds as part of their Kharif operations. Now, with heavy rain lashing upstream of Srisailam, they are pinning hopes on the release of water from the Almatti Dam, which would fill up the reservoirs downstream.

According to WRD officials, as much as 92 tmcft of water is stored in Almatti Dam.

Almatti Dam

- **The Lal Bahadur Shastri Dam is also known as Almatti Dam is a hydroelectric project on the Krishna River in North Karnataka, India which was completed in July 2005.**

Scientists find that a bacteria tricked a wasp to get rid of its males

Shenyang Agricultural University researchers noticed that in the wild, *Encarsia formosa* wasps almost never produced males. In the laboratory, however, they found that if the female wasp was treated with tetracycline, an antibiotic, almost 70% of the progeny were male

D.P. Kasbekar

A hundred years ago, two American researchers named Marshall Hertig and Simeon Burt Wolbach discovered that mosquitoes harboured bacteria within their cells. Other researchers later found similar bacteria in the cells of most insects and many other arthropods. The genus to which the bacteria belonged was named *Wolbachia*.

Wolbachia bacteria are also present in insect eggs, but they are absent in the sperm. This means females can transmit *Wolbachia* to their offspring, whereas males can't – from the bacteria's point of view, an evolutionary dead end. As a result, *Wolbachia* have evolved ways to manipulate their insect hosts to produce more female than male progeny.

A new study reports that the bacteria may have taken it a bit too far this time. Researchers from Shenyang Agricultural University (SAU), China, published a paper in the June 3 issue of the journal *Current Biology* showing that *Wolbachia* bacteria had manipulated the wasp *Encarsia formosa* to entirely get rid of its males.

Tomato leaf with whitefly nymphs (white) parasitised by *Encarsia formosa* wasps (black). These wasps were among the world's first agents of biological pest control. GOLDLOCKI (CC BY-SA 3.0)

THE GIST

A paper in the journal *Current Biology* showed that *Wolbachia* bacteria had manipulated the wasp *Encarsia formosa* to entirely get rid of its males

Wolbachia bacteria can induce unfertilised eggs to somehow double the chromosome number and enable development of female wasps. It is not known how the bacteria do this, but this renders males superfluous

Wolbachia bacteria were shown to be smart enough to double the chromosome number in their host's unfertilised eggs and to supply them with *tra*

The farmer-friendly Amazon

E. formosa wasps are of interest to agricultural scientists because they provide an efficient way to control whiteflies. Whiteflies feed on the sap of plant leaves, causing productivity losses, and are thus a major agricultural pest. Whiteflies belong to the insect order *Hemiptera*, whereas wasps belong to the insect order *Hymenoptera*. The wasp seeks out the nymphs (or larvae) of whiteflies and lays its eggs on them. When the eggs hatch, the larvae that emerge penetrate the nymph, feed on its tissues, grow to adulthood, and in the process kill the nymph.

The progeny wasps emerge from the nymph's carcass. As a parasitoid of whiteflies, the female wasp is in effect a search and destroy weapon. The male wasps are superfluous in this role.

Doubling up with Wolbachia

Generally, among hymenopterans such as ants, bees, and wasps, the eggs fertilised by sperm cells develop into females, while unfertilised eggs develop into males. The males contain only one set of chromosomes, derived from the egg, and are thus said to be haploid. In contrast, the females are diploid because they contain two sets of chromosomes: one set derived from the egg and the other from the sperm.

The females use a specialised form of cell division called meiosis to transmit only one set of chromosomes to their eggs, while the males transmit their single chromosome set to all of their sperm by the more general cell-division process called mitosis. This, in a nutshell, is how haplo-diploid sex determination works.

The SAU researchers noticed that in the wild, the *E. formosa* wasp almost never produced males.

In the laboratory, however, they found that if the female wasp was treated with an antibiotic (usually tetracycline), almost 70% of the progeny were male.

(They are easy to identify with the eye. The females are tiny – about 0.6 mm long – and are black with a yellow abdomen; the males are only slightly larger but completely black.)

The reason for this was that antibiotic treatment reduced the titre, or concentration, of the *Wolbachia* bacteria. As a result, the chromosome number remained undoubled and the eggs developed into males.

That is, normal titres of *Wolbachia* bacteria could induce unfertilised eggs to somehow double the chromosome number and enable the development of female wasps. We don't yet know how the bacteria do this, but again, this action rendered the males superfluous.

The findings are of interest even to scientists whose primary interest is not whitefly control.

A coleoptera gene to the rescue

A gene named *tra* has an evolutionarily conserved role in promoting female development in insects. ('Evolutionarily conserved' means all insects have it.) That is, if the *tra* gene mutates, cells won't be able to make a functional Tra protein, and progeny development proceeds along the default mode towards male production.

> *Wolbachia* bacteria are also present in insect eggs, but they are absent in the sperm. This means females can transmit *Wolbachia* to their offspring, whereas males can't

The SAU researchers found that the *tra* gene in the *E. formosa* genome was missing some 'pieces' important for its function. How then did the female wasps develop?

The researchers found the genome of the wasp's *Wolbachia* bacteria contained a functional version of *tra*. Ordinarily, bacteria don't have any reason to possess a *tra* gene. But the wasp's *Wolbachia* acquired one from a distantly related insect, one belonging to the order coleoptera, which includes beetles. That is, the bacteria had acquired the gene through horizontal gene transfer.

Having lost its own *tra* gene, the *E. formosa* wasps had to rely on their *Wolbachia*'s *tra* gene to allow their eggs to develop into females. This is the first example of a bacterium using a horizontally transferred gene to manipulate female production in an insect.

No males, no species

The males produced by the SAU researchers after antibiotic treatment didn't mate with females and didn't inseminate them. This could be because the males were absent from *E. formosa* populations for so long that they have now lost their ability to mate. An alternative possibility is that the inability to mate was an unintended consequence of antibiotic treatment.

To resolve these two possibilities, scientists will now need to examine those rare naturally produced males to know whether at least a fraction of them can engage in sex with females. If sexual exchange is absolutely missing in the wasp, the species will no longer have the ability to purge bad mutations that accumulate in its genome. In this case, the wasp-*Wolbachia* duo faces a relatively early extinction.

The *Wolbachia* bacteria were shown to be smart enough to double the chromosome number in their host's unfertilised eggs and to supply them with *tra*. But are they also smart enough to occasionally allow a few males to emerge and enable sexual exchange and thus delay their own extinction?

(D.P. Kasbekar is a retired scientist.)

Wolbachia bacteria

- American researchers named Marshall Hertig and Simeon Burt Wolbach discovered that mosquitoes harboured bacteria within their cells.
- Other researchers later found similar bacteria in the cells of most insects and many other arthropods.
- The genus to which the bacteria belonged was named Wolbachia.
- Wolbachia bacteria are also present in insect eggs, but they are absent in the sperm.

- **This means females can transmit Wolbachia to their offspring, whereas males can’t — from the bacteria’s point of view, an evolutionary dead end.**
- **As a result, Wolbachia have evolved ways to manipulate their insect hosts to produce more female than male progeny.**

- A paper in the journal Current Biology showed that Wolbachia bacteria had manipulated the wasp Encarsia formosa to entirely get rid of its males
- Wolbachia bacteria can induce unfertilised eggs to somehow double the chromosome number and enable development of female wasps.
- It is not known how the bacteria do this, but this renders males superfluous Wolbachia bacteria were shown to be smart enough to double the chromosome number in their host's unfertilised eggs and to supply them with tra

E. formosa

- E. formosa wasps are of interest to agricultural scientists because they provide an efficient way to control whiteflies.
- Whiteflies feed on the sap of plant leaves, causing productivity losses, and are thus a major agricultural pest.
- Whiteflies belong to the insect order Hemiptera, whereas wasps belong to the insect order Hymenoptera.

- The wasp seeks out the nymphs (or larvae) of whiteflies and lays its eggs on them. When the eggs hatch, the larvae that emerge penetrate the nymph, feed on its tissues, grow to adulthood, and in the process kill the nymph.
- The progeny wasps emerge from the nymph’s carcass.
- As a parasitoid of whiteflies, the female wasp is in effect a search and destroy weapon. The male wasps are superfluous in this role.

About ‘Tra’

- A gene named tra has an evolutionarily conserved role in promoting female development in insects. (‘Evolutionarily conserved’ means all insects have it.)
- That is, if the tra gene mutates, cells won’t be able to make a functional Tra protein, and progeny development proceeds along the default mode towards male production.
- Having lost its own tra gene, the E. formosa wasps had to rely on their Wolbachia’s tra gene to allow their eggs to develop into females.
- This is the first example of a bacterium using a horizontally transferred gene to manipulate female production in an insect

WHAT IS IT?

Palimpsest: a historic emblem of reuse

Vasudevan Mukunth

For a major part of history, people used parchment to write. Parchment was a writing material made from the untanned skins of animals, especially goats. Since it was expensive in many parts of the world, people often scraped or washed off any existing text on parchment and reused it to write. Any page that has been reused in this manner is called a palimpsest. Writers used many methods to remove existing text from parchment. Until the early Middle Ages, they used milk and oat bran. Older text would often reappear on palimpsests washed in this way and such text was called underwriting. Contemporary scholars have often been able to decipher the underwriting to reveal otherwise inaccessible historical texts; they are also beginning to use machine learning to glean more information from it. Towards the late mediaeval period, writers turned to scraping text away with pumice, permanently 'deleting' it.

Many a famous textual work has survived only as palimpsests, including the Sana'a palimpsest, the Archimedes palimpsest, and Cicero's 'De re publica'.

Other scholars have adopted this word to refer to analogous instances in their fields of study. For example, in astronomy, palimpsests refer to craters on planetary bodies — like other planets and moons — that have become eroded to barely resemble one. A palimpsest in geology is a natural feature created by different structures forming at the same location at different times.

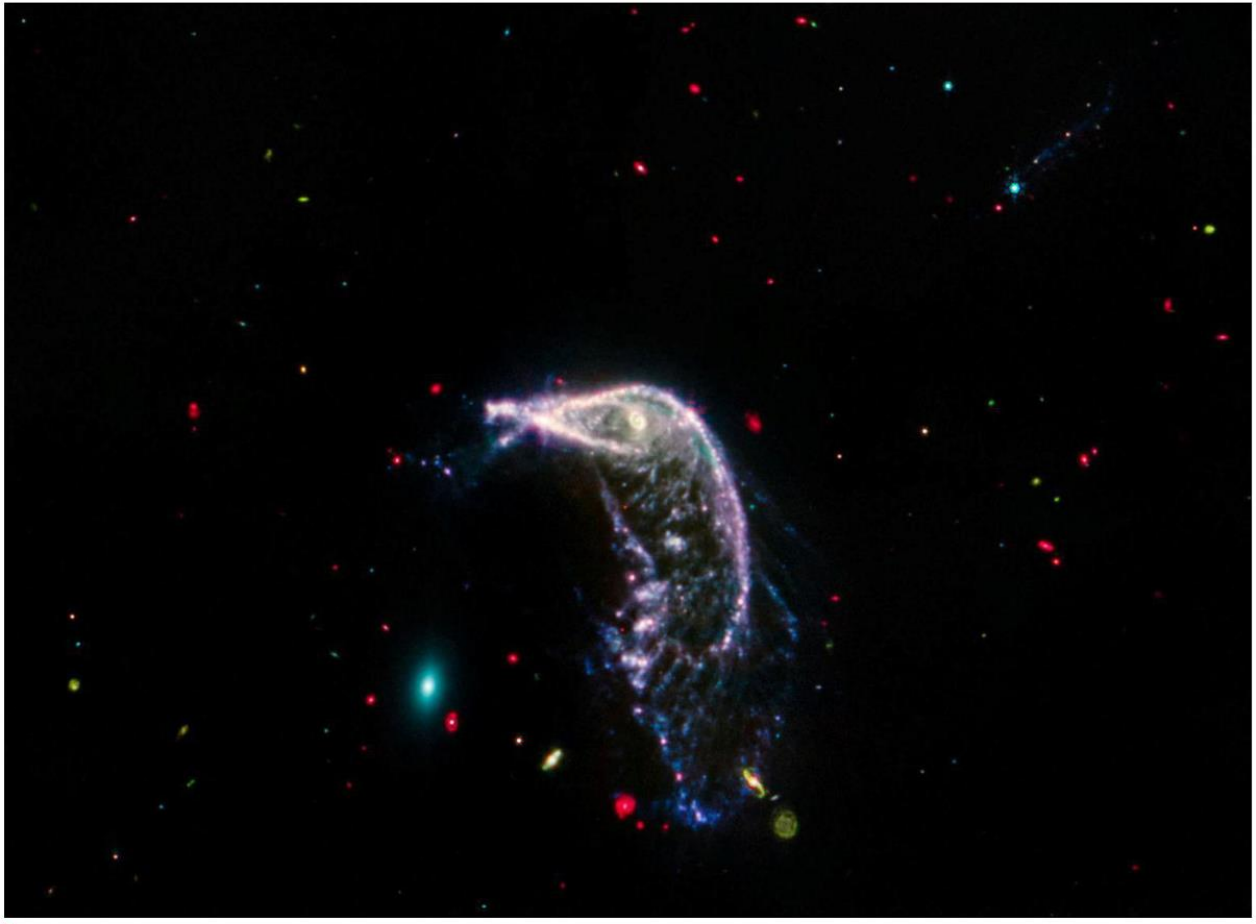
Many a famous work has survived only as palimpsests, including the Sana'a palimpsest, the Archimedes palimpsest, and Cicero's 'De re publica'. Image for representation only. GETTY IMAGES

For feedback and suggestions
for 'Science', please write to
science@thehindu.co.in
with the subject 'Daily page'

palimpsest.

- For a major part of history, people used parchment to write.
- Parchment was a writing material made from the untanned skins of animals, especially goats.
- Since it was expensive in many parts of the world, people often scraped or washed of any existing text on parchment and reused it to write.
- Any page that has been reused in this manner is called a palimpsest.

BIG SHOT



Two galaxies interact in an image taken by the James Webb Space Telescope using its Mid-Infrared Instrument (MIRI). It was released by NASA on Friday. At left is NGC 2937, an elliptical galaxy that looks like a tiny teal oval and is nicknamed the Egg. At right is NGC 2936, a distorted spiral galaxy nicknamed the Penguin, which is larger. NASA, ESA, CSA, STSCI

Two galaxies merging

- **Two galaxies interact in an image taken by the James Webb Space Telescope using its Mid-Infrared Instrument (MIRI).**
- **NGC 2937, an elliptical galaxy that looks like a tiny teal oval and is nicknamed the Egg.**
- **NGC 2936, a distorted spiral galaxy nicknamed the Penguin, which is larger.**

On the jurisdiction of the CBI

Is the Central Bureau of Investigation an independent agency or does it come under the control of the Union government? Does the CBI need the permission of the State to carry out investigation in its territory? Which are the States that have withdrawn general consent to the central agency?

EXPLAINER

Aaratrika Bhaumik

The story so far:

The Supreme Court on July 10 upheld the maintainability of the West Bengal government's suit accusing the Union government of "constitutional overreach" by employing the Central Bureau of Investigation (CBI) to register and investigate cases in the State despite its withdrawal of general consent on November 16, 2018. A Bench comprising Justices B.R. Gavai and Sandeep Mehta rejected the Centre's preliminary objections that it was wrongly made a defendant in the suit as it did not control the CBI, which was an "independent agency." Perusing various provisions of the Delhi Special Police Establishment (DSPE) Act, 1946, under which the CBI functions, the Bench concluded "the very establishment, exercise of powers, extension of jurisdiction, the superintendence of the DSPE [Act], all vest with the Government of India." Accordingly, the Court ruled that the suit discloses a valid cause of action and must be heard on merits. It posted the next hearing on August 13.

What is general consent?

Under Section 6 of the DSPE Act, the CBI is required to obtain consent from the concerned State government before initiating an investigation within its jurisdiction.

This permission is crucial since "police" and "public order" are subjects that fall within the State List under the seventh schedule of the Constitution. However, no such prior consent is necessary in Union territories or railway areas. General consent is given by States to facilitate the agency's seamless investigation into corruption charges against Central government employees in their territories. However, since 2015, several States such as Chhattisgarh, Jharkhand, Kerala, Mizoram, Punjab, Rajasthan, Telangana, Meghalaya and West Bengal have revoked their general consent alleging that the Centre is misusing the federal agency to unfairly target the Opposition. "In the absence of such an omnibus consent, the CBI will be unable to register any fresh cases in these States without the explicit permission of the respective State governments," P.D.T. Achary, former Secretary General, Lok Sabha told *The Hindu*.

What does the case filed by the West Bengal government allege?

In August 2021, the West Bengal government filed an original suit under Article 131 of the Constitution arguing that the actions of the Union government and the involvement of the CBI in the State infringed upon its sovereignty. The suit highlighted that despite the withdrawal of general consent for CBI investigations by the Trinamool Congress government on November 16, 2018, the agency proceeded to register 12 new cases. Deeming this to be a "constitutional overreach," the State sought the annulment of these 12 cases and a restraint on the agency from lodging any further cases.

The framers of the Constitution envisioned such conflicts between the Centre and the States owing to the existing quasi-federal structure and dual polity. As a result, they conferred original and exclusive jurisdiction upon the Supreme Court to address such disputes, under Article 131. For a suit to be maintainable under this provision, two conditions have to be satisfied – it should relate to a dispute between the Government of India and one or more State Governments (or) between one or more State Governments, and it must involve a question of law or fact crucial to the determination of legal rights.

GETTY IMAGES

In *State Of Karnataka vs Union Of India* (1977), the Supreme Court observed that Article 131 is a feature of federalism and should be "widely and generously interpreted" to advance the intended remedy. Similarly, in *State Of Rajasthan & Ors. vs Union Of India* (1977), the top Court cautioned against taking a very "restrictive or a hyper-technical view of the State's rights."

What was the Union government's argument?

Solicitor-General Tushar Mehta, appearing for the Union government, pressed the Court to dismiss West Bengal's suit by raising preliminary objections to its maintainability. He pointed out that original suits under Article 131 of the Constitution exclusively involve the Union and States as parties. "It is the CBI which has registered the cases in question. But the CBI is not a defendant in this suit, and it cannot be made one, as the CBI is not a 'State' under Article 131," Mr. Mehta contended.

He further argued that the CBI was an "independent agency" since it did not function under the direct control of the Union government. "The Union does not supervise the registration of offences or investigation or closure or filing of chargesheet or conviction or acquittal of cases by the CBI," he reasoned. However, later in the proceedings, Mr. Mehta finally conceded that the agency cannot initiate any investigation without the express authorisation of the Union government under Section 5 of the DSPE Act.

On the contrary, senior advocate Kapil Sibal highlighted that the case extended beyond the Centre's control over the CBI to the fundamental question of whether the agency could disregard a specific notification issued by the West Bengal government in 2018, withdrawing its consent. Mr. Sibal asserted that once a State grants and then withdraws its consent, the CBI lacks jurisdiction to exercise its powers within that State.

What did the verdict state?

The Court observed that a bare perusal of the provisions of the DSPE Act reveals that right from the constitution of the CBI, the classes of offences which are to be investigated by it, to its administration and powers, it is the "Central government that it is vitally concerned with."

"Under Section 4 of the DSPE Act, except the offences under the Prevention of Corruption Act, in which the superintendence will be with the Central Vigilance Commission, the superintendence of the DSPE in all other matters would vest with the Central government," Justice Gavai, who authored the verdict, noted. The judge also reminded the Centre that Section 6 of the DSPE Act mandates the prior consent of the State government to a CBI probe within its jurisdiction.

While the Court recognised that the CBI would always be entitled to investigate offences independently, it underscored that this autonomy "would not water down" its administrative control and superintendence that vests with the Centre. It thus proceeded to conclude that the Solicitor General's argument that the CBI is an "independent agency" holds no water.

The verdict, however, clarified that these observations were only made to meet the preliminary objections raised by the Union government and would not have any bearing on the merits of the suit.

What are the implications?

According to Mr. Achary, if the CBI is permitted to initiate investigations in States that have revoked their general consent, it would be an affront to federalism. "This could strain Centre-State relations, particularly since the police is a State subject under the Constitution. Allowing the CBI to register cases would effectively confer upon it the same powers as the State police forces," he adds. While the Supreme Court has so far only addressed the preliminary objections to the maintainability of West Bengal's suit, the constitutional expert pointed out that the final ruling on its merits will have a significant bearing on other similar pending cases.

Another Bench of the top Court is tackling a similar question of law related to the State of Tamil Nadu in the case of Ankit Tiwari, an Enforcement Directorate (ED) officer against whom the Tamil Nadu Directorate of Vigilance and Anti-Corruption had launched a criminal prosecution for bribery. A Bench of Justices Surya Kant and K.V. Viswanathan had recommended judicial oversight over the cross-fire of criminal cases filed between Central agencies like the ED and the police in Opposition-ruled States to protect innocents from prosecution.

THE GIST

- The Supreme Court on July 10 upheld the maintainability of the West Bengal government's suit accusing the Union government of "constitutional overreach" by employing the Central Bureau of Investigation (CBI) to register and investigate cases in the State despite its withdrawal of general consent on November 16, 2018.
- Under Section 6 of the DSPE Act, the CBI is required to obtain consent from the concerned State government before initiating an investigation within its jurisdiction.
- Solicitor-General Tushar Mehta, appearing for the Union government, pressed the Court to dismiss West Bengal's suit by raising preliminary objections to its maintainability. He argued that the CBI was an "independent agency" since it did not function under the direct control of the Union government.

Supreme court on CBI Jurisdiction

- **The Supreme Court on July 10 upheld the maintainability of the West Bengal government's suit accusing the Union government of "constitutional overreach" by employing the Central Bureau of Investigation (CBI) to register and investigate cases in the State despite its withdrawal of general consent on November 16, 2018.**

- **Perusing various provisions of the Delhi Special Police Establishment (DSPE) Act, 1946, under which the CBI functions, the Bench concluded “the very establishment, exercise of powers, extension of jurisdiction, the superintendence of the DSPE [Act], all vest with the Government of India.”**

What is general consent?

- Under Section 6 of the DSPE Act, the CBI is required to obtain consent from the concerned State government before initiating an investigation within its jurisdiction.
- This permission is crucial since “police” and “public order” are subjects that fall within the State List under the seventh schedule of the Constitution.
- However, no such prior consent is necessary in Union territories or railway areas.

- **General consent is given by States to facilitate the agency's seamless investigation into corruption charges against Central government employees in their territories.**
- **However, since 2015, several States such as Chhattisgarh, Jharkhand, Kerala, Mizoram, Punjab, Rajasthan, Telangana, Meghalaya and West Bengal have revoked their general consent alleging that the Centre is misusing the federal agency to unfairly target the Opposition**

About Verdict

- The Court observed that a bare perusal of the provisions of the DSPE Act reveals that right from the constitution of the CBI, the classes of offences which are to be investigated by it, to its administration and powers, it is the “Central government that it is vitally concerned with.”
- “Under Section 4 of the DSPE Act, except the offences under the Prevention of Corruption Act, in which the superintendence will be with the Central Vigilance Commission, the superintendence of the DSPE in all other matters would vest with the Central government,” Justice Gavai, who authored the verdict, noted.

- **The judge also reminded the Centre that Section 6 of the DSPE Act mandates the prior consent of the State government to a CBI probe within its jurisdiction.**
- **While the Court recognised that the CBI would always be entitled to investigate offences independently, it underscored that this autonomy “would not water down” its administrative control and superintendence that vests with the Centre**

The SC ruling on portrayal of disability in films

Are the laws governing rights of differently abled persons being implemented properly?

Sreeparna Chakrabarty

The story so far:

On July 8, while hearing a plea to ban the film *Aaankh Micholi* for derogatory portrayal of people with disabilities, the Supreme Court in a landmark ruling laid down comprehensive guidelines to prevent stereotyping and discrimination of persons with disabilities (PwDs) in visual media, including films and documentaries.

What is the framework?

The Supreme Court's framework focuses on the prevention of stigmatisation and discrimination, recognising their profound impact on the dignity and identity of persons with disabilities. Among the guidelines is a call to avoid words that cultivate institutional discrimination, such as "cripple" and "spastic," as they contribute to negative self-image and perpetuate discriminatory attitudes. A Bench headed by the Chief Justice of India D.Y. Chandrachud said stereotyping differently abled persons in visual media and films must end, asking creators to provide an accurate representation of disabilities rather than mocking them. Language that individualises the impairment and overlooks disabling social barriers, for example, words like "afflicted," "suffering" and "victim", should be avoided, it said. The court also asked creators to practice the principle of "nothing about us, without us," and involve persons with disabilities in the creation and assessment of visual media content.

What are laws which grant disability rights?

The law which comprehensively deals with disability rights is the Rights of Persons with Disabilities (RPwD) Act which came into force from April 19, 2017. It replaced the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. The National Trust Act (1999), Rehabilitation Council of India Act (1992), Mental Health Care Act (2017) are the other laws that govern disability rights.

According to Shashank Pandey, a lawyer based out of Delhi and a founder of the Politics and Disability Forum, there are broadly two models under which disability rights are looked at, namely medical and social models. The human rights model, which is a recent one, is an evolution of the social model which says that people with disability are a part of society and have the same rights as everyone else. The Supreme Court's emphasis on the human rights model is significant as it makes the government and private parties obliged to facilitate full and effective participation of persons with disabilities in society. The advantage is that it places individuals in a sphere where all human rights principles which are applicable to anyone can be claimed by the disabled populace. The disadvantage is that it is an abstract idea and difficult to implement, says Mr. Pandey. The framework is also limited, as it is only for visual media, he adds, pointing out that the guidelines could have been sent by the SC to all departments for sensitisation.

The Supreme Court's framework focuses on the prevention of stigmatisation and discrimination, recognising their profound impact on the dignity of persons with disabilities

V. Muralidharan of the National Platform for the Rights of the Disabled welcomed the ruling, adding that the framework has stressed on the guidelines which were in place in the 2016 legislation. He rues the fact that the law is not being implemented properly. "However, we cannot lose sight of the conditions prevailing in the country. Disabled people are still considered objects of charity. Even the government's coinage of 'Divyang' looks at disability through the lens of charity. It is regressive and reinforces a patronising mindset. Also, the usage of words like 'pappu' and 'balak buddhi' by the ruling party to paint its opponents in a poor light only shows how big the battle is," he points out.

What about creative freedom?

Cinematic expression doesn't have absolute power when it operates in the context of marginalised communities. It has to be looked at from the overall context of the expression and intent behind the expression. The Supreme Court said "the creative freedom of the filmmaker cannot include the freedom to lampoon, stereotype, misrepresent or disparage those already marginalised". In determining these aspects, the "intention" and "overall message" of the film have to be considered.

What is the way forward?

The court emphasised on collaboration with disability advocacy groups to gain invaluable insights and guidance on respectful and accurate portrayals, ensuring the content aligns with the lived experiences of persons with disabilities. It has also said that implementing training programmes for writers, directors, producers, and actors to emphasise the impact of portrayals on public perceptions and the lived experiences of persons with disabilities is a necessity.

The SC ruling on portrayal of disability in films

- while hearing a plea to ban the film Aaankh Micholi for derogatory portrayal of people with disabilities, the Supreme Court in a landmark ruling laid down comprehensive guidelines to prevent stereotyping and discrimination of persons with disabilities (PwDs) in visual media, including films and documentaries.

What is the framework?

- **The Supreme Court's framework focuses on the prevention of stigmatisation and discrimination, recognising their profound impact on the dignity and identity of persons with disabilities.**
- **Among the guidelines is a call to avoid words that cultivate institutional discrimination, such as "cripple" and "spastic," as they contribute to negative self-image and perpetuate discriminatory attitudes.**

- **A Bench headed by the Chief Justice of India D.Y. Chandrachud said stereotyping differently abled persons in visual media and films must end, asking creators to provide an accurate representation of disabilities rather than mocking them.**

What are laws which grant disability rights?

- The law which comprehensively deals with disability rights is the Rights of Persons with Disabilities (RPwD) Act which came into force from April 19, 2017.
- It replaced the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. The National Trust Act (1999), Rehabilitation Council of India Act (1992), Mental Health Care Act (2017) are the other laws that govern disability rights.

What about creative freedom?

- Cinematic expression doesn't have absolute power when it operates in the context of marginalised communities. It has to be looked at from the overall context of the expression and intent behind the expression.
- The Supreme Court said "the creative freedom of the filmmaker cannot include the freedom to lampoon, stereotype, misrepresent or disparage those already marginalised".
- In determining these aspects, the "intention" and "overall message" of the film have to be considered.

How is India's hunt for critical minerals going?

Why are lithium, copper, cobalt, graphite and others essential for the economy's green transition? In which States have reserves been found? Why have there been hiccups in the auction process? What lies ahead? Which country dominates global supplies?

Vikas Dhoot

The story so far:

In late June, the Centre declared the winning bidders for mining rights in six blocks of critical minerals, including graphite, phosphorite and lithium, for which India largely relies on imports. These are the first private players awarded such rights under the revamped Mines and Minerals law.

Why are critical minerals important?

Minerals such as copper, lithium, nickel, cobalt are known as critical minerals, as they along with some rare earth elements, are essential for the world's ongoing efforts to switch to greener and cleaner energy. As per the International Energy Agency (IEA), lithium demand rose by 30% in 2023, followed by nickel, cobalt, graphite and rare earth elements which saw an 8% to 15% growth, with the aggregate value of such minerals pegged at $325 billion. In its Global Critical Minerals Outlook 2024 report, the agency has flagged that the world's goal to limit global warming to 1.5 degrees Celsius in the net zero emissions scenario, would translate into very rapid growth in demand for these minerals. By 2040, the demand for copper is expected to rise 50%, double for nickel, cobalt and rare earth elements, quadruple for graphite and eightfold for lithium, which is crucial for batteries. The development of sustainable supply chains for such minerals is, therefore, an unavoidable task. In India, the lack of ready reserves of critical minerals has resulted in 100% import dependence for minerals like lithium, cobalt, and nickel. Late last month, Union Mines Minister G. Kishan Reddy highlighted that 95% of India's copper requirements are met through imports. China is a key supplier or processor of many of these items.

India has natural reserves of some of these minerals, but they haven't been explored or tapped fully

Big discovery: The lithium stones found in Reasi, Jammu in 2023. PTI

What is being done to spur production?

While India has natural reserves of some of these minerals, they haven't been explored or tapped fully. For instance, India holds 11% of the world's deposits of ilmenite, the main source of titanium dioxide used in many applications, but still imports a billion dollars of titanium dioxide a year, former Mines Secretary Vivek Bharadwaj once pointed out. Then there is the "lucky" discovery of lithium reserves in the Union Territory of Jammu and Kashmir (J&K) while the Geological Survey of India (GSI) was exploring the State's terrain for limestone, which triggered hope of some self-sufficiency in the mineral. Announced as the first discovery of lithium in the country last February, these reserves were pegged at 5.9 million tonnes, enthusing the government to expedite its tapping.

Acknowledging that reliance on a few nations for the ores and processing of these minerals could pose significant vulnerabilities for Indian supply chains, the central government amended the Mines and Minerals (Development and Regulation) Act, 1957 in August 2023 to enable it to grant mining concessions for 24 critical and strategic minerals. By November, the first auctions of 20 critical mineral blocks, with the lithium block identified in J&K's Reasi district on the list, were launched, followed by two more tranches with 18 more blocks offered this February and March. However, investor interest has been tepid – the auction of most of the first 20 blocks was scrapped for lack of adequate bidders. After a delayed process, the Mines Ministry on June 24, announced six winners from the maiden auction tranche for three blocks in Odisha, and one each in Tamil Nadu, U.P. and Chhattisgarh. The outcomes of the second and third round of auctions are still awaited, while the Ministry has initiated a fourth tranche, which includes 10 blocks that are being offered for the second time.

Why are some blocks not finding takers?

Among the first attempt blocks offered in the latest auction, two phosphorite blocks along with a glauconite block are in Chhattisgarh, while two blocks each are up for grabs in U.P. (phosphorite and rare earth elements), Karnataka (phosphate and nickel), and Rajasthan (potash and halite). A graphite block is being auctioned in Jharkhand and Arunachal Pradesh, with five additional blocks of graphite, tungsten and vanadium offered in the northeastern State for the second time. The 'second attempt' blocks also include a tungsten reserve in Tamil Nadu's Madurai district, a cobalt and manganese block in Karnataka's Shimoga, and a chromium and nickel block in Sindhudurg, Maharashtra.

As per industry experts, the reasons for low interest among miners for some of these blocks include the lack of adequate data on the potential reserves buried within them. Technology challenges also affect outcomes. For instance, the lithium block in J&K has clay deposits, and the technology for the mineral's extraction from clay remains untested globally, pointed out Girishkumar Kadam, senior vice-president and group head for corporate sector ratings at ICRA.

When is domestic production likely to begin?

Given the preliminary stage of exploration for most of the domestic blocks being auctioned, their commercialisation and associated benefits are unlikely to fully accrue in the current decade ending 2030, ICRA said. "India's manufacturing is thus likely to remain exposed to potential future supply shocks of these minerals till then," it concluded. Apart from spurring exploration and attracting more miners, the Centre is looking to acquire overseas assets from key resource-rich regions as a parallel measure to bolster mineral security. The first such mine, for lithium brine, was acquired in Argentina this year by Khanij Bidesh India Limited, a joint venture of NALCO, Hindustan Copper, and Mineral Exploration Company. While it scouts for more assets, India has also joined the U.S.-led Mineral Security Partnership, a block consisting of large buyers and sellers of critical minerals.

Why are critical minerals important?

- Minerals such as copper, lithium, nickel, cobalt are known as critical minerals, as they along with some rare earth elements, are essential for the world's ongoing efforts to switch to greener and cleaner energy.
- As per the International Energy Agency (IEA), lithium demand rose by 30% in 2023, followed by nickel, cobalt, graphite and rare earth elements which saw an 8% to 15% growth, with the aggregate value of such minerals pegged at $325 billion.
- In its Global Critical Minerals Outlook 2024 report, the agency has flagged that the world's goal to limit global warming to 1.5 degrees Celsius in the net zero emissions scenario, would translate into very rapid growth in demand for these minerals..

- By 2040, the demand for copper is expected to rise 50%, double for nickel, cobalt and rare earth elements, quadruple for graphite and eightfold for lithium, which is crucial for batteries.
- The development of sustainable supply chains for such minerals is, therefore, an unavoidable task. In India, the lack of ready reserves of critical minerals has resulted in 100% import dependence for minerals like lithium, cobalt, and nickel.
- 95% of India’s copper requirements are met through imports. China is a key supplier or processor of many of these items

CRITICAL MINERALS: INDIA'S NET IMPORT RELIANCE (2020)

Critical Mineral	%age	Major import sources
Lithium	100%	Chile, Russia, China, Ireland, Belgium
Cobalt	100%	China, Belgium, Netherlands, US, Japan
Nickel	100%	Sweden, China, Indonesia, Japan, Philippines
Vanadium	100%	Kuwait, Germany, South Africa, Brazil, Thailand
Niobium	100%	Brazil, Australia, Canada, South Africa, Indonesia
Germanium	100%	China, South Africa, Australia, France, US
Rhenium	100%	Russia, UK, Netherlands, South Africa, China
Beryllium	100%	Russia, UK, Netherlands, South Africa, China
Tantalum	100%	Australia, Indonesia, South Africa, Malaysia, US
Strontium	100%	China, US, Russia, Estonia, Slovenia
Zirconium (zircon)	80%	Australia, Indonesia, South Africa, Malaysia, US
Graphite (natural)	60%	China, Madagascar, Mozambique, Vietnam, Tanzania
Manganese	50%	South Africa, Gabon, Australia, Brazil, China
Chromium	2.5%	South Africa, Mozambique, Oman, Switzerland, Turkey
Silicon	<1%	China, Malaysia, Norway, Bhutan, Netherlands

Source: 'Unlocking Australia-India Critical Minerals Partnership Potential', Australian Trade and Investment Commission, July 2021

Air pollution harms pollinators more than pests, study finds

The Hindu Bureau

Bees and other beneficial bugs are disproportionately harmed by air pollution compared to crop-destroying pests, according to a new study. Researchers from the University of Reading analysed data from 120 scientific papers to understand how 40 types of insects in 19 countries respond to air pollutants like ozone, nitrogen oxides, sulfur dioxide and particulate matter. The study published in the journal *Nature Communications* found that pollinators – including bees and some moths and butterflies – experienced a 39% decline in foraging efficiency after being exposed to elevated air pollution levels. In contrast, plant-eating aphids and other pests were not significantly impacted.

The researchers suggest that beneficial insects – such as bees and wasps – are more affected by air pollution due to their reliance on scent-based communication. Many beneficial insects use airborne chemical signals to locate flowers, find mates, or hunt their prey.

Air pollutants can chemically alter these scent trails or interfere with insects' ability to detect them, essentially disrupting their sensory landscape. In contrast, many pests rely less on long-distance scent cues and more on direct contact or visual cues, making them less vulnerable to air pollution's effects on airborne chemical signals.

The study focused on how air pollution impacts various insect behaviour and biological aspects, including feeding, growth, survival, reproduction, and ability to locate food sources. Of all these factors, insects' ability to find food was most severely impaired by air pollution, declining by about one-third on average.

Among air pollutants, ozone emerged as particularly harmful to beneficial insects, reducing their ability to thrive and carry out their roles in the ecosystem by 35%. Ozone pollution has the most detrimental impacts and even low ozone levels below current air quality standards can cause significant damage. Nitrogen oxides also substantially impaired beneficial insects.

"Changes in invertebrate performance are not dependent on air pollutant concentrations, indicating that even low levels of pollution are damaging. Predicted increases in tropospheric ozone could result in unintended consequences to global invertebrate populations and their valuable ecological services," the researchers write.

Air pollution harms pollinators more than pests,

- Bees and other beneficial bugs are disproportionately harmed by air pollution compared to crop-destroying pests, according to a new study
- The researchers suggest that beneficial insects — such as bees and wasps — are more affected by air pollution due to their reliance on scent-based communication.
- Many beneficial insects use airborne chemical signals to locate flowers, find mates, or hunt their prey.
- Air pollutants can chemically alter these scent trails or interfere with insects' ability to detect them, essentially disrupting their sensory landscape

- In contrast, many pests rely less on long-distance scent cues and more on direct contact or visual cues, making them less vulnerable to air pollution’s effects on airborne chemical signals.
- , insects’ ability to find food was most severely impaired by air pollution, declining by about one-third on average.
- Among air pollutants, ozone emerged as particularly harmful to beneficial insects, reducing their ability to thrive and carry out their roles in the ecosystem by 35%.

- **Ozone pollution has the most detrimental impacts and even low ozone levels below current air quality standards can cause significant damage.**
- **Nitrogen oxides also substantially impaired beneficial insects.**
- **. Predicted increases in tropospheric ozone could result in unintended consequences to global invertebrate populations and their valuable ecological services,”**

Nobel laureate supports India's pursuit for a neutrino lab

Nobel laureate Takaaki Kajita opens up about the parallels and contrasts between Japan and India's quests to further research on enigmatic elementary particles called neutrinos

Nandita Jayaraj

If the obstacle-ridden India-based Neutrino Observatory (INO) ever becomes a reality, it will be one of the largest basic science projects in the country. Nobel laureate and neutrino researcher Takaaki Kajita is convinced that the proposed underground laboratory is still worth fighting for.

Neutrinos are abundant particles that may be relevant to our understanding of the origin of matter in the universe. About 60 years ago, historic science experiments inside a goldmine in Kolar, Karnataka, would lead to the 1965 discovery of atmospheric neutrinos. This was a collaboration between Indian, Japanese and British scientists.

Awakened to the potential of neutrino research, Japan continued with experiments on – or rather, under – their soil, in the underground Kamioka Observatory situated under Mount Ikeno. This was where Masatoshi Koshiba's team would discover cosmic neutrinos in the late 1980s. Subsequently, Japan decided to establish a dedicated neutrino observatory, Super-Kamiokande, which began operation in 1996. In 2002, Koshiba won a Nobel Prize for his contributions.

Indian scientists had no intention of being left behind. Though the original experiments had to end in 1992 due to the closure of the goldmines in Kolar, plans to build our own observatory were already underway. After extensive deliberations, a proposal was drawn and in 2011, the Indian government announced its intention to set aside about Rs.1,350 crores for an India-based Neutrino Observatory, which would be situated 1.3 km underground in Tamil Nadu. Over a decade later, there has been no progress. Today, the fate of INO is uncertain.

Meanwhile, Japanese researchers received the first evidence for a phenomenon called neutrino oscillation within a year of the Super-Kamiokande. This discovery would go on to (jointly) win Koshiba's student Takaaki Kajita, another Nobel in 2015.

Having spent his entire research career in Japan, Takaaki Kajita is a living example of how much is to be gained by having a neutrino laboratory close to home. "We can easily access the laboratory and the detector is nearby," he said, in an interview with this reporter during the 73rd Lindau Nobel Laureate Meeting which concluded on July 5.

Two of the main reasons for opposition to INO are adverse environmental impacts and the fear of radioactivity. This is despite INO scientists repeatedly stating that the observatory would be located a kilometre underground and hence would have minimal impact on wildlife and the ecosystem. What about radioactivity? "The experiment will neither produce any radioactivity nor can it function well where there is radiation," they point out on INO's website. The whole point of housing the detector underground is to protect it from the natural radiation that hits the surface of Earth.

According to Kajita, the Japanese project did not face as much opposition. "We decided to construct the detector in an active mine, so there was no need for additional excavation," he pointed out. Besides, the original experiment was designed to search not for neutrinos but for a hypothetical phenomenon called proton decay. "That was nothing to do with radiation," he said. The biggest stroke of luck for the Japanese neutrino scientists was the timing of a supernova that was observed in February 1987. The Supernova 1987A happened while the Kamiokande-II detector was online, leading to the discovery of cosmic neutrinos by the team led by Koshiba. "This had a great impact. People suddenly knew neutrinos, and had only a good image about them," said Kajita, who was Koshiba's PhD student.

A neutrino observatory at home is envisioned to give the Indian scientific community, including students of particle physics, the opportunity to work with a world-class detector without needing to travel outside national borders. Back in the 1980s, the young Kajita greatly benefited from this privilege. He recalled the excitement during the construction of the Kamiokande detector. "It's the young postdocs involved in the Kamiokande and Super Kamiokande experiments who first saw and analysed the data," he said.

Today, the Super-Kamiokande facility continues to train new generations of particle physicists.

While some of them secure positions abroad, many choose to stay back in Japan. After he won his Nobel in 2015, Kajita himself declined invitations to take up new positions in other countries.

"As an experimental physicist, it is very important that I am near the detector," he explained.

Aware of the setbacks his Indian colleagues have suffered, Kajita insists that the INO dream is worth salvaging.

"It may be a bit late to start the construction of the detector, but it is very important to continue working towards an underground lab. There are a lot of things [yet] to be done [in the field of neutrino physics]."

(Nandita Jayaraj is a freelance science writer and co-author of Lab Hopping: A Journey to Find India's Women in Science)

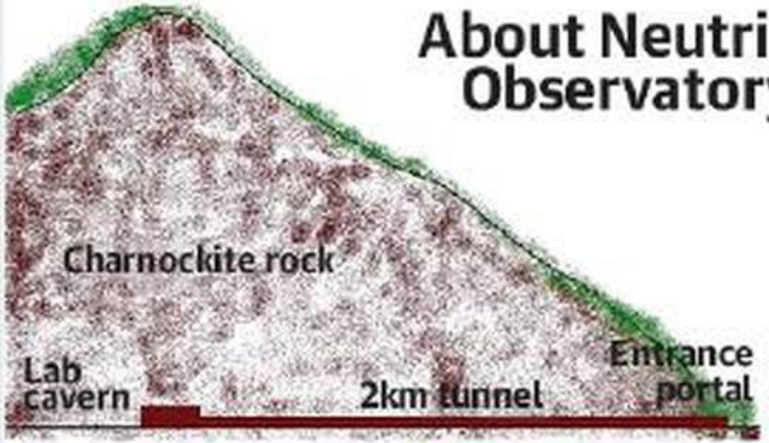
India's INO dream is worth salvaging

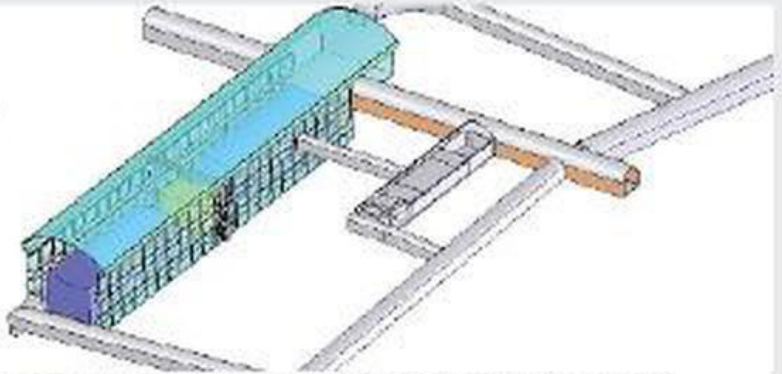
Over a decade after a proposal was drawn, the fate of INO is still uncertain

- About 60 years ago, historic science experiments inside a goldmine in Kolar, Karnataka, led to the 1965 discovery of atmospheric neutrinos
- This was a collaboration between Indian, Japanese and British scientists
- Japan continued with experiments in the underground Kamioka Observatory situated under Mount Ikeno
- Japan established a dedicated neutrino observatory, Super-Kamiokande, which began operation in 1996
- The INO would be located a kilometre underground, and hence would have minimal impact on wildlife and the ecosystem
- The experiments to be will neither produce any radioactivity nor can it function well where there is radiation
- In fact, the main reason for locating the laboratory underground is to create an environment free of the radiation that abounds on the Earth's surface

Nobel laureate Takaaki Kajita is convinced that the proposed underground laboratory is still worth fighting for. PHOTO: NANDITA JAYARAJ

About Neutrino Observatory





A SCHEMATIC VIEW OF THE PROPOSED INDIA-BASED NEUTRINO OBSERVATORY UNDERGROUND LAB

Where

At Pottipuram village in Theni district, on the Tamil Nadu-Kerala border

Why

The initial goal of India-based Neutrino Observatory (INO) is to study neutrinos

Neutrino

Neutrinos are the smallest particles that form the universe

Highlights

Two underground laboratory caverns with a rock cover of over 1000 metres; access tunnel of 2 km length

Where else

Underground
SNO, Canada; **Kamioka**, Japan; **Gran Sasso**, Italy

Underwater
Amundsen - Scott South Pole Station, Antarctica;
Antares - under Mediterranean sea off the coast of Toulon, France

SOURCE: INO WEBSITE

India's INO dream is worth salvaging

Over a decade after a proposal was drawn, the fate of INO is still uncertain

- About 60 years ago, historic science experiments inside a goldmine in Kolar, Karnataka, led to the 1965 discovery of atmospheric neutrinos
- This was a collaboration between Indian, Japanese and British scientists
- Japan continued with experiments in the underground Kamioka Observatory situated under Mount Ikeno
- Japan established a dedicated neutrino observatory, Super-Kamiokande, which began operation in 1996
- The INO would be located a kilometre underground, and hence would have minimal impact on wildlife and the ecosystem
- The experiments to be will neither produce any radioactivity nor can it function well where there is radiation
- In fact, the main reason for locating the laboratory underground is to create an environment free of the radiation that abounds on the Earth's surface

Nobel laureate Takaaki Kajita is convinced that the proposed underground laboratory is still worth fighting for. PHOTO: NANDITA JAYARAJ

New atmospheric particles form in upper troposphere

New atmospheric particles form when stratospheric air intrudes into the troposphere below, revealing a previously unrecognised mechanism for new particle formation (NPF) in the upper troposphere. The finding suggests that NPF aloft occurs frequently and over large geographic regions. Aerosol particles smaller than one micron in diameter are abundant in the troposphere. They serve as condensation sites for water vapor, contributing to cloud formation, and play a role in Earth's radiative balance.

new particle formation (NPF)

- New atmospheric particles form when stratospheric air intrudes into the troposphere below, revealing a previously unrecognised mechanism for new particle formation (NPF) in the upper troposphere.
- The finding suggests that NPF aloft occurs frequently and over large geographic regions.
- Aerosol particles smaller than one micron in diameter are abundant in the troposphere.
- They serve as condensation sites for water vapor, contributing to cloud formation, and play a role in Earth’s radiative balance

What is Nipah virus?

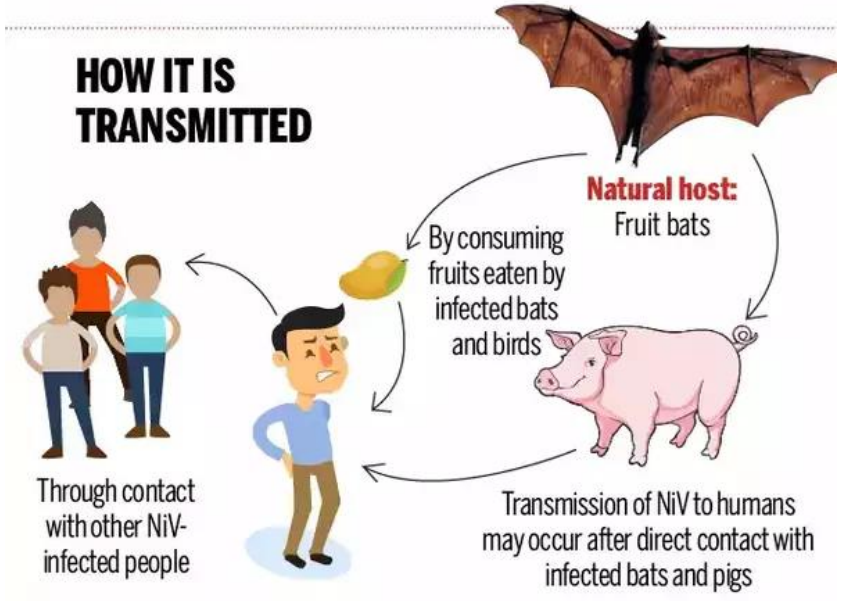
TOI

NIPAH VIRUS (NiV) INFECTION IS A NEWLY EMERGING ZOONOSIS THAT CAUSES SEVERE DISEASE IN BOTH ANIMALS AND HUMANS

NiV first identified in 1998 during an outbreak in Malaysia

Fruit bats are natural hosts of NiV

HOW IT IS TRANSMITTED



Island vertebrates are at risk of human-driven extinction

A study involving 2,813 species of tetrapod vertebrates shows that island-dwelling species have slower relative metabolic rates than their mainland counterparts. Moreover, this slow pace of life puts insular species at a higher risk of anthropogenic extinction. Island evolution is a balancing act. Species must adapt to a limited space with finite resources, leading to unique characteristics, such as dwarfism or gigantism. This phenomenon is called ‘island syndrome’.

‘island syndrome’.

- A study involving 2,813 species of tetrapod vertebrates shows that island-dwelling species have slower relative metabolic rates than their mainland counterparts.
- Moreover, this slow pace of life puts insular species at a higher risk of anthropogenic extinction.
- Island evolution is a balancing act. Species must adapt to a limited space with finite resources, leading to unique characteristics, such as dwarfism or gigantism.
- This phenomenon is called ‘island syndrome’.

Nipah monoclonal antibody trials may begin in India in 2025

R. Prasad

If the Indian drug regulator greenlights it, a human clinical trial to test the safety and efficacy of a novel Nipah monoclonal antibody MBP1F5, which might offer immediate protection to people at risk of infection against the deadly disease, might begin next year. A similar trial will be carried out in Bangladesh as well. Though trials on many vaccines are currently under way, there is no approved vaccine against the Nipah virus anywhere in the world. The Nipah virus has a 40% to 75% mortality rate in people who are infected.

India and Bangladesh have been chosen for the trial as Nipah virus outbreaks have been reported in these two countries in recent years. Nipah outbreaks have occurred in Kerala in 2018, 2019, 2021 and 2023. In the case of Bangladesh, Nipah outbreaks have been occurring since 2001; the virus has been reported from 34 of 64 districts in Bangladesh with 341 cases detected so far and 242 deaths.

The novel Nipah monoclonal antibody is currently undergoing a phase-1 clinical trial in the U.S., which is carried out by the U.S. Department of Defence.

A spokesperson of the Coalition for Epidemic Preparedness Innovations (CEPI), which is funding the human trials, told *The Hindu* that the trial led by ServareGMP (a non-profit biotechnology organisation based in California) and supported by Mapp Biopharmaceutical, which is also located in California, will work with local clinical research networks to carry out the trial in India and Bangladesh.

The trial in India and Bangladesh will begin "upon completion of the U.S. Department of Defence Phase-1 trial in the U.S". "ServareGMP, Mapp and CEPI have already initiated discussions with public health and regulatory authorities in India and Bangladesh about the desire to conduct this trial," he says.

Fruit bats are natural reservoirs of Nipah virus. VELANKANNI RAJ B

According to the CEPI spokesperson, the trial in India is planned to begin in 2025, pending regulatory review. The assessment made by the Indian drug regulator will determine "whether the Phase-1 trial data carried out by the U.S. Department of Defence will be sufficient to continue onwards with Phase-2 trials in India, or whether Phase-1 data should also be collected from the Indian population".

The number of participants who will be recruited for the clinical trial will depend on whether the clinical trial begins as a phase-1 or phase-2 trial in India. "But the intention is to recruit at least 200 participants," says the spokesperson.

While the trial will be conducted in multiple sites in both countries, the decision on the location and number of sites appropriate to generate data that demonstrate the safety and tolerability of the monoclonal antibody will be taken based upon consultation with public health and regulatory authorities, he says.

"Preclinical studies for pre-exposure prophylaxis have been completed. In these studies, conducted in animal models, the monoclonal antibody has demonstrated high potency against the Nipah virus, proving it effective at preventing the virus from entering the host cell and causing Nipah virus disease. In preclinical studies, this Nipah monoclonal antibody has been shown to be safe at all dose levels tested," he says.

The monoclonal antibody is designed to bind to the Nipah virus F protein, preventing the virus from entering a host cell and causing infection in people. "This mechanism will offer protection against both known strains of Nipah virus (Bangladesh and Malaysia) and its closely related viral cousin, Hendra virus, for at least six months – enough time for vaccine immunity to build," says a CEPI release.

In response to a question about equitable access to monoclonal antibodies, once the trial results are positive, he says: "Alongside ensuring pricing commitments for Global South countries, a reserve of monoclonal antibody doses will be stored in a Nipah-affected country, helping to enable rapid availability in the event of an outbreak and accessibility for those most in need."

. Monoclonal antibodies

- A type of protein that is made in the laboratory and can bind to certain targets in the body, such as antigens on the surface of cancer cells.
- There are many kinds of monoclonal antibodies, and each monoclonal antibody is made so that it binds to only one antigen.
- Monoclonal antibodies are being used in the diagnosis and treatment of many diseases, including some types of cancer.
- They can be used alone or to carry drugs, toxins, or radioactive substances directly to cancer cells.

Topics

- ISRO and space economy
- spade-toothed whales
- Heat waves impact on women
- What is an EEG?
- Mains

By saurabh Pandey

THE HINDU

Target Mains -2024/25 -

Q ‘Space economy has to be demand driven rather than supply driven’ . Explain this statement in the context of ISRO approach towards commercialisation of space

ISRO has a problem: many rockets, but too few satellites to launch

The Indian space programme used to follow a supply-driven model: ISRO would launch satellites and then look for customers for services provided by the satellites. This changed to a demand-driven model in 2019-2020, in which a satellite is built and launched only if there is already demand for it

Pradeep Mohandas

In June, S. Somanath, Chairman of the Indian Space Research Organisation (ISRO) and Secretary of the Department of Space, said ISRO's launch vehicle capability was three-times the demand. Many experts in the spaceflight sector and beyond interpreted this to mean the space launch market was grim. Mr. Somanath also suggested strong demand was needed for launch vehicles from the domestic Indian market.

India currently has four launch vehicles: the Small Satellite Launch Vehicle (SSLV), the Polar Satellite Launch Vehicle (PSLV), the Geosynchronous Satellite Launch Vehicle (GSLV), and the Launch Vehicle Mark-III (LVM-3). These rockets can launch satellites weighing up to four tonnes to the geosynchronous orbit. India also relies on foreign launch vehicles, like Europe's Ariane V and SpaceX's Falcon 9, when a satellite weighs more than four tonnes.

At present, the country operates a fleet of satellites with applications in communications, remote sensing, positioning, navigation and timing (PNT), meteorology, disaster management, space-based internet, scientific missions, and experimental missions. It also needs launch vehicles for space missions like Chandrayaan 3 and Aditya L1.

All this makes it look like there are more applications and satellites than there are launch vehicles – which is the opposite of what Mr. Somanath mentioned. Where then is the issue?

An LVM-3 launch vehicle lifts off from ISRO's Sriharikota spaceport carrying the Chandrayaan-3 mission to orbit. ISRO

Demand-driven model

The Indian space programme used to follow a supply-driven model: ISRO would build and launch satellites and then look for customers who needed the services provided by the satellites. When the Indian government reformed the space sector in 2019-2020, it changed this to a demand-driven model. Here, a satellite needs to be built and launched only if there is already demand for it. This may have led to the situation Mr. Somanath mentioned.

There is now a chicken and egg problem. The customer of the services provided by the satellite needs to be educated about the need for the service. The customer will then create a demand for a service that will need a satellite to be launched. This will provide the demand Mr. Somanath is asking for.

Consider the example of the internet. There needs to be a demand for space-based internet in a country already filled with affordable fibre and mobile-based internet services, so a company will launch a constellation of satellites into orbit to provide that service.

The question arises: Who will educate the customer, ISRO or the industry?

Without such educated customers, demand at the scale ISRO expects will not be created. The customers here are not only consumers of space-based internet. These are other companies, government institutions, defence enterprises, and ordinary people including farmers, bankers, etc. So the 'amount' of education required is very great.

The other area from which demand is likely to arise is human spaceflight. This includes human-rated launch vehicles that carry humans and supplies into orbit station or the moon. There could in future be demand for space tourism as well.

Launch capability limitations

India's launch vehicles are also not powerful enough to undertake certain missions, like Chandrayaan 4. China used its Long March 5 launch vehicle to launch its Chang'e 4 and Chang'e 5 missions in a single launch. India's LVM-3 has less than one-third of Long March 5's capability (28% to be more precise) and will need two LVM-3 launches to launch all the components of Chandrayaan 4.

ISRO will be upgrading the LVM-3 with a semi-cryogenic engine to boost its payload capacity to six tonnes to the geostationary transfer orbit (GTO). The organisation will also need a new launch vehicle – already dubbed the Next Generation Launch Vehicle (NGLV), a.k.a. Project Soorya – to carry 10 tonnes to GTO. But it has only submitted a funding proposal thus far for this project. Other variants of this launch vehicle are expected to raise this vehicle's lift capacity.

India will also need one more successful flight of the SSLV to be confident about its ability to launch smaller satellites. Smaller satellites are usually experimental and university-built. More success in this domain will encourage space companies to build larger satellites, eventually leading to a demand for launch vehicles.

Launch vehicle economics

All these launch vehicles will need satellites to launch. The heavier vehicles can fulfil some national goals like lunar

> There is now a chicken and egg problem. The customer of the services provided by the satellite needs to be educated. The customer will then create a demand for a service that will need a satellite to be launched

ISRO can use the smaller satellites for technology and capability demonstration. However, the latter will constitute only a small number of launches.

Satellites have a defined mission life. As they get old, they will need to be replaced with newer satellites. This will also create a demand for launch vehicles. However, mission operators like their satellites to live longer and have been improving their lifetimes with software and hardware upgrades. This complicates estimates of the number and frequency of launch vehicles that will be needed.

Launch vehicles are improving as well. In a single launch, the PSLV can deliver multiple satellites in multiple orbits. Rocket stages are becoming reusable, which reduces the cost of building the rocket and increases profitability. ISRO has been building its Reusable Launch Vehicle and vertical landing technologies to make reusable landing stages. It is also making an effort to replace toxic fuels for rocket engines with green alternatives.

Private sector vs government

Mr. Somanath himself provided a solution for the problem he highlighted. He suggested we need an ecosystem that creates demand for various services, more sources of data (like satellites), culminating in a demand for launch vehicles. The richer the ecosystem, the greater the demand.

The Indian government wants the private sector to create demand among customers and to build and launch satellites. It wants them to look for services to offer customers in India and abroad. It also wants revenue by providing launch services of its own. Finally, the government wants to upskill workers and give them jobs.

However, private companies don't want the government to be in the launch business. Instead, they want the government to be their customer and to provide rule of law and reliable regulations.

This is because private players desire a reliable source of revenue, which the Indian government can be over a long period of time. There is thus talk of the government being an 'anchor customer' helping companies in their early days.

The roadmap here is for the government to exit the launch vehicle business at some point, leaving the companies with sufficient demand for launch vehicles. This is similar to the situation in the U.S., where arms of the U.S. government award contracts to SpaceX, Blue Origin, etc. to execute launches with their payloads.

Thus, the Indian government will absorb the cost of the transition from supply-driven to demand-driven building of satellites and launch vehicles. But it isn't yet educating its own Ministries and creating some of the anchor demand for satellites and launch vehicles.

(Pradeep Mohandas is a technical writer

ISRO and space economy

- India currently has four launch vehicles: the Small Satellite Launch Vehicle (SSLV), the Polar Satellite Launch Vehicle (PSLV), the Geosynchronous Satellite Launch Vehicle (GSLV), and the Launch Vehicle Mark-III (LVM-3).
- These rockets can launch satellites weighing up to four tonnes to the geosynchronous orbit.
- India also relies on foreign launch vehicles, like Europe’s Ariane V and SpaceX’s Falcon 9, when a satellite weighs more than four tonnes.

- At present, the country operates a fleet of satellites with applications in communications, remote sensing, positioning, navigation and timing (PNT), meteorology, disaster management, space-based internet, scientific missions, and experimental missions.
- It also needs launch vehicles for space missions like Chandrayaan 3 and Aditya L1.
- All this makes it look like there are more applications and satellites than there are launch vehicles

Demand-driven model

- The Indian space programme used to follow a supply-driven model: ISRO would build and launch satellites and then look for customers who needed the services provided by the satellites.
- When the Indian government reformed the space sector in 2019-2020, it changed this to a demand-driven model.
- Here, a satellite needs to be built and launched only if there is already demand for it

- The customer of the services provided by the satellite needs to be educated about the need for the service.
- The customer will then create a demand for a service that will need a satellite to be launched.
- The other area from which demand is likely to arise is human spaceflight.
- This includes human-rated launch vehicles that carry humans and supplies into orbit and to destinations like an orbiting space station or the moon.
- There could in future be demand for space tourism as well.

- **Launch capability limitations India’s launch vehicles are also not powerful enough to undertake certain missions, like Chandrayaan 4.**
- **China used its Long March 5 launch vehicle to launch its Chang’e 4 and Chang’e 5 missions in a single launch.**
- **India’s LVM-3 has less than one-third of Long March 5’s capability (28% to be more precise) and will need two LVM-3 launches to launch all the components of Chandrayaan 4.**

- **ISRO will be upgrading the LVM-3 with a semi-cryogenic engine to boost its payload capacity to six tonnes to the geostationary transfer orbit (GTO).**
- **The organisation will also need a new launch vehicle — already dubbed the Next Generation Launch Vehicle (NGLV), a.k.a. Project Soorya — to carry 10 tonnes to GTO. But it has only submitted a funding proposal thus far for this project**

Launch vehicle economics

- All these launch vehicles will need satellites to launch.
- The heavier vehicles can fulfill some national goals like lunar exploration and a space station while ISRO can use the smaller satellites for technology and capability demonstration.
- However, the latter will constitute only a small number of launches. Satellites have a dened mission life.
- As they get old, they will need to be replaced with newer satellites.

- This will also create a demand for launch vehicles.
- However, mission operators like their satellites to live longer and have been improving their lifetimes with software and hardware upgrades.
- Launch vehicles are improving as well. In a single launch, the PSLV can deliver multiple satellites in multiple orbits.
- Rocket stages are becoming reusable, which reduces the cost of building the rocket and increases profitability.
- ISRO has been building its Reusable Launch Vehicle and vertical landing technologies to make reusable landing stages.

- The Indian government wants the private sector to create demand among customers and to build and launch satellites.
- It wants them to look for services to offer customers in India and abroad.
- It also wants revenue by providing launch services of its own.
- Finally, the government wants to upskill workers and give them jobs

A rare spade-toothed whale after it was found washed ashore in the second week of July on a beach near Otago, New Zealand. AP

World's rarest whale may have washed up on beach in New Zealand

Associated Press

The spade-toothed whales are the world's rarest, with no live sightings ever recorded. No one knows how many there are, what they eat, or even where they live in the vast expanse of the southern Pacific Ocean. However, scientists in New Zealand may have finally caught a break.

The country's conservation agency said Monday a creature that washed up on a South Island beach this month is believed to be a spade-toothed whale. The five-meter-long creature, a type of beaked whale, was identified after it washed ashore on Otago Beach by its colour patterns and the shape of its skull, beak, and teeth.

"We know very little, practically nothing about the creatures," Hannah Hendriks, Marine Technical Advisor for the Department of Conservation said. "This is going to lead to some amazing science and world-first information."

If the cetacean is confirmed to be the elusive spade-toothed whale, it would be the first specimen found in a state that would permit scientists to dissect it, allowing them to map the relationship of the whale to the few others of the species found, learn what it eats, and perhaps lead to clues about where they live.

Only six other spade-toothed whales have ever been pinpointed, and those found intact on New Zealand's North Island beaches had been buried before DNA testing could verify their identification, Hendriks said, thwarting any chance to study them.

This time, the beached whale was

If the cetacean is confirmed to be the spade-toothed whale, it would be the first specimen found in a state that would permit scientists to dissect it

quickly transported to cold storage, and researchers will work with local Maori iwi (tribes) to plan how it will be examined, the conservation agency said.

New Zealand's Indigenous people consider whales a taonga – a sacred treasure – of cultural significance. In April, Pacific Indigenous leaders signed a treaty recognising whales as "legal persons," although such a declaration is not reflected in the laws of participating nations.

Nothing is currently known about the whales' habitat. The creatures deep-dive for food and likely surface so rarely that it has been impossible to narrow their location further than the southern Pacific Ocean, home to some of the world's deepest ocean trenches, Hendriks said.

"It's very hard to do research on marine mammals if you don't see them at sea," she said. "It's a bit of a needle in a haystack. You don't know where to look." The conservation agency said the genetic testing to confirm the whale's identification could take months.

It took "many years and a mammoth amount of effort by researchers and local people" to identify the "incredibly cryptic" mammals, Kirsten Young, a senior lecturer at the University of Exeter who has studied spade-toothed whales, said in emailed remarks.

The fresh discovery "makes me

spade-toothed whales

- **The spade-toothed whales are the world's rarest, with no live sightings ever recorded.**
- **The spade-toothed whale (*Mesoplodon traversii*) is a very little-known species, the rarest species of beaked whale.**
- **No one knows how many there are, what they eat, or even where they live in the vast expanse of the southern Pacific Ocean.**
- **New Zealand's Indigenous people consider whales a taonga — a sacred treasure — of cultural significance.**

- In April, Pacific Indigenous leaders signed a treaty recognising whales as “legal persons,” although such a declaration is not reflected in the laws of participating nations.
- Nothing is currently known about the whales’ habitat.
- The creatures deep-dive for food and likely surface so rarely that it has been impossible to narrow their location further than the southern Pacific Ocean, home to some of the world’s deepest ocean trenches,

- **The spade-toothed whale is covered by the Memorandum of Understanding for the Conservation of Cetaceans and Their Habitats in the Pacific Islands Region (Pacific Cetaceans MOU).**
- **The species' IUCN Red List conservation status is "Data Deficient (DD)" due to lack of information and uncertain data**

The toll that extreme heat takes on women

Pradeep Kumar Choudhury

Assistant Professor at Zakir Husain Centre for Educational Studies, School of Social Sciences, Jawaharlal Nehru University, New Delhi

Steny Rapheal

PhD student at Zakir Husain Centre for Educational Studies, School of Social Sciences, Jawaharlal Nehru University, New Delhi

Extreme heat is our planet's norm for now and perhaps for years to come. The warmest year on record was 2023. Temperatures in several parts of India during May-June 2024 were reported to be record-breaking. Women are disproportionately harmed by extreme heat, largely because of unequal power dynamics, gender norms, and unequal access to resources, as reflected in the Global Gender Gap Index that places India at 18th rank from the bottom. Perhaps we should be alarmed by the numbers – India is home to more than one-in-six women in the world – and extreme heat is now their reality.

Hidden toll

A recent report by the ADB (Rising Above the Heat) highlights the unequal impact of extreme heat on women in Asia and the Pacific. For instance, women living in informal settlements in cities (also at the margins and in slums) face multiple challenges due to rising temperatures. Their homes could turn into heat chambers since the material used in informal, urban neighbourhoods, such as tin, asbestos, and plastic, trap heat. Women also toil in poorly ventilated kitchens, experiencing scorching temperatures while cooking. Rising temperatures are compounded by extreme time poverty and care burden for them.

Due to lower productivity stemming from heat stress, women work considerably longer hours to complete their share of unpaid work at home. According to Arsht-Rock's 'Scorching Divide' report, the productivity loss due to heatwaves translates to 90 more minutes of care work per day in India. This adds to the pre-existing gender differences in time-use pattern; in doing unpaid work like cooking, cleaning, and fetching water and fuel, women spend two and a half times minutes more per day than men (National Statistical Office 2019 data). Intriguingly, more than two-third of women's productivity loss from heat strain occurs in the domain of unpaid labour in India. The loss also reflects opportunity costs associated with heat stress – that women could have earned extra income, acquired skills, or rested enough.

> Women are disproportionately harmed by extreme heat, largely because of unequal power dynamics, gender norms, and unequal access to resources

Worryingly pervasive

Urban female informal labourers face harsh weather, whether working in marketplaces, streets, construction sites, landfills, or even their employers' homes. Due to their occupational settings, these casual-wage workers – street vendors, paid domestic helpers, construction workers, and sanitation workers – are vulnerable to climatic extremes, reports the International Labour Organization ('Work in a Changing Climate'). The situation worsens with energy poverty – living without cooling facilities such as ventilated spaces, fans, air conditioners, or coolers. Greenery and other natural forms of cooling are also becoming increasingly unavailable for public consumption in dense urban areas. Furthermore, water scarcity and power fluctuations raise the challenge of being hydrated and staying comfortable.

The situation in rural India is equally severe. Consider the daily routine of a woman in a heatwave-affected rural area: she begins her morning cooking using biomass over a hot stove, bearing the brunt of ensuing disease burden. Since 56.8% of rural Indian families cook on biomass (NFHS-5), acknowledging the extent of this public health hazard is essential. Women's days also involve longer working hours under heat stress. If she does home-based work inside the living area with asbestos or tin roofing, temperatures could become unbearable, making labour increasingly unsafe. Also, if she faces restrictive gender norms on mobility and clothing, she could be forced to stay indoors and follow dressing styles that are not heat friendly. Conversely, if she works outdoors in the field, MGNREGA, for example, it is under the scorching sun. Additionally, prolonged exposure to heatwaves adversely affects crop yields; for poor rural women, heat may decide whether they live in hunger and poverty or not.

Unequal health strain

The incidence of heat-related diseases is also on the rise with increasing temperature. Heat stress puts the body under a great deal of strain, making it harder for it to regulate its temperature, leading to several illnesses, including heat cramps, severe heat stroke, and hyperthermia. Women are at greater risk because of their physiological makeup – their body fat percentage and water content levels affect heat tolerance and hydration, while hormonal changes associated with menstrual cycles and pregnancy affect body temperature regulation. Women have a dual burden from heat-related health issues since they are more susceptible to its effects and also shoulder majority of the care-giving responsibility that follows. Additionally, heat stress has a pronounced impact on maternal and child health. The data on heat strain's effects translating to a rise in preterm delivery, miscarriage, and stillbirths is especially worrying in India, given its higher maternal mortality rates.

The burden on women becomes evident as India grapples with soaring temperatures. Millions continue to face worse heat-related losses, with no respite in sight. Strengthening their resilience to heat strain is the need of the hour – climate-friendly urban planning, development of and access to sustainable cooling technologies, fair division of care work, and public provisioning of essential services should be our immediate concerns. And we cannot talk about adaptation and resilience without addressing the social power gradient that determines women's capacity to face the crisis we are experiencing.

- **Women are disproportionately harmed by extreme heat, largely because of unequal power dynamics, gender norms, and unequal access to resources, as reflected in the Global Gender Gap Index that places.**

Heat waves impact on women

- , women living in informal settlements in cities (also at the margins and in slums) face multiple challenges due to rising temperatures.
- Their homes could turn into heat chambers since the material used in informal, urban neighbourhoods, such as tin, asbestos, and plastic, trap heat.
- Women also toil in poorly ventilated kitchens, experiencing scorching temperatures while cooking.
- Rising temperatures are compounded by extreme time poverty and care burden for them.
- Due to lower productivity stemming from heat stress, women work considerably longer hours to complete their share of unpaid work at home.

- According to Arsht-Rock's 'Scorching Divide' report, the productivity loss due to heat waves translates to 90 more minutes of care work per day in India.
- This adds to the pre-existing gender differences in time-use pattern; in doing unpaid work like cooking, cleaning, and fetching water and fuel, women spend two and a half times minutes more per day than men

- **Urban female informal labourers face harsh weather, whether working in marketplaces, streets, construction sites, landfills, or even their employers' homes.**
- **Due to their occupational settings, these casual-wage workers — street vendors, paid domestic helpers, construction workers, and sanitation workers — are vulnerable to climatic extremes, reports the International Labour Organization ('Work in a Changing Climate').**

- The situation worsens with energy poverty — living without cooling facilities such as ventilated spaces, fans, air conditioners, or coolers.
- Greenery and other natural forms of cooling are also becoming increasingly unavailable for public consumption in dense urban areas.
- Furthermore, water scarcity and power fluctuations raise the challenge of being hydrated and staying comfortable

- **Women’s days also involve longer working hours under heat stress.**
- **If she does home-based work inside the living area with asbestos or tin roofing, temperatures could become unbearable, making labour increasingly unsafe.**
- **Also, if she faces restrictive gender norms on mobility and clothing, she could be forced to stay indoors and follow dressing styles that are not heat friendly**

Unequal health strain

- The incidence of heat-related diseases is also on the rise with increasing temperature.
- Heat stress puts the body under a great deal of strain, making it harder for it to regulate its temperature, leading to several illnesses, including heat cramps, severe heat stroke, and hyperthermia.
- Women are at greater risk because of their physiological makeup — their body fat percentage and water content levels affect heat tolerance and hydration, while hormonal changes associated with menstrual cycles and pregnancy affect body temperature regulation.

- **Women have a dual burden from heat-related health issues since they are more susceptible to its effects and also shoulder majority of the caregiving responsibility that follows.**
- **Additionally, heat stress has a pronounced impact on maternal and child health.**

Inside the brain: Researchers inject gel under the electroencephalography (EEG) cap at the Technische Universitaet Muenchen (TUM) in Garching near Munich in 2014. REUTERS

100 years of EEG: how does it work and what is its significance?

This year marks the centenary of the first human EEG, produced by German physiologist Hans Berger. EEG measures electrical activity in the brain generated by neurons. In research, scientists use EEG for neuroscience, cognitive psychology, neurolinguistics etc

Vasudevan Mukunth

The EEG is a marvel of physics and neurobiology that opens a simple window into the human brain. This window is often small and yet it reveals so much. But not least is the wonder that it reveals anything at all without having to break open the skull first. This year is the centenary of the first human EEG, produced by German physiologist Hans Berger.

How was the EEG invented?

Berger's feat was preceded by incremental but significant advances across Europe from the late 19th century. In 1875, British physician Richard Caton reported evidence of electrical activity in the brains of monkeys and rabbits. Fifteen years on, his Polish peer Adolf Beck found evidence of fluctuating activity in the brains of dogs and rabbits when he stimulated their senses. In 1912, Vladimir Pravdich-Neminsky produced the first mammalian EEG, of a dog's brain. Berger succeeded him in 1924 with the human counterpart. He is also credited with inventing the EEG, naming it, and introducing its utility in clinical settings.

What is an EEG?

EEG stands for electroencephalography. 'Electro' pertains to electricity; 'encephalo' refers to the brain; and 'graphy' is a suffix meaning to show or to represent. Neurons in the brain perform various functions by moving electrically charged particles such as ions. The movement of these particles gives rise to electrical activity that a health worker can use an EEG test to visualise. Researchers have also been able to relate data obtained from an EEG with different levels and modes of brain activity, and used it to distinguish reliably between normal and abnormal states.

EEG is not an uncommon diagnostic test in clinical settings. Among other applications, it is the reference standard – that is, the best test available – to diagnose epilepsy. An EEG test can also reveal the effects of anaesthesia, sleeping patterns, neurological activity during a coma, and availability of oxygen. EEG can also confirm brain death, one of the two legally recognised forms of death in India.

In research, scientists use EEG for neuroscience, cognitive psychology, neurolinguistics, neuromarketing studies and to develop brain-computer interfaces.

What is volume conduction?

EEG measures electrical activity in the brain generated by neurons. During an EEG test, a health worker will place electrodes on your scalp. There are many layers of skin, fluid, and bone between the electrodes and the neurons. When a neuron produces electrical activity, charged particles will move through all these media before reaching the electrodes, and will be reflected, refracted, scattered, etc. en route.

Volume conduction refers to the movement of electrical activity through this three-dimensional volume. It also stands for the fact that the electrical activity is produced in one place whereas the detectors that detect it are located at some distance. The raw data collected by the electrodes will first need to be corrected for the effects of volume conduction, and then for noise in the data arising from faulty electrodes and incidental physiological activity (such as blinking or muscle activity). A clinician finally interprets the processed data.

How does an EEG test work?

The neurons that make up the human brain are constantly exchanging atoms, molecules, proteins, etc. with their surroundings. Sometimes neurons will push ions out into the space between neurons. Since ions of the same charge repel each other, this 'motion' can push away other ions, which push away even other ions, and so on.

When a large number of neurons start this cascade at the same time, a (relatively) big wave of electrical activity flows through the brain. The electrodes on the scalp are made of metal and track the changes in voltage as the waves move past them, creating an electroencephalogram.

Where are the electrodes placed?

You can place them anywhere, but if you're comparing notes with a scientist or want to follow clinical standards, you should follow the International 10-20 System.

In this system, the distance between two adjacent electrodes is either 10% or 20% of the total distance between two points on the head along which electrodes are being placed.

Four common points of reference are the nasion (the depression between the eyes, just above the bridge of the nose) and the inion (the crest at the back of the skull) going front to back, and from tragus to tragus going side to side. (The tragus is the small flap-like projection on the outer ear; you push it in to shut your ears when there's a loud noise.)

What does and doesn't EEG show?

The changes in voltage recorded at the electrodes are transmitted to a computer, which plots the readings on a graph with voltage on one axis and time passed on another. Health workers are typically interested in two types of data in the graph: the voltage (measured in millionths of a volt) and the frequency of the variations (measured in hertz). They will also factor in, among other things, the location of the neurons responsible for the electrical activity recorded by the test (for example, in the neocortex or the allocortex, the two types of cortices of the cerebral cortex).

EEG is better than other diagnostic devices at tracking relatively rapid electrical activity in the brain, in the order of milliseconds. On the downside, it is biased towards electrical signals generated closer to the surface of the cortex, and significantly so towards currents generated by neurons' dendrites and against those generated by the axons. The process to pinpoint where some electrical activity originated within the brain, to result in some electrical data, is also less than straightforward.

To overcome these and other challenges, researchers have used EEG together with other tests, like magnetic resonance imaging (MRI), and have developed sophisticated data acquisition, processing, and reconstruction methods.

Are EEGs affordable?

Aside from its metrological and diagnostic abilities, an EEG setup is also relatively simple and cost-effective.

The equipment involved doesn't take up much space, doesn't emit high-energy radiation or sounds, doesn't confine patients to small spaces (like MRI), is non-invasive, and is portable (the invasive version of EEG is called electrocorticography, or ECoG).

Similarly, aside from its diagnostic downsides, setting up an EEG test requires time – including applying a gel on the person's head and placing the electrodes in precise locations according to the 10-20 System – and its readings can be affected if the person has so much as thicker hair.

What is an EEG?

- EEG stands for electroencephalography. ‘Electro’ pertains to electricity; ‘encephalo’ refers to the brain; and ‘graphy’ is a suffix meaning to show or to represent.
- Neurons in the brain perform various functions by moving electrically charged particles such as ions.
- The movement of these particles gives rise to electrical activity that a health worker can use an EEG test to visualise.

- Researchers have also been able to relate data obtained from an EEG with different levels and modes of brain activity, and used it to distinguish reliably between normal and abnormal states.
- EEG is not an uncommon diagnostic test in clinical settings.
- Among other applications, it is the reference standard — that is, the best test available — to diagnose epilepsy.
- An EEG test can also reveal the effects of anaesthesia, sleeping patterns, neurological activity during a coma, and availability of oxygen.
- EEG can also confirm brain death, one of the two legally recognised forms of death in India

- In 1912, Vladimir Pravdich-Neminsky produced the first mammalian EEG, of a dog’s brain.
- Berger succeeded him in 1924 with the human counterpart. He is also credited with inventing the EEG, naming it, and introducing its utility in clinical settings

SC to look into use of Money Bills to pass laws

Chief Justice Chandrachud says appeals challenging the use of Money Bills by the Centre to pass contentious amendments in Parliament will be listed when he forms Constitution Benches; a Money Bill is restricted only to specified financial matters; Justice Chandrachud had delivered a dissenting opinion in 2021, overruled by the majority

The Hindu Bureau
NEW DELHI

Chief Justice of India D.Y. Chandrachud on Monday agreed to list petitions challenging the Money Bill route taken by the Centre to pass contentious amendments in the Parliament.

"I will list when I form Constitution Benches," the Chief Justice addressed senior advocate Kapil Sibal, who made an oral mentioning on behalf of the petitioners, including Rajya Sabha MP Jairam Ramesh.

The Money Bill question was referred to a seven-judge Bench in November 2019 by a five-judge Bench headed by Chief Justice Ranjan Gogoi in the case of Rojer Mathew vs. South Indian Bank Ltd. The cardinal issue is whether such amendments could be passed as a Money Bill, circumventing the Rajya Sabha, in violation of Article 110 of the Constitution.

The provisions

A Money Bill is deemed to contain only provisions dealing with all or any of the matters under clauses (a) to (g) of Article 110(1), largely including the appropriation of money from the Consolidated Fund of India and taxation.

In other words, a Money Bill is restricted only to the specified financial matters.

The reference includes legal questions concerning amendments made from 2015 onwards in the Prevention of Money Laundering Act (PMLA) through Money Bills, giving the Enforcement Directorate almost blanket powers of arrest, raids, etc. Though the court had upheld the legality of the PMLA amendments, it left the question whether the amendments could have been passed as Money Bills to the seven-judge Bench.

Similarly, the case also raises questions about the passage of the Finance Act of 2017 as a Money Bill to alter the appointments to 19 key judicial tribunals.

Mr. Ramesh, a petitioner in this case, had argued that the 2017 Act was deliberately categorised as a Money Bill to "extend executive control over these institutions (tribunals) by altering the composition of the selection committees and vastly downgrading the qualifications and experience required to staff these bodies".

The question of passage of laws after dressing them up as Money Bills had come up in the Aadhaar case too. However, the top court had, in a majority verdict in 2021, refused to review its 2018 judgment (K. Puttaswamy case) upholding the validity of the Aadhaar Act and its certification as a Money Bill.

Justice Chandrachud (as he was then) had delivered a dissenting opinion on the Review Bench in 2021. The two questions before the Review Bench had been whether the Lok Sabha Speaker's decision to declare the proposed Aadhaar law as a Money Bill was "final". The second, whether the Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016 was correctly certified as a 'Money Bill' under Article 110(1) of the Constitution.

Justice Chandrachud, in his dissent, had said the Review Bench ought to wait till the seven-judge Bench decided the larger questions on the Money Bill in the Rojer Mathew reference. But the majority had disagreed with him.

The contentious route

Some of the legislations passed as Money Bills in the Parliament include:

- Amendments to the Prevention of Money Laundering Act
- The Finance Act of 2017
- Aadhaar Act, 2016

A Money Bill is a financial legislation that contains provisions exclusively related to revenue, taxation, government expenditures, and borrowing

Cong. welcomes court's decision

NEW DELHI

The Congress on Monday welcomed the Supreme Court agreeing to consider a submission for setting up a Constitution Bench to hear pleas challenging the validity of passage of laws as Money Bills. » PAGE 5

Topics

- LUCA
- Omega Centauri
- As thoughts become digitised, who will protect our neurorights?
- Mount Etna,
- Mains

By saurabh Pandey

THE HINDU

Glimpses of LUCA, the life-form from which all other life descended

As mysteries go, a close second to the origin of life is how life-forms started to evolve. Researchers believe bacteria, archaea, and eukarya all originated from the last universal common ancestor. There is no fossil evidence of its existence, but the fact that modern genomes share so many features provides some clues

Sridhar Sivasubbu
Vinod Scaria

The origin of life on earth is one of the world's most enduring mysteries. There are a number of competing theories, but all of them lack conclusive proof. Nonetheless, scientists widely believe a combination of geological, climatic, and chemical processes gave rise to the building blocks of life.

In the 1920s, Alexander Oparin and J. B. S. Haldane independently proposed their origin theories – the first of their kind. In 1924 and 1929, Oparin and Haldane, respectively, suggested the first molecules making up the earliest life forms gradually self-organised from a "primordial soup" in a young earth's tempestuous, prebiotic environment. This idea is today called the Oparin-Haldane hypothesis.

Researchers have also conducted biochemistry experiments and found evidence to support this hypothesis. A particularly famous one was the Miller-Urey experiment in 1952, in which University of Chicago researchers Stanley Miller and Harold Urey showed that in the right conditions, inorganic compounds could give rise to complex organic compounds. Miller and Urey mixed methane, ammonia, and water, and when they applied a strong electric current – like a lightning strike might have – the mixture contained amino acids, the building blocks of proteins. They reported their discovery the very next year in the journal *Science*.

While we have evidence today that the earth's environment then may not have been much like what the experiment presumed to mimic, the very fact that amino acids could be created in a broth of inorganic molecules was groundbreaking.

Other researchers have proposed other theories about the origin of life. A particularly prominent one is that meteorites from space could have brought the building blocks of life, sustained by discoveries on the earth as well as out there. In August 2019, French and Italian scientists reported discovering extra-terrestrial organic material 3.3 billion years old, whereas Japan's Hayabusa 2 mission to the asteroid Ryugu indicated the presence of more than 20 amino acids there.

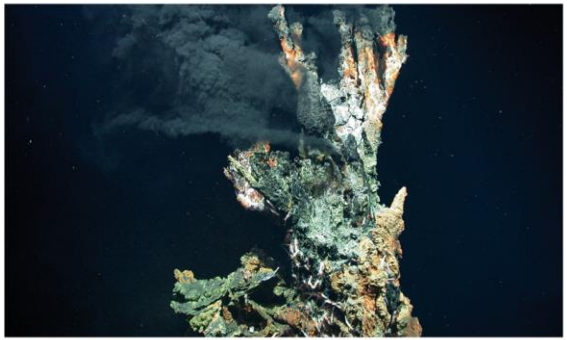
LUCA and the molecular clock

As mysteries go, a close second to the origin of life is how life-forms evolved to produce the rich diversity we see around us today. Researchers believe all three branches of life – bacteria, archaea, and eukarya – originated from a single cell, called the last universal common ancestor (LUCA). There is no fossil evidence to support the existence of LUCA, but the fact that modern genomes share so many features provides some insights. An important concept that allows scientists to reconstruct the 'tree of life' is the theory of the molecular clock. Molecular biologist Emile Zuckerkandl and biochemist Linus Pauling proposed it in the 1960s, and biologist Motoo Kimura subsequently improved it.

According to a simplified version of the theory, the rate at which mutations are added or removed from a population's genome is proportional to the rate of acquiring new mutations, which is constant. Later studies also found that the mutation rate varies between species. Using these two facts, researchers developed a way to estimate how much time could have passed between two evolutionary events.

To calibrate the molecular clock to a particular rate of mutations, researchers establish links between a genome and known events, such as the 'date' on which the first mammal evolved or the age of certain fossils. These links act like temporal benchmarks.

Thanks to the large number of genome sequences and fossils of various organisms, as well as the computing power available today, researchers routinely use the molecular clock to understand the evolution of various life-forms on earth through time.



The 'Candelabra' hydrothermal vent on the Mid-Atlantic Ridge, which is 3.3 km underwater. In the past, scientists have found evidence of ancient life forms in the precipitates around such vents. MARUM (CC BY 4.0)

> Scientists widely believe a combination of geological, climatic, and chemical processes gave rise to the building blocks of life

Which is older: LUCA or fossils?

In a recent paper in the journal *Nature Ecology and Evolution*, researchers at the University of Bristol and Exeter in the U.K. constructed a phylogenetic tree of 350 bacterial and 350 archaeal genomes. Then, using a molecular clock, the team estimated when LUCA could have originated: around 4.2 billion years ago, just 300 million years after the earth itself formed.

The team also reported that LUCA may have had a small genome, of some 2.5 million bases and encoding around 2,600 proteins, all just enough to help it survive in a unique environmental niche. The team also suggested the metabolites produced by LUCA – compounds produced as a result of its metabolism – could have created a 'secondary' ecosystem in which other microbes could have emerged.

Importantly, the origin of LUCA by 4.2 billion years significantly predates previous suggestions about the origin of life on earth. For context, researchers have found fossil records of the earliest life-forms in the Pilbara Craton in western Australia, one of the few places on the planet where archaean rocks are exposed aboveground and accessible. Studies of these fossils have suggested that life that lived on the rocks emerged around 3.4 billion years ago. The current study, on the other hand, pushes this date back by almost a billion years, almost on the heels of the birth of our planet itself.

The researchers also found some reasons to believe LUCA may have had genes responsible for immunity, suggesting it had to fight off viruses.

Taken together, the findings are tremendously significant, not just for understanding how life emerged and evolved on the earth: they also speak to our ability to look for similar forms of life across the universe. The insights into evolution they provide will also give a significant fillip to human ambitions to engineer synthetic organisms for various industrial, chemical, and biological processes on the earth, as well as to create or moderate ecosystems on other planets in the future.

(The authors are senior consultants at Vishwanath Cancer Care Foundation, and adjunct professors at IIT Kanpur and Dr. D.Y. Patil Vidyapeeth, and distinguished visitors at Ashoka University.)

THE GIST

In 1952 researchers applied a strong electric current to a mixture of methane, ammonia, and water. This reaction formed amino acids, the building blocks of proteins

In 2019, scientists reported discovering extra-terrestrial organic material 3.3 billion years old. Japan's Hayabusa 2 mission to the asteroid Ryugu indicated the presence of more than 20 amino acids

Researchers recently constructed a phylogenetic tree of 350 bacterial and 350 archaeal genomes. Then, using a molecular clock, they estimated that LUCA possibly originated around 4.2 billion years ago, 300 million years after the earth formed

LUCA

- . In 1924 and 1929, Oparin and Haldane, respectively, suggested the first molecules making up the earliest life forms gradually self-organised from a “primordial soup” in a young earth’s tempestuous, prebiotic environment.
- This idea is today called the Oparin-Haldane hypothesis.
- Researchers believe all three branches of life — bacteria, archaea, and eukarya — originated from a single cell, called the last universal common ancestor (LUCA).
- There is no fossil evidence to support the existence of LUCA, but the fact that modern genomes share so many features provides some insights.

- **using a molecular clock, the team estimated when LUCA could have originated: around 4.2 billion years ago, just 300 million years after the earth itself formed.**

QUESTION CORNER

The ABO classification system

How are blood groups differentiated?

A: Human blood consists of red blood corpuscles as a constituent, which give it its red colour. On the surfaces of these red cells are present one or both of two types of antigens (proteins), designated A and B. Other than these, two antibodies, designated as antibody-A and antibody-B, present in the serum are also involved in the classification of human blood. (Serum, a constituent of blood, is a straw-coloured liquid that can be seen after removing all the other blood cells from a sample.)

Antibodies have the property of clumping red cells. When antigen-A is present on the red cells, the serum contains only antibody-B, which will clump red cells with antigen-B on their surface. Then the blood is classified as group A.

When antigen-B is present on the red cells, the serum contains only antibody-A, which clumps red cells with antigen-A. As a result, the blood is classified as group B.

In some people, both antigens A and B are present on all the red cells, so their serum does not contain any of the antibodies. They belong to the AB group. Their blood cells don't clump whether they receive A group or B group blood. That is, A and B are compatible with the AB group.

The fourth type, O, has neither of the antigens on its red cells but has both antibodies in the serum.

Red blood cells carry oxygen from the lungs to the body's tissues. White cells monitor for potential threats and respond to infections. GETTY IMAGES

In order to keep red cells from clumping, those with A group blood can receive only A and O group blood, and those with B group blood can only receive B and O group blood. But the AB group can receive blood from any of the groups. Thus, it is called the universal recipient. Similarly, those with O-group blood are universal donors.

This system of classification is called the ABO system. Blood groups are also classified by the Rhesus system (Rh). The Rh factor leads to one type in which the Rh factor is present (Rhesus positive) and another in which it is not (Rhesus negative).

For feedback and suggestions for 'Science', please write to **science@thehindu.co.in** with the subject 'Daily page'

ABO Blood group

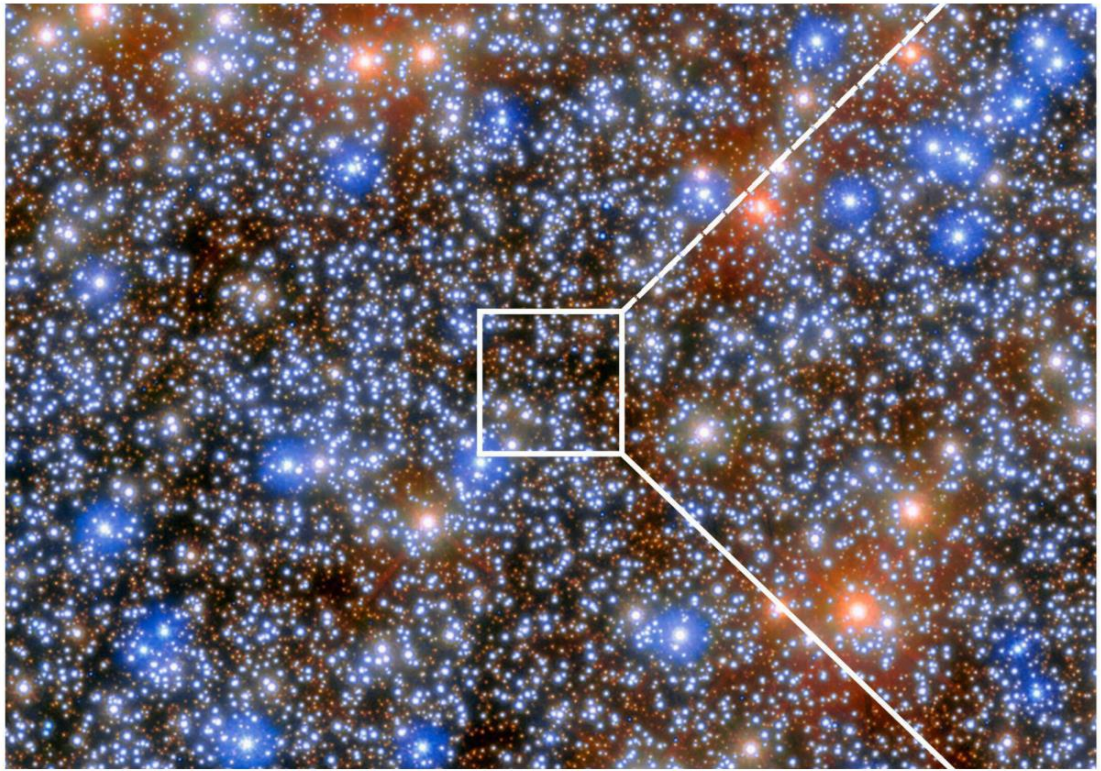
- Human blood consists of red blood corpuscles as a constituent, which give it its red colour.
- On the surfaces of these red cells are present one or both of two types of antigens (proteins), designated A and B.
- Other than these, two antibodies, designated as antibody-A and antibody-B, present in the serum are also involved in the classification of human blood.

- (Serum, a constituent of blood, is a straw-coloured liquid that can be seen after removing all the other blood cells from a sample.)
- Antibodies have the property of clumping red cells.
- When antigen-A is present on the red cells, the serum contains only antibody-B, which will clump red cells with antigen-B on their surface.
- Then the blood is classified as group A.

- When antigen-B is present on the red cells, the serum contains only antibody-A, which clumps red cells with antigen-A.
- As a result, the blood is classified as group B.
- In some people, both antigens A and B are present on all the red cells, so their serum does not contain any of the antibodies.
- They belong to the AB group.
- Their blood cells don’t clump whether they receive A group or B group blood. That is, A and B are compatible with the AB group.

- The fourth type, O, has neither of the antigens on its red cells but has both antibodies in the serum.
- In order to keep red cells from clumping, those with A group blood can receive only A and O group blood, and those with B group blood can only receive B and O group blood. But the AB group can receive blood from any of the groups.
- Thus, it is called the universal recipient. Similarly, those with O-group blood are universal donors.
- This system of classification is called the ABO system.
- Blood groups are also classified by the Rhesus system (Rh).
- The Rh factor leads to one type in which the Rh factor is present (Rhesus positive) and another in which it is not (Rhesus negative).

BIG SHOT



This image captured by the Hubble Telescope, and released last week, shows the star cluster Omega Centauri. One of the enduring mysteries of the cosmos has been the strange absence of medium-sized black holes between the very small and very big extremes. On July 10, astronomers said they had found the best evidence yet of the existence of one of these "missing link" black holes, located within the square in this image. THE HINDU

Omega Centauri

- Omega Centauri is a globular cluster in the constellation of Centaurus that was first identified as a non-stellar object by Edmond Halley in 1677.
- Located at a distance of 17,090 light-years (5,240 parsecs), it is the largest-known globular cluster in the Milky Way at a diameter of roughly 150 light-years.

- It is estimated to contain approximately 10 million stars, with a total mass of 4 million solar masses, making it the most massive known globular cluster in the Milky Way.
- Omega Centauri is very different from most other galactic globular clusters to the extent that it is thought to have originated as the core remnant of a disrupted dwarf galaxy

ISTOCKPHOTO

As thoughts become digitised, who will protect our neurorights?

The right to safeguard one's mental statuses and thoughts from surveillance are precious fundamental rights but technological advancements may cheapen them in some contexts. The digitisation of neuro-data raises great opportunities as well as concerns

Krishna Ravi Srinivas

Neurotechnologies have come a long way since the development of electroencephalography (EEG). Invented a hundred years ago, the EEG has had a significant impact on our knowledge of the human brain and various treatments of brain disorders. Many researchers expect that soon there will be wearable EEGs that could directly assist human cognitive functions. Elon Musk's Neuralink has also kindled hope about using brain-computer links to help physically impaired people restore some lost function.

The 1990s was popularly known as the 'decade of the brain' as research on neuroscience and neurotechnologies received a big boost from various governments. The European Union's 'Human Brain Project' and the subsequent 'BRAIN' initiative were some of the major initiatives. Today, research in these areas is also supported by private companies, especially in the life sciences sector, and is also more extensive than before, including brain pathophysiology, deep-brain stimulation, and neuromarketing.

Neurotechnologies range from Magnetic Resonance Imaging (MRI) that health workers routinely use to the rarer Brain-Computer Interfaces (BCI). In the last few decades, the type of sensory information these technologies have become able to record has expanded considerably. Sophisticated biosensors that can record a person's physiological activities, behavioural responses, and emotions are no longer fiction.

How is neurodata valuable?

The digitisation of neuro-data raises great opportunities as well as concerns. Not all neurotech users are care-seekers, as smartwatches, apps, and 'embeddables' are integrated more into day-to-day activities. After users' devices collect these data, there will be an option to transmit them to healthcare providers and private companies, who will have an incentive to integrate them in a larger knowledge framework to offer, say, real-time tracking of health indicators and personalised suggestions.

This also increases the risk of surveillance – from multiple sources for different purposes. For example, a manager can monitor the movements and mental states of an employee to track alertness, fatigue, and other indicators. This data can be shared with various state and non-state actors, including other employers and physicians. This can be a boon but can also help these actors exert more control over individuals' behaviour. Digitised health data also has great commercial value in advertising and marketing (including neuromarketing).

Surging investment by the private sector in neurotechnologies has also raised concerns about their governance and regulation. There are unique ethical concerns here because these neurotechnologies can probe individuals' physiological and psychological states.

Ultimately the right to think freely and mental privacy can be imperilled. In the garb of monitoring and assessing efficiency, different entities may be able to track and monitor the movements and behaviour of diverse sections of the population, individually and collectively.

What is neuroethics?

The right to think freely and the right to safeguard one's mental statuses and thoughts from surveillance and monitoring are precious fundamental rights but technological advancements may cheapen them in some contexts. Experts strive to adopt ethical standards such that humankind benefits most from the use of neurotechnologies while minimising harm. This is the principal concern of neuroethics. It has emerged as an important field of research and action in the last two decades.

Various institutions and funding agencies have tried to identify and enforce ethical principles for neuro-X research and development. In 2015, the U.S. Presidential Commission on Bioethics published a two-volume report entitled 'Gray Matters'. It focused its analysis on three "controversial topics that illustrate the ethical tensions and societal implications of advancing neuroscience and technology: cognitive enhancement, consent capacity, and neuroscience and the legal system".

In 2019, the Organisation for Economic Co-operation and Development (OECD) recommended nine principles to ensure the ethical development and use of neurotechnologies based on the concept of responsible innovation. Two of them were "safeguarding personal brain data" and "anticipating and monitoring potential unintended use and/or misuse".

UNESCO published a paper in 2022 in which it said: "As [neurotech] actively interacts with, and alters the human brain, this technology also raises issues of human identity, freedom of thought, autonomy, privacy and flourishing. The risk of unauthorised access to the sensitive information stored in the brain is a case in point. Already today, neural data is increasingly sought after for commercial purposes, such as digital phenotyping, emotional information, neurogaming and neuromarketing. Neuromarketing units have been developed by industry to evaluate, and even alter consumer preferences – raising serious concerns about mental privacy. These risks can also pose serious problems when dealing with non-democratic governments."

In 2023, researchers at the Institute of Neuroethics in Atlanta in the U.S. reviewed several guideline documents and ethical frameworks published by institutions, think-tanks, governments, etc. worldwide. Among other things, they wrote, these texts ask researchers to "proactively consider and communicate potential implications of scientific advances" and "to improve and meaningfully incorporate ethics in training and the conduct of research".

What are your neurorights?

Internationally accepted human rights principles and the Universal Declaration of Human Rights provide some inkling as to individuals' neurorights. But the extent to which they are enforceable depends on the laws in each jurisdiction.

In 2021, Chile became the first country to legally recognise its citizens' neurorights when its Senate agreed to amend the constitution. As a result, according to a 2022 article in the journal *AI & Society*, technological developments in the country must "respect people's physical and mental integrity" and its laws should "protect brain activity and information related to it". In the U.S., Colorado enacted a law in April 2024 to protect individuals' neurological privacy while California is deliberating a similar instrument.

But some legal scholars have said the current rights framework is adequate and that laws specific to neurorights may be limited in scope. For example, in a paper published last year in the journal *AJOB Neuroscience*, Pennsylvania State University scholars discussed whether neuro-privacy is meaningfully separate from data privacy.

An important challenge to developing suitable neuroethical standards is that the underlying technologies are evolving rapidly. The contexts in which people use these technologies are also diverse, beset by disparate expectations and cultural norms. For now, UNESCO has appointed an expert group to develop the "first global framework on the ethics of neurotechnology", expected to be adopted by the end of 2025. While this framework is not likely to result in a treaty or a binding convention, it could have a major impact on governments' guidance documents and policy narratives. Apart from UNESCO, various intergovernmental organisations are also actively working on the human rights dimension of neurotechnologies.

Krishna Ravi Srinivas is adjunct professor of law, NALSAR University of Law Hyderabad; consultant, RIS, New Delhi; and associate faculty fellow, CeRAI, IIT Madras.

As thoughts become digitised, who will protect our neurorights?

- Neurotechnologies have come a long way since the development of electroencephalography (EEG).
- Invented a hundred years ago, the EEG has had a significant impact on our knowledge of the human brain and various treatments of brain disorders.
- Many researchers expect that soon there will be wearable EEGs that could directly assist human cognitive functions.
- Elon Musk's Neuralink has also kindled hope about using brain-computer links to help physically impaired people restore some lost

What are your neurorights?

- Internationally accepted human rights principles and the Universal Declaration of Human Rights provide some inkling as to individuals' neurorights.
- But the extent to which they are enforceable depends on the laws in each jurisdiction.
- In 2021, Chile became the first country to legally recognise its citizens' neurorights when its Senate agreed to amend the constitution.

- As a result, according to a 2022 article in the journal AI & Society, technological developments in the country must “respect people’s physical and mental integrity” and its laws should “protect brain activity and information related to it”.
- In the U.S., Colorado enacted a law in April 2024 to protect individuals’ neurological privacy while California is deliberating a similar instrument.

- An important challenge to developing suitable neuroethical standards is that the underlying technologies are evolving rapidly.
- The contexts in which people use these technologies are also diverse, beset by disparate expectations and cultural norms.
- For now, UNESCO has appointed an expert group to develop the “first global framework on the ethics of neurotechnology”, expected to be adopted by the end of 2025

Vantage point

A person watches a cloud and lava erupting over the Mount Etna volcano in Sicily on Monday. Sicily's Catania airport began gradually reopening for flights on July 5, after they were temporarily suspended following an eruption from Europe's largest active volcano. AFP

Mount Etna,

- Mount Etna, active volcano on the east coast of Sicily.
- Like other active volcanoes, it varies in height, increasing from deposition during eruptions and decreasing from the periodic collapse of the crater's rim.
- Mount Etna is the highest active volcano in Europe, its topmost elevation being about 10,900 feet


CZECH REPUBLIC
GERMANY
SLOVAKIA
AUSTRIA
HUNGARY
SWITZERLAND
FRANCE
SLOVENIA
CROATIA
BOSNIA AND HERZEGOVINA
SERBIA
SAN MARINO
ADRIATIC SEA
MONTENEGRO
ITALY
Corsica (FRANCE)
Rome
ALBANIA
Sardinia
TYRRHENIAN SEA
GREECE
IONIAN SEA
MEDITERRANEAN SEA
Sicily
0 100 200 mi
0 150 300 km
MEDITERRANEAN SEA
© Encyclopædia Britannica, Inc.

Topics

- Supreme court on inclusion of scheduled caste
- Human Auditory system
- Agarwood
- Intergenerational equity And financial distribution
- Agriculture and post harvest losses
- What about women representatives in independent India?
- Indo Pacific Economic Framework for Prosperity (IPEF)
- *Battir – Land of Olives and Vines*
- Mains

By saurabh Pandey

THE HINDU

States cannot tinker with the Scheduled Castes List, says SC

The Hindu Bureau
NEW DELHI

The Supreme Court has held that the States cannot tinker with the Scheduled Castes List notified under Article 341 of the Constitution.

"Any inclusion or exclusion of any caste, race or tribe or part of or group within the castes, races or tribes has to be, by law, made by the Parliament, and not by any other mode or manner," a Bench of Justices Vikram Nath and P.K. Mishra said while clarifying on the law.

The judgment by the top court came in a challenge by Dr. Bhim Rao Ambedkar Vichar Manch, Patna, to a July 1, 2015 notification issued by the Bihar government, on the basis of the recommendation of the State Backward Classes Commission to merge the Extremely Backward Class (EBC) of Tanti-Tantwa with the Scheduled Caste of Pan/Sawasi in the Scheduled Castes List. The merger would enable the Tanti-Tantwa to claim the benefits of Scheduled Castes.

Justice Nath, who authored the judgment, pronounced the 2015 resolution as "patently illegal and erroneous".

"The State government had no competence/authority/power to tinker with the lists of Scheduled Castes published under Article 341 of the Constitution," Justice Nath concluded in the July 15 verdict.

The court said the State Backward Commission, in the first place, had jurisdiction to recommend the joining of a caste or group with a notified Scheduled Caste community.

"Even if it makes such a recommendation, right or wrong, the State has no authority to proceed to implement the same when it was fully aware that the Constitution does not permit it to do so," Justice Nath observed.

Supreme court on inclusion of scheduled caste

- **The Supreme Court has held that the States cannot tinker with the Scheduled Castes List notified under Article 341 of the Constitution.**
- **“Any inclusion or exclusion of any caste, race or tribe or part of or group within the castes, races or tribes has to be, by law, made by the Parliament, and not by any other mode or manner**

Inclusions and exclusions in the Scheduled Castes List are only possible through law made by the Parliament; neither the President nor the Centre can make changes: Supreme Court judgment.

Article 341

(1) The President may with respect to any State or Union territory, and where it is a State, after consultation with the Governor thereof, by public notification, specify the castes, races or tribes or parts of or groups within castes, races or tribes which shall for the purposes of this Constitution be deemed to be Scheduled Castes in relation to that State or Union territory, as the case may be.

(2) Parliament may by law include in or exclude from the list of Scheduled Castes specified in a notification issued under clause (1) any caste, race or tribe or part of or group within any caste, race or tribe, but save as aforesaid a notification issued under the said clause shall not be varied by any subsequent notification.

How the same ear senses murmurs and withstands deafening music

At the heart of our auditory system are intricate hair cells nestled within the cochlea. Each cochlea houses around 16,000 of these sensory cells, each with a cluster of hair-like projections called stereocilia. These stereocilia, arranged like a staircase from the shortest to the tallest, are key to hearing

T.V.Venkateswaran

A tree that is flexible enough to shake in a gentle breeze will undoubtedly be uprooted during a squall. On the other hand, a hardy tree that resists the force of a strong gale will hardly shudder during a gentle breeze. But unlike the tree, our ears can handle both ends of the spectrum.

The human auditory system, a marvel of nature, doesn't only detect the faintest sound signals but also demonstrates remarkable resilience in the face of thunderous noises. This adaptability allows us to distinguish the gentlest whispers from our loved ones and immerse ourselves in the thundering music of a nightclub.

Recent research has unveiled a fascinating mechanism that allows our auditory system to adapt to various sound environments. Just as our pupils dilate in the dark and contract in bright light, our ears have mechanisms that help us adjust to "see" in dim sound environments and protect us from harsh sound environments.

How do we hear?

At the heart of our auditory system are intricate hair cells nestled within the human cochlea. Each cochlea houses around 16,000 of these flask-shaped sensory cells, each with a cluster of hair-like projections called stereocilia. These stereocilia, arranged like a staircase from the shortest to the tallest, are the key to our hearing.

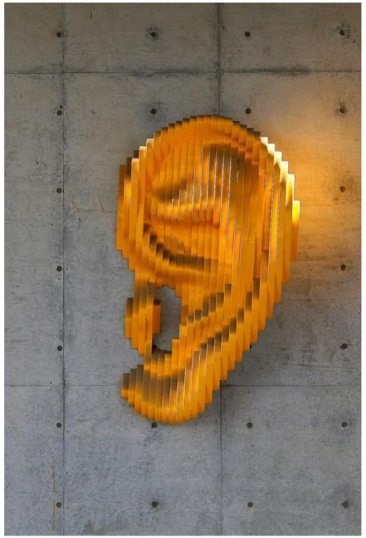
Two adjacent stereocilia are connected by a filamentous extracellular tether called a tip link. These tip links, functioning like a complex network of connections, are pivotal in our hearing process, converting sound waves into electrical signals our brain can interpret.

When sound waves reach the ear, they create vibrations in the inner ear fluid. These vibrations cause the stereocilia to bend, stretching the tip links that connect them. This stretching opens ion channels in the stereocilia that allow potassium ions to enter the hair cell and create an electrical signal.Nerve cells attached to the hair cells pick up this signal and send it to the brain, where it is interpreted as sound. This mechanism is similar to a microphone converting sound waves into electrical signals.

A mechanical circuit breaker

Humans can perceive sound in the range of 20 Hz to 20 kHz in frequency and 5-120 decibels (dB) in intensity. These sounds produce a force of 10-100 piconewtons (pN) on tip links. We must apply roughly one newton (N) of force to hold an apple or orange in our hands. One newton is equal to one thousand billion piconewtons. So we can imagine how small the force acting on the tip links is.

The auditory system relies on tip links. Each tip link consists of two proteins, cadherin-23 (CDH23) and protocadherin-15 (PCDH15). These proteins are at risk of breaking when exposed to loud noises. Surprisingly, this breaking is actually a protective mechanism that prevents damaging sounds from reaching the hair cells in the ear, which can't regenerate once they are damaged. But unlike hair cells, the tip links can regenerate, which helps preserve our hearing.



Humans can perceive sound in the range of 20 Hz to 20 kHz in frequency and 5-120 dB in intensity. Representative image. JAEE KIM/UNSPLASH

The tip links disassociate naturally in response to ambient sounds. Typically, a tip link complex's average lifetime is about 31.8 seconds. The tip links unbind and rejoin repeatedly and maintain the network in the hair cells.

The temporary hearing loss we might experience after a loud blast or blaring music is the result of losing multiple tip link complexes at the same time. Once the complexes re-form, hair cell function returns to normal levels. In effect, they function like a mechanical circuit breaker in the auditory system.

The lifetime of the tip links is related to the loudness of the sounds to which they are exposed. If the loudness is high, the tip links survive only for a short duration. They break fast. At 1 kHz, the tip links experience a tension of 5 pN. At a higher frequency of 4 kHz, the tension shoots up to 34 pN. The average lifetime of the tip link complex is just eight seconds when subjected to a force of 10 pN. This implies that the tip links must break up within minutes in noisy environments.

"The human ear is sensitive to even 5 dB, and the tip link that can respond to those low stimuli ought not to survive the piercing sound in a nightclub or orchestra, rendering most people deaf. Since this does not occur, it seems appropriate to expect a mechanism that safeguards the transduction at large forces," Sabyasachi Rakshit, a lead author of the new paper and associate professor in the Department of Chemical Sciences at the Indian Institute of Science Education and Research, Mohali, said.

> The human auditory system doesn't only detect the faintest sound signals but also withstands thunderous noises. This allows us to distinguish the gentlest whispers and immerse ourselves in the music of a nightclub

Abhishek Chaudhuri, the other lead author and an associate professor in the Department of Physical Sciences at the same institute, added: "We were interested in finding the mechanism that enables tip links to survive forces of varying frequency and amplitude and capture the features that can explain uninterrupted hearing."

Testing tip links

We can determine the strength of a length of thread by securing one end with a clamp to the roof and hanging weights on the other end. Similarly, the researchers used an atomic force microscope (AFM) to secure the tip link complexes and observed the lifespan of the tip link: how long it survived without breaking when the amount of force was changed.

They found that a tip-link complex exhibits three distinct types of responses based on the force.

As anticipated, the complex's lifetime decreased when the applied force was low. But when the magnitude of the force was increased, the lifetime decreased. The complex was also surprisingly unaffected by mid-range tensile forces between around 36 pN and 70 pN.

When subjected to strong forces greater than 80 pN – representing intense sounds – the tip-links are disconnected in order to protect the hearing system. At even higher forces, the tip links only remain intact for a short period of time.

"The tip links act like the force sensor, balancing the incoming force and stepping in to protect us from the danger. This response at a louder noise level cuts off the transmission protecting the hair cells," Dr. Rakshit said.

Like a sensitive switchboard in our ears, the tip-link first detects the subtle mechanical signals from incoming sounds. It then converts them into electrical signals, allowing us to hear faint sounds. "However, this tiny protein-protein complex transforms into a gatekeeper when the sound is loud," Dr. Chaudhuri said. We discovered that tip-links act as force filters, selectively transmitting low forces to activate ion channels while blocking intermediate force levels. Moreover, when faced with extremely high forces, the tip-links disengage altogether, preventing damage to our hearing apparatus."

It is well-known that a mutation in the PCDH15 protein results in inherited deafness. "We conducted similar studies with mutated tip links, and found that the lifetime-force curve of the mutant is dramatically different," says Sabyasachi.

The lifetime of the tip link showed three kinds of responses across the force range for regular tip links. However, in the mutated tip link, the response is reduced with increased force across all the force ranges.

"We were not able to see the mid-range behaviour found in the normal tip link, in the mutated tip links," he added.

This implies that the ability of the normal tip link to respond to mid-range forces is crucial for hearing, and inherited deafness results from mutation-related loss of this function.

"By unravelling the intricate mechanisms of tip-links, we are paving the way for developing innovative strategies to protect against hearing loss caused by loud noises. With further research, we aspire to unlock more secrets of this fascinating biological system. This could potentially enhance the quality of life for millions affected by hearing impairment," Amin Sagar, a lead author and a former postdoc at IISER Mohali, said.

The team consisted of Nisha Arora, Jagadish P. Hazra, Sandip Roy, Gaurav K. Bhati, Sarika Gupta, K. P. Yogendran, Abhishek Chaudhuri, Amin Sagar, and Sabyasachi Rakshit. The study paper was published in the journal *Nature Communications*.

(T.V. Venkateswaran is a science communicator and visiting faculty member at the Indian Institute of Science Education and Research, Mohali.)

Human Auditory system

- At the heart of our auditory system are intricate hair cells nestled within the human cochlea.
- Each cochlea houses around 16,000 of these flask-shaped sensory cells, each with a cluster of hair-like projections called stereocilia.
- These stereocilia, arranged like a staircase from the shortest to the tallest, are the key to our hearing.
- Two adjacent stereocilia are connected by a filamentous extracellular tether called a tip link.
- These tip links, functioning like a complex network of connections, are pivotal in our hearing process, converting sound waves into electrical signals our brain can interpret.

- When sound waves reach the ear, they create vibrations in the inner ear fluid.
- These vibrations cause the stereocilia to bend, stretching the tip links that connect them.
- This stretching opens ion channels in the stereocilia that allow potassium ions to enter the hair cell and create an electrical signal.
- Nerve cells attached to the hair cells pick up this signal and send it to the brain, where it is interpreted as sound.
- This mechanism is similar to a microphone converting sound waves into electrical signals.

- **Humans can perceive sound in the range of 20 Hz to 20 kHz in frequency and 5-120 decibels (dB) in intensity.**
- **These sounds produce a force of 10–100 piconewtons (pN) on tip links.**
- **We must apply roughly one newton (N) of force to hold an apple or orange in our hands.**
- **One newton is equal to one thousand billion piconewtons.**

- **The auditory system relies on tip links. Each tip link consists of two proteins, cadherin-23 (CDH23) and protocadherin-15 (PCDH15).**
- **These proteins are at risk of breaking when exposed to loud noises**

THE SCIENCE QUIZ

The odoriferous life of agarwood

Vasudevan Mukunth

Please send in your answers to science@thehindu.co.in

QUESTION 1

Agarwood is a fragrant wood produced naturally by trees belonging to a few genera. The principal among them is _____, trees of which are distributed around South and Southeast Asia. The genus name in Latin roughly means "eagle." Fill in the blank.

QUESTION 2

The process by which these trees produce agarwood, a.k.a. agalloch, begins when they are infected by a particular fungus. Name the fungal species.

QUESTION 3

Name the tree that provides most of the world's agarwood, which is used to make perfumes, incense sticks, and other aromatic products. The first half of its binomial nomenclature is the answer to Q1. It is also the state tree of Tripura. What is the scientific (species) name of this tree?

QUESTION 4

Due to unchecked demand for agarwood, trade in the tree that produces it (in Q3) and its products is protected by a multilateral treaty called _____. This treaty also requires countries that ratify it to ensure agarwood isn't harvested in a way that affects its survival. Name the treaty.

QUESTION 5

Researchers have found several compounds in the oil extracted from agarwood using steam distillation. Many of them belong to the class called Z. These compounds are derived from another compound that's the main component of natural rubber. A Z compound is also responsible for eucalyptus's unique fragrance. Name Z.

Answers to July 16 quiz:

1. Mathematicians who first developed a reasoned answer to the problem of points – **Ans: Blaise Pascal and Pierre de Fermat**
2. The mathematical foundation for statistics – **Ans: Probability**
3. Aristotle's hypothesis that Pascal overturned in 1647 – **Ans: Horror vacui**
4. Theorem that Andrew Wiles solved in 1994 – **Ans: Fermat's Last Theorem**
5. Subject of Fermat's principle that takes the shortest path – **Ans: Ray of light**

Visual: **Voltaire**

First contact: Irfan Ali | Pratyush Shukla | Seema Das

Visual: Over time, the resin saturates a part of the tree called X (a.k.a. Y), shown above. This X (or Y) is called agarwood. Name X and Y. This woody part of the tree derives one of its names from its location rather than its function. RBREIDBROWN

Agarwood

- **Agarwood, aloeswood, eaglewood, gharuwood or the Wood of Gods, most commonly referred to as oud or oudh is a fragrant, dark and resinous wood used in incense, perfume, and small hand carvings.**
- **It forms in the heartwood of *Aquilaria* trees after they become infected with a type of *Phaeoacremonium* mold, *P. parasitica*. The tree defensively secretes a resin to combat the fungal infestation.**
- **Prior to becoming infected, the heartwood mostly lacks scent, and is relatively light and pale in colouration.**

- **However, as the infection advances and the tree produces its fragrant resin as a final option of defense, the heartwood becomes very dense, dark, and saturated with resin.**

- **This product is harvested, and most famously referred to in cosmetics under the scent.**
- **Since 1995, the Convention on International Trade in Endangered Species of Wild Fauna and Flora has listed *Aquilaria malaccensis* (the primary source) in its Appendix II (potentially threatened species).**

17/7/24.

Q Neurotechnology with neuroethics will impact neuroright. Illustrate (10m)

Neurotechnology refers to a technology that interacts with Brain or Nervous system.

GROWING IMPORTANCE -

1. Neurotechnologies have come long way since development of Electroencephalography (EEG). It have serious effect on knowledge of human brain & treatment of Brain disorders.
2. Example, Elon's musk Neuralink has also kindled hope about using Brain computer links to help physically impaired people.
3. Range from Magnetic resonance Imaging (MRI) to Brain computer interface, Neurostimulation & Neuropharmacology.

CONCERNS -

1. Privacy issue → Data extracted from Real time tracking - Digitalised, increased risk of monitoring can control over individual behaviour.
2. Neurocognitive Risks → these can probe individual physiological states, interacting actively with human brain, Human autonomy, as it gives access to sensitive info. stored in Brain.
3. Neuromarketing → Developed by industry to evaluate, alter consumer preference - raising concern on mental health.

NEUROETHICS - NEURORIGHT - A PRO-ACTIVE RIGHT -

- Internationally accepted human rights principles & universal declaration of Human Rights do provide some linking as to individual Neuro Right.
- But extent has yet to be decided on enforcable part, in each jurisdiction.
- In 2021, Chile became first country to legally recognize it's citizen's neuro right. Followed by Colorado late 2024, & California deliberating similar instrument.
- UNESCO has expected to adopt "first global framework on ethics of Neurotechnology" by 2025. Here, important challenge is developing suitable Neuroethical standards with the rapidly evolving technologies. The context in which people use these technologies are also diverse, bear by disparate expectations & cultural norms.

To address Ethical concern proactively, ensuring advancement with benefiting the society, while minimizing potential risks & ensuring individual autonomy & Right is need of the moment.

Intergenerational equity as tax devolution criterion

S. Raja Sethu Durai

Professor of Economics, University of Hyderabad

R. Srinivasan

Member, Tamil Nadu State Planning Commission

The devolution of Union tax revenue to States is a topic that has been in discussion in the political sphere in recent times. However, it is an evergreen subject of discussion for economists. One of the points in this discussion is the factors in the horizontal distribution of States' share in Union tax revenue among States. The Finance Commission (FC) decides the horizontal distribution formula once every five years. Despite repeated quinquennial revisits to this distribution formula, conceptually, it is predictable that equity is prioritised over efficiency. Equity in the distribution formula is about intragenerational equity, that is, to redistribute tax revenue among States. The undesirable consequence of this is the accentuation of intergenerational inequity within States. The argument is that intergenerational equity should be a factor in India's horizontal distribution formula for tax devolution.

Intergenerational fiscal equity

In general, intergenerational equity is the principle of providing equal opportunities and outcomes to every generation. Intergenerational equity ensures that the decisions or actions of current generations should not burden the future generation. From a public finance point of view, it refers to a situation where every generation pays for the public services it receives and does not burden the future generation through borrowings.

For any government, there are only two ways to raise its revenue: tax or borrowing. If, in a period, the tax revenue equals the current expenditure of the government, then the current taxpayers pay for the public services they receive. If the government finances the current expenditure through borrowings, it means the future generation is going to pay higher taxes to repay this borrowing and interest. In other words, borrowing to meet the current expenditure of the government amounts to intergenerational inequity.

There is an argument in fiscal economics called Ricardian Equivalence Theory that whenever the government resorts to borrowing to finance current expenditure, households react through higher savings and thus enable the future generation to pay higher taxes as well as keep aggregate demand in the economy constant over different periods. This theory assumes that the current generation pays tax less than the value of the current public services it receives, and thus saves. Whereas in our present federal situation this is not the case. Households in developed States pay taxes that are not entirely used within the specific States, thus compelling such States to borrow more or curtail current expenditure. On the contrary, households in developing States pay taxes much less than the value of current expenditure and fill the gap by receiving higher financial transfers from the Union government.

The Finance Commission needs to have a relook at the indicators in rewarding State fiscal efficiency

Versus intragenerational equity

To give the broader picture, let us divide some of the major States into high-income and low-income – Tamil Nadu, Kerala, Karnataka, Maharashtra, Gujarat, and Haryana as high-income States and Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, Odisha and Jharkhand as low-income States. Let us analyse only the 14th FC period (2015-20). The own tax revenue financed up to 59.3% of revenue expenditure in high-income States, while in low-income States, their own tax revenue was financing only 35.9%. The Revenue Expenditure to GSDP ratio for high-income States was 10.9%, which is lower than the similar ratio of 18.3% for low-income States. Thus, while high-income States curtailed their revenue expenditure and began financing a substantial part of it through their own tax revenues, the low-income States not only had higher Revenue Expenditure to GSDP but also financed only a smaller portion of it through their own tax revenues. Nearly 57.7% of revenue expenditure in low-income States was financed by Union financial transfers, and only 27.6% of revenue expenditure was financed by Union financial transfers in high-income States.

We can see three aspects of federal finances. First, low-income States finance a smaller portion of their revenue expenditure with their own tax revenue and also receive larger amounts of Union financial transfers. Second, high-income States finance a substantial portion of their revenue expenditure with their own tax revenue but receive too little Union financial transfers. Third, we can also deduce that the high-income States had to incur a deficit of 13.1%, and the low-income States ended up with a deficit of only 6.4% of revenue expenditure. Thus, the high-income States raise higher amounts of their own tax revenue and curtail their own revenue expenditure, yet incur higher deficits because of lower Union financial transfers compared to low-income States.

People of a State know the level of direct and indirect taxes they pay and expect an equivalent value of services from the government. So, the public services provided to the people of a State by both the State and the Union government should match this expectation. Any other fiscal behaviour would only result in burdening the high-income States with higher tax payments for both present and future generations. We understand the need for intragenerational equity across States in a federal system as it provides a larger unified market for everyone. Balancing both intragenerational and intergenerational equity is important, and it reiterates the need to balance equity and efficiency in the distribution formula for tax devolution to States. This squarely falls under the purview of the FC to have a fair mechanism to address the conflicting equity issues

Address conflicting equities

Usually, FCs use indicators such as per capita income, population, and area in the distribution formula. These indicators reflect the differences between States in terms of demand for public services (population and area) and the size of public revenue available (per capita income). These indicators carry a larger weight and assure equity in the distribution of Union financial transfers among States. Variables such as tax effort and fiscal discipline carry smaller weight in the distribution formula to reward the fiscal efficiency of States.

You may find that the equity variables are proxy variables, and that they do not reflect the actual fiscal situations in States. The efficiency indicators are fiscal variables from the State budget. The Union financial transfers make an impact only on the Budget and alter the fiscal behaviour of States. Therefore, it is appropriate to include more fiscal variables in the tax devolution criterion such that the Union financial transfers change the fiscal behaviour of the States in the desired direction.

Every State has a Fiscal Responsibility Act restricting the quantum of deficit and public debt. However, reduced Union financial transfers to some States compel them to breach this legal limit. Therefore, the FC should assign a larger weight to fiscal indicators and incentivise tax effort and expenditure efficiency through larger Union financial transfers. This will automatically ensure intergenerational fiscal equity and sustainable debt management by States.

Intergenerational equity And financial distribution

- horizontal distribution of States' share in Union tax revenue among States.
- The Finance Commission (FC) decides the horizontal distribution formula once every five years.
- Despite repeated quinquennial revisits to this distribution formula, conceptually, it is predictable that equity is prioritised over efficiency.
- Equity in the distribution formula is about intragenerational equity, that is, to redistribute tax revenue among States.
- The undesirable consequence of this is the accentuation of intergenerational inequity within States.
- The argument is that intergenerational equity should be a factor in India's horizontal distribution formula for tax devolution.

- **Intergenerational fiscal equity In general, intergenerational equi is the principle of providing equal opportunities and outcomes to every generation.**
- **Intergenerational equity ensures that the decisions or actions of current generations should not burden the future generation.**
- **From a public finance point of view, it refers to a situation where every generation pays for the public services it receives and does not burden the future generation through borrowings.**
- **For any government, there are only two ways to raise its revenue: tax or borrowing.**

- **If, in a period, the tax revenue equals the current expenditure of the government, then the current taxpayers pay for the public services they receive.**
- **If the government finances the current expenditure through borrowings, it means the future generation is going to pay higher taxes to repay this borrowing and interest.**
- **In other words, borrowing to meet the current expenditure of the government amounts to intergenerational inequity.**

- First, low-income States finance a smaller portion of their revenue expenditure with their own tax revenue and also receive larger amounts of Union financial transfers.
- Second, high-income States finance a substantial portion of their revenue expenditure with their own tax revenue but receive too little Union financial transfers.
- Third, we can also deduce that the high-income States had to incur a deficit of 13.1%, and the low-income States ended up with a deficit of only 6.4% of revenue expenditure.

- **Thus, the high-income States raise higher amounts of their own tax revenue and curtail their own revenue expenditure, yet incur higher deficits because of lower Union financial transfers compared to low-income States.**
- **Usually, FCs use indicators such as per capita income, population, and area in the distribution formula.**
- **These indicators reflect the differences between States in terms of demand for public services (population and area) and the size of public revenue available (per capita income).**

- **These indicators carry a larger weight and assure equity in the distribution of Union financial transfers among States.**
- **Variables such as tax effort and fiscal discipline carry smaller weight in the distribution formula to reward the fiscal efficiency of States.**

- Every State has a Fiscal Responsibility Act restricting the quantum of deficit and public debt.
- However, reduced Union financial transfers to some States compel them to breach this legal limit.
- Therefore, the FC should assign a larger weight to fiscal indicators and incentivise tax effort and expenditure efficiency through larger Union financial transfers.
- This will automatically ensure intergenerational fiscal equity and sustainable debt management by States.

Choosing the right track to cut post-harvest losses

Shweta Lamba

Program Manager, Food, Land and Water program at WRI India

Nitya Sharma

Program Manager, Food, Land and Water program at WRI India

India ranks second in global agriculture production, but its share in global agricultural exports is only 2.4%, placing it eighth in the world. This is attributed to several factors that include low productivity, an inability to meet desired quality standards and inefficiencies in the supply chain such as an inadequate transportation network and infrastructure, which also leads to significant post-harvest losses.

India's post-harvest losses amount to approximately ₹1,52,790 crore annually, according to a Ministry of Food Processing Industries 2022 study. As India's population continues to grow, the challenge of meeting the food and nutrition demand of its people will continue to intensify. While growing more food is part of the solution, the prevention of post-harvest losses is crucial.

A closer look at India's post-harvest loss

The biggest loss is from perishable commodities, which include livestock produce such as eggs, fish and meat (22%), fruits (19%) and vegetables (18%). During the export of perishables, approximately 19% of food is lost, particularly at the import-country (trade partner) stage. Storage, transportation and marketing play a critical role in ensuring that perishable products reach the consumer in time. The strengthening of agri-logistics is recognised as a priority by the Committee on Doubling Farmer's Income (DFI).

There are multiple logistical requirements in a single supply chain. Starting with first mile transport from farmgate to *mandi* (wholesale/retail), long haul or wholesale transportation by rail, road, water or air, and last mile transportation to the consumer. The trade of perishables faces a time shortage once the crop is harvested. The latest agriculture Census shows that 86% of farmers in India are small and marginal (SMF). They struggle to attain economy of scale due to the small production. Together with a lack of assured market connectivity, this results in post-harvest losses, which includes income losses for the farmers.

Integrating the Railways with agricultural product logistics management can cut post-harvest losses significantly; it will also help the environment

In India, food price volatility has been caused partly by supply constraints affecting perishable produce. As in a NITI Aayog report, the revenue of the Indian Railways is primarily driven by freight transport, which includes commodities such as iron, steel, fertilizers and agricultural produce. In the 2022 fiscal year, it accounted for 75% of its total earnings. The Indian Railways efficiently connects urban centres and rural areas across the country. The Food Corporation of India is heavily dependent on the Indian Railways to move approximately 90% of its food grains. In contrast, about 97% of fruits and vegetables are transported by road.

Initiatives by the Railways

The Indian Railways has taken a few initiatives to improve its freight operations in perishables. The truck-on-train service carries loaded trucks on railway wagons. Efforts are being made to expand this service following successful trial runs involving commodities such as milk and cattle feed. During the COVID-19 pandemic, the Railways introduced parcel special trains to transport perishables and seeds between market and producers.

Additionally, to support SMFs, the Kisan Rail was initiated to connect perishables (inclusive of milk, meat and fish) production surplus regions to consumption regions more efficiently. A recent study highlighted the impact of the Kisan Rail scheme on reducing post-harvest losses and enhancing farmer incomes in India. For example, grape growers in Nashik, Maharashtra, secured a net profit of ₹5,000 per quintal by supplying about 22,000 quintals using Kisan Rail. This highlights the advantage of using rail-based long-haul of fruits and vegetables.

In recent times, the role of the Railways in the agricultural sector has shown promising results. However, initiatives must also focus on increasing awareness and accessibility of farmers to available Railway schemes. Friends of Champions 12.3 India, a coalition of food supply chain actors powered by WRI India, also identified that multiple touch points during the transport of perishables using the Railways is a challenge.

Therefore, investment in specialised wagons for temperature-controlled transport and the establishment of rail-side facilities for safe cargo handling are essential. This would also present a significant opportunity to enhance food safety in the agriculture sector, by minimising spoilage and contamination risks, thereby supporting both domestic and export markets. Further, the DFI committee recommends streamlining loading and unloading processes to minimise transit times. It also emphasises addressing staffing shortages through recruitment and training initiatives. Prioritising the Railways over roadways, particularly for fruit and vegetable transportation, promises efficient transportation.

Untapped opportunities

The Railways offers a tremendous opportunity to reduce post-harvest losses and positively impact not just livelihoods but also the environment. Findings from the Logistics Division, Ministry of Commerce, state that the Indian Railways generates up to 80% less carbon dioxide for freight traffic than road transport.

There is a need for adopting systems-based approach, cutting across modes of transport and geographies. The private sector can play a crucial role in enhancing operational efficiency and strengthening the rail infrastructure through public-private partnerships. The budgetary allocation for agriculture 2024 also aims to bridge the farm-to-market gap with modern infrastructure and value-addition support. Such Railway initiatives complement these efforts by supporting the efficient transportation of perishable goods and minimising post-harvest losses.

The views expressed are personal

Agriculture and post harvest losses

- India ranks second in global agriculture production, but its share in global agricultural exports is only 2.4%, placing it eighth in the world.
- This is attributed to several factors that include low productivity, an inability to meet desired quality standards and inefficiencies in the supply chain such as an inadequate transportation network and infrastructure, which also leads to significant post-harvest losses.
- India’s post-harvest losses amount to approximately ₹1,52,790 crore annually, according to a Ministry of Food Processing Industries 2022 study

- **The biggest loss is from perishable commodities, which include livestock produce such as eggs, fish and meat (22%), fruits (19%) and vegetables (18%).**
- **During the export of perishables, approximately 19% of food is lost, particularly at the import-country (trade partner) stage.**
- **Storage, transportation and marketing play a critical role in ensuring that perishable products reach the consumer in time.**
- **The strengthening of agri-logistics is recognised as a priority by the Committee on Doubling Farmer's Income (DFI).**

- **There are multiple logistical requirements in a single supply chain.**
- **Starting with first mile transport from farmgate to mandi (wholesale/retail), long haul or wholesale transportation by rail, road, water or air, and last mile transportation to the consumer.**
- **The trade of perishables faces a time shortage once the crop is harvested.**
- **The latest agriculture Census shows that 86% of farmers in India are small and marginal (SMF).**

- **The Food Corporation of India is heavily dependent on the Indian Railways to move approximately 90% of its food grains.**
- **In contrast, about 97% of fruits and vegetables are transported by road.**
- **to support SMFs, the Kisan Rail was initiated to connect perishables (inclusive of milk, meat and fish) production surplus regions to consumption regions more efficiently.**
- **A recent study highlighted the impact of the Kisan Rail scheme on reducing post-harvest losses and enhancing farmer incomes in India**

- investment in specialised wagons for temperature-controlled transport and the establishment of rail-side facilities for safe cargo handling are essential.
- This would also present a significant opportunity to enhance food safety in the agriculture sector, by minimising spoilage and contamination risks, thereby supporting both domestic and export markets

- **The Railways offers a tremendous opportunity to reduce post-harvest losses and positively impact not just livelihoods but also the environment.**
- **Findings from the Logistics Division, Ministry of Commerce, state that the Indian Railways generates up to 80% less carbon dioxide for freight traffic than road transport.**
- **There is a need for adopting systems-based approach, cutting across modes of transport and geographies.**
- **The private sector can play a crucial role in enhancing operational efficiency and strengthening the rail infrastructure through public-private partnerships**

On political representation of women

Have women been fairly represented in Parliament in independent India? Should political parties provide internal reservations to increase womens' political participation? When will the 106th constitutional amendment be implemented?

EXPLAINER

Rangarajan. R

The story so far:

In the recently concluded general elections in the U.K., a record 263 women MPs (40%) have been elected to the House of Commons. The South African National Assembly has around 45% women representation, while the U.S. House of Representatives has 29%. Universal suffrage was achieved in various parts of the world after prolonged political movements. New Zealand as a self-governing unit under British rule was the first to grant universal women suffrage in 1893. The U.K., itself provided all its women the right to vote only in 1928. The U.S., granted equal voting rights through the nineteenth amendment only in 1920.

What about women representatives in independent India?

India as a sovereign republic provided the right to vote for all its women right from the first general elections in 1952. While the right to vote was provided to all women since the commencement of the Constitution, the representation of women in the Lok Sabha and State legislative assemblies has been far from satisfactory. The percentage of women MPs in the Lok Sabha had been very low between 5% and 10% till 2004. It rose marginally to 12% in 2014 and currently stands at 14% in the 18th Lok Sabha. The representation in State Legislative Assemblies is even poorer with the national average being around 9%.

The 73rd and 74th amendments of the Constitution in 1992/1993, provided for one-third reservation for women in panchayats and municipalities. However, attempts between 1996 and 2008 to provide similar reservation in the Lok Sabha and assemblies were unsuccessful.

How do women MPs fare worldwide?

Women representation in parliament varies across different democracies. It is a perennial issue to promote higher representation for women who constitute half the population in all countries. The important methods used across the world to ensure higher representation of women are (a) voluntary or legislated compulsory quotas for candidates within political parties and (b) quota in parliament through reservation of seats. Quotas within political parties provide more democratic choice to voters and allows flexibility to parties in choosing women candidates. Opponents of having a reserved quota in parliament for women argue that it would be seen as women not competing on merit. As the seats reserved for women would be rotated after each delimitation, it may also reduce the incentive for MPs to work hard to nurture their constituencies. The table above provides a snapshot of women's representation in some democracies across the world. As can be seen, countries like Bangladesh and Pakistan that have quotas in parliament fare poorer than countries with political party quotas.

Long fight: From a protest march demanding the women's Reservation Bill in 2016. FILE PHOTO

Country wise data on women representation*

Women representation in parliament varies across different democracies

Moving forward: Trinamool Congress MPs take selfies at the Parliament House complex during the first session of the 18th Lok Sabha, on June 25. PTI

Country	% of elected women	Quota in Parliament	Quota in political parties
Sweden	46%	No	Yes
South Africa	45%	No	Yes
Australia	38%	No	Yes
France	38%	No	Yes
Germany	35%	No	Yes
U.K.	40%	No	Yes
U.S.	29%	No	No
Pakistan	16%	Yes	No
Bangladesh	20%	Yes	No

*(as of September 2023) | Source: PRS legislative research

Voluntary or legislated quotas within political parties are unlikely to yield the desired representation in our country

What is the 106th amendment?

As on April 2024, India ranks 143 in the list of countries in the 'Monthly ranking of women in national parliaments' published by the Inter-Parliamentary Union, a global organisation for national parliaments. The Trinamool Congress has the highest proportion of women MPs in the current Lok Sabha at 38%. The ruling Bharatiya Janata Party and principal Opposition Congress party have around 13% each. Naam Tamilar Katchi, a State party in Tamil Nadu, has been following a voluntary quota of 50% for women candidates in the last three general elections.

However, voluntary or legislated quotas within political parties are unlikely to yield the desired representation in our country. This is why the Parliament through the 106th constitutional amendment, in September 2023, provided for one-third reservation of seats for women in the Lok Sabha and State legislative assemblies. This would ensure a fair representation of women in legislatures that would increase gender sensitivity in parliamentary processes and legislation. It would also hopefully increase the number of women Ministers in the Centre and States.

This reservation shall come into effect based on the delimitation exercise after the relevant figures of the first Census conducted after the commencement of this act is published. Hence, the Census which is overdue since 2021 should be conducted without any further delay to ensure that this reservation is implemented starting with the general elections in 2029.

Rangarajan. R is a former IAS officer and author of 'Polity Simplified'. He currently trains civil-service aspirants at 'Officers IAS Academy'. Views expressed are personal.

THE GIST

- India as a sovereign republic provided the right to vote for all its women right from the first general elections in 1952.
- The important methods used across the world to ensure higher representation of women are (a) voluntary or legislated compulsory quotas for candidates within political parties and (b) quota in parliament through reservation of seats.
- As on April 2024, India ranks 143 in the list of countries in the 'Monthly ranking of women in national parliaments' published by the Inter-Parliamentary Union, a global organisation for national parliaments.

What about women representatives in independent India?

- **India as a sovereign republic provided the right to vote for all its women right from the first general elections in 1952.**
- **While the right to vote was provided to all women since the commencement of the Constitution, the representation of women in the Lok Sabha and State legislative assemblies has been far from satisfactory.**
- **The percentage of women MPs in the Lok Sabha had been very low between 5% and 10% till 2004.**

- **It rose marginally to 12% in 2014 and currently stands at 14% in the 18th Lok Sabha.**
- **The representation in State Legislative Assemblies is even poorer with the national average being around 9%.**
- **The 73rd and 74th amendments of the Constitution in 1992/1993, provided for one-third reservation for women in panchayats and municipalities.**
- **However, attempts between 1996 and 2008 to provide similar reservation in the Lok Sabha and assemblies were unsuccessful.**

What is the 106th amendment?

- As on April 2024, India ranks 143 in the list of countries in the ‘Monthly ranking of women in national parliaments’ published by the Inter-Parliamentary Union, a global organisation for national parliaments.
- the Parliament through the 106th constitutional amendment, in September 2023, provided for one-third reservation of seats for women in the Lok Sabha and State legislative assemblies.
- This would ensure a fair representation of women in legislatures that would increase gender sensitivity in parliamentary processes and legislation.
- It would also hopefully increase the number of women Ministers in the Centre and States.

IPEF: India likely to sign clean, fair economy pacts

Amiti Sen
NEW DELHI

India is likely to soon be able to sign the clean economy and fair economy agreements under the U.S.-led Indo Pacific Economic Framework for Prosperity (IPEF) as the Cabinet notes on the pacts are in an advanced stage of finalisation, official sources said.

The country, however, is not yet ready to join the trade pillar of IPEF as it continues to be uncomfortable with some of its components, such as framing of high-standard rules on digital economy, including cross-border data flows and data localisation, and labour and environment issues, the source added.

"The Cabinet notes on clean economy and fair economy pacts have almost been readied by the Commerce Department as other Ministries and Departments are largely on board on its contents.

"Since India is not set to take on heavy additional obligations by signing the two pacts, the domestic discussions are not complicated," an official told *businessline*.

India was the only country in the 14-member IPEF bloc that had not endorsed the clean economy and fair economy pacts at the Ministerial level meeting in Singapore held in June because of general elections. It had assured other members that it would get domestic clearances after a new government was in place.

Countering China

In a move seen by many as an attempt to counter China's growing influence in the Indo-Pacific region, U.S. President Joe Biden unveiled the IPEF in Tokyo on May 23, 2022.

Taking off: All 14 IPEF members, including India, have signed the supply chains resilience agreement. GETTYIMAGES/ISTOCK

'India hopes to attract investments and concessional financing for clean energy projects'

The 14 members include the U.S., India, Australia, Brunei, Fiji, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand and Vietnam.

Four pillars

The IPEF framework is structured around the four pillars of trade, supply chains, clean energy and tax and anti-corruption, but there are no provisions on tariff cuts on goods.

All 14 IPEF members, including India, signed the supply chains resilience agreement which entered into force on February 24.

Energy security

The clean economy pact focusses on energy security and transition, climate resilience and adaptation; GHG (greenhouse gas) emissions mitigation; find/develop innovative ways of reducing dependence on fossil fuel energy; promote technical cooperation, workforce development, capacity building, and research collaborations; and collaborate to facilitate development, access, and deployment of clean energy and climate-friendly technologies.

"India hopes to attract investments and concessional financing for its clean energy projects," the official said.

'More transparency'

The agreement on fair economy intends to create a more transparent and predictable business environment that can spur greater trade and investment in the markets of member countries; enhance efforts to prevent and combat corruption by strengthening anti-corruption frameworks, support efforts to improve tax transparency and exchange of information for tax purposes between competent authorities.

The pillar 1 of IPEF which deals with trade is nowhere near finalisation as the U.S. does not seem to be interested any more in the chapter on digital trade. India had opted out of the negotiations on trade pillar right at the beginning.

(The writer is with The Hindu businessline)

Indo Pacific Economic Framework for Prosperity (IPEF)

- **India is likely to soon be able to sign the clean economy and fair economy agreements under the U.S.- led Indo Pacific Economic Framework for Prosperity (IPEF).**

- **The third Indo-Pacific Economic Framework for Prosperity (IPEF) Ministerial Meeting was held in San Francisco, California on 14 November 2023 hosted by the US.**
- **Union Minister for Commerce and Industry, Consumer Affairs, Food and Public Distribution, and Textiles, Shri Piyush Goyal participated in the Ministerial meeting.**
- **IPEF was launched jointly by the USA and other partner countries of the Indo-Pacific region on May 23, 2022 at Tokyo.**
- **IPEF has 14 partner countries including Australia, Brunei, Fiji, India, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand, Vietnam & USA.**
- **It seeks to strengthen economic engagement among partner countries with the goal of advancing growth, peace and prosperity in the region.**

- **The framework is structured around four pillars relating to Trade (Pillar I); Supply Chains (Pillar II); Clean Economy (Pillar III); and Fair Economy (Pillar IV).**
- **India had joined Pillars II to IV of IPEF while it has an observer status in Pillar-I.**

Four pillars

- The IPEF framework is structured around the four pillars of trade, supply chains, clean energy and tax and anti-corruption, but there are no provisions on tari•cuts on goods.
- All 14 IPEF members, including India, signed the supply chains resilience agreement which entered into force on February 24.

Energy security

The clean economy pact focusses on energy security and transition, climate resilience and adaptation; GHG (greenhouse gas) emissions mitigation; find/ develop innovative ways of reducing dependence on fossil fuel energy; promote technical cooperation, workforce development, capacity building, and research collaborations; and collaborate to facilitate development, access, and deployment of clean energy and climate-friendly technologies

Israeli settlement threatens Palestinian UNESCO village

Agence France-Presse
BATTIR


A new Israeli settlers outpost seen from the village of Battir, a UNESCO heritage site in the occupied West Bank, on July 8. AFP

On a hillside near Palestinian landowner Olayan Olayan's olive groves, young Israeli settlers are hammering out a new, illegal outpost in a UNESCO-protected zone.

Mr. Olayan and his neighbours have long battled attempts to settle the land in Battir, one of the four UNESCO listed heritage sites in the Israeli-occupied West Bank, famed for its ancient stone terraces.

Israeli construction in the West Bank has boomed since the war began in the Gaza Strip, even though all settlements in the territory are considered illegal under international law.

The new outpost on a Battir hilltop, also not approved by Israel, was served an eviction notice that Mr. Olayan's cousin Ghassan Olayan said has not been enforced because of the Gaza war.

The outpost already has a flagpole, living quarters and a barn for sheep that roam a rocky hill covered by olive trees belonging to Palestinian farmers.

Battir's inhabitants have beaten in court at least three previous Israeli settlement outpost attempts.

But Mr. Ghassan Olayan fears the war on Gaza will make the new, government-approved settlement more likely to become reality.

If that is achieved, Battir and the nearby Palestinian villages would be cut off from Bethlehem and the rest of the West Bank, a process they fear will fragment a future Palestinian state.

Battir – Land of Olives and Vines

- **Battir is a Palestinian village in the Bethlehem Governorate of the State of Palestine, in the West Bank, 6.4 km west of Bethlehem, and southwest of Jerusalem.**
- **Battir has long history that dates back to ancient times.**
- **Within its area is an archaeological site containing the remains of Beitar, the last stronghold of the Bar Kokhba revolt against the Roman Empire.**
- **The village is particularly known for its ancient terraces and an irrigation system that dates back to the Roman period.**

- **Due to this, In 2014, Battir was inscribed in the List of World Heritage Sites as a World Heritage Site in the State of Palestine, under the name *Battir – Land of Olives and Vines — Cultural Landscape of Southern Jerusalem***

Topics

- Health and economics ,
- WHO FCTC
- Strategic autonomy in foreign policy
- Finance commission and state finance
- Foreign tribunals
- Mains

By saurabh Pandey

THE HINDU

Target Mains -2024/25 -

Q Strategic autonomy in foreign policy is outcome of multipolarity ‘’ Explain

Vasco da Gama's toxic legacy is now a 'pandemic' that kills 8 million globally

Tobacco has profound and multifaceted effects on the body, contributing to a range of issues, including cancers, respiratory diseases, cardiovascular problems, and conditions such as diabetes, infertility, a weakened immune system, and complications in pregnancy. Its consumption can also lead to severe addiction due to the presence of nicotine

C. Aravinda

What does the voyage of Vasco da Gama have to do with a commodity that is the cause of much grief and ill health across the world? The answer, in a word, is tobacco, but the story is as follows: on July 8, 1497, began the historic voyage of Vasco da Gama. This journey reshaped global maritime routes and left an indelible mark on trade and culture. Among the myriad exchanges catalysed by this era of exploration was the introduction and dissemination of tobacco, a commodity that has since impacted societies profoundly and multifacetedly.

Tobacco has a pernicious effect on the human body, contributing to a range of health issues including various cancers (lung, mouth, throat, oesophagus, pancreas, and bladder), respiratory diseases (chronic obstructive pulmonary disease, emphysema, chronic bronchitis), cardiovascular problems (heart disease, stroke, hypertension), and other conditions such as diabetes, infertility, a weakened immune system, and complications in pregnancy. Its consumption can lead to severe addiction due to the presence of nicotine, a highly addictive substance. The pervasive nature of tobacco consumption and its severe health consequences make it a global public health crisis that requires urgent and coordinated action.

Despite its "Pan Indian" use, tobacco, originally cultivated by Native Americans, was brought to Europe in the 16th Century and, soon after, introduced to South Asia by European traders and colonisers. The Portuguese, followed by the Dutch and the British, were instrumental in spreading tobacco use. Tobacco quickly embedded itself into the cultural and social fabric of South Asian societies. Yet, it is essential to remember that smoking was alien to Indian ethos and culture. Despite the linguistic diversity in India, with as many as five linguistic families (thousands of languages), none of the Indian languages have a native or original word for "tobacco". The exception in Dravidian languages is due to the functionality – or description-related coinage – for "tobacco," and there is no literary evidence about the use of tobacco before the European arrival.

Surprisingly, the economic dimensions of the tobacco menace have not been subject to debate since the colonial era. There has not been a robust enough critique of the British Raj for tobacco. Indeed, it isn't the Kohinoor that should symbolise European exploitation, but the countless lives lost to smoking that should be the true emblem of colonial greed. The introduction of tobacco in Indiahas left a lasting legacy of addiction and disease.

An exhibit on the impact of tobacco consumption set up by a hospital in Mumbai. FILE PHOTO

Ethical and revenue considerations

Tobacco, being a drought-tolerant, hardy crop, is economically significant to the underprivileged. Today, tobacco accounts for 2% of India's agri-exports and employs more than 45 million people. The industry is a major source of revenue through taxation and exports exceeding ₹22000 crore. However, this benefit comes at a tremendous human and financial cost. The total economic cost of smoking in India, including health expenditure and productivity losses, amounts to ₹1.82 trillion annually.

Tobacco use is responsible for over 1.2 million deaths in India each year, with smoking-related diseases accounting for the majority. Tobacco is a significant contributor to the country's cancer burden, with 27% of all cancers in India attributable to tobacco use. This aspect of colonial legacy – where tobacco was a tool of economic gain for colonial powers but a source of health devastation for local populations – deserves more attention in historical discourse.

Stacking up priorities

The contemporary landscape of tobacco research in India is marked by a conflict of priorities between two premier institutions: the Indian Council of Medical Research (ICMR) and the Indian Council of Agricultural Research (ICAR). The ICMR advocates for the elimination of tobacco to mitigate its public health impact, and investing in research and policies aimed at reducing tobacco use. In stark contrast, the ICAR focuses on increasing tobacco crop yields and employing modern genetic techniques to enhance the productivity of tobacco farmers. ICAR's Central Tobacco Research Institute (CTRI) in Rajahmundry is at the forefront of this research. The

> Vasco da Gama's journey reshaped global maritime routes and left an indelible mark on trade and culture. Among the myriad exchanges catalysed by this era was the introduction of tobacco

organisation interest is to enhance tobacco productivity and commerce while ensuring the sustainability and quality of tobacco leaves and seeds. This is in conflict with ICMR's aspirations for a tobacco-free India, creating a significant policy and ethical dilemma.

However, the law is quite clear. Article 21 of the Indian Constitution guarantees the right to life and personal liberty, including the right to health, as an integral part of this fundamental right. Furthermore, the Directive Principles of State Policy (DPSP) under Articles 39(e), 39(f), 41, 42, and 47 mandate the state to work towards improving public health, ensuring social justice, and raising the standard of living. These provisions compel the state to prioritise the health and well-being of its citizens over the economic benefits of tobacco farming.

Will CRISPR make a difference?

In scientific innovation, gene editing technique CRISPR (clustered regularly interspaced short palindromic repeats) presents a potential solution to the tobacco epidemic. Researchers are using CRISPR to develop genetically-modified tobacco plants that are less harmful or harmless. This technology could potentially alter the nicotine content and other harmful substances in tobacco leaves, providing a safer alternative for consumers.

Recent studies have shown promise in using CRISPR to knock out specific genes in tobacco plants, thereby reducing nicotine content significantly. For example, targeting the transcription factor genes *ERF199* and *ERF189* resulted in an ultra-low-nicotine phenotype, with nicotine levels reaching only 2-5% of wild-type levels. Knocking out the *QPT2* gene drastically reduced nicotine production but caused severe growth inhibition, making it unsuitable for agricultural use.

Additionally, targeting all six members of the *BBL* gene family reduced foliar nicotine levels by up to 94% . These developments highlight the potential for CRISPR to create tobacco lines with dramatically reduced nicotine content. However, further characterisation is needed to ensure these modifications do not negatively impact other important agronomic traits. The collaboration between ICMR and ICAR is crucial. By working together, these institutions can develop tobacco crops that reduce health risks while maintaining economic viability.

Surrogate advertising

The tobacco industry has shown remarkable resilience and ingenuity in circumventing regulations to curb its influence. Despite stringent advertising bans under the Framework Convention on Tobacco Control (FCTC), the tobacco lobby has employed surrogate advertising to promote its products. This involves using brand names on non-tobacco products, sponsoring events, and promoting tobacco-related imagery in media and entertainment. Such tactics undermine public health efforts and perpetuate tobacco consumption.

There is a popular misconception that "epidemic" and "pandemic" apply exclusively to infectious diseases. However, tobacco consumption perfectly fits the existing definition of a pandemic. A pandemic is characterised by its widespread prevalence, severe consequences, and the ability to affect a significant portion of the population across multiple countries. Tobacco use meets these criteria, causing over 8 million deaths worldwide annually and affecting millions more through chronic diseases and disabilities.

The scale and severity of tobacco-related diseases, coupled with its pervasive presence across the globe, justify the classification of tobacco consumption as a pandemic.

This perspective could galvanise international efforts and resources to combat tobacco use more effectively, treating it with the urgency and coordinated action typically reserved for infectious disease outbreaks.

(Dr. C. Aravinda is an academic and public health physician. aravindaaiimsjr10@hotmail.com)

THE GIST

Originally cultivated by Native Americans, tobacco, was introduced to South Asia by European traders. They were instrumental in spreading tobacco use in the region though smoking was alien to Indian ethos and culture

The cultivation of tobacco yields over ₹2200 crore. However, this comes at a tremendous human and financial cost. The total economic cost of smoking in India, including health expenditures and productivity losses, amounts to ₹1.82 trillion annually

Tobacco consumption perfectly fits the definition of a pandemic. It causes over 8 million deaths worldwide annually and affects millions more through chronic diseases. The scale and severity of tobacco-related diseases, justify classification as a pandemic

Health vs economics

- the law is quite clear. Article 21 of the Indian Constitution guarantees the right to life and personal liberty, including the right to health, as an integral part of this fundamental right.
- Furthermore, the Directive Principles of State Policy (DPSP) under Articles 39(e), 39(f), 41, 42, and 47 mandate the state to work towards improving public health, ensuring social justice, and raising the standard of living.
- These provisions compel the state to prioritise the health and well-being of its citizens over the economic benefits of tobacco farming

CRISPR AND TOBACCO

- In scientific innovation, gene editing technique CRISPR (clustered regularly interspaced short palindromic repeats) presents a potential solution to the tobacco epidemic.
- Researchers are using CRISPR to develop genetically-modified tobacco plants that are less harmful or harmless.
- This technology could potentially alter the nicotine content and other harmful substances in tobacco leaves, providing a safer alternative for consumer

- **For example, targeting the transcription factor genes ERF199 and ERF189 resulted in an ultra-low-nicotine phenotype,**
- **Knocking out the QPT2 gene drastically reduced nicotine production but caused severe growth inhibition, making it unsuitable for agricultural use.**

(WHO FCTC)

- The WHO Framework Convention on Tobacco Control (WHO FCTC) is the first international treaty negotiated under the auspices of WHO.
- It was adopted by the World Health Assembly on 21 May 2003 and entered into force on 27 February 2005.
- It has since become one of the most rapidly and widely embraced treaties in United Nations history.
- The WHO FCTC was developed in response to the globalization of the tobacco epidemic and is an evidence-based treaty that reaffirms the right of all people to the highest standard of health.
- The Convention represents a milestone for the promotion of public health and provides new legal dimensions for international health cooperation

India and a case for strategic autonomy

Stanly Johny

On July 11, 2024, two days after Prime Minister Narendra Modi had concluded his first visit to Moscow since Russia invaded Ukraine on February 24, 2022, Eric Garcetti, the United States Ambassador to India, said, "In times of conflict there is no such thing as strategic autonomy; we will, in crisis moments, need to know each other." When Mr. Modi was in Russia, on the eve of a North Atlantic Treaty Organization (NATO) summit in Washington, the Joe Biden administration had expressed its "concerns" publicly. "We have expressed those [concerns] privately, directly to the Indian government and continue to do so," a U.S. State Department spokesperson said.

President Joe Biden's National Security Adviser Jake Sullivan joined the debate on July 13 by telling MSNBC that "a bet on Russia as a long-term, reliable partner is not a good bet... Russia would side with China over India any day of the week". There were reports in the U.S. media that U.S. officials had asked New Delhi to postpone Mr. Modi's Moscow visit as the NATO summit was to begin on July 9, but India decided to go ahead with the plan, which "disturbed" the Biden administration.

Stress points, historical overview

While the overall trajectory of the strategic partnership between India and the U.S. seems steady, stress points have appeared in the relationship in recent years. Of these, the most consequential was India's refusal to toe the western line *vis-à-vis* Russia on the Ukraine war. While the U.S. and its allies imposed economic sanctions on Russia and supplied weapons worth billions of dollars to Ukraine to fight the invading troops, India maintained its strategic partnership with Moscow, expanded its energy cooperation and refused to condemn the invasion at international fora, even as it called for bringing the war to an end and show respect towards the territorial sovereignty and integrity of all countries. For India, this was a neutral position, but in the West, this was seen as economic support for the Russian President Vladimir "Putin's war". This caused wrinkles in the India-U.S. partnership, which has widened over the past two and a half years. The public comments by top U.S. officials earlier this month were the sharpest manifestation of the persisting stress points.

Ambassador Garcetti's comment that strategic autonomy is meaningless during the time of crises goes against the very premise of strategic autonomy. A simple definition of the concept is that countries should be able to make decisions that best serve their national interests, irrespective of the pulls and pressures from other parties. There are two elements in this concept. The first is the inherent conviction that a nation is capable of taking decisions that serve its interests. The second is that the nation should have the will and the resources to take those decisions even in the face of high pressure. So, if India is not able to take autonomous foreign policy decisions during the times of "conflict" and "crisis moments", as Mr. Garcetti has said, it is not exercising its strategic autonomy.

India's partners in the West must understand that New Delhi wants the international system to be more representative in line with geopolitical realities

All Indian governments since Independence have followed strategic autonomy in one form or the other, whether it is called non-alignment, multi-alignment, multi-directional foreign policy or strategic autonomy. And they did not follow this as a dogma but as a foreign policy approach to the country's interests in a choppy international system. A conventional understanding about India's foreign policy was that it was too idealistic in the initial years to understand the currents of power politics. But non-alignment and Asian solidarity, as envisaged by Prime Minister Jawaharlal Nehru and others, helped India, a newly decolonised republic that was born into a bipolar global order, mobilise voices in the Third World and stay out of both blocs and pursue its interests and those of the newly decolonised countries. This gave both a moral footing and pragmatic levers to India's foreign policy.

India initially stayed equidistant to both the capitalist and the communist blocs. But after the U.S. formed new treaty alliances in Asia (Pakistan became a member of both the Southeast Asia Treaty Organization, or SEATO and the Central Treaty Organization, or CENTO) and China moved closer towards the U.S. after breaking up with the Soviet Union, India began building stronger ties with Moscow, but without forfeiting its strategic autonomy. And when the Soviet Union and the communist bloc collapsed by 1991, India chose greater integration with the global economy and closer strategic partnership with the West.

Great power rivalry

From India's point of view, the global order is again changing. The U.S. remains the world's most powerful country but the world order is no longer unipolar. China, already the world's second largest economy, is rising as a strong competitor to America's global primacy. Russia is challenging the western security architecture in Europe, militarily. In West Asia, a shadow war between Israel, an American ally, and Iran, a close Russian strategic partner, is heating up. In an anarchic order, India wants to strike a balance between great powers without joining any alliance system. And for this, maintaining its strategic autonomy is essential.

The Russia policy is a case in point. While energy ties with Russia are largely opportunistic and driven by cheap prices (India's crude imports from Russia jumped from $2.4 billion in 2021-22 to $46.5 billion in 2023-24), the defence partnership is structural. Russia is the source of over 40% of India's defence imports, and 86% of the Indian military's equipment is of Russian origin. This cannot be undone overnight. Russia is also an important partner in continental Asia where India works with Eurasian powers for economic progress, connectivity and tackling security challenges.

To be sure, Russia's deepening ties with China alter the essence of India's historical partnership with Moscow. But it is also an opportunity to recast the India-Russian partnership as a more equal bilateral partnership – during the Cold War it was heavily lopsided – where both sides would be mindful of each other's sensitivities. India would not like to see Russia, cut off from the West, going completely into the Chinese embrace, and Moscow would like to have multiple options rather than putting all its eggs in one basket of the 'Middle Kingdom'. If India were part of any alliance systems, such as Germany, for example, which had to silently accept the destruction of the Nord Stream pipeline which it part owns, India would not have the strategic space to pursue its partnership with Russia, while staying a closer partner of the West. Here, autonomy plays a major part.

Positive-sum game

The U.S. need not see this as an unfriendly foreign policy choice. India is not a disruptive, revisionist power. It supports a multilateral global order, and that is because it wants the international system to be more representative in line with the geopolitical realities of the present. The world is already multipolar, economically, but a similar transition has not taken place in its power dynamics. India wants to improve the system where its voice, and that of the Global South, would be heard with greater interest. For New Delhi, strategic autonomy does not call for isolationism. It calls for greater engagement with different power centres rooted in informed national interest. Theorists of strategic autonomy do not look at foreign policy as a zero-sum game, where one party gains something at the expense of others. For them, it is a positive-sum game, where everyone gains. For example, India's energy trade with Moscow made sure that Russian crude kept flowing into the market, helping steady global oil prices. Its close cooperation with Russia can also act as a speed breaker in Moscow's quasi-alliance with China, which the West sees as the only "revisionist" power that has the capability to rewrite the existing global order.

Unfortunately, India's partners in the West, who are agitated over New Delhi's Russia ties and its emphasis on strategic autonomy, do not appreciate the bigger picture. This is the unipolar mentality – you are either with us or against us. This approach was not quite successful even during the unipolar era, as the two-decade-long war against terror would testify. How is it going to work, post-unipolarity?

stanly.johny@thehindu.co.in

Strategic autonomy in foreign policy

- A simple definition of the concept is that countries should be able to make decisions that best serve their national interests, irrespective of the pulls and pressures from other parties.
- There are two elements in this concept.
- The first is the inherent conviction that a nation is capable of taking decisions that serve its interests. The second is that the nation should have the will

- and the resources to take those decisions even in the face of high pressure.
- So, if India is not able to take autonomous foreign policy decisions during the times of “conflict” and “crisis moments”, as Mr. Garcetti has said, it is not exercising its strategic autonomy.
- All Indian governments since Independence have followed strategic autonomy in one form or the other, whether it is called non-alignment, multi-alignment, multi-directional foreign policy or strategic autonomy

- From India’s point of view, the global order is again changing.
- The U.S. remains the world’s most powerful country but the world order is no longer unipolar. China, already the world’s second largest economy, is rising as a strong competitor to America’s global primacy.
- Russia is challenging the western security architecture in Europe, militarily. In West Asia, a shadow war between Israel, an American ally, and Iran, a close Russian strategic partner, is heating up.

- In an anarchic order, India wants to strike a balance between great powers without joining any alliance system.
- And for this, maintaining its strategic autonomy is essential.
- The Russia policy is a case in point.
- While energy ties with Russia are largely opportunistic and driven by cheap prices (India’s crude imports from Russia jumped from $2.4 billion in 2021-22 to $46.5 billion in 2023-24), the defence partnership is structural.
- Russia is the source of over 40% of India’s defence imports, and 86% of the Indian military’s equipment is of Russian origin.

- . This cannot be undone overnight.
- Russia is also an important partner in continental Asia where India works with Eurasian powers for economic progress, connectivity and tackling security challenges.
- To be sure, Russia’s deepening ties with China alter the essence of India’s historical partnership with Moscow.
- But it is also an opportunity to recast the India-Russian partnership as a more equal bilateral partnership — during the Cold War it was heavily lopsided — where both sides would be mindful of each other’s sensitivities. I

- The world is already multipolar, economically, but a similar transition has not taken place in its power dynamics.
- India wants to improve the system where its voice, and that of the Global South, would be heard with greater interest.
- For New Delhi, strategic autonomy does not call for isolationism. It calls for greater engagement with different power centres rooted in informed national interest.
- Theorists of strategic autonomy do not look at foreign policy as a zero-sum game, where on

What is the role of the Finance Commission?

How is horizontal devolution of taxes between States decided? For how long do the recommendations of the Commission last? Why do States complain that the Centre does not give them an ample share of the tax revenue? From where do States get their funds?

EXPLAINER

Prashanth Perumal

The story so far:
The sixteenth Finance Commission headed by former Niti Aayog Vice-Chairman Arvind Panagariya has begun its work by inviting suggestions from the public on the mandate set for it by the Centre. The latest Finance Commission, which consists of five members including the chairman, was constituted in December last year and is expected to submit its recommendations by October, 2025. Its recommendations will be valid for five years starting from April 1, 2026.

What is the Finance Commission?
The Finance Commission is a constitutional body that recommends how tax revenues collected by the Central government should be distributed among the Centre and various States in the country. The Centre, however, is not legally bound to implement the suggestions made by the Finance Commission. The Commission is reconstituted typically every five years and usually takes a couple of years to make its recommendations to the Centre.

How does the Commission decide?
The Finance Commission decides what proportion of the Centre's net tax revenue goes to the States overall (vertical devolution) and how this share for the States is distributed among various States (horizontal devolution). The horizontal devolution of funds between States is usually decided based on a formula created by the Commission that takes into account a State's population, fertility level, income level, geography, etc. The vertical devolution of funds, however, is not based on any such objective formula. Nevertheless, the last few Finance Commissions have recommended greater vertical devolution of tax revenues to States. The 13th, 14th and 15th Finance Commissions recommended that the Centre share 32%, 42% and 41% of funds, respectively, from the divisible pool with States. It should be noted that the Centre may also aid States through additional grants for certain schemes that are jointly funded by the Centre and the States.

GETTY IMAGES

The 16th Financial Commission is also expected to recommend ways to augment the revenues of local bodies such as panchayats and municipalities. It should be noted that, as of 2015, only about 3% of public spending in India happened at the local body level, as compared to other countries such as China where over half of public spending happened at the level of the local bodies.

Why is there friction between the Centre and States?
The Centre and the States have been at loggerheads over the issue of sharing tax revenues for a while now. The Centre collects major taxes such as the income tax, the corporate tax, and the goods and services tax (GST) while the States primarily rely on taxes collected from the sale of goods such as liquor and fuels that are beyond the ambit of GST. The States, however, are responsible for the delivery of many services to citizens, including education, healthcare and the police. This has led to complaints that the Centre has reduced the power of the States to collect taxes and that it does not give enough funds to the States to match with the scale of their responsibilities.

What are the disagreements?
The States and Centre often disagree on what percentage of the total tax proceeds should go to the States and about the actual delivery of these funds.

States argue that they should receive more funds than what is recommended by the Finance Commission as they have greater responsibilities to fulfil than the Centre. They also point out that the Centre does not even share the amount of funds recommended by the Finance Commissions, which they believe is already too low. For example, according to analysts, the Centre has devolved an average of only 38% of funds from the divisible pool to the States under the current Fifteenth Finance Commission as against the Commission's actual recommendation of 41%.

Further, States have complaints about what portion of the Centre's overall tax revenues should be considered as part of the divisible pool out of which the States are funded. It is believed that cesses and surcharges, which do not come under the divisible pool and hence not shared with the States, can constitute as much as 28% of the Centre's overall tax revenues in some years, causing significant revenue loss for States. So, the increased devolution of funds from the divisible pool, as recommended by successive Finance Commissions, may be offset by rising cess and surcharge collections. In fact, it is estimated that if cesses and surcharges that go to the Centre are also taken into account, the share of States in the Centre's overall tax revenues may fall to as low as 32% under the 15th Finance Commission.

More developed States such as Karnataka and Tamil Nadu have also complained that they receive less money from the Centre than what they contribute as taxes. Tamil Nadu, for example, received only 29 paise for each rupee that the State contributed to the Centre's exchequer while Bihar gets more than ₹7 for each rupee it contributes. In other words, it is argued that more developed States with better governance are being penalised by the Centre to help States with poor governance. Some critics also believe that the Finance Commission, whose members are appointed by the Centre, may not be fully independent and immune from political influence.

THE GIST

- The sixteenth Finance Commission headed by former Niti Aayog Vice-Chairman Arvind Panagariya has begun its work by inviting suggestions from the public on the mandate set for it by the Centre.
- States argue that they should receive more funds than what is recommended by the Finance Commission as they have greater responsibilities to fulfil than the Centre. They also point out that the Centre does not even share the amount of funds recommended by the Finance Commissions, which they believe is already too low.
- More developed States such as Karnataka and Tamil Nadu have also complained that they receive less money from the Centre than what they contribute as taxes.

Finance commission and state finance

- T he sixteenth Finance Commission headed by former Niti Aayog Vice-Chairman Arvind Panagariya has begun its work by inviting suggestions from the public on the mandate set for it by the Centre.
- What is the Finance Commission?
- The Finance Commission is a constitutional body that recommends how tax revenues collected by the Central government should be distributed among the Centre and various States in the country.
- The Centre, however, is not legally bound to implement the suggestions made by the Finance Commission.

The Commission is reconstituted typically every five years and usually takes a couple of years to make its recommendations to the Centre.

How does the Commission decide?

- The Finance Commission decides what proportion of the Centre's net tax revenue goes to the States overall (vertical devolution) and how this share for the States is distributed among various States (horizontal devolution).
- The horizontal devolution of funds between States is usually decided based on a formula created by the Commission that takes into account a State's population, fertility level, income level, geography, etc.

- **The vertical devolution of funds, however, is not based on any such objective formula. Nevertheless, the last few Finance Commissions have recommended greater vertical devolution of tax revenues to States.**
- **The 13th, 14th and 15th Finance Commissions recommended that the Centre share 32%, 42% and 41% of funds, respectively, from the divisible pool with States.**
- **It should be noted that the Centre may also aid States through additional grants for certain schemes that are jointly funded by the Centre and the States.**

- **The 16th Financial Commission is also expected to recommend ways to augment the revenues of local bodies such as panchayats and municipalities.**
- **It should be noted that, as of 2015, only about 3% of public spending in India happened at the local body level, as compared to other countries such as China where over half of public spending happened at the level of the local bodies**

Why is there friction between the Centre and States?

- The Centre and the States have been at loggerheads over the issue of sharing tax revenues for a while now.
- The Centre collects major taxes such as the income tax, the corporate tax, and the goods and services tax (GST) while the States primarily rely on taxes collected from the sale of goods such as liquor and fuels that are beyond the ambit of GST.
- The States, however, are responsible for the delivery of many services to citizens, including education, healthcare and the police.

- This has led to complaints that the Centre has reduced the power of the States to collect taxes and that it does not give enough funds to the States to match with the scale of their responsibilities.
- States argue that they should receive more funds than what is recommended by the Finance Commission as they have greater responsibilities to fulfill than the Centre.
- They also point out that the Centre does not even share the amount of funds recommended by the Finance Commissions, which they believe is already too low.

- States have complaints about what portion of the Centre's overall tax revenues should be considered as part of the divisible pool out of which the States are funded.
- It is believed that cesses and surcharges, which do not come under the divisible pool and hence not shared with the States, can constitute as much as 28% of the Centre's overall tax revenues in some years, causing signi cant revenue loss for States.
- More developed States such as Karnataka and Tamil Nadu have also complained that they receive less money from the Centre than what they contribute as taxes.

How do Assam's Foreigners Tribunals function?

How do these tribunals decide whether a person is Indian or not? Does the Border police play a role?

Rahul Karmakar

The story so far:

On July 5, the Assam government asked the Border wing of the State's police not to forward cases of non-Muslims who entered India illegally before 2014 to the Foreigners Tribunals (FTs). This was in keeping with the Citizenship (Amendment) Act of 2019 that provides a citizenship application window for non-Muslims – Hindus, Sikhs, Christians, Parsis, Jains, and Buddhists – who allegedly fled persecution in Afghanistan, Bangladesh, and Pakistan.

How did the FTs come about?

The FTs are quasi-judicial bodies formed through the Foreigners (Tribunals) Order of 1964 under Section 3 of the Foreigners' Act of 1946, to let local authorities in a State refer a person suspected to be a foreigner to tribunals. The FTs are currently exclusive to Assam as cases of "illegal immigrants" are dealt with according to the Foreigners' Act in other States. Each FT is headed by a member drawn from judges, advocates, and civil servants with judicial experience. The Ministry of Home Affairs told Parliament in 2021 that there are 300 FTs in Assam but the website of the State's Home and Political Department says that only 100 FTs are currently functioning, beginning with 11 established before the Illegal Migrants (Determination by Tribunals) Act of 1983 was scrapped in 2005.

What is the role of the Border police?

The Assam Police Border Organisation was established as a part of the State police's Special Branch in 1962 under the Prevention of Infiltration of Pakistani (PIP) scheme. The organisation was made an independent wing in 1974 and is now headed by the Special Director General of Police (Border). After the liberation war of Bangladesh, the PIP scheme was renamed Prevention of Infiltration of Foreigners or PIF scheme. The Centre has sanctioned the posts of 3,153 out of the 4,037 personnel of this wing under the PIF scheme while 884 are sanctioned by the Assam government. The members of this wing are tasked with detecting and deporting illegal foreigners, patrolling the India-Bangladesh border with the Border Security Force, maintaining a second line of defence to check the entry of illegal foreigners, and monitoring people "settled in riverine and char (sandbar) areas". This is apart from referring people of suspicious citizenship to the FTs to decide whether they are Indian or not based on documents. Cases of 'D' or doubtful voters can also be referred to an FT by the Election Commission of India and people excluded from the complete draft of the National Register of Citizens (NRC) released in August 2019 can appeal to the FT concerned to prove their citizenship. Some 19.06 lakh out of 3.3 crore applicants were excluded from the NRC, whose process has been on hold.

How does an FT function?

According to the 1964 order, an FT has the powers of a civil court in certain matters such as summoning and enforcing the attendance of any person and examining him or her on oath and requiring the production of any document. A tribunal is required to serve a notice in English or the official language of the State to a person alleged to be a foreigner within 10 days of receiving the reference from the authority concerned. Such a person has 10 days to reply to the notice and another 10 days to produce evidence in support of his or her case. An FT has to dispose of a case within 60 days of reference. If the person fails to provide any proof of citizenship, the FT can send him or her to a detention centre, now called transit camp, for deportation later.

Why are some FT orders under fire?

On July 11, the Supreme Court set aside an FT order declaring Rahim Ali, a deceased farmer, a foreigner 12 years ago. The apex court called the order a "grave miscarriage of justice" while pointing out that the Foreigners' Act does not empower the authorities to pick people at random and demand that they prove their citizenship. In September 2018, an FT member in central Assam's Morigaon observed that foreigners' cases have assumed the form of an industry where everyone involved is "trying to mint money by any means". The member also noted that notices are "hung up on some trees or electric pole" without the suspected non-citizens unaware of such a case against them.

THE GIST

- On July 5, the Assam government asked the Border wing of the State's police not to forward cases of non-Muslims who entered India illegally before 2014 to the Foreigners Tribunals (FTs).
- According to the 1964 order, an FT has the powers of a civil court in certain matters such as summoning and enforcing the attendance of any person and examining him or her on oath and requiring the production of any document.
- The Assam Police Border Organisation was established as a part of the State police's Special Branch in 1962 under the Prevention of Infiltration of Pakistani (PIP) scheme.

How did the FTs come about?

- The FTs are quasi-judicial bodies formed through the Foreigners (Tribunals) Order of 1964 under Section 3 of the Foreigners' Act of 1946, to let local authorities in a State refer a person suspected to be a foreigner to tribunals.
- The FTs are currently exclusive to Assam as cases of "illegal immigrants" are dealt with according to the Foreigners' Act in other States.
- Each FT is headed by a member drawn from judges, advocates, and civil

How does an FT function?

- According to the 1964 order, an FT has the powers of a civil court in certain matters such as summoning and enforcing the attendance of any person and examining him or her on oath and requiring the production of any document.
- A tribunal is required to serve a notice in English or the official language of the State to a person alleged to be a foreigner within 10 days of receiving the reference from the authority concerned.

- Such a person has 10 days to reply to the notice and another 10 days to produce evidence in support of his or her case.
- An FT has to dispose of a case within 60 days of reference. If the person fails to provide any proof of citizenship, the FT can send him or her to a detention centre, now called transit camp, for deportation later

Frozen feast

Cooling off: A tamarin monkey eats frozen fruits to cool off at the Bioparco di Roma zoo during a heat wave in Rome, Italy on Thursday. AFP

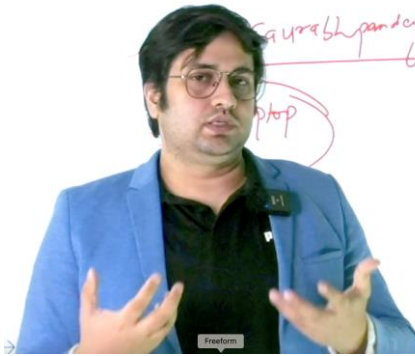
Tamarins Monkey

- **The tamarins are squirrel-sized New World monkeys from the family Callitrichidae in the genus *Saguinus*.**
- **They are the first offshoot in the Callitrichidae tree, and therefore are the sister group of a clade formed by the lion tamarins, Goeldi's monkeys and marmosets**

- Tamarin species vary considerably in appearance, ranging from nearly all black through mixtures of black, brown and white. Mustache-like facial hairs are typical for many species.
- Tamarins range from southern Central America through central South America, where they are found in northwestern Colombia, the Amazon basin, and the Guianas.

Topics

- India carbon crediting mechanism with Japan
- India and global electronics revolution
- What is fissile material??
- JCPOA
- Mavavgat coastline
- ***Caretta caretta***
- Mains



By saurabh Pandey

THE HINDU

India plans to enter into carbon crediting mechanism with Japan

Abhishek Law
NEW DELHI

Green move: The proposal will boost job creation via investments in low-carbon and clean technologies. GETTY IMAGES/ISTOCK

India is looking to enter into a carbon trading and carbon credit adjustment mechanism with Japan.

The two countries plan to sign a Memorandum of Cooperation for setting up a Joint Crediting Mechanism (JCM) with emission-reduction credits being shared, as per Cabinet note prepared in July and reviewed by *businessline*.

Under the mechanism, carbon credits will be 'allocated through a structured process' and there will be a 'registry to track these credits," as per the note.

Projects will be taken up only when they are cleared through a Joint Committee, and both governments will notify these credits issued based on the submitted reports. The credits will be allocated to the respective registries of India and Japan, and can subsequently be used towards the Nationally Determined Contribution (a climate action plan to cut emissions and adapt to climate impact) of both countries.

The proposal will "boost job creation by attracting investments in low-carbon and clean technologies". There will also be any financial implication of such a project.

"A draft Cabinet Note has been prepared ..... authorising the MoEFCC (Ministry of Environment, Forest and Climate Change) for the signing of MoC (Memorandum of Cooperation) between Government of India and the Government of Japan in consultation with the concerned ministries.... and MEA," as per office memorandum of one of the Ministries said. The JCM will facilitate diffusion of leading decarbonising technologies, equipment, machinery, products, systems and infrastructure, implementation of mitigation actions, among others.

The draft (Cabinet note) has approval of the Environment Minister.

Bilateral ties

The JCM will be formed under Article 6.2 of the Paris Agreement.

As per the draft Memorandum of Cooperation, the mechanism will be implemented in accordance with "relevant domestic laws and regulation" in these respective countries.

A joint committee will be established and it will develop rules and guidelines required for implementation of the JCM that cover project cycle procedures, methodologies, project design documents, monitoring and designation of third-party entities, among others.

"Decisions by the Joint Committee on registration of the project, crediting period, sharing of credits, issuance of credits, and other related matters on the JCM are made with prior confirmation of the Government of Japan and Government of India, unless otherwise specified," one of the provisions stated.

Emission cuts

Both governments "mutually recognise that part of JCM credits issued from emission reductions and removals may be towards the achievement of Japan's nationally determined contribution and rest of the said JCM credits may contribute to the achievement of India's nationally determined contribution" while ensuring double counting is avoided.

Each government can authorise part of JCM credits for international mitigation purposes too.

The two countries will confirm registration of a project prior to a decision by the joint committee; while the percentage of credit allocation will also be decided.

The MoC (draft) also mentions Japan will facilitate the transfer of technology, finance and capacity building in respect of new technologies for the joint crediting mechanism.

(The writer is with The Hindu businessline)

India plans to enter into carbon crediting mechanism with Japan

- **India is looking to enter into a carbon trading and carbon credit adjustment mechanism with Japan.**
- **The two countries plan to sign a Memorandum of Cooperation for setting up a Joint Crediting Mechanism (JCM) with emission reduction credits being shared**

What is carbon credit ??

- Carbon credits are permits that allow the owner to emit a certain amount of carbon dioxide or other greenhouse gases (GHGs).
- One credit permits the emission of one ton of carbon dioxide or the equivalent of other greenhouse gases. Carbon credits are also known as carbon offsets

What is the Paris Agreement Crediting Mechanism?

- Article 6 of the Paris Agreement sets out how countries can pursue voluntary cooperation to reach their climate targets.
- It enables international cooperation to tackle climate change and unlock financial support for developing countries.
- This means that, under Article 6, countries are able to transfer carbon credits earned from the reduction of greenhouse gas emissions to help one or more countries meet their climate targets.

- There are three tools which countries can draw upon under Article 6, one of which is the Paris Agreement Crediting Mechanism (PACM) - the UN’s new high-integrity carbon crediting mechanism.

Elevating India's capital goods for a global electronics revolution

BUDGET IN FOCUS

Pankaj Mohindroo

In the early days of the Industrial Revolution, a single invention changed the world: the steam engine. This powered factories, drove progress and transformed economies. The steam engine symbolised a nation's ability to innovate, produce, and lead.

Today, India stands at similar crossroads with its capital-goods industry, especially in electronics manufacturing. The industrial countries of East Asia did not invest in machinery by chance. The investments were driven by export-oriented strategies and demands of international competition. To seize this moment, we must harness the same spirit of innovation that fuelled the Industrial Revolution.

India's electronics production has reached an impressive milestone of about $115 billion in FY24, growing by almost four times in the past decade. Projections for the next five years are even more promising, with expectations to multiply this figure by five times. Globally, the electronics market, currently valued at $4.5 trillion, is anticipated to soar to $6.1 trillion by 2030.

These figures highlight an opportunity and a call to action for India to capture its rightful place in the world stage.

Central to this vision is the role of capital goods – machinery, tools, and equipment that drive production. Advanced capital goods enable us to produce high-quality electronics efficiently and at scale. Our focus should be on developing unique, cutting-edge solutions that serve domestic and global markets. This demands a significant investment in research and development, supported by policies that encourage innovation and protect intellectual property rights (IPR).

Demand supply gap

Meeting domestic demand and targeting the export market are both essential. At home, there is an urgent need to close the gap between the demand and supply of capital goods. By bolstering our manufacturing infrastructure, we can reduce dependency on imports and ensure a steady supply of high-quality equipment for local consumption. As India aims to increase its electronics production by five times, the demand for advanced manufacturing technologies will also surge, necessitating a robust domestic capital goods sector.

To spearhead this initiative, there is a need for a dedicated centre with a substantive corpus of minimum ₹1,000 crore focused on innovation in capital goods, potentially housed at the Central Manufacturing Technology Institute (CMTI). Such a centre could drive the development of advanced manufacturing technologies and build capabilities essential for electronics and high-tech manufacturing. The CMTI can partner industry leaders and academic institutions to foster innovation, streamline production processes and raise overall competitiveness of Indian manufacturers.

Fostering R&D

India's robust IPR protection can create a secure environment where new ideas can thrive. By promoting strong R&D ecosystem, we can develop indigenous technologies that not only meet international standards but also set new benchmarks in quality and efficiency.

Globally, the aim is to position Indian firms as formidable contenders. This needs a strategic approach, including understanding global market dynamics, adhering to international quality standards and building a reputation for excellence. The question then arises: why can't India produce firms that rival the likes of ASML, the Dutch giant known for advanced machinery?

Creating such an Indian champion involves many critical steps.

Prioritising the development and acquisition of advanced manufacturing technologies is crucial, supported by dedicated funds for acquiring and enhancing capital goods, including second-hand equipment.

Investing in education and training programmes to equip workforce with technical and soft skills is equally vital. Strong collaboration between industry and academia can foster innovation and ensure that research aligns with industry needs, leading to breakthrough technologies and processes. Additionally, government policies must support the growth of the capital-goods industry by providing incentives for R&D, facilitating ease of doing business, and ensuring a stable regulatory environment.

As the world moves towards sustainable manufacturing practices, India must adopt eco-friendly technologies and processes, enhancing our global competitiveness and positioning India as a responsible manufacturing hub. Embracing digital technologies such as AI, IoT, and big data can revolutionise manufacturing processes, making them more efficient and cost-effective.

Addressing technology and skill gaps is also critical for India's ambitions in the electronics sector. Joint ventures with global leading firms can facilitate skills and technology transfer, while government programme to attract skilled diaspora and foreign experts can build domestic capabilities.

Establishing a roadmap for developing key equipment and progressing to the most cutting-edge technologies, will be essential.

Reducing the cost of capital can enable Indian manufacturers to invest more in technology and innovation, making them more competitive globally.

(Pankaj Mohindroo is the Chairman of India Cellular & Electronics Association, the country's apex industry body for electronics with a vision to make India a global hub for electronics manufacturing and exports. Kapil Gupta, Associate Director, ICEA has contributed to this article)

India and global electronics revolution

- India’s electronics production has reached an impressive milestone of about $115 billion in FY24, growing by almost four times in the past decade.
- Projections for the next ve years are even more promising, with expectations to multiply this figure by five times.
- Globally, the electronics market, currently valued at $4.5 trillion, is anticipated to soar to $6.1 trillion by 2030

- Central to this vision is the role of capital goods — machinery, tools, and equipment that drive production.
- Advanced capital goods enable us to produce high-quality electronics efficiently and at scale.
- Our focus should be on developing unique, cutting edge solutions that serve domestic and global markets.
- This demands a significant investment in research and development, supported by policies that encourage innovation and protect intellectual property rights (IPR).

Steps needed

- Demand supply gap Meeting domestic demand and targeting the export market are both essential.
- At home, there is an urgent need to close the gap between the demand and supply of capital goods.
- By bolstering our manufacturing infrastructure, we can reduce dependency on imports and ensure a steady supply of high-quality equipment for local consumption

- To spearhead this initiative, there is a need for a dedicated centre with a substantive corpus of minimum ₹1,000 crore focused on innovation in capital goods.
- India’s robust IPR protection can create a secure environment where new ideas can thrive.
- By promoting strong R&D ecosystem, we can develop indigenous technologies that not only meet international standards but also set new benchmarks in quality and effciency

- **Prioritising the development and acquisition of advanced manufacturing technologies is crucial, supported by dedicated funds for acquiring and enhancing capital goods, including second-hand equipment.**
- **Investing in education and training programmes to equip workforce with technical and soft skills is equally vital.**

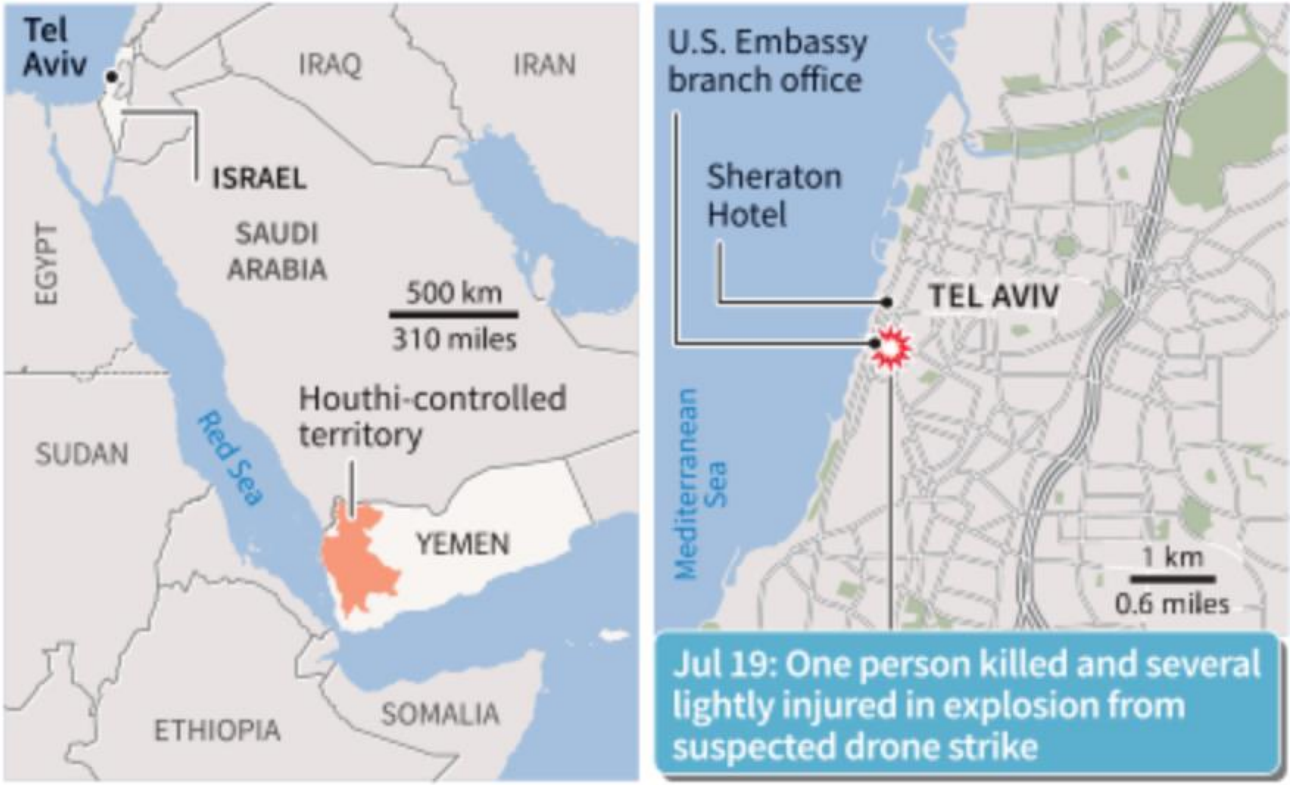
- **Strong collaboration between industry and academia can foster innovation and ensure that research aligns with industry needs, leading to breakthrough technologies and processes.**
- **Additionally, government policies must support the growth of the capital-goods industry by providing incentives for R&D, facilitating ease of doing business, and ensuring a stable regulatory environment.**

- As the world moves towards sustainable manufacturing practices, India must adopt eco-friendly technologies and processes, enhancing our global competitiveness and positioning India as a responsible manufacturing hub.
- Embracing digital technologies such as AI, IoT, and big data can revolutionise manufacturing processes, making them more efficient and cost-effective.

- **Addressing technology and skill gaps is also critical for India’s ambitions in the electronics sector.**
- **Joint ventures with global leading rms can facilitate skills and technology transfer, while government programme to attract skilled diaspora and foreign experts can build domestic capabilities**

Long range

Yemen's Houthis have claimed a deadly drone strike on Tel Aviv



Iran capable of producing fissile material, says Blinken

Agence France-Presse
WASHINGTON

Iran is capable of producing fissile material for use in a nuclear weapon within "one or two weeks," U.S. Secretary of State Antony Blinken said on Friday.

News of Iran's capabilities follows the recent election of President Masoud Pezeshkian, who has said his goal is to "get Iran out of its isolation," and who favours reviving the 2015 nuclear deal between Iran and global powers.

Mr. Blinken said that "what we've seen in the last weeks and months is an Iran that's actually moving forward" with its nuclear program.

The United States unilaterally withdrew in 2018 from the Iran nuclear deal, which was designed to regulate Iran's atomic activities in exchange for the lifting of international sanctions.


Antony Blinken

Speaking at a security forum in Colorado, Mr. Blinken blamed the collapse of the nuclear deal for the acceleration in Iran's capabilities.

"Instead of being at least a year away from having the breakout capacity of producing fissile material for a nuclear weapon, [Iran] is now probably one or two weeks away from doing that," Mr. Blinken said. He added that Iran had not yet developed a nuclear weapon.

Iran's acting Foreign Minister Ali Bagheri told *CNN* earlier this week that his country remained committed to the deal, known as the JCPOA.

"We are still a member of JCPOA. America has not yet been able to return to the JCPOA, so the goal we are pursuing is the revival of the 2015 agreement," he said.

Mr. Bagheri added that: "Neither I nor anyone else in Iran has not talked and will not talk about a new agreement."

Mr. Blinken made the statement just days after reports emerged that the U.S. Secret Service increased security for Republican presidential nominee Donald Trump weeks ago, after authorities learned of an alleged Iranian plot to kill him.

What is fissile material??

- A nuclide that is capable of undergoing fission after capturing low-energy thermal (slow) neutrons.
- Although sometimes used as a synonym for fissionable material, this term has acquired its more-restrictive interpretation with the limitation that the nuclide must be fissionable by *thermal neutrons*.
- With that interpretation, the three primary fissile materials are uranium-233, uranium-235, and plutonium-239.
- This definition excludes natural uranium and depleted uranium that have not been irradiated, or have only been irradiated in thermal reactors.

JCPOA

- The JCPOA was the result of prolonged negotiations from 2013 and 2015 between Iran and P5+1 (China, France, Germany, Russia, the United Kingdom, the United States and the European Union, or the EU).
- The JCPOA obliged Iran to accept constraints on its enrichment programme verified by an intrusive inspection regime in return for a partial lifting of economic sanction

- On the nuclear front, beginning in May 2019, Iran began to move away from JCPOA's constraints incrementally:
- exceeding the ceilings of 300kg on low-enriched uranium and 130 MT on heavy-water; raising enrichment levels from 3.67% to 4.5%;
- stepping up research and development on advanced centrifuges;
- resuming enrichment at Fordow;
- and violating limits on the number of centrifuges in use

- **. Finally, in January 2020, following the drone strike on Islamic Revolutionary Guard Corps commander Gen. Qasem Soleiman, Tehran announced that it would no longer observe the JCPOA’s restraints.**

- Tensions rose as the U.S. pushed ahead with its unilateral sanctions, widening their scope to cover nearly all Iranian banks connected to the global financial system,
- industries related to metallurgy, energy and shipping, individuals related to the defence, intelligence and nuclear establishment

- **For the first year after the U.S. withdrawal, Iran's response was muted as the E-3 (France, Germany, the U.K.) and the EU promised to find ways to mitigate the U.S. decision.**

Safe harbour

A view of Mavavgat coastline in Antalya, Turkey, where sea turtles lay eggs. The coastline is a major breeding area for the endangered loggerheads also known as Caretta carettas, on the International Union for Conservation of Nature's red list of threatened species. AFP

Mavavgat coastline

- Mavavgat coastline in Antalya, Turkey, where sea turtles lay eggs.
- The coastline is a major breeding area for the endangered loggerheads also known as Caretta carettas, on the International Union for Conservation of Nature’s red list of threatened species.


Turkish Riviera
ASPENDOS
PERGE
ANTALYA
MANAVGAT FALLS
BELEK
SIDE
KEMER
ALANYA
PHASLLIS
OLYMPOS
MYRA
PATARA
DEMRE
KAS
Mediterranean Sea

Caretta caretta / Loggerhead sea turtle

***Caretta caretta* is found in nearly all the world's temperate and tropical oceans: the Atlantic Ocean from Newfoundland to Argentina, the Indian Ocean from southern Africa to the Arabian Gulf to western Australia, the Mediterranean Sea, and the Pacific Ocean from Alaska to Chile and Australia to Japan. During winter months loggerhead sea turtles migrate to tropical and subtropical waters.**

Preferred habitat of *Caretta caretta* individuals changes throughout the life cycle.

Adult females go ashore to lay eggs and seem to prefer steeply sloped, high energy beaches.

When hatchlings emerge from the nest, they head for the ocean.

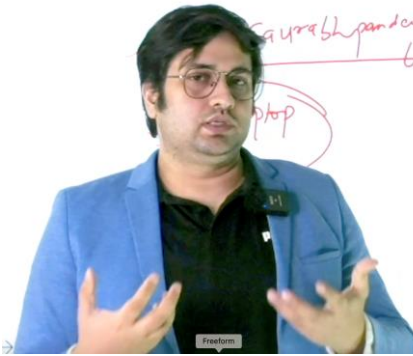
Young juveniles are typically found among drifting *Sargassum* mats in warm ocean currents.

Older juveniles and adults are most often found in coastal waters and tend to prefer a rocky or muddy substrate over a sandy one

Topics

- Female employment
- The Piracicaba River
- Dyson spheres
- India and geo strategic divide
- What is an emulator in PC?

- Neva river
- City of Kyrenia
- bdelloid rotifers
- ipRGC)
- Artemisinin-based combination therapies (ACTs)
- heparinoids
- Mains



By saurabh Pandey

THE HINDU

Focus on female employment to counter unemployment

Indranil De

Professor, Institute of Rural Management Anand, Gujarat

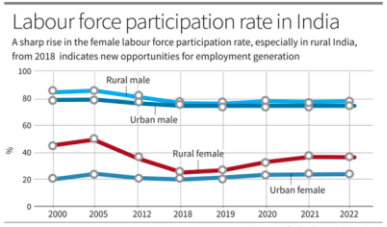
The difficulty in getting jobs and inflation were the two major issues that played a role in the results of the Lok Sabha Elections 2024, according to the Lokniti-CSDS pre-poll survey (*The Hindu*, April 11, 2024). The India Employment Report (IER) 2024, published by the Institute for Human Development and the International Labour Organization, also illustrated a rise in the unemployment rate from a little more than 2% in 2000 and 2012 to 5.8% in 2019. Unemployment reduced somewhat to 4.1% in 2022, although time-related underemployment was high at 7.5%. The labour force participation rate (LFPR) also fell from 61.6% in 2000 to 49.8% in 2018 but recovered halfway to 55.2% in 2022. But in this gloomy picture marked by unemployment and underemployment, there was a steep and steady upward trend of female LFPR from 24.6% in 2018 to 36.6% in 2022 in rural India. It also increased by around 3.5% from 20.4% in 2018 in urban areas. This is in contrast with male LFPR, which rose marginally by 2% in rural areas and almost stagnant in urban areas.

Female LFPR in India is low when compared to the world average of 53.4% (2019), and it has decreased from 38.9% in 2000 to 23.3% in 2018. Against this backdrop, the current increasing trend in female LFPR, especially a 12% rise in rural India during 2018-22, indicates an untapped opportunity for employment generation. Women have been engaged in unpaid family labour work in both rural and urban areas. While 9.3% of males were employed as unpaid family workers, the same was as high as 36.5% for females in 2022. Moreover, the difference between female and male unpaid family labour employment was 31.4% in rural areas against only 8.1% in urban areas. Hence, if appropriate strategies are taken, there is a much greater opportunity for female employment generation, especially in rural areas.

The choice of employment for earnings may be extremely gendered, which makes generating employment opportunities for females tricky. Our study on work conditions and employment for women in the slums of Bhuj, Gujarat, shows that women are more interested in engaging in traditional employment activities from home, such as *bandhani*, embroidery and fall beading, rather than other opportunities, including non-farm casual labour. The flexibility of work and the possibility of working from home were the major reasons for preferring traditional occupations despite their low income. The study also found that 30% of women were stuck to their traditional occupations due to the unavailability of other options. A lower rise of female LFPR in urban than rural areas during 2018-22, as shown in IER 2024, also indicates a lack of appropriate and gainful opportunities for females in urban areas. The opportunity to develop one's own enterprise was difficult due to limited access to capital and binding social norms where males of a particular community control the dominant business of the locality – tie and dye. Collectivising women under self-help groups (SHG), and, further, through federations may benefit women involved in traditional occupations. SHG women may be trained to acquire new skills, and federations may link women directly to the market for better returns. The Kutch Mahila Vikas Sangathan (KMVS), a local non-profit organisation, is working in the region towards this end.

Traditional occupations are accepted by society as they conform to local gender norms. These occupations have emerged as the dominant choice of women. Traditional occupations support women's practical gender needs, such as managing both household work and earnings. However, they may not help in meeting strategic gender needs, such as challenging regressive gender norms. Moving out of their own dwelling and working in a professional environment increases women's agency and empowers them to meet strategic gender needs.

A better female labour force participation rate can improve overall family income and welfare, especially in rural India



The importance of market access

The foray of women into male-dominated workspaces would increase competition for labour work. This competition can be avoided by generating new opportunities in previously neglected arenas. In a study on the relationship between the type of dominant irrigation source of a region (canal or groundwater) and women's empowerment (farm employment and decision-making abilities) in the villages in the Upper Gangetic Plains of Uttarakhand and Uttar Pradesh, we found that women's wages in farm labour work and decision-making abilities increased with the expansion of relatively less dominant source of irrigation and vice versa. Males may take more interest if more water is available through the dominant source of the region. Further, the expansion of canal irrigation during *Ziad* (summer slump season), when males had less interest in agriculture, positively affected female empowerment.

Additional non-conventional irrigation benefits women, as this writer's recent field visits to villages in West Bengal showed. Women have initiated farming, pisciculture, nursery and vermicompost after water is made available through ponds or tube wells in arid and monocropped regions. These women are part of an all-women water user's association supported by the West Bengal Accelerated Development of Minor Irrigation Project, Government of West Bengal. Availability of work near home has reduced female migration with the whole family and has increased family welfare. Male family members help in heavy activities that demand strength, such as ploughing or netting in ponds. In most tribal villages, women are barred from ploughing due to gender norms. Similar norms exist for netting in ponds. Women said that they could carry on without the help of male family members if they used hired tractors for ploughing and hired labour for netting. More market interaction empowers women by enabling them to circumvent gender norms and reduce dependency on male family members. Far away, in the Upper Gangetic Plains, a more vibrant water market was found to be associated with higher agency by women to influence the purchase of agricultural inputs.

The earnings of both men and women contribute to family income and welfare. Hence, the strategy to enhance women's workforce participation and reduce underutilisation of time can be possible by developing income-earning opportunities where males need not be confronted and driven out of the labour market. Women's work opportunities at or near home can enhance the family income and women's position in the family. Strikingly, a woman in West Bengal was proud that she could lend money to her husband to buy agricultural inputs. In another study in the slums of Kolkata, it was observed that women's participation in the workforce has reduced economic vulnerability and improved resilience during the COVID-19 pandemic.

Need for a better work environment

At the same time, participation in work outside the home should be focused. This has a more direct impact on women's empowerment. However, a long-term strategy is required to develop a better work environment for women. Safety and basic facilities in the workplace (toilets and crèches) should be made available. Public policy should mandate these facilities in small- and medium-manufacturing or business units.

A strategy of focusing on the improvement of female LFPR would improve overall employment and the family income. In rural areas, public policy should help women by providing more access to resources (such as water) and markets (to buy inputs and implements and to sell produce). In urban areas, better facilities in the workplace should be mandated. Collectivising women and federating collectives in rural and urban India under planned economic activities will be most helpful. The *Lakhpati Didi* programme aiming at raising an SHG woman's annual income to ₹1 lakh or above may pave the way.

The views expressed are personal

Female employment

- Female LFPR in India is low when compared to the world average of 53.4% (2019), and it has decreased from 38.9% in 2000 to 23.3% in 2018.
- Against this backdrop, the current increasing trend in female LFPR, especially a 12% rise in rural India during 2018-22, indicates an untapped opportunity for employment generation.
- Women have been engaged in unpaid family labour work in both rural and urban areas.
- While 9.3% of males were employed as unpaid family workers, the same was as high as 36.5% for females in 2022.
- Moreover, the difference between female and male unpaid family labour employment was 31.4% in rural areas against only 8.1% in urban areas

- **The study also found that 30% of women were stuck to their traditional occupations due to the unavailability of other options.**
- **The opportunity to develop one's own enterprise was difficult due to limited access to capital and binding social norms where males of a particular community control the dominant business of the locality — tie and dye.**
- **Collectivising women under self-help groups (SHG), and, further, through federations may benefit women involved in traditional occupations**

- **The earnings of both men and women contribute to family income and welfare.**
- **Hence, the strategy to enhance women's workforce participation and reduce underutilisation of time can be possible by developing income-earning opportunities where males need not be confronted and driven out of the labour market. Women's work opportunities at or near home can enhance the family income and women's position in the family**
- **The *Lakhpati Didi* programme aiming at raising an SHG woman's annual income to ₹1 lakh or above may pave the way.**

BIG SHOT

A drone view shows thousands of dead fish killed by contamination in the environment protection area of Taqua on the Piracicaba river in the state of Sao Paulo, Brazil on Thursday. REUTERS

The Piracicaba River

- Tons of dead fish are rotting in the Piracicaba River in Sao Paulo state downstream from where local authorities say a sugar and ethanol plant dumped industrial waste this month.
- **The Piracicaba River** is a river of São Paulo state in southeastern Brazil. It is a tributary of the Tietê River, which it joins in the reservoir created by Barra Bonita Dam.

WHAT IS IT?

Dyson sphere: an energy devourer

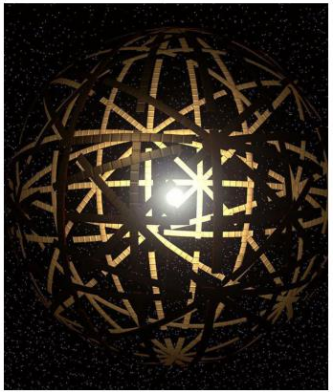
Arkatapa Basu

Imagine you are an astronomer looking deep into space in search of extraterrestrial life. You spot a star that is emitting infrared radiation in anomalous fashion. You zoom in and see a swarm of solar panels covering the star like a shell, quietly collecting an enormous amount of solar energy from the star. Et voila: you have found a Dyson sphere.

The Dyson sphere is named after theoretical physicist Freeman Dyson (1923-2020), who hypothesised its existence. He said that technologically advanced civilisations will have such a tremendous demand for energy that they will have to harness the entire radiative power of a star, using solar energy collectors arranged in a sphere around the orb.

Dyson also figured that these spheres would emit excess heat from the star as infrared radiation, which he said astronomers could look for as an indirect sign of intelligent life — especially life capable of building such megastructures.

Of course, not all unusual infrared radiation emissions are indicative of Dyson spheres. In May this year, scientists set out to look specifically for the signature of



Freeman Dyson said that technologically advanced civilisations will harness the entire radiative power of a star.

Dyson spheres. They scanned 5 million stars within 1,000 light years of the earth. After analysing this data, they found seven stars whose infrared radiation they could not explain. There is no conclusive evidence still, but might one of these seven stars have a Dyson sphere surrounding it?

For feedback and suggestions
for 'Science', please write to
science@thehindu.co.in
with the subject 'Daily page'

Dyson spheres

- Dyson spheres are hypothetical artificial megastructures built around a star to collect all of its radiant energy.
- In theory, detecting a Dyson sphere could be a way to find a technologically advanced alien civilization that did not wish to communicate.
- However, many challenges exist for both building and finding such Dyson spheres, also called Dyson swarms

- The idea behind a Dyson sphere is to collect as much energy from a star as possible.
- On Earth, the total amount of energy we receive from the sun — a value known as the total solar irradiance — is 1,361 watts per square meter, as measured by NASA's Solar Radiation and Climate Experiment.
- Yet that is just a tiny proportion of the sun's total energy output radiated in all directions, which is 380 billion quadrillion (3.86×10^{26}) watts every second, according to the Australian Space Weather Forecasting Centre. Because Earth is so small by comparison, we receive only a tiny proportion of this energy.

- Suppose, though, that an enterprising technological civilization wanted to make use of all their star's energy that would otherwise move off into space at the speed of light.
- If they had sufficiently advanced technology, they might build themselves a Dyson sphere — a spherical swarm of solar-energy collectors that would fully encapsulate their star and collect all of its energy.
- In 1960, physicist Freeman Dyson suggested that technological extraterrestrial civilizations might build a cloud of solar energy collectors that would completely surround their star and that would be detectable from its waste heat.

The importance of both Quad and BRICS

T.S. Tirumurti

Foreign Service Officer who was India's Permanent Representative to the UN, New York, and India's Sherpa for BRICS

The Quad Foreign Ministers' meeting in Japan end-July, after a long gap of 10 months, comes at a time when the United Nations Security Council (UNSC) is paralysed and its reform nowhere in sight, international law is violated with impunity both in the Ukraine war and in the assault on Gaza by Israel, an axis of Russia, China, North Korea, and Iran is gaining traction, and Chinese influence is growing not just in the Indo-Pacific, but elsewhere too.

The U.S. has, in turn, realised that it needs not just allies, but also credible partners in its security architecture, including in the Indo-Pacific, and reached "across the aisle" to "non-ally" countries like India to partner with them in smaller pluri-lateral groupings and joint security initiatives. Further, ASEAN countries are getting increasingly vulnerable, with South China Sea remaining a flashpoint.

While India is a member of many pluri-lateral groups on both sides of the geo-strategic "divide", its engagement in Quad and with BRICS present the country with interesting, and sometimes contrasting, dilemmas.

India has enthusiastically embraced Quad and its strategic objectives. U.S. President Joe Biden's belief in the Quad has given it the necessary fillip at the highest level since 2021. The fact that India, during its presidency of the UNSC in August 2021, held a high-level virtual event on 'Enhancing Maritime Security', presided over by Prime Minister Narendra Modi and attended by Russian President Vladimir Putin, among others, indicates the importance India attaches to strengthening maritime security in the Indo-Pacific and beyond.

India's role in the Quad

While Quad has always had a geopolitical security objective vis-à-vis China, India's vision goes beyond this narrow thrust to a much broader redrawing of the security and techno-economic architecture of the Indo-Pacific region. With Quad now working on reorientation of global supply chains of critical technologies and on a range of areas of direct strategic relevance to the region, including digital, telecom, health, power, and semi-conductors, it has underlined that development too has a security perspective which cannot be ignored. India, in its turn, has benefited through enhanced bilateral relations with Quad partners, especially the U.S.

On the other hand, the formation of AUKUS with the U.S., Australia, and the U.K., with a view to enhance their military capabilities, especially Australia's with nuclear submarines, has put securitisation of the Indo-Pacific region and deterrence of China at the centre. The Ukraine war and enhanced focus on NATO has made the West look at Asia too through a military lens. AUKUS may well suit India's geo-strategic interests, but India's reluctance to go the whole nine yards in embracing a purely security vision for Quad is seen as a dampener, in spite of the Indian External Affairs Minister clarifying that Quad is not an Asian NATO and India is not a treaty ally unlike the other three. In fact, I used to tell my Quad colleagues in the UN that the only value-add we have in Quad is India. Instead of factoring in India's viewpoint, if they merely want to convert India to their cause, then they are wasting the opportunity to become inclusive and enhance their overall impact in the region, which includes developing countries with differing compulsions, not all of which are military-centric.

India's independent policy of close relations with Russia and calling for a diplomatic solution to the Ukraine war, both of which are frowned upon by the West, do not distract India from strengthening the Quad. Some Quad members and European countries are themselves enhancing their bilateral engagement with China, underlining their differing bilateral and regional compulsions.

Against the backdrop of India's enthusiastic engagement with Quad, its engagement with BRICS presents a different conundrum. India was an enthusiastic founder of BRICS. In fact, at the 10th annual summit of the BRICS in 2018 in Johannesburg, South Africa, it was Mr. Modi who reminded the leaders that BRICS was founded to reform the multilateral system and proposed for the first time his vision of "reformed multilateralism." However, India's participation in BRICS has fluctuated from enthusiastic to lukewarm. While BRICS' initiatives such as New Development Bank and the Contingent Reserve Arrangement have been pioneering, the attempt by China to use BRICS to grandstand and push its world view on the Global South and now, to push back the West has made India wary of giving BRICS a higher profile.

The potential of BRICS

India had, consequently, been reluctant to expand BRICS. In fact, in 2018, Mr. Putin too underlined his reluctance to expand BRICS by quoting former South African President Nelson Mandela: "After climbing a great hill, one only finds that there are many more hills to climb." But after Quad and the situation in Ukraine, Russia too realised the potential of BRICS, which includes pushing back the West, and lined up behind China. The change of guard in Brazil leaves India as the lone member to push back China. A reluctant India decided to accept BRICS's expansion than oppose it and now many more countries are reportedly waiting to join. Even if India has the best of bilateral relations with all the new members, we need to make sure it all adds up to support for India inside BRICS. For this, India cannot afford to be ambivalent about BRICS any more. To counter moves to take BRICS in a direction India does not like, we need to be more engaged, not less. With India being the only country common to both Quad and BRICS, the country cannot afford to downplay one for the other.

With India being the only country common to both Quad and BRICS and a founding member of both, it cannot afford to downplay one for the other

India and geo strategic divide

- **India is a member of many plurilateral groups on both sides of the geo-strategic “divide”, its engagement in Quad and with BRICS present the country with interesting, and sometimes contrasting, dilemmas.**
- **India has enthusiastically embraced Quad and its strategic objectives**

- With Quad now working on reorientation of global supply chains of critical technologies and on a range of areas of direct strategic relevance to the region, including digital, telecom, health, power, and semiconductors, it has underlined that development too has a security perspective which cannot be ignored.
- India, in its turn, has benefited through enhanced bilateral relations with Quad partners, especially the U.S.
- On the other hand, the formation of AUKUS with the U.S., Australia, and the U.K., with a view to enhance their military capabilities, especially Australia's with nuclear submarines, has put securitisation of the Indo-Pacific region and deterrence of China at the centre.

- **The Ukraine war and enhanced focus on NATO has made the West look at Asia too through a military lens.**
- **AUKUS may well suit India’s geo-strategic interests, but India’s reluctance to go the whole nine yards in embracing a purely security vision for Quad is seen as a dampener, in spite of the Indian External Affairs Minister clarifying that Quad is not an Asian NATO and India is not a treaty ally unlike the other three**

- **India’s independent policy of close relations with Russia and calling for a diplomatic solution to the Ukraine war, both of which are frowned upon by the West, do not distract India from strengthening the Quad.**
- **Some Quad members and European countries are themselves enhancing their bilateral engagement with China, underlining their differing bilateral and regional compulsions.**

- **In fact, at the 10th annual summit of the BRICS in 2018 in Johannesburg, South Africa, it was Mr. Modi who reminded the leaders that BRICS was founded to reform the multilateral system and proposed for the first time his vision of “reformed multilateralism.”**

- after Quad and the situation in Ukraine, Russia too realised the potential of BRICS, which includes pushing back the West, and lined up behind China.
- The change of guard in Brazil leaves India as the lone member to push back China.
- A reluctant India decided to accept BRICS expansion than oppose it and now many more countries are reportedly waiting to join

GETTY IMAGES

What is a PC emulator, and why did Apple allow it on the App Store?

An emulator, as the name suggests, is a software that allows a computer device to emulate another software. The difference in how a device operates allows it to run and use software designed for other, previously, incompatible devices

Nabeel Ahmed

The story so far:

Apple approved a PC emulator for iOS for the first time this week. The move will allow users to run classic software, mostly games on iOS, iPadOS and visionOS. Earlier this year, Apple updated its App Store guidelines to allow retro game console emulators, mini games, and HTML5 mini apps on iPhones.

What is an emulator in PC?

An emulator, as the name suggests, is a software that allows a computer device to emulate another software. The difference in how a device operates allows it to run and use software designed for other, previously, incompatible devices.

For example, software designed for a Windows PC will have to be redesigned to run on macOS. This redesign will have to be done by developers, who may choose to not include all the functionalities available on Windows to Mac users.

An emulator can be used in this scenario to run software designed for Windows on macOS by emulating the design architecture of Windows. Emulators are commonly used to run applications designed for different operating systems, play video games from older consoles, and test software across different platforms.

Why did Apple allow emulators?

Apple, in the past, did not allow emulators on its platform. The Cupertino-based tech giant approved UTM SE, an app for emulating a computer, to run classic software and games. The move came weeks after the company rejected it and barred it from being notarised for third-party app stores in the European Union. The move may be an attempt by the company to shake off anti-trust allegations in the U.S. for operating as a monopoly and restricting certain gaming apps on its App Store and preventing competition.

Allowing emulators on its App Store could help the iPhone-maker ensure users do not use third-party app stores in the EU to download emulators.

Are PC emulators legal?

Emulators come in handy when testing and designing software, and they do not use proprietary codes. So, they are considered legal to use. However, sharing copyrighted ROMs (Read Only Memory) online is illegal.

But, as most emulators are used to running software not originally meant for a particular device, the question of legality becomes complicated.

Using an emulator is considered legal if users own the software they are running on the emulator. However, if they use the emulator to run pirated copies of a software or use the emulator to distribute or download ROMs of software they do not own, it is considered illegal.

Are emulators risky?

Unlike proprietary software, which receives timely updates to ensure smooth and secure functions, using an emulator can be a risky proposition. Especially, if the emulator is downloaded from unofficial sources. These can contain malware that can compromise the security of a system.

Additionally, depending on the software users choose to emulate, they may inadvertently end up violating licensing agreements or copyright laws. This can result in refusal by the Original Equipment Manufacturer (OEM) to provide maintenance, or technical support and even lead to users being penalised for using proprietary ROMs.

Emulators can also impact the performance of a device. They are resource-intensive and may lead to decreased CPU performance, overheating, and potential damage to the battery. Additionally, poorly designed and untested emulators may lead to data corruption, especially if the emulator crashes or if there are combability issues with the ROMs or software being used.

Are emulators banned?

Due to their ability to help developers use different operating ecosystems for testing purposes without having to switch hardware or the underlying software, emulators are not typically banned in any country. However, the legal status of emulators depends on specific laws in each country, and on how they are used in that jurisdiction.

Are emulators legal in India?

In India, the laws do not specifically ban the use of emulators. However, their use is subject to copyright and intellectual property laws.

While it is legal to use and distribute emulators in India, users may land in trouble if they use emulators to run software such as games, operating systems, or applications without the proper licences or ownership. Distributing ROMs without proper ownership can be problematic.

Additionally, the concept of fair use applies if users own an original copy of the software and are using the emulator as a backup.

What is an emulator in PC?

- An emulator, as the name suggests, is a software that allows a computer device to emulate another software.
- The difference in how a device operates allows it to run and use software designed for other, previously, incompatible devices.
- For example, software designed for a Windows PC will have to be redesigned to run on macOS.
- This redesign will have to be done by developers, who may choose to not include all the functionalities available on Windows to Mac users.

- An emulator can be used in this scenario to run software designed for Windows on macOS by emulating the design architecture of Windows.
- Emulators are commonly used to run applications designed for different operating systems, play video games from older consoles, and test software across different platforms.

Show of strength

Majestic cruise: Warships sail along the Neva river during a naval parade rehearsal in St. Petersburg on Sunday. Russia will celebrate Navy Day on July 28, the last Sunday of July by tradition. AP

Neva river

- The Neva is a river in northwestern Russia flowing from Lake Ladoga through the western part of Leningrad Oblast to the Neva Bay of the Gulf of Finland.
- Despite its modest length of 74 kilometres, it is the fourth-largest river in Europe in terms of average discharge

Turkish delight

Turkish fighter jets fly over a warship off the city of Kyrinia, in the self-proclaimed Turkish Republic of Northern Cyprus, as part of the 50th anniversary celebrations of July 20 Peace and Freedom Day, marking the Turkish invasion of the Mediterranean island. AFP

City of Kyrenia

- Kyrenia is a city on the northern coast of Cyprus, noted for its historic harbour and castle.
- It is under the *de facto* control of Northern Cyprus.
- While there is evidence showing that the wider region of Kyrenia has been populated before, the city was built by the Greeks named Achaeans from the Peloponnese after the Trojan War (1300 BC).

Animals acquire genes from bacteria that can produce antibiotics

The Hindu Bureau

A group of small, freshwater animals protect themselves from infections using antibiotic recipes "stolen" from bacteria, according to a new study. The tiny creatures are called bdelloid rotifers, which means 'crawling wheel-animals'. They have a head, mouth, gut, muscles and nerves like other animals, though they are smaller than a hair's breadth.

When these rotifers are exposed to fungal infection, the study found, they switch on hundreds of genes that they acquired from bacteria and other microbes. Some of these genes produce resistance weapons, such as antibiotics and other antimicrobial agents, in the rotifers. The findings were published in the journal *Nature Communications*.

Prior research found that rotifers have been picking up DNA from their surroundings for millions of years, but the new study is the first to discover them using these genes against diseases. No other animals are known to "steal" genes from microbes on such a large scale.

"These complex genes – some of which aren't found in any other animals – were acquired from bacteria but have undergone an evolution in rotifers," coauthor David Mark Welch, senior scientist and director of the Josephine Bay Paul Center at the Marine Biological Laboratory says in a release. "This raises the potential that rotifers are producing novel antimicrobials that may be less toxic to animals, including humans, than those we develop from bacteria and fungi."

"When rotifers were challenged with a fungal pathogen, horizontally acquired genes were over twice as likely to be upregulated as other genes – a stronger enrichment than observed for abiotic stressors," the authors write. "Among hundreds of upregulated genes, the most markedly overrepresented were clusters resembling bacterial polyketide and nonribosomal peptide synthetases that produce antibiotics. Upregulation of these clusters in a pathogen-resistant rotifer species was nearly ten times stronger than in a susceptible species."

Most of antibiotics are produced naturally by fungi and bacteria in the wild, and humans can make artificial versions to use as medicine. The study suggests that rotifers might be doing something similar. The scientists think that rotifers could give important clues in the hunt for drugs to treat human infections caused by bacteria or fungi. One problem with developing new drugs is that many antibiotic chemicals made by bacteria and fungi are poisonous or have side effects in animals.

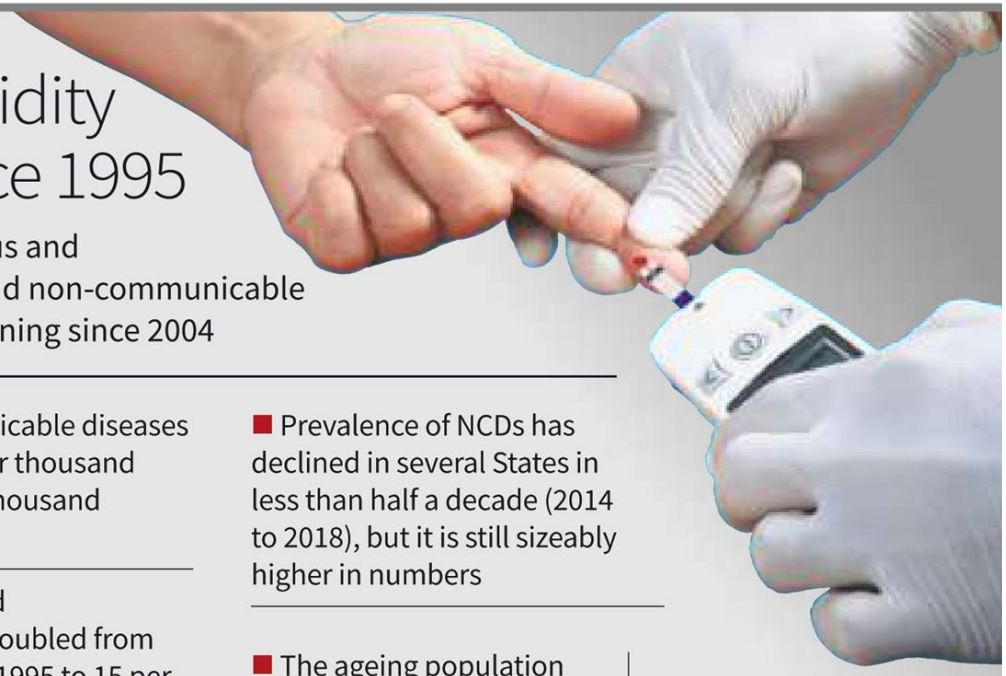
bdelloid rotifers

- A group of small, freshwater animals protect themselves from infections using antibiotic recipes “stolen” from bacteria, according to a new study.
- The tiny creatures are called bdelloid rotifers, which means ‘crawling wheel-animals’.
- They have a head, mouth, gut, muscles and nerves like other animals, though they are smaller than a hair’s breadth

- When these rotifers are exposed to fungal infection, the study found, they switch on hundreds of genes that they acquired from bacteria and other microbes.
- Some of these genes produce resistance weapons, such as antibiotics and other antimicrobial agents, in the rotifers

Marked morbidity transition since 1995

The prevalence of infectious and communicable diseases and non-communicable diseases have started declining since 2004



- Prevalence of non-communicable diseases (NCDs) has tripled from 8.6 per thousand individuals in 1995 to 30 per thousand individuals in 2018
- Prevalence of infectious and communicable diseases has doubled from 8 per thousand population in 1995 to 15 per thousand population in the past two decades
- Kerala has the highest prevalence of NCDs followed by Puducherry, Andhra Pradesh, Goa, Tamil Nadu, and Punjab. The north-eastern States have the lowest prevalence of non-communicable diseases
- Prevalence of NCDs has declined in several States in less than half a decade (2014 to 2018), but it is still sizeably higher in numbers
- The ageing population and rising life expectancy are concurrently fuelling the prevalence of NCDs without necessarily displacing existing infectious and communicable morbidities
- While NCDs burden has been higher in women than in men, it has tripled in both men and women between 1995 and 2014

Rise and shine: morning sunlight and your wellbeing

SPEAKING OF SCIENCE

D. Balasubramanian

We humans are affected by the cycle of light and darkness that occurs every day. Our bodies have a 24-hour (circadian) rhythm that is translated into physiological processes such as hormone secretion, which in turn drive our actions. To stay in synchrony with the environment, and therefore to perform the right activities at the right time, light serves as an alarm clock. This light synchronisation, photoentrainment, happens in the brain by light signals coming from the eye.

Many other species also depend on light to provide them with cues for their daily routine. When these light patterns are disrupted, their natural rhythms and behaviours can be affected. An example: tourism operators in the Maldives take boatloads of visitors out at night, and shine bright lights of about 4000 watts on the ocean surface. Biological activity in the water picks up as if it is morning, and tourists get to see whale sharks.

Our vision is enabled by the rods and cones, which are photoreceptor cells in the outer retina. The rods are very sensitive to light but are not colour sensitive and so are most useful in dim light; the cones work best in bright light, giving us colour vision. Rods and cones convert photons of light into electrical signals, which are passed on to retinal ganglion cells. These cells process information from the retina and pass it on to the brain.

A pattern of earlier sleep timing is associated with a lowered risk of major depressive disorder. FILE PHOTO

Photosensitive cells

About 20 years ago, a new class of cells that could perceive light was found in the inner retina. Called the intrinsically photosensitive retinal ganglion cells (ipRGC), these cells contain a photopigment, melanopsin, that allows them to directly respond to light. These cells have very important roles in our body's interaction with light that are not related to seeing.

Electrical impulses from the ipRGC travel to areas of the brain that are involved in sleep, alertness and mood regulation. Signals also project to the area of the brain that controls the pupils of the eyes, causing them to constrict in response to bright light.

Importantly, electrical signals travel to a part of the hypothalamus that regulates circadian rhythms. This part of the brain has long been known to be the master clock, where your body's internal clock is synchronised with the light-dark cycle in the outside world that is driven by the sun.

Morning birds

Morning diurnal preference is the classification for people who prefer early sleep and who rise early. Peak performance is earlier in the day, and the condition is associated with a reduced risk of obesity as well as better academic performance. Several studies have also shown that a pattern of earlier sleep timing is associated with a lowered risk of major depressive disorder (Scientific Reports, 12003, 2021).

Stanford neurobiology professor Andrew Huberman, in his popular podcast has pointed to the beneficial effects of low-angle light from the morning sun in resetting the circadian clock. ipRGC cells are most responsive to blue light (480 nm). The morning light has a low ratio of blue to yellow light, just enough to send a message to the hypothalamus marking the start of another circadian cycle. Sixteen hours later, your body is going to be sleepy. So go out and be in the morning light – sunny or cloudy, but don't stare at the sun! Synchronising your clock will improve your health – physical and mental.

(The article was written in collaboration with Sushil Chandani, who works in molecular modelling)

ipRGC)

- Our vision is enabled by the rods and cones, which are photoreceptor cells in the outer retina.
- The rods are very sensitive to light but are not colour sensitive and so are most useful in dim light; the cones work best in bright light, giving us colour vision.
- Rods and cones convert photons of light into electrical signals, which are passed on to retinal ganglion cells.
- These cells process information from the retina and pass it on to the brain. Photosensitive cells About 20 years ago, a new class of cells that could perceive light was found in the inner retina.

- Called the intrinsically photosensitive retinal ganglion cells (ipRGC), these cells contain a photopigment, melanopsin, that allows them to directly respond to light.
- These cells have very important roles in our body's interaction with light that are not related to seeing.
- Electrical impulses from the ipRGC travel to areas of the brain that are involved in sleep, alertness and mood regulation

- **ipRGC cells are most responsive to blue light (480 nm).**
- **The morning light has a low ratio of blue to yellow light, just enough to send a message to the hypothalamus marking the start of another circadian cycle.**

Rising antimalarial resistance in Africa needs urgent action

Artemisinin-based combination therapies (ACTs) have become the cornerstone of malaria treatment and control. However, the emergence and spread of artemisinin-resistance (ART-R) in malaria-causing Plasmodium falciparum parasites in eastern Africa has compromised the efficacy of these crucial treatments. To counter ART-R in Africa, researchers recommend using triple ACTs (TACTs), combining an artemisinin derivative with two partner drugs, which have proven effective in Asia.

Artemisinin-based combination therapies (ACTs)

- Artemisinin-based combination therapies (ACTs) have become the cornerstone of malaria treatment and control.
- However, the emergence and spread of artemisinin-resistance (ART-R) in malaria-causing Plasmodium falciparum parasites in eastern Africa has compromised the ecacy of these crucial treatments.
- To counter ART-R in Africa, researchers recommend using triple ACTs (TACTs), combining an artemisinin derivative with two partner drugs, which have proven effective in Asia.

Spitting cobra venom reveals a promising antivenom

By studying the molecular characteristics of venom from spitting cobras, scientists have discovered that approved drugs called heparinoids can shield against the venom's destructive effects on local tissue. The study in cells and mice suggests that heparinoids could potentially be developed into antidotes for cobra bites. These compounds also don't require refrigeration like most antibody-based antivenoms, making heparinoids useful in remote regions that lack medical infrastructure.

heparinoids

- By studying the molecular characteristics of venom from spitting cobras, scientists have discovered that approved drugs called heparinoids can shield against the venom’s destructive effects on local tissue.
- The study in cells and mice suggests that heparinoids could potentially be developed into antidotes for cobra bites.
- These compounds also don’t require refrigeration like most antibody-based antivenoms, making heparinoids useful in remote regions that lack medical infrastructure.

In painstaking steps, scientists piece the neutrino universe together

Researchers conducting an experiment with the Large Hadron Collider reported observing electron-neutrinos in a particle collider for the first time. Understanding these particles could transform what we know about our universe, the tools we use to study it, and the technologies in our lives

Qudsia Gani

A technician works on the NOvA prototype Near Detector. REIDAR HAHN/FERMILAB

Neutrinos are a type of subatomic particle. They don't have an electric charge, have a small mass, and are left-handed (a physics term meaning the direction of its spin is opposite to the direction of its motion). And they are flooding the universe. They are the second-most abundant particles after photons (particles of light) and the most abundant among particles that make up matter.

The study of neutrinos is an area of immense current interest among particle physicists and astrophysicists. These particles are produced when particles called leptons interact with matter. For example, when a type of lepton called a muon interacts with matter, the interaction produces a muon-neutrino. The same goes for electrons (electron-neutrino) and taouons (tau-neutrino). However, the neutrinos themselves interact with matter very, very rarely to produce a corresponding muon, electron, or taouon.

This small interaction rate makes studying neutrinos difficult. For example, a muon-neutrino will scatter off an atom's nucleus only once out of a million times or so, producing a muon and a proton. So to study them, physicists have built detectors with very fine tracking capabilities. They are also large to maximise the number of interactions between the neutrinos and the detectors' matter.

New data from NOvA

One such experiment is NovA, an acronym for 'NuMI Off-axis ν_e Appearance', in Minnesota in the U.S. It creates a beam of neutrinos that fly towards a 14,000-tonne detector located 800 km away. NOvA is managed by the Fermi National Accelerator Laboratory.

Scientists presented the latest results from the NOvA collaboration at a conference in Italy on June 17. They said the collaboration had acquired twice as much data as it had during NOvA's previous run, four years ago. The new results complemented the previous ones with greater precision.

NOvA was designed to determine the role of neutrinos in the evolution of the cosmos. It does this by trying to understand which neutrino type has the most mass and which type has the least. This is an important detail because neutrinos may get their mass through a different mechanism from other matter particles. Unravelling it could answer many open questions in physics.

In pursuit of this goal, on July 11, a study at the Large Hadron Collider in Europe also reported observing electron-neutrinos at a particle collider for the first time.

The surprise of mass

Physicists first detected extraterrestrial neutrinos coming from a supernova in 1987, when a star exploded around 150,000 light years away. Three hours before light from the explosion reached the earth, three underground detectors in Japan, Russia, and the U.S. recorded a spike in the number of neutrinos coming from the explosion. This event was the birth of neutrino astronomy.

For almost 50 years, physicists thought neutrinos were massless particles, like photons. According to the special theory of relativity, a massive particle can't travel at the speed of light (in vacuum). So a light signal could overtake the neutrino, and it would appear right-handed when viewed in the opposite direction, i.e., with its directions of motion and spin aligned with each other. However, physicists had never detected right-handed neutrinos, so they concluded neutrinos are massless.

But from the late 1960s, scientists in Japan and Canada found evidence to overturn this view and prove neutrinos actually have mass. They found that when neutrinos travel through space, they can change from one type to another, which massless particles can't do.

The existing theory of how particles behave and their properties, called the Standard Model of particle physics, doesn't predict massive neutrinos. Incorporating them in the Standard Model will require far-reaching changes that physicists are still working out.

Ordering the neutrinos

This is why physicists study how neutrinos (and their antimatter counterparts, antineutrinos) change their type as they travel large distances. This quantum mechanical phenomenon is called neutrino oscillation. For example, all neutrinos from the Sun are electron-neutrinos, yet we receive a big chunk of them on the earth as muon-neutrinos.

Theoretical models predict two possible solutions for the neutrino mass hierarchy problem, called *normal* and *inverted*. The normal order proposes that one of the three types is much heavier and that the other two have comparable lower masses. In the inverted order, one of the neutrino types is lighter and the other two have comparable heavier masses.

> If we find a way to transmit neutrinos, it wouldn't be far-fetched to say we can replace electromagnetic waves in communication channels with neutrino beams within a few decades

The new NOvA data favours the normal order, but not conclusively.

Cracking the hierarchy problem is closely related to the universe's evolution. Their low interaction rate means neutrinos are excellent carriers of information from the universe's past, from sources like exploding stars and black holes. We can't otherwise access a lot of this information today. Supernovae are known to release 99% of their radiant energy in a short, 10-second burst of neutrinos.

Studying these neutrinos can reveal how light or radio waves from the explosion diffuse after travelling a certain distance.

The best information carriers

Indeed, because neutrinos pass through most matter untouched, they can carry information across large distances. Humans currently use electromagnetic waves to do this job because they are easier to transmit and to detect. But in some situations, they don't work well.

For example, seawater is opaque to electromagnetic radiation of shorter wavelength, which impedes the transmission of waves of certain frequencies to submarines. Neutrinos on the other hand can easily pass through 1,000 light years (9,400 million million km) of lead, so an ocean will hardly be a barrier.

We only need to find a way to transmit and capture them, which is tied to understanding them fully. If this happens, it wouldn't be far-fetched to say we can replace electromagnetic waves in communication channels with neutrino beams within a few decades.

Eyes on the neutrino universe

Given all these advantages, the world's more scientifically endowed countries are racing to study neutrinos.

A few of the experiments involved are the Super-K III in Japan; the Sudbury Neutrino Observatory (in its new SNO+ avatar) in Canada; the MiniBOONe, the MicroBOONe, and NOvA in the U.S.; the Double CHOOZ in France; the Jiangmen Underground Neutrino Observatory in China; the OPERA experiment in Switzerland; and the IceCube Neutrino Observatory in Antarctica.

India's own India-based Neutrino Observatory, funded by the Department of Atomic Energy, was supposed to come up in Tamil Nadu but currently faces an uncertain future over procedural lapses and lack of political support.

Just as more matter increases the number of interactions with neutrinos, a large number of experiments increase the chances of cracking the mass hierarchy and other problems, and bring us closer to a complete picture of the universe.

(Qudsia Gani is an assistant professor in the Department of Physics, Government Degree College Pattan, Baramulla.)

Neutrinos

- Neutrinos are a type of subatomic particle.
- They don’t have an electric charge, have a small mass, and are left-handed (a physics term meaning the direction of its spin is opposite to the direction of its motion).
- And they are flooding the universe.
- They are the second-most abundant particles after photons (particles of light) and the most abundant among particles that make up matter

- . These particles are produced when particles called leptons interact with matter.
- For example, when a type of lepton called a muon interacts with matter, the interaction produces a muon-neutrino.
- The same goes for electrons (electron-neutrino) and tauons (tau-neutrino). However, the neutrinos themselves interact with matter very, very rarely to produce a corresponding muon, electron, or tauon.

- This small interaction rate makes studying neutrinos difficult.
- For example, a muon-neutrino will scatter of an atom’s nucleus only once out of a million times or so, producing a muon and a proton.
- So to study them, physicists have built detectors with very fine tracking capabilities

- New data from NOvA One such experiment is NovA, an acronym for ‘NuMI Off-axis ve Appearance’, in Minnesota in the U.S.
- It creates a beam of neutrinos that fly towards a 14,000-tonne detector located 800 km away.
- NOvA is managed by the Fermi National Accelerator Laboratory

- **NOvA was designed to determine the role of neutrinos in the evolution of the cosmos.**
- **It does this by trying to understand which neutrino type has the most mass and which type has the least.**

- **because neutrinos pass through most matter untouched, they can carry information across large distances.**
- **Humans currently use electromagnetic waves to do this job because they are easier to transmit and to detect.**
- **But in some situations, they don’t work well.**

- **For example, seawater is opaque to electromagnetic radiation of shorter wavelength, which impedes the transmission of waves of certain frequencies to submarines.**
- **Neutrinos on the other hand can easily pass through 1,000 light years (9,400 million million km) of lead, so an ocean will hardly be a barrier.**

Ordering the neutrinos

- This is why physicists study how neutrinos (and their antimatter counterparts, antineutrinos) change their type as they travel large distances.
- This quantum mechanical phenomenon is called neutrino oscillation.
- For example, all neutrinos from the Sun are electron-neutrinos, yet we receive a big chunk of them on the earth as muon-neutrinos.

- **Theoretical models predict two possible solutions for the neutrino mass hierarchy problem, called normal and inverted.**
- **The normal order proposes that one of the three types is much heavier and that the other two have comparable lower masses.**
- **In the inverted order, one of the neutrino types is lighter and the other two have comparable heavier masses.**

- **The new NOvA data favours the normal order, but not conclusively.**
- **Cracking the hierarchy problem is closely related to the universe’s evolution.**
- **Their low interaction rate means neutrinos are excellent carriers of information from the universe’s past, from sources like exploding stars and black holes.**

Heat stress is more than a degree of concern

Ishawar Choudhary
pursuing a PhD in economics in the Department of Economics and Finance at the BITS Pilani, Pilani campus, Rajasthan

Balakrushna Padhi
an Assistant Professor in the Department of Economics and Finance at BITS Pilani

Geetilaxmi Mohapatra
an Associate Professor in the Department of Economics and Finance at the BITS Pilani, Pilani campus, Rajasthan

In recent periods, climate change and environmental degradation have significantly affected the safety and the health of workers worldwide. Heat stress is anticipated to affect labour efficiency and productivity, in turn reducing work hours and hindering the International Labour Organization's (ILO) objective of promoting fair and decent employment. Workers, who are particularly vulnerable to climate change hazards, sometimes cannot cease working despite hazardous conditions because of financial constraints.

The main health effects of heat stress on workers include heat stroke, heat cramps, cardiovascular disease, acute kidney injury, and physical injury. The Intergovernmental Panel on Climate Change (IPCC) states that to retain normal physiological activities, it is necessary to maintain a core body temperature of roughly 37°C. Temperature elevations over 38°C have a deleterious effect on one's cognitive and physical capabilities. During various life stages, women who are employed in heat-exposed sectors, such as subsistence agriculture, may be at risk for pregnancy-related complications, including hypertension, miscarriages, and premature births. An increase in temperature can diminish work productivity due to excessive heat that makes it difficult to work. Or, there is a need for personnel to operate at a slower pace.

ILO study findings

The ILO study (2019) estimated that "Heat stress is projected to reduce total working hours worldwide by 2.2 percent and global GDP by US$2,400 billion in 2030... Agricultural and construction workers are expected to be the worst affected, accounting for 60 percent and 19 percent, respectively of working hours lost to heat stress in 2030". Agricultural workers face a significantly higher risk from heat than workers in other occupations, with farmworkers being 35 times more susceptible to heat-related fatalities. Recent ILO (2024) estimates that 2.41 billion workers worldwide are exposed to extreme heat. Further, exposure to extreme heat at work is directly associated with about 22.85 million injuries and 18,970 fatalities annually. The Asia and the Pacific regions experience the highest Gross Domestic Product (GDP) losses due to heat stress affecting labour productivity. In 1995, the region's GDP was estimated to have decreased by 1.4%, which is forecast to decrease by 2.3% in 2030 due to climate change. Projections indicate that Thailand, Cambodia, and India will experience significant declines in their national GDP in 2030, with a decrease of over 5%.

Asia and the Pacific exhibit exceptional diversity in terms of climate and the varying levels of economic development among various countries. The geographical distribution of heat stress impact is not uniform. It is projected that by 2030, there would be a decrease of almost 5% in working hours in southern Asia and western Africa, while the reduction in the European subregions will be only 0.1%.

Further, southern Asia and sub-Saharan Africa are most susceptible to experiencing declines in labour productivity due to heat stress; these regions are already vulnerable to climate change and home to most of the world's poor population, which counteracts efforts to reduce inequalities. The countries that are most susceptible to experiencing decreases in productivity are those having a significant proportion of their workforce employed in the agricultural and/or construction sectors, as well as those situated in the tropical and subtropical latitudes. The decline in available working hours and output among small-scale and subsistence farmers is expected to affect household food security. Heat stress significantly impacts labour hours and productivity, and the impact is not uniform across regions and genders. Heat stress poses concerns that have the potential to exacerbate gender disparities in the workforce, particularly by deteriorating working conditions for the numerous women engaged in subsistence agriculture. Excessive heat stress is expected to impact the achievement of various Sustainable Development Goals (SDGs).

The Asia and Pacific regions could experience significant economic losses due to heat stress affecting labour productivity

Impact in India

India is undergoing a consistent increase in temperatures annually. By 2030, an estimated 160 million-200 million individuals around the nation may face the risk of experiencing deadly heat waves every year. Approximately 34 million people in India will experience job losses due to reduced productivity caused by heat stress. A study in West Bengal shows that as the temperature increases by 1°C, there is a corresponding decrease of approximately 2% in the productivity of female brickmaking workers. India is the country that experiences the most impact from heat stress; in 1995, it lost 4.3% of its working hours, which is anticipated to increase to 5.8% by 2030.

In addition, India is expected to experience a significant decline in full-time employment by 2030 as a result of heat stress, which can be attributed to its large population. Further, migrant workers often work in hazardous and physically demanding jobs, primarily in the informal economy. They are particularly vulnerable to the risks posed by climate change, as they usually lack occupational safety and health protections, essential services, and infrastructure.

Informal workers may continue working despite the risk to their health from extreme climate events due to financial constraints. Thus, there is a need to strengthen adaptation and mitigation measures at the global, national, and workplace levels to reduce the detrimental impact of heat stress on workers.

There are national guidelines under the title, 'Preparation of Action Plan – Prevention and Management of Heat Wave', by the National Disaster Management Authority in collaboration with the Ministry of Home Affairs. These guidelines are designed to protect the Indian workforce from the negative impacts of extreme heat. They are designed to help public officials create heatwave action plans for both urban and rural areas, with a focus on the general population.

The importance of the following factors is highlighted: providing education to workers; ensuring proper hydration; managing work schedules, and offering necessary medical facilities. The General Discussion Committee of the International Labour Conference, in June 2023, highlighted the urgent need to implement measures to ensure the safety and the health of workers impacted by climate-related risks and extreme weather events. This involves tackling the effects on their mental and physical well-being and the advocating of secure and conducive working environments.

In this regard, it is crucial for all stakeholders, including governments, employers, and workers, to collaborate in implementing measures that prioritise the protection of the most vulnerable individuals. These measures should include the development of sufficient infrastructure and enhanced early warning systems for extreme weather events.

Additionally, there should be a focus on improving the implementation of international labour standards that are related to occupational safety and health. This will ensure that those affected by heat stress are provided with suitable working conditions. Further, effective communication between workers and employers is essential to facilitate the adjustment of working hours, guarantee adequate rest breaks, provide access to drinking water, and offer training on the identification and management of heat stress. This can help alleviate the adverse effects of heat stress.

Think of green jobs

The government may implement adequate regulatory and legislative measures in occupations that are susceptible to heat waves in order to ensure the safety and well-being of workers. Additionally, infrastructure-related measures, such as implementing construction standards, should safeguard indoor workers. Considering the current climate change scenario, decent and green employment emerges as a promising solution for the future of work. Green jobs are employment opportunities that help protect or restore the environment while also supporting economic and social well-being.

The views expressed are personal

Impact of heat waves

- In recent periods, climate change and environmental degradation have significantly affected the safety and the health of workers worldwide.
- Heat stress is anticipated to aect labour efficiency and productivity, in turn reducing work hours and hindering the International Labour Organization’s (ILO) objective of promoting fair and decent employment.
- Workers, who are particularly vulnerable to climate change hazards, sometimes cannot cease working despite hazardous conditions because of financial constraints.
- The main health effects of heat stress on workers include heat stroke, heat cramps, cardiovascular disease, acute kidney injury, and physical injury.

- **The Intergovernmental Panel on Climate Change (IPCC) states that to retain normal physiological activities, it is necessary to maintain a core body temperature of roughly 37°C.**
- **Temperature elevations over 38°C have a deleterious effect on one's cognitive and physical capabilities.**
- **During various life stages, women who are employed in heat-exposed sectors, such as subsistence agriculture, may be at risk for pregnancy-related complications, including hypertension, miscarriages, and premature births.**
- **An increase in temperature can diminish work productivity due to excessive heat that makes it difficult to work**

Impact in India

- India is undergoing a consistent increase in temperatures annually.
- By 2030, an estimated 160 million-200 million individuals around the nation may face the risk of experiencing deadly heat waves every year.
- Approximately 34 million people in India will experience job losses due to reduced productivity caused by heat stress.

- , **India is expected to experience a significant decline in full-time employment by 2030 as a result of heat stress, which can be attributed to its large population.**
- **Further, migrant workers often work in hazardous and physically demanding jobs, primarily in the informal economy.**
- **They are particularly vulnerable to the risks posed by climate change, as they usually lack occupational safety and health protections, essential services, and infrastructure**

Steps

- There are national guidelines under the title, ‘Preparation of Action Plan – Prevention and Management of Heat Wave’, by the National Disaster Management Authority in collaboration with the Ministry of Home Affairs.
- These guidelines are designed to protect the Indian workforce from the negative impacts of extreme heat.
- They are designed to help public officials create heatwave action plans for both urban and rural areas, with a focus on the general population.
- The importance of the following factors is highlighted: providing education to workers; ensuring proper hydration; managing work schedules, and oering necessary medical facilities

- there should be a focus on improving the implementation of international labour standards that are related to occupational safety and health.
- This will ensure that those affected by heat stress are provided with suitable working conditions.
- Considering the current climate change scenario, decent and green employment emerges as a promising solution for the future of work.
- Green jobs are employment opportunities that help protect or restore the environment while also supporting economic and social well-being.

How and when can a bill be defined as a money Bill?

Why do money Bills have a special procedure for approval? What is the way forward?

Rangarajan.R

The story so far:

The Chief Justice of India (CJI) has agreed to list before Constitution Benches, the petitions challenging the money Bill route taken by the Centre to pass contentious laws/amendments.

What are money and financial Bills?

The Constitution defines certain categories of bills that deal with financial matters as money Bills and financial Bills. Article 110(1)(a) to (f) defines a money Bill as a bill that contains 'only' provisions dealing with one or more of six specific matters. They relate to taxation; borrowing by government; custody of consolidated fund or contingency fund and payment/withdrawal of money from such fund; appropriation out of consolidated fund; expenditure charged on consolidated fund; receipt on account of consolidated fund or public account or the audit of accounts of Union or States.

Clause (g) of Article 110 (1) provides that any matter incidental to these six matters can also be classified as a money Bill. Classic examples of money Bills include the Finance Act and the Appropriation Act that deal primarily 'only' with taxation and spending out of the consolidated fund respectively. Article 117 provides for two different categories of financial Bills. Category I contains any of the six matters mentioned in Article 110(1)(a) to (f) along with any other matter. Category II Bills do not contain any of those six matters but would involve expenditures from the consolidated fund.

What is procedure for a money Bill?

As per Article 109, a money Bill shall be introduced only in the Lok Sabha. After it is passed in the Lok Sabha, the Rajya Sabha has only 14 days to provide its recommendations on such a Bill which may or may not be accepted by the Lok Sabha. Money Bills deal 'only' with financial matters that are crucial for the administration of the country. Hence, the Constitution provides for this special procedure that effectively requires only the approval of Lok Sabha where the ruling government enjoys a majority. It has its origin in the U.K., where in 1911 the powers of the unelected House of Lords over the Budget were curtailed. The Budget was required to be passed only by the House of Commons that reflected the will of the people. However, it must be noted that the operative word of the definition of a money Bill is the word 'only.' It is the Speaker of Lok Sabha who certifies a Bill to be a money Bill.

Financial Bills of Category I and II do not enjoy this special procedure.

What are the issues?

Certification of a Bill as a 'money Bill' by the Speaker came under judicial review during the scrutiny of the Aadhaar Act passed in 2016. This law contains provisions with respect to process for enrolment and authentication, establishment of authority for Aadhaar, mechanism for safeguards, and penalties for offences under the Act. Section 7 of the Act provides that the Central or State government may require Aadhaar authentication of an individual as a condition for providing subsidy, benefit or service, for which expenditure is incurred from the consolidated fund. Stating the withdrawal of funds from the consolidated fund as the primary purpose of the Act, with all other provisions being incidental to it, this law was passed as a 'money Bill'. While this was a debatable classification, the Supreme Court upheld this with a majority of 4:1. The current CJI was the lone dissenting judge who held that the Aadhaar Act did not fulfil the definition of a 'money Bill'.

The Finance Act, 2017 was even more controversial, in passing amendments to various Acts for reorganisation of tribunals such as the National Green Tribunal, as a money Bill. These amendments were struck down in *Rojer Mathew versus South Indian Bank* (2019) wherein a five-judge Bench opined that the Aadhaar case judgment did not substantially discuss the effect of the word 'only' in the definition of money Bill. It referred the matter to a larger Bench for consideration. A seven-judge Bench should be constituted for an authoritative judgment on the definition of money Bills. The Speakers should also uphold the spirit of the definition while certifying a 'money Bill.'

Rangarajan. R is a former IAS officer and author of 'Polity Simplified'. Views expressed are personal.

THE GIST

- The Constitution defines certain categories of bills that deal with financial matters as money Bills and financial Bills. Article 110(1)(a) to (f) defines a money Bill as a bill that contains 'only' provisions dealing with one or more of six specific matters.
- Certification of a Bill as a 'money Bill' by the Speaker came under judicial review during the scrutiny of the Aadhaar Act passed in 2016.
- A seven-judge Bench should be constituted for an authoritative judgment on the definition of money Bills.

What are money and financial Bills?

- The Constitution defines certain categories of bills that deal with financial matters as money Bills and financial Bills. Article 110(1)(a) to (f) defines a money Bill as a bill that contains ‘only’ provisions dealing with one or more of six specific matters.
- They relate to taxation; borrowing by government; custody of consolidated fund or contingency fund and payment/withdrawal of money from such fund; appropriation out of consolidated fund; expenditure charged on consolidated fund; receipt on account of consolidated fund or public account or the audit of accounts of Union or States.
- Clause (g) of Article 110 (1) provides that any matter incidental to these six matters can also be classified as a money Bill.

- **Classic examples of money Bills include the Finance Act and the Appropriation Act that deal primarily ‘only’ with taxation and spending out of the consolidated fund respectively. Article 117 provides for two different categories of financial Bills.**
- **Category I contains any of the six matters mentioned in Article 110(1)(a) to (f) along with any other matter.**
- **Category II Bills do not contain any of those six matters but would involve expenditures from the consolidated fund**

- **Classic examples of money Bills include the Finance Act and the Appropriation Act that deal primarily ‘only’ with taxation and spending out of the consolidated fund respectively.**
- **Article 117 provides for two different categories of financial Bills.**
- **Category I contains any of the six matters mentioned in Article 110(1)(a) to (f) along with any other matter.**
- **Category II Bills do not contain any of those six matters but would involve expenditures from the consolidated fund**

What is procedure for a money Bill?

- As per Article 109, a money Bill shall be introduced only in the Lok Sabha.
- After it is passed in the Lok Sabha, the Rajya Sabha has only 14 days to provide its recommendations on such a Bill which may or may not be accepted by the Lok Sabha.
- Money Bills deal ‘only’ with financial matters that are crucial for the administration of the country.
- Hence, the Constitution provides for this special procedure that effectively requires only the approval of Lok Sabha where the ruling government enjoys a majority.

- It has its origin in the U.K., where in 1911 the powers of the unelected House of Lords over the Budget were curtailed.
- The Budget was required to be passed only by the House of Commons that reflected the will of the people.
- However, it must be noted that the operative word of the definition of a money Bill is the word ‘only.’
- It is the Speaker of Lok Sabha who certifies a Bill to be a money Bill.
- Financial Bills of Category I and II do not enjoy this special procedure.

A case for regulating gig-based work

Karnataka's draft Bill introduces provisions that mandate fair contracts and income security for platform workers. These provisions strengthen the position of workers who are at the same time not considered employees, nor do they enjoy the freedom and flexibility of being independent contractors

ECONOMIC NOTES

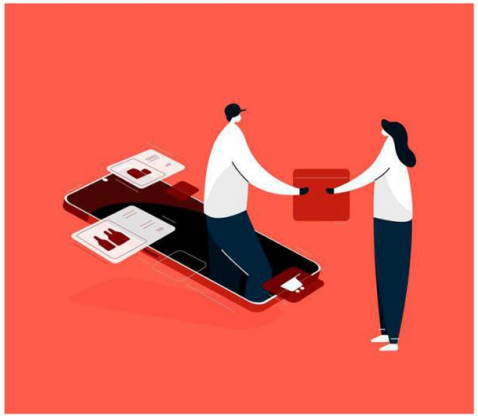
Rakshita Swamy
Biju Mathew

The Karnataka government's intent to introduce a legislation for the welfare of gig workers is a welcome and necessary step.

It squarely addresses the three big myths propagated by the gig and platform industry. The first myth that aggregators sell to promote platform work is that they would have "no boss" and would be "partners" and "captains" – anything but workers. This drew in many people, particularly the young, to join platform-based gigs. However, it soon became clear that this was not the case. There was a big boss – the algorithm and a network of team managers deployed at the local level to enforce the algorithm.

Algorithms dictate the number of hours the worker needs to put in on weekends, the orders to be delivered, cancellations and rating scores that ought to be maintained in order for tasks to be continually allocated to the worker, and finally when a worker is deactivated or fired. Shaikh Salauddin from the Indian Federation of App-based Transport Workers put it succinctly when he said that "Gig workers spend hours trying to guess what the algorithm is doing and it feels like they are a rat in a maze". This is totally opposite to the idea of being one's own boss. A plain reading of the digitally generated terms and conditions that the worker has to invariably agree on to commence work dispels any notion of being an independent contractor. Every aspect of the work is monitored and dictated, with workers facing the consequences if they do not comply.

The Karnataka Bill recognises the pervasive role played by such algorithms and makes the aggregator responsible for sharing the parameters that are used by the algorithm to determine allocation of work, grounds for denial of work, the categorisation of workers and how



ISTOCKPHOTO

personal data of workers is being used to determine their ability to work and earn through the aggregator. The Bill breaks the algorithmic control the companies have and allows workers to take back control for at least some part of their work lives.

The myth of flexibility

The second myth that is perpetuated is that persons engaged in platform work enjoy flexible work arrangements. This assertion has enabled platforms to keep gig-based workers away from protections under labour laws. Multiple studies have shown how the term flexibility is abused in the industry. All flexibility in truth rests only with the employer and none with the worker. The payment structure consisting of a number of incentive schemes which enable workers to earn the minimum surplus required to cover costs, in effect, leaves no flexibility with the workers. For instance, workers have to comply with mandatory login hours to be eligible for incentives. If they log in after gaps of being 'inactive', they have to make peace with disadvantaged rate cards and incentive schemes. Karnataka's draft Bill introduces provisions that mandate fair contracts, income security and the right of platform workers to refuse work without being slapped with sanctions. The above provisions strengthen the position of these workers who are at the same time not considered employees, nor do they enjoy the freedom and flexibility of being independent contractors.

The third myth is that these are 'part time' workers, who engage in platform-based gig work for additional income. According to a study of the platform economy in India by PAIGHAM and the University of Pennsylvania, 96% of the cab drivers surveyed, secured 100% of their daily income from gigs. The corresponding figure for delivery workers was 90.7%. Average daily work hours for taxi drivers was in excess of 11 hours, and 10 hours for delivery workers. By making social security a mandatory requirement, the Karnataka Law takes a necessary step towards acknowledging this fact and makes room for an umbrella of schemes that can assist workers through events such as old age, death, health shocks etc.

India's stand

Even though the Government of India endorsed a progressive statement on the rights of platform workers at the G-20 last year, it's Code on Social Security, which is the only legislation that makes a passing reference to gig workers, has been detrimental as it delinks workers from minimum labour protections of wages, occupational safety and health. Significantly, it is the State Governments that are showing the way forward. Rajasthan is the first State to pass a legislation on the issue, closely followed by Karnataka. Jharkhand, Tamil Nadu, Haryana, Telangana are following suit.

In the political context of guarantees funded purely by the state exchequer, this law is an important development. It shows how social security for workers ought to also be financed from the market and that private actors should no longer be abdicated from their primary economic accountability towards workers. There are many things that could be improved in the Bill. These include the Bill's silence on critical issues such as minimum wage, occupational safety and health, working hours, and rights on collective bargaining. However, it is also true that this law allows workers to mobilise and assert for more.

Rakshita Swamy is Director, Social Accountability Forum for Action and Research and Biju Mathew is President, International Alliance of App Based Transport Workers.

THE GIST

The first myth that aggregators sell to entice people towards platform work is that they would have "no boss" and would be "partners" and "captains" — anything but workers.

The second myth that is perpetuated is that persons engaged in platform work enjoy flexible work arrangements. This assertion has enabled platforms to keep gig-based workers away from protections under labour laws.

The third myth is that these are 'part time' workers, who engage in platform-based gig work for additional income.

Text & Context

- Text & Context pages will not be available on July 24, 2024

Karnataka bill on Gig workers

- **THE KARNATAKA PLATFORM-BASED Gig Workers (Social Security and Welfare) Bill, 2024 (the Bill), as the name suggests, aims to put a social security mechanism for gig workers involved with aggregators such as Zomato, Swiggy, Uber, etc.**
- **This draft legislation consists of several key reforms, including the establishment of a welfare board with major stakeholders overseeing the implementation of the Bill;**
- **a clause on payouts to workers at least once a week, with the workers to be informed about pay deductions; greater autonomy to workers, giving them the right to refuse a certain number of jobs per week and protect themselves from exploitation;**

- **the establishment of a welfare fund to be contributed towards by the aggregator (basis either per transaction or the total turnover), the state, and the Centre;**
- **contractual security, which mandates at least a 14-day notice period prior to dismissal with valid reason; among others.**

A satellite image of burning oil tanks in Yemen's port of Hodeida on Sunday. AFP

Yemeni port still burning days after Israeli air strikes

Agence France-Presse
HODEIDA

Firefighting teams on Monday were struggling to contain a massive blaze at Yemen's Hodeida port, days after a deadly Israeli strike on Houthi targets damaged oil storage facilities and endangered aid ships in the harbour.

Heavy flames and black smoke were seen spiralling into the sky for a third consecutive day following the strike on Saturday, said a correspondent in Hodeida. Firefighting teams appear to have made little progress, with the blaze seemingly expanding in some parts of the port, the correspondent said, amid fears it could reach food storage facilities.

Analysis of satellite imagery from Planet by Dutch peace organisation PAX showed at least 33 destroyed oil storage tankers, said Wim Zwijnenburg, a project leader with the organisation.

"We expect (to find) more damage, as not all storage tanks are visible because of heavy smoke" from the fire and burning fuel, Mr. Zwijnenburg said. The fuel depot is run by the Yemen Petroleum Company which said on Sunday that the six people killed in the Israel strike were its employees. The Houthis say more than 80 others were wounded in the attack, many of them with severe burns. The strike on Saturday was the first by Israel on the Arabian Peninsula's poorest country and came in response to a Houthi drone strike that breached Israel's air defences, killing one person in Tel Aviv the day before.

The Houthis, who are fighting Israel as part of a regional network of Iran-backed groups, have pledged a "huge" response to the strikes and threatened to once again attack Tel Aviv.

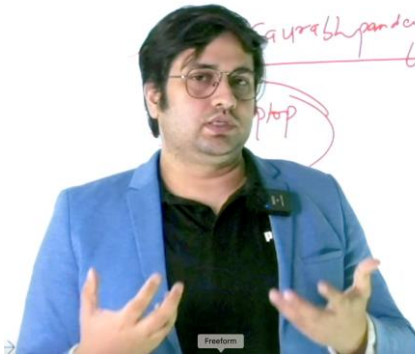
Hodeidah,

- **Hodeidah, city, western Yemen.**
- **It is situated on the Tihāmah coastal plain that borders the Red Sea.**
- **It is one of the country's chief ports and has modern facilities.**

- **The Hudaydah Port is a key Yemeni port on the Red Sea coast.**
- **It is the second largest port in the country, located in Al Hudaydah, the fourth largest city in Yemen.**
- **The port handles up to 80% of the humanitarian supplies, fuel and commercial goods in northern Yemen.**

Topics

- Tinzaparin
- Barbiturates,
- Flooding and fossils
- What is the history between China and Taiwan?
- Taung Kalat
- Russia and china cooperation in Arctic
- The Polavaram Project
- long-term and short-term capital gains (STCG) tax
- Angel tax
- Future and options
- What Is Venture Capital (VC)?
- Mains



By saurabh Pandey

THE HINDU

Drug used to treat clots can protect against cobra venom damage

Researchers found tinzaparin, a drug commonly used to prevent blood clots, significantly reduced damage to human cells caused by spitting cobra venom; the team also found the drug reduced skin damage in mice injected with the venom; the scientists have filed for a patent and may start human clinical trials soon

Sayantan Datta

Dealing with snakes is a tricky business. Even more dangerous is the task of rearing poisonous reptiles and extracting their venom for medical research. Here, Romulus Whitaker holds a cobra while puncturing a rubber sheet stretched over a cup with its fangs. THE HINDU ARCHIVES

Orange-red in colour and native to Tanzania, the *Naja pallida* – the red-spitting cobra – is a formidable, 1.2-metre-long foe. When threatened, it raises its hood and hisses loudly. If this display doesn't deter its predator, it will use its most potent weapon, its venom. Muscles around the snake's venom glands squeeze, releasing jets of venom onto the eyes, nose, and mouth of the threat. As the victim's face sears in pain, the cobra takes the opportunity to lunge forward and bite, delivering a massive quantity of venom into the victim's body.

The venom attacks cells in the body and damages the nervous system. For most of the cobra's regular victims – toads, frogs, birds, and other snakes – the only fate is death. A lucky human might be spared, but with a permanent disability.

Bad deal on antivenoms

Encounters with venomous snakes kill about 1.4 lakh people every year, especially in the tropical regions of Africa and Asia. Despite this alarming number, the treatment for snakebites has remained archaic.

Based on the work of French scientists in the late 1800s, antivenom is made today by injecting domestic animals like horses and sheep with small amounts of snake venom. This kicks the animal's immune system into action, producing antibodies to neutralise the venom. Researchers extract these antibodies from the animal's blood and transport them in cold storage to hospitals, where they are injected into the bodies of snakebite victims.

Difficulties in production, storage, transportation, and administration aside, antivenoms are also expensive and can have severe side effects in humans; some of them could be fatal.

That may soon change. In a July 2024 study published in the journal *Science Translational Medicine*, a team of Australian, British, Canadian, and Costa Rican scientists reported that tinzaparin, a drug commonly used to prevent blood clots, significantly reduces damage to cells due to spitting cobra venom. The team also found the drug could reduce skin damage in mice injected with the venom.

According to a press release, the scientists have filed for a patent and may start human clinical trials soon.

According to Kartik Sunagar, an associate professor at the Centre for Ecological Sciences, Indian Institute of Science (IISc), Bengaluru, who studies the evolution of snake venoms, "This discovery could pave the way for a real-world solution for regions that suffer the highest burden of snakebite morbidity."

How venom kills cells

The venom of the red and the black-necked spitting cobras – the two species whose venom the researchers used in the study – is "poorly understood," R.N.V. Krishna Deepak, who studies snake venoms using computational methods at Azim Premji University, Bengaluru, said.

Our understanding of how these venoms kill human cells is worse, which contributes to the lack of advances in antivenom development.

To address this issue, the researchers first investigated how spitting cobra venom affects human cells. They grew a collection of human cells in the laboratory that had a single gene removed. (They used CRISPR-Cas9, a Nobel-winning genome-editing tool, to build this collection.) When this gene was knocked out, cells that used the genome couldn't manufacture a particular protein – a protein researchers suspected was involved in cells being damaged.

The researchers then treated the cells with the venom of either of the two snakes and selected those that survived. Given that this resistance to spitting cobra venom had been conferred by the absence of a gene, the authors concluded the said genes were involved in facilitating the venom's effects on normal human cells.

Further investigation revealed that many of these genes were involved in the synthesis of a sugar compound called heparan sulphate, which is known to regulate the formation of blood vessels and clots in the human body.

> The venom attacks cells in the body and damages the nervous system. For most of the cobra's victims — toads, frogs, and other snakes — the only fate is death. A human might survive, but with permanent disability

Blood thinner to antidote

The researchers hypothesised that if the venom's toxicity depended on the biological pathway that synthesised heparan sulphate, artificially stopping this pathway could ameliorate the venom's toxic effects.

One way of doing so is to introduce molecules that closely resemble heparan sulphate. As the body senses an excess of these molecules, it shuts down the pathways responsible for heparan sulphate synthesis. One such molecule is tinzaparin, a drug used to treat serious blood clots.

When the team introduced tinzaparin immediately after subjecting cells to the snake venom, the cells survived. Tinzaparin could protect these cells even when it was introduced an hour after the cells had been exposed to the venom. Further experiments revealed that tinzaparin worked by blocking the interaction between the venom and its receptor in the cell by binding to venom molecules.

When the researchers injected mice with venom from either of the two cobras along with tinzaparin, they found that skin damage resulting from the venom was much less when the mice were provided with the drug versus when they were deprived of it.

'Hiding right under our noses'

Dr. Deepak said the study's use of the "highly efficient CRISPR approach" to a "mighty but neglected problem" could potentially renew the global scientific community's interest in understanding mechanisms underlying snake venom toxicity.

IISc venomologist Dr. Sunagar added that the study is "one of the few research undertakings where the molecular mechanism of how venom causes damage is taken into account to design a targeted therapy." The therapeutic agent itself that the study proposes – tinzaparin – is inexpensive, widely available, and has been "hiding right under our noses", Dr. Deepak said.He added that he is excited to see how different research groups follow up on the study's findings. In the meantime, he hoped the study would garner enough attention to make a case for increased funding that will allow researchers to employ "advanced methods like CRISPR-Cas9 to address snakebite envenoming."

(Sayantan Datta is a science journalist and a faculty member at Krea University. The author tweets at @queersprings.)

THE GIST

Venomous snakes kill about 1.4 lakh people every year, especially in Africa and Asia. Despite this, treatment for snakebites has remained archaic and is still based on the work of French scientists in the late 1800s

Researchers grew human cells that had a gene removed.These cells now couldn't manufacture a particular protein. The cells were treated with venom and those that survived were selected. The authors concluded the said gene facilitated the venom's effects

This gene is involved in the synthesis of heparan sulphate, which regulates blood vessels. Introducing molecules that resembled heparan sulphate led the body to shut down pathways responsible for heparan sulphate synthesis. One such molecule is tinzaparin

Tinzaparin

- . In a July 2024 study published in the journal Science Translational Medicine, a team of Australian, British, Canadian, and Costa Rican scientists reported that tinzaparin, a drug commonly used to prevent blood clots, significantly reduces damage to cells due to spitting cobra venom.
- The team also found the drug could reduce skin damage in mice injected with the venom.

Heparan sulfate (HS)

- **Heparan sulfate (HS) is a linear polysaccharide found in all animal tissues.**
- **It occurs as a proteoglycan (HSPG, i.e. Heparan Sulfate ProteoGlycan) in which two or three HS chains are attached in close proximity to cell surface or extracellular matrix proteins.**

- regulates a wide range of biological activities, including developmental processes, angiogenesis, blood coagulation, abolishing detachment activity by GrB (Granzyme B),and tumour metastasis.
- Angiogenesis is the physiological process through which new blood vessels form from pre-existing vessels
- Metastasis is a pathogenic agent's spread from an initial or primary site to a different or secondary site within the host's body; the term is typically used when referring to metastasis by a cancerous tumor

QUESTION CORNER

Inducing sleep with pills

Q: What chemical in tablets causes sedation and how does it work?

A: Barbiturates, derivatives of barbituric acid, are mainly used in tablets to cause sedation and hypnotic activity. The list also includes benzodiazepines and alcohol. They decrease the total REM time and proportion of sleep spent in REM sleep with enhanced amounts of NREM sleep.

REM, or 'rapid eye movement', sleep is characterised by loss of reflexes, intermittent jerky eyeball movements, brief body twitches, and irregular heart beats and blood pressure. Non-REM is a relatively deactivated phase divided into four stages, numbered 1-4.

By most physiological criteria related to the autonomic and central nervous systems, REM sleep is more like wakefulness than non-REM sleep, but drugs that cause arousal in wakefulness, such as amphetamines, suppress REM sleep.

Sedatives cause reversible depression of the activity of all excitable tissues, including the central nervous system. The exact mechanism of the action is not known. However, they are suspected to inhibit neurotransmission in the nervous system. Neurotransmission is responsible for the exchange of information between nerve cells.

In the brain, there are two types of pathways, one that activates and the other that inhibits its activities. The endogenous neurotransmitters of the inhibitory system include gamma amino butyric acid (GABA). Sedatives potentiate the action of GABA and thereby inhibit the major pathways of the brain that keep a person awake, thus resulting in sedation or sleep.

Sedatives cause reversible depression of the activity of all excitable tissues, including the central nervous system. GETTY IMAGES

In the brain, there are two types of pathways: one that activates and the other that inhibits its activities. The endogenous neurotransmitters of the inhibitory system include gamma-aminobutyric acid (GABA). Sedatives potentiate the action of GABA and thereby inhibit the major pathways of the brain that keep a person awake, thus resulting in sedation or sleep.

Not all drugs are REM-deprivers. Some of the latest drugs reduce stage 4 of non-REM sleep. Most of the stimulants, including amphetamines, and depressants such as barbiturates and alcohol tend to reduce REM activity on an electroencephalogram.

(B. Sri Krupa and S. Lalitha, Chennai)

For feedback and suggestions for 'Science', please write to **science@thehindu.co.in** with the subject 'Daily page'

Barbiturates,

- Barbiturates, derivatives of barbituric acid, are mainly used in tablets to cause sedation and hypnotic activity.
- The list also includes benzodiazepines and alcohol.
- They decrease the total REM time and proportion of sleep spent in REM sleep with enhanced amounts of NREM sleep.
- REM, or ‘rapid eye movement’, sleep is characterised by loss of reflexes, intermittent jerky eyeball movements, brief body twitches, and irregular heart beats and blood pressure

- During the three stages of non-REM sleep, a person falls asleep and then moves from a light sleep into a deep sleep.
- This is when a person's brain activity, breathing, and heart rate slow down, body temperature drops, muscles relax, and eye movements stop

BIG SHOT

Palaeontologists from the Federal University of Santa Maria working on a dinosaur fossil discovered in Sao Joao do Polesine, Brazil. The image was released on July 18. Heavy rain that caused historic flooding in southern Brazil brought to the surface a "very well-preserved" dinosaur fossil about 230 million years old, scientists said. AFP

Flooding and fossils

- Palaeontologists from the Federal University of Santa Maria working on a dinosaur fossil discovered in Sao Joao do Polesine, Brazil.
- Heavy rain that caused historic flooding in southern Brazil brought to the surface a “very well-preserved” dinosaur fossil about 230 million years old
- Santa Maria is a municipality in the central region of Rio Grande do Sul, the southernmost state of Brazil

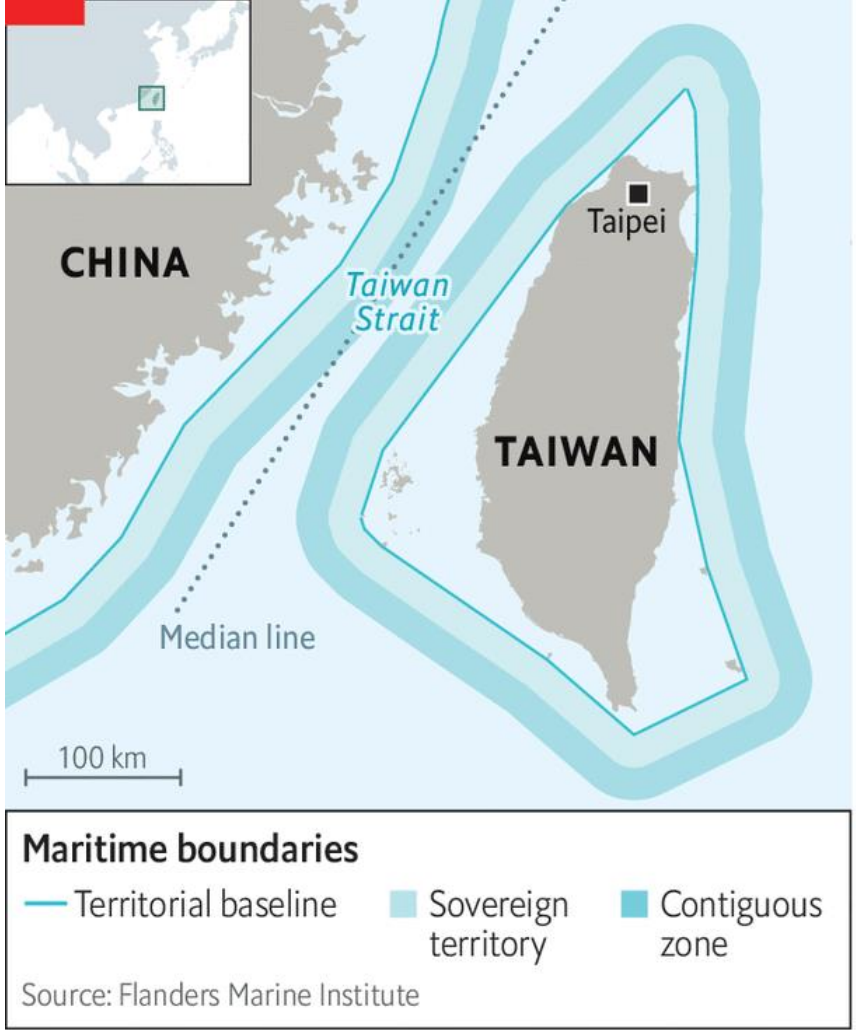
BEIJING

Taiwan Strait is not a 'political showground', China tells Japan

AP

China warned Japan that the Taiwan Strait is not a "political showground", and that Japan should be cautious in its words and deeds when it comes to the Taiwan issue. Chinese Foreign Minister Wang Yi gave the warning during a meeting with visiting MP Hiroshi Moriyama of Japan's Liberal Democratic Party. REUTERS


ASIA
RUSSIA
MONGOLIA
SEA OF JAPAN
NORTH KOREA
JAPAN
SOUTH KOREA
CHINA
EAST CHINA SEA
NEPAL
BHUTAN
INDIA
Taiwan Strait
PACIFIC OCEAN
TAIWAN
Bay of Bengal
SOUTH CHINA SEA
0 300 600 mi
0 300 600 km
© Encyclopædia Britannica, Inc.



The Economist

What is the history between China and Taiwan?

- Taiwan's first known settlers were Austronesian tribal people, believed to have come from modern day southern China.
- Chinese records appear to first mention the island in AD239, when an emperor dispatched an expeditionary force to it - a fact Beijing uses to back its territorial claim.
- After a relatively brief spell as a Dutch colony, Taiwan was administered by China's Qing dynasty, before it was ceded to Tokyo after Japan won the First Sino-Japanese War.

- After World War Two, Japan surrendered and relinquished control of territory it had taken from China. Afterwards, Taiwan was officially considered occupied by the Republic of China (ROC), which began ruling with the consent of its allies, the US and UK.
- But in the next few years a civil war broke out in China, and then-leader Chiang Kai-shek's troops were defeated by Mao Zedong's Communist army

- **Chiang, the remnants of his Kuomintang (KMT) government and their supporters - about 1.5m people - fled to Taiwan in 1949.**
- **Chiang established a dictatorship that ruled Taiwan until the 1980s.**
- **Following his death, Taiwan began a transition to democracy and held its first elections in 1996**

Cut off: The Taung Kalat Buddhist complex on Mount Popa in Myanmar's Mandalay Region. AFP

War in Myanmar's heartland silences volcano shrine

Agence France-Presse
POPA

A shrine perched on an extinct volcano in Myanmar's Mandalay region, once thronged with the bustle of pilgrims praying to flower-eating spirit Popa Maedaw, has been cut off from the faithful following the civil war.

Now, the prayers have fallen silent at the Taung Kalat shrine, the plains around it a battle zone and the faithful mostly blocked from access by fighting and checkpoints manned by all sides in the conflict.

Myanmar has been in turmoil since 2021, when the military ousted Aung San Suu Kyi's government, ending a 10-year experiment with democracy and sparking nationwide protests. The junta's crackdown on dissent sparked renewed fighting with ethnic minority armed groups in the borderlands and sent thousands to join newer People's Defence Forces (PDF) formed to battle the military. "There are not many young people here anymore," said one shop owner on the road that winds up through thick forest to the summit of Mount Popa, the extinct volcano. "They have gone to join the PDF."

The Taung Kalat shrine honours Popa Maedaw, one of dozens of nats, or guardian spirits, that exist alongside Buddhism in Myanmar.

The plains surrounding Mount Popa are home to the Bamar ethnic majority and were largely untouched by decades of previous conflict between

Taung Kalat

- **Taung Kalat is a Buddhist monastery and temple complex located on Mount Popa in Mandalay Region, Myanmar.**
- **The site is built on a tall volcanic plug, and is one of several prominent *nat* spiritual sites in the vicinity of nearby Mount Popa.**
- **The nats are god-like spirits venerated in Myanmar and neighbouring countries in conjunction with Buddhism.**

Russia, China push back after U.S. Arctic strategy flags military cooperation

Agence France-Presse
WASHINGTON

Russia and China on Tuesday pushed back against a U.S. warning over their increasing military and economic cooperation in the Arctic, where climate change is opening up greater competition.

Russia has in recent years beefed up its military presence in the Arctic by reopening and modernising several bases and airfields abandoned since the end of the Soviet era, while China has poured money into polar exploration and research.

"We have seen growing cooperation between the PRC and Russia in the Arctic commercially, with the PRC being a major funder of Russian energy exploitation in the Arctic," Deputy Secretary of Defence Kathleen Hicks told presspersons on Monday, using an abbreviation for the People's Republic of China.

'Joint exercises'

There is also growing military cooperation, "with Russia and China conducting joint exercises off the coast of Alaska," Ms. Hicks said as the department released its 2024 Arctic strategy.

"All of these challenges have been amplified because the effects of climate change are rapidly warming temperatures and thinning ice coverage, and it's enabling all of this activity," she said.

The rapid melting of polar ice has sent activity in the inhospitable region into overdrive as nations eye newly viable oil, gas and mineral deposits as well as shipping routes in an area with a complex web of competing territorial claims.

Moscow is heavily promoting its Northern Sea Route, an alternative cargo route for vessels travelling between Europe and Asia.

China and Russia both defended their policies in the region on Tuesday.

The rapid melting of polar ice has sent activity in the region into overdrive as nations eye oil, gas and mineral deposits. REUTERS

Beijing said it acts on the "principles of respect, cooperation, mutual wins and sustainability", adding it was "committed to maintaining peace and stability" in the region.

"The United States distorts China's Arctic policy and makes thoughtless remarks on China's normal Arctic activities (which are) in accordance with international law," Foreign Ministry spokesperson Mao Ning said.

'Territory of discord'

Kremlin spokesperson Dmitry Peskov said Russia "does its part to ensure that the Arctic does not become a territory of discord and tension."

He told presspersons that Russia's cooperation with China "contributes to an atmosphere of stability and predictability" in the Arctic and their actions were not targeted against other countries.

Washington's Arctic strategy describes the area as "a strategically important region" for the United States that includes "the northern approaches to the homeland" and "significant U.S. defence infrastructure."

It says climate change could result in the Arctic experiencing its first "practically ice-free summer by 2030."

"Increases in human activity will elevate the risk of accidents, miscalculation, and environmental degradation," and U.S. forces "must be ready and equipped to mitigate the risks associated with potential contingencies in the Arctic," the strategy said.

Russia and china cooperation in Arctic

- Russia and China pushed back against a U.S. warning over their increasing military and economic cooperation in the Arctic, where climate change is opening up greater competition.
- Russia has in recent years beefed up its military presence in the Arctic by reopening and modernising several bases and air-fields abandoned since the end of the Soviet era, while China has poured money into polar exploration and research

- growing military cooperation, “with Russia and China conducting joint exercises of the coast of Alaska.
- The rapid melting of polar ice has sent activity in the inhospitable region into overdrive as nations eye newly viable oil, gas and mineral deposits as well as shipping routes in an area with a complex web of competing territorial claims.
- Moscow is heavily promoting its Northern Sea Route, an alternative cargo route for vessels travelling between Europe and Asia

US Approach

- Washington's Arctic strategy describes the area as "a strategically important region" for the United States that includes "the northern approaches to the homeland" and "significant U.S. defence infrastructure."
- It says climate change could result in the Arctic experiencing its first "practically ice-free summer by 2030."
- "Increases in human activity will elevate the risk of accidents, miscalculation, and environmental degradation,

A.P. gets ₹15,000 cr. to build Amaravati, aid for Polavaram

Appaji Reddem
VIJAYAWADA

The Union Budget spells a boost to Andhra Pradesh, with a special financial support of ₹15,000 crore for developing its capital Amaravati, besides assistance for the Polavaram irrigation project, grants for backward regions.

"Recognising the State's need for a capital, we will facilitate special financial support through multilateral development agencies. In the current financial year, ₹15,000 crore will be arranged, with additional amounts in future years," Union Finance Minister Nirmala Sitharaman said in her Budget speech on Tuesday.

She said the government has made concerted efforts to fulfil the commitments in the AP Reorganisation Act.

Ms. Sitharaman said the Centre would come up with a plan named 'Purvodaya' for the overall development of Bihar, Jharkhand, West Bengal, Odisha and Andhra Pradesh.

A few days ahead of the Budget, Chief Minister and TDP chief N. Chandrababu Naidu, a key NDA ally, had apprised the Centre of the "dismal" financial situation in the State.

A.P. Chief Minister N. Chandrababu Naidu in Amaravati. G. N. RAO

Blaming the past government of "irregularities", he sought substantial financial support for developing Amaravati, the Polavaram project and other projects in the State.

Ms. Sitharaman said the Centre is also fully committed to financing and early completion of the Polavaram irrigation project. This apart, she has also ensured the promotion of industrial development, and funds for essential infrastructure such as roads, water, power and railways.

As part of it, the Koppartthy Industrial Node, the corridor between Visakhapatnam and Chennai, will be developed on a priority basis. Grants for backward regions of Rayalaseema, Prakasam and north coastal Andhra Pradesh will also be provided.

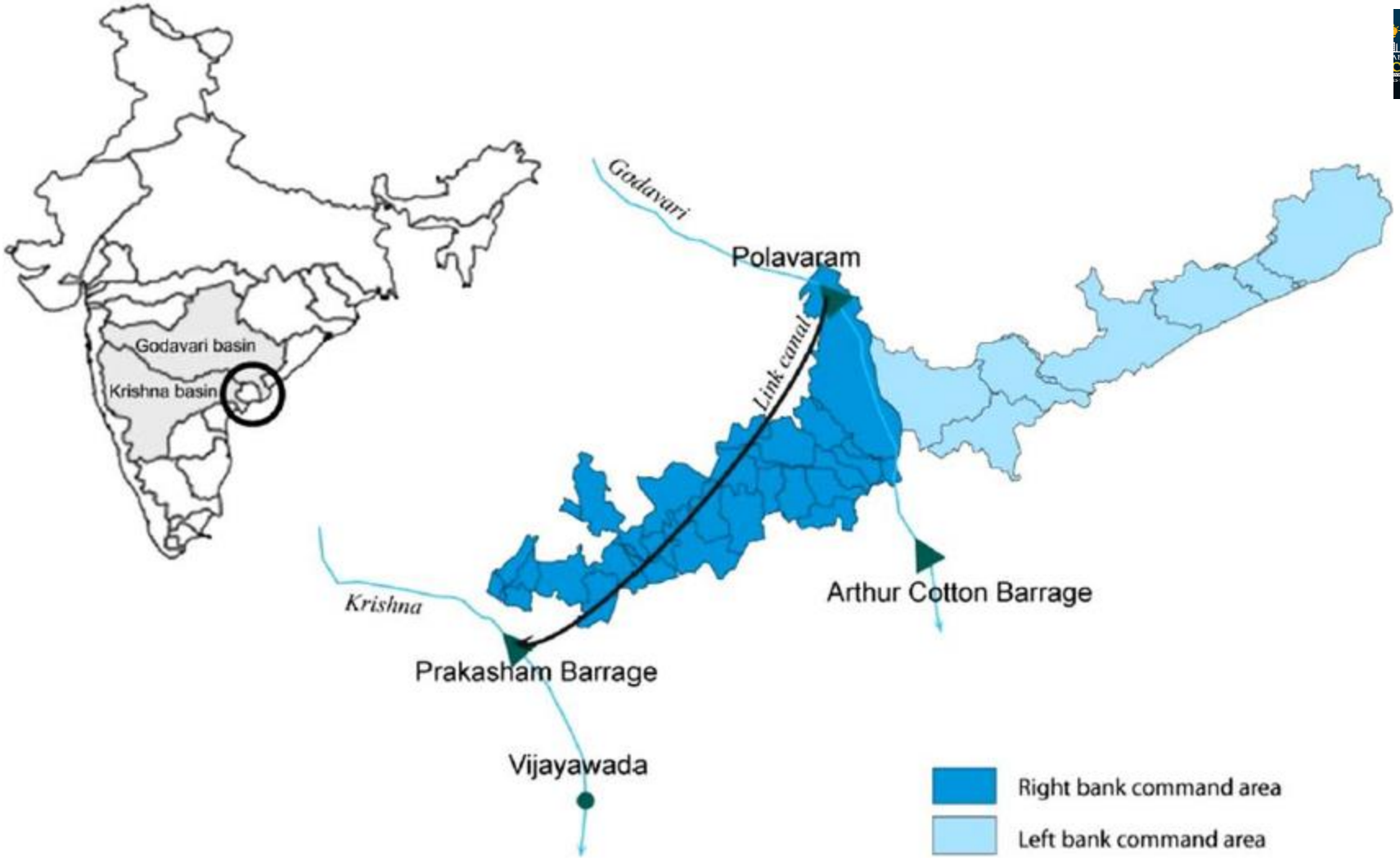
The State is also expected to benefit from the funding plan that will cover 53,000 tribal villages across the country.

Mr. Naidu thanked Prime Minister Narendra Modi on X for the allocations to the State.

"On behalf of the people of Andhra Pradesh, I thank the Hon'ble Prime Minister, @narendramodi Ji and Hon'ble Union Finance Minister, @nsitharaman Ji, for recognising the needs of our State and focusing on a capital...This support from the Centre will go a long way towards rebuilding Andhra Pradesh. I congratulate you on the presentation of this progressive and confidence-boosting Budget," Mr. Naidu said

The Polavaram Project

- **The Polavaram Project is an under construction multi-purpose irrigation project on the Godavari River in the Eluru District and East Godavari District in Andhra Pradesh.**
- **The project has been accorded National project status by the Central Government of India.**


Godavari basin
Krishna basin
Godavari
Polavaram
Link canal
Arthur Cotton Barrage
Krishna
Prakasham Barrage
Vijayawada
Right bank command area
Left bank command area

Angel tax on foreign investments in start-ups nixed

Ashokamithran T.
MUMBAI

In a major respite to India's fledgling start-ups, Finance Minister Nirmala Sitharaman announced scrapping of the contentious angel tax on foreign investments received by such enterprises, a development that is expected to ease their funding woes.

Ms. Sitharaman introduced the measure stating that it would help "bolster the Indian start-up ecosystem, boost the entrepreneurial spirit, and support innovation".

The tax was introduced during the UPA regime, she said in a media briefing on Tuesday while outlining measures the NDA government took for the growth of start-ups.

Replying to queries on the possibility of money laundering due to the abolition, Revenue Secretary Sanjay Malhotra said, "There are other provisions in the Income Tax [Act] itself to find out the source of these funds." The Prevention of Money Laundering Act continued to be in existence. The existing laws were sufficient to cater to it, Mr. Malhotra added.

"We hope that even some of the past investments which are not already under dispute will probably have a little more benign outlook from the tax department," Ashish Aggarwal, VP & Head of Public Policy at NASSCOM, told *The Hindu*.

> We hope some past investments not already under dispute will have a little more benign outlook from the tax department
>
> **ASHISH AGGARWAL,** VP & Head of Public Policy, NASSCOM

"This new development will lead to cessation of fresh litigation. Furthermore, funds that would have been tied up in deposits for cases involving notice issuance cease," said Brijesh Damodaran, Partner at Auxano Capital. The abolition of angel tax assumes significance as it comes at a time when start-up funding fell 60% in 2023 to $10 billion, according the Indian Tech Startup Funding Report 2023 by Inc42, a private start-up media and information platform.

The tax was opposed by several industry players as they believed it curbed foreign investment and deterred the growth of start-ups.

Angel tax

- Angel tax refers to the income tax that the government imposes on funding raised by unlisted companies, or startups, if their valuation exceeds the company's fair market value.
- It falls under Section 56 (II) (viib) of the Income Tax Act.
- "Govt abolishes Angel tax for all classes of investors in startups

Stocks wobble on capital gain tax plan

The key benchmark indices recovered most of the lost ground in the second half of trading; the reaction came on the proposal to increase capital gains tax, which has been viewed as negative by investors; 'the increase in LTCG and STCG would amount to ₹15,000 crore'

Lalatendu Mishra
MUMBAI

Volatile day: The BSE Sensex, having seen intraday swing of more than 1,500 points, closed with a loss of 73.04 points. ANI

Stock markets reacted negatively to the Budgetary provisions concerning additional tax burden on investors and closed in the negative territory led by losses in banking after experiencing high volatility.

The key benchmark indices recovered most of the lost ground in the second half of trading.

The reaction came on the proposal to raise capital gains tax, which has been viewed negatively by investors. The 5% increase in Short Term Capital Gains (STCG) tax may adversely impact short-term investors in the near term.

The BSE Sensex, having seen intraday swing of more than 1,500 points, closed with a loss of 73.04 points at 80,429.04.

The NSE Nifty 50, too, saw excess volatility and closed with a loss of 30.20 points, or 0.12%, at 24,479.05. Intraday movement was in the range of more than 500 points.

The top losers in the Sensex included L&T down 3.10%, Bajaj Finance (2.18%) and SBI (1.65%) .

Heavy profit booking

After initial gains, the indices witnessed heavy profit booking on volatility surrounding the Union Budget. However, the market managed to digest the negative factors and concluded the day on a marginal negative note, said Hrishikesh Yadve, AVP Technical & Derivative Research at Asit C Mehta Investment Intermediates.

V. K. Vijayakumar, Chief Investment Strategy, Geojit Financial Services, said the Budget proposals, with the intent of raising tax revenue from capital gains, were slightly negative.

"The increase in STCG tax from 15% to 20% is sharp. The increase in Long Term Capital Gains (LTCG) tax from 10% to 12.5% is only marginal, particularly when seen from the perspective of increasing the LTCG tax exemption limit from ₹1 lakh to ₹1.25 lakh. "The taxation of share buyback income at the hands of the recipients also is a negative. The higher taxes on F&O was expected and being done to reduce excessive speculative trades in the market."

Stating there has been an increase of Securities Transaction Tax (STT) on transactions in derivative trades in stock markets, buyback tax is now charged to individuals as against being paid by the company, Deven R. Choksey, MD, KRChoksey Shares and Securities Pvt. Ltd., said the increase in LTCG and STCG would amount to ₹15,000 crore.

"When the new tax code is introduced next year, simplification in tax rates, unified tax rates will be a reality. It is expected, with simplified tax rates under the new tax code, tax rate will go down. Thus, in preparation of the same, FM increased LTCG by 2.5% to 12.5 % (from 10%) and STCG to 20% (from 15%)," he said.

"In FY 25, there will be two tax computations required for arriving at the capital gains levy. One for transactions done between April 1, 2024 to July 23, 2024 and the second will be for transactions done between July 24, 2024 to March 31, 2025. This will create significant hardships for taxpayers."

long-term and short-term capital gains (STCG) tax

- increase in both long-term and short-term capital gains (STCG) tax budget 2024-25
- As per definition, any profit or gain that arises from the sale of a 'capital asset' is a capital gain.

- **Any profit and gains arising from the transfer of capital assets such as property, shares, bonds, vehicles, etc., shall be chargeable to tax under the head "Income from Capital Gains." Capital assets are classified into short-term and long-term assets.**

- **Short-term capital gain/loss arises if a short-term capital asset is transferred.**
- **A short-term capital asset is an asset which is held for a period of less than or equal to 36 months, except for certain exceptions where the period is shorter: listed shares and equity-oriented funds qualify if held for less than or equal to 12 months,**
- **while immovable property and unlisted shares require a holding period of less than or equal to 24 months to be considered short-term capital assets.**

Future and options

Futures and options (F&O) are derivative products in the stock market. Since they derive their values from an underlying asset, like shares or commodities, they are called derivatives.

Two parties enter a derivative contract where they agree to buy or sell the underlying asset at an agreed price on a fixed date. This fixed date is termed the expiry date in the stock market. The reason for entering such a contract is to hedge market risks by locking the price of an asset for a future date.

One party expects the prices to rise, while the other expects the opposite. As a result, one counterpart stands to profit, and the other party bears the loss.

A future is a contract to buy or sell an underlying stock or other assets at a pre-determined price on a specific date. On the other hand, options contract gives an opportunity to the investor the right but not the obligation to buy or sell the assets at a specific price on a specific date, known as the expiry date.

₹1,000-crore venture capital fund to be set up for space technology start-ups

Vasudevan Mukunth
CHENNAI

The Department of Space received a marginal rise (0.02% points) as a share of outlays in the 2024-25 Union Budget compared with Revised Estimates of FY24. The bulk of the absolute increase goes toward the development of space technologies. The allocation increased marginally for space applications, decreased for space sciences, and almost halved for INSAT satellite systems over the budgeted amount in 2023-2024.

Ms. Sitharaman also announced a pool of ₹1,000 crore, or around $120 million, as venture capital funding for space start-ups, with the goal of "expanding the space economy by five times in the next 10 years".

However, this announcement was met with mixed reactions. Many called it a "pittance" and said the pool had to have been "10-100 times bigger". Arup Dasgupta, Distinguished Professor in the Academy of Geoinformatics, Bhaskaracharya Institute of Space Applications and Geoinformatics, Gandhinagar, called the pool "a start" but added that "somewhere down the line, the government has to realise that globally governments are anchor financiers and customers".

Big ambitions: ISRO's PSLV-C58 lifts off on January 1. PTI

Susmita Mohanty, director-general of think-tank Spaceport Sarabhai, said that the allocation is out of step with the Finance Minister's ambitions considering "the total funds raised in 2023-2024 by all our space start-ups combined was a paltry $134 million".

"As an industry, we need to show some success beyond raising venture funding," Prateep Basu, CEO of decision analytics start-up SatSure, told *The Hindu*. "There is not a single start-up that has crossed ₹100 crore in revenue, so the demand metrics for increasing the financial risk appetite of venture capital funding and private equity is limited today."

Narayan Prasad, chief operations officer at satsearch, a space industry marketplace, was more optimistic about the impact of the government procuring from start-ups as an anchor customer. "The government acting as a customer is the best validation for many high-risk products to be then taken into the market," he said.

"The government is then creating a market for competition and not picking winners based on input, which means it allows the money on the table to be looked at as an opportunity for other investors to back companies that will compete against each other to get the pie," he added.

Mr. Basu also said the government "acting as a sponsor taking the catalytic first loss risk will cement trust in the ecosystem".

Removing angel tax

Ms. Sitharaman also proposed removing angel tax, which space industry members hailed as less friction against new investments. In February this year, the Indian government allowed 100% automatic foreign direct investment (FDI) in satellite component manufacturing and satellite and user ground segments; up to 74% in satellite-manufacturing and operations; and up to 49% in rockets and space ports.

What Is Venture Capital (VC)?

Venture capital (VC) is a form of private equity and a type of financing for startup companies and small businesses with long-term growth potential.

Venture capital generally comes from investors, investment banks, and financial institutions.

Venture capital can also be provided as technical or managerial expertise.

ATTENTION!! BATCH FOR 2025/26 LAUNCHED

connect with sir -9057921649

CURRENT AFFAIRS PLUS (FOR UPSC 2025)

INCLUDES

- PIB Analysis with pdf
- Down to earth
- physics.org
- science daily
- Major newspapers
- With practice test and Mains Mock

starting 1st may 2024

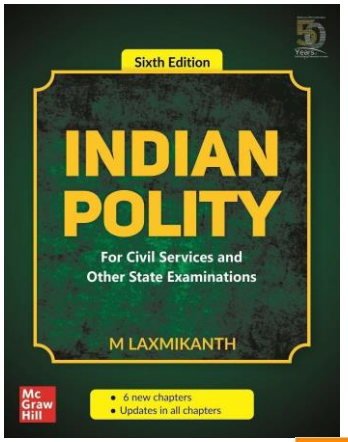
BY SAURABH PANDEY SIR

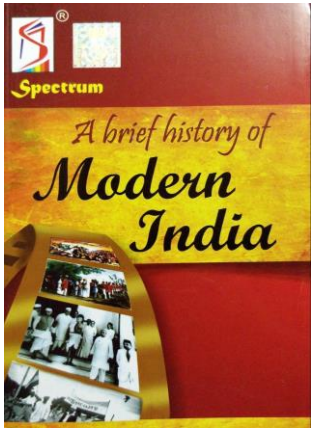
Link in description

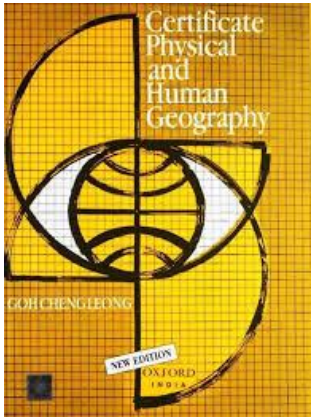
Msg -9057921649

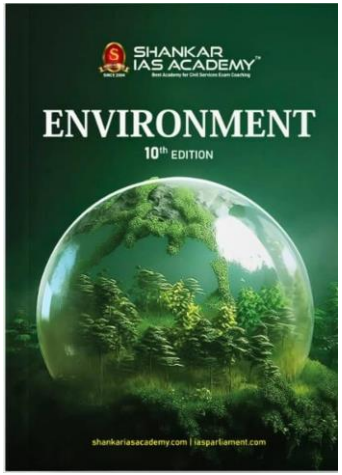
Download -
saurabh pandey
cse app

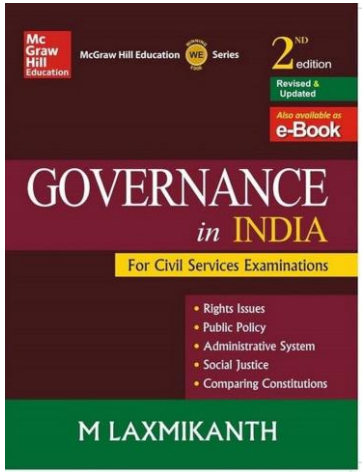
ALL Advance books for upsc IN ONE COURSE

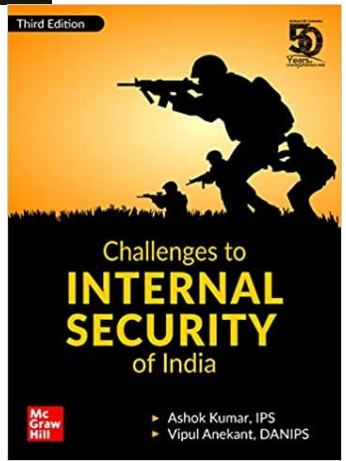


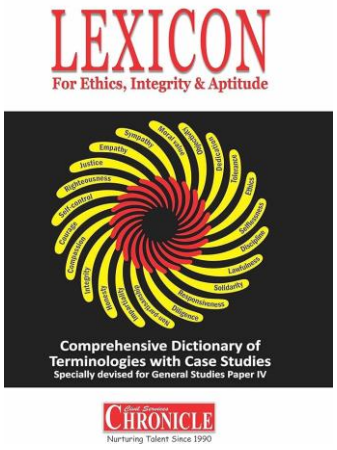










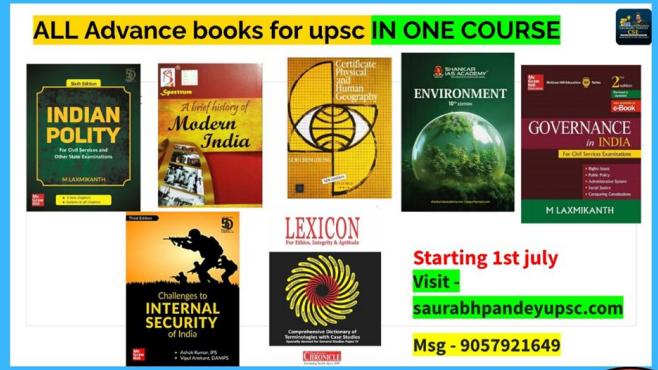


Starting 1st june

Visit - saurabhpandeyupsc.com

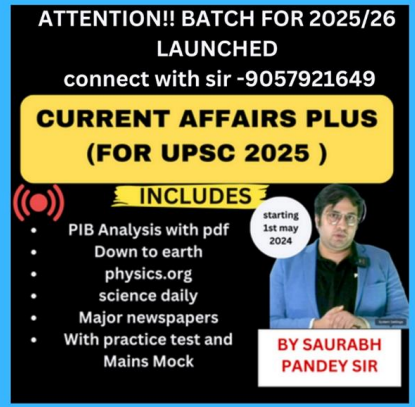
Msg - 9057921649

COMBO COURSE FOR UPSC 2025



+

Save Rs 1000/-



Scan - to get free content

The hindu session pdf

Download the hindu session pdf

Telegram link in description box

Download the hindu pdf - https://t.me/gesreporter

Connect with sir
9057921649

Target Mains -2024/25 -

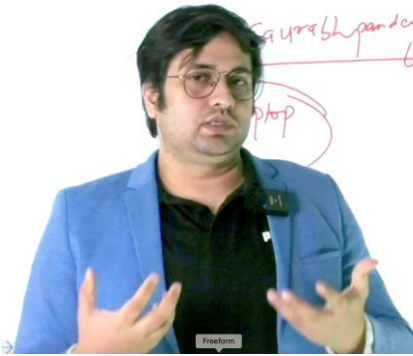
Q Why ‘straits’ are so important in international trade ??

Connect with sir 9057921649

send your answer - Saurabh pandey upsc telegram channel

Topics

- **Krishna Raja Sagara**
- PM Visit to Russia
- **Why is illegal coal mining rampant in India?**
- Why Landslide in ethiopia ??
- **Tu-95MS**
- 'States have unlimited right to tax mineral-rich lands'
- **Mains**



By saurabh Pandey

THE HINDU

Target Mains -2024/25 -

Q Explain the role of judiciary in maintaining and sustaining federalism in india

Connect with sir 9057921649

send your answer - Saurabh pandey upsc telegram channel

Google Play Games Apps Movies Books Kids

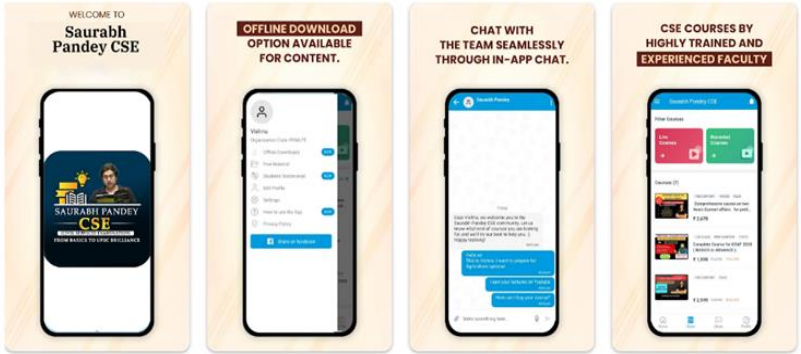
Saurabh Pandey CSE

Saurabh Pandey CSE

4.8★ 77 reviews | 1K+ Downloads | 3+ Rated for 3+

Install Share Add to wishlist

This app is available for your device



App support

Over one lakh cusecs likely to be released from KRS dam; flood warning issued

The Hindu Bureau
MYSURU

In the wake of heavy rain in the catchment areas, the water release from the Krishnaraja Sagar (KRS) dam across the Cauvery will be stepped up to over one lakh cusecs from the 70,000 cusecs at present.

A release from Cauvery Neeravari Nigam Ltd. (CNNL) and the Mandya district administration on Thursday evening said the outflow from the KRS dam would be stepped up to one lakh cusecs to 1.5 lakh cusecs in due course.

This will be the highest in terms of outflow from the dam in the last two years and is due to the dam attaining the full level of 124.8 ft with no let-up in the rate of inflow into the reservoir.

Monsoon tour: Heavy rain and water release from dams have increased the flow in the Bharachukki falls in Chamarajanagar district of Karnataka. K. MURALI KUMAR

Issuing a flood warning, authorities directed people in low-lying areas and those living on the banks downstream to move to safer locations. The Mandya district administration has already identified 92 villages as vulnerable to flooding. Places of tourist interest along the banks are out of bounds for public due to surge in the water levels. The Forest Department ordered the closure of the Ranganathittu Bird sanctuary to public with effect from Thursday.

Krishna Raja Sagara

- **Krishna Raja Sagara, also popularly known as KRS, is a lake and the dam that creates it.**
- **They are close to the settlement of Krishna Raja Sagara in the Indian State of Karnataka.**
- **The gravity dam made of *surki* mortar is below the confluence of river Kaveri with its tributaries Hemavati and Lakshmana Tirtha, in the district of Mandya.**

The 'geo-calculus' of the Moscow visit

Suhasini Haidar

Two weeks after Prime Minister Narendra Modi visit to Russia, his first bilateral trip in the third tenure of the government, the dust from the storm it kicked up in the United States and Europe is only just beginning to settle. The evident warmth between Mr. Modi and the Russian President, Vladimir Putin, drew sharp criticism from the Ukraine President, Volodymyr Zelenskyy, and also a series of statements from the U.S. State Department, the National Security Adviser and the U.S. Ambassador to India, expressing disappointment. New Delhi has asserted its "freedom of choice" but has moved to allay concerns that anything fundamental has changed in India's worldview as a result of the Russia visit. It would be a mistake, however, to assume that nothing has indeed changed, purely by examining formal outcomes. In many ways, Mr. Modi's visit was the message itself.

Assessment of the conflict in Ukraine

To begin with, the fact that the Prime Minister decided to travel to Russia two years after the war began, and not earlier, is significant. After the Russian invasion of Ukraine, he had decided not to go for an annual India-Russia summit in 2022 and 2023, and the only public messaging revolved around Mr. Modi's "this era is not of war" statement that he made to Mr. Putin at the Shanghai Cooperation Organisation (SCO) summit in Uzbekistan in September 2022. While the war in Ukraine continues, the nature of the conflict has changed, and Mr. Modi's Moscow visit must be read in the context of how New Delhi sees the progress of the conflict. The Russian army suffered a great toll in the first two years – there was a botched offensive on Kyiv; a gross miscalculation of the resilience of Mr. Zelenskyy and Ukrainian defences; the desperate attempt at a draft for Russian youth that led many Moscow elites to leave the country; massive military casualties, and questions over the efficacy of Russian military hardware against the new equipment Ukraine was being supplied by North Atlantic Treaty Organization (NATO) countries. However, today, Russia seems to be in a far better place for holding the status quo line over the area in Ukraine's east that it occupies, and has subsequently folded into its own territory with constitutional amendments.

As western countries now push for a "peace process", that began with the conference in Switzerland (June 2024), New Delhi seems to have concluded that a frozen conflict is the most likely outcome. Any change to that status quo could only come from a massive escalation by Ukraine, requiring major new commitments of men and also military ground and airpower from its western partners. New Delhi also wagered, even before U.S. President Joe Biden announced that he would bow out of the U.S. Presidential race, that there is going to be a change in Washington in November – with Mr. Biden's challenger. the former U.S. President Donald Trump, indicating a reduced commitment to Kyiv in the war, and less antagonism towards Moscow.

If so, Mr. Modi's visit was an acknowledgement that Russia has already weathered the worst, and that it would be pointless for India to continue its rupture of the annual summit to the detriment of bilateral ties. The reference in the India-Russia joint statement, of the conflict "around Ukraine" as opposed to "in Ukraine", even seems to be a subtle acceptance of Russian claims. Another reference, showing "appreciation" for peace proposals "in accordance with international law and on the basis of the UN Charter", suggests common ground between the two countries. India has refused to criticise Russia for the war so far, with more than 20 abstentions at the United Nations, including during the latest vote, on July 11 at the UN General Assembly, over a resolution calling on Russia to cease fire after deadly missile attacks that targeted a children's hospital among other buildings. Despite meetings with Mr. Zelenskyy and a visit to India by Ukraine Minister of Foreign Affairs, Dmytro Kuleba, in March this year, New Delhi has hesitated on other requests from Kyiv as well – such as allowing Indian companies to provide construction, medical devices and telecom infrastructure to the Ukrainian government, or move beyond its aid of humanitarian items, thereby indicating its unwillingness to invoke Russian ire.

Keeping Russia from China

The geopolitical signalling of the visit extends to other spheres: by going to Moscow, days after cancelling his visit to Astana, Kazakhstan, for the SCO Summit, Mr. Modi showed that he was willing to forego a joint appearance with Chinese President Xi Jinping, but not with Mr. Putin. This is the reverse of western messaging, that has been calling on China to reduce its support to Russia, rather than the other way around. India's concerns about keeping Russia on-side in the face of continuing tensions with China at the Line of Actual Control remain a priority, regardless of its partnerships with western countries in the Indo-Pacific. The U.S.'s actions in the past few years have also given many in New Delhi cause for pause – the Biden administration has forged AUKUS (Australia-U.K.-U.S.) for nuclear submarines, engaged "Quad Plus"-countries such as New Zealand, South Korea, Vietnam and the Philippines intensely, and during the NATO summit in Washington that was held at the same time as the Modi-Putin summit, the U.S. hosted the "AP-4" or leaders of Australia, New Zealand, South Korea and Japan. With its refusal to make the Quad (India, Japan, Australia, U.S.) a strategic concept, New Delhi stands in danger of limiting its utility to Indo-Pacific partners compared to these other groups. It remains to be seen whether the Modi government is able to convince them to infuse new energy into the Quad on other fronts, with a Quad Foreign Ministers' meeting around the corner, and plans for a possible Quad summit later this year in New Delhi. In that sense, the Russia visit was not just an assertion of India's strategic autonomy but also a reminder that India still has other options.

There was one clear message — of the sure bet the Narendra Modi government has placed on India-Russia ties

Geo-economics thrust

Finally, Mr. Modi's Russian journey must be considered in its 'geo-economic' rather than just its 'geopolitical' context. Regardless of the outcomes on the battlefield in Ukraine, it is clear that western sanctions against Russia will remain, and, consequently, so will India's supply of discounted Russian oil as well. These imports have meant that India-Russia trade ties, that have hovered in the $5 billion-$10 billion range for decades, grew by 66% to a whopping $65 billion last year; this has grown a further 20% in the first quarter of 2024. The spurt is unsustainable unless India develops payment mechanisms for the oil imports. The Modi-Putin summit took many steps to address that issue, listing action-items in nine specific areas in a Joint Vision statement on trade by 2030 that appeared to make circumventing western sanctions a priority.

In addition, the joint statement on furthering cooperation in Russia's Far East focuses on increasing energy (oil and LNG) supplies from Russia, as well as much-needed commodities exports from India, using the yet-to-be-operationalised Chennai-Vladivostok maritime corridor. While these will help rationalise the trade imbalance, both sides will also seek mutual investments, of the kind seen when Rosneft acquired a controlling stake in the Gujarat-based Vadinar refinery (Nayara Energy), the largest foreign direct investment of its kind in India, at more than $23 billion, according to Mr. Putin. In turn, Indian public sector units have bought stakes in Russian oil fields to the tune of $15 billion. Despite the financial implications, the U.S. and Europe have steered clear of sanctioning any of these transactions, as they accept Vadinar-processed Russian oil products as "Indian-products", and New Delhi is surmising that more such deals could be a safe proposition in the future as well. Russian access to the North Sea trade route around the Arctic region is invaluable as India seeks new connectivity possibilities to its east – a Trump administration is likely to double down on strictures against Iran-led connectivity routes such as the International North-South Transport Corridor (INSTC) and the Chabahar project to India's west. At a time when military hardware imports, that have been the mainstay of India-Russia ties, are being reduced due to India's decade-long diversification and Russia's preoccupation with the Ukraine war, such geo-economic strategies give New Delhi new levers in the bilateral relationship.

While all such calculations could still go awry, depending on how the Ukraine war proceeds, the Russian economy struggles with sanctions, and the U.S. sets a new course post-elections, the enduring message from the Moscow visit is the solid bet the Modi government has placed on India-Russia ties.

suhasini.h@thehindu.co.in

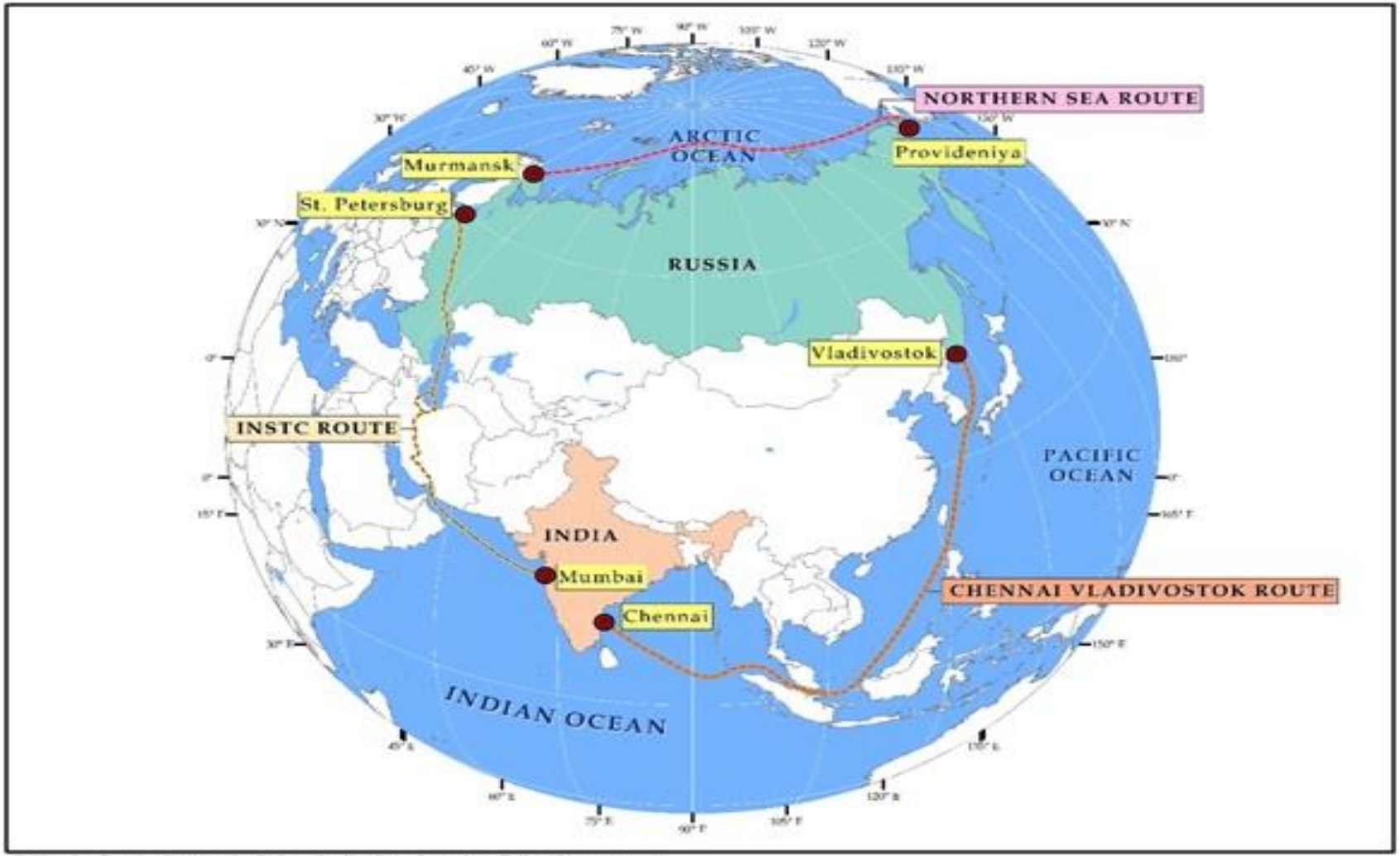
PM Visit to Russia

- **Finally, Mr. Modi's Russian journey must be considered in its 'geo-economic' rather than just its 'geopolitical' context.**
- **Regardless of the outcomes on the battlefield in Ukraine, it is clear that western sanctions against Russia will remain, and, consequently, so will India's supply of discounted Russian oil as well.**
- **These imports have meant that India-Russia trade ties, that have hovered in the $5 billion-$10 billion range for decades, grew by 66% to a whopping $65 billion last year; this has grown a further 20% in the first quarter of 2024**

- **The spurt is unsustainable unless India develops payment mechanisms for the oil imports.**
- **The Modi-Putin summit took many steps to address that issue, listing action-items in nine specific areas in a Joint Vision statement on trade by 2030 that appeared to make circumventing western sanctions a priority.**

- **In addition, the joint statement on furthering cooperation in Russia's Far East focuses on increasing energy (oil and LNG) supplies from Russia, as well as much-needed commodities exports from India, using the yet-to-be-operationalised Chennai-Vladivostok maritime corridor.**
- **While these will help rationalise the trade imbalance, both sides will also seek mutual investments, of the kind seen when Rosneft acquired a controlling stake in the Gujarat-based Vadinar refinery (Nayara Energy), the largest foreign direct investment of its kind in India, at more than $23 billion, according to Mr. Putin.**


EXISTING
Port of Mumbai, India to Port of St. Petersburg, Russia:
8675
nautical miles
PROPOSED
Port of Chennai, India to Port of Vladivostok, Russia:
5647
nautical miles



- In turn, Indian public sector units have bought stakes in Russian oil fields to the tune of $15 billion.
- Despite the financial implications, the U.S. and Europe have steered clear of sanctioning any of these transactions, as they accept Vadinar-processed Russian oil products as “Indian-products”, and New Delhi is surmising that more such deals could be a safe proposition in the future as well.

- **Russian access to the North Sea trade route around the Arctic region is invaluable as India seeks new connectivity possibilities to its east — a Trump administration is likely to double down on strictures against Iran-led connectivity routes such as the International North–South Transport Corridor (INSTC) and the Chabahar project to India’s west.**

- **At a time when military hardware imports, that have been the mainstay of India-Russia ties, are being reduced due to India’s decade-long diversification and Russia’s preoccupation with the Ukraine war, such geo-economic strategies give New Delhi new levers in the bilateral relationship.**


Ukraine
Moscow
RUSSIA
Far Eastern
Federal
District
Khabarovsk
Kazakhstan
China
Mongolia
China
Japan

India's illegal coal mining problem

How prevalent is illegal coal mining in India? What are the legal frameworks governing coal mining in India? Why is the responsibility for addressing illegal mining placed on State governments? What factors contribute to the persistence of illegal coal mining? What safety risks do workers face?

EXPLAINER

Priyali Prakash

The story so far:

On July 13, three workers died of asphyxiation inside an illegal coal mine in Gujarat's Surendranagar district. The officials said that the workers were working in a mine near Bhet village in Thangadh taluka without helmets, masks, or other safety equipment. The first information report (FIR) indicated that the accused failed to provide essential safety gear to the labourers, who died after inhaling toxic gas in the mine. The police have registered a case of culpable homicide not amounting to murder against four people.

What is the issue?

The Surendranagar incident is not an isolated case.

In June 2023, three people, including a ten-year-old child, were reportedly killed after an illegal mine collapsed in the Dhanbad district of Jharkhand. Similarly, at least three people were killed in October 2023 after a coal mine collapsed during illegal extraction in West Bengal's Paschim Bardhaman district.

These are just a few examples of how illegal coal mining has led to worker fatalities in India.

Coal in India was nationalised in two phases: first with the coking coal (used for the production of coke in the steel industry) in 1971-72; and then with the non-coking coal mines in 1973. The Coal Mines (Nationalisation) Act, 1973 is the central legislation that determines eligibility for coal mining in India. Illegal mining constitutes a law and order problem, which is a State list subject. Hence, the onus of dealing with it falls on State governments rather than the Union government.

Why is illegal coal mining rampant in India?

According to the Ministry of Coal, illegal mining in India is mostly carried out in abandoned mines or shallow coal seams in remote or isolated places. Several factors contribute to illegal coal mining in India.

Mining perils: Labourers carry baskets of coal from an open-cast mine in Jharkhand. AP

Coal is the most abundant fossil fuel in India, accounting for 55% of the country's energy needs. The high demand for power in India translates into a high demand for coal, which often outstrips the legal supply, prompting illegal supply. Many areas that are rich in coal are also situated close to homes for populations struggling with poverty and unemployment, which contributes to illegal mining in these areas.

In remote areas, mining regulations can be weak due to inadequate monitoring and lack of resources, leading to weaker enforcement. This can result in the rise of "coal mafias," as has been alleged in multiple cases of illegal coal mining in India. For example, in 2018, activist Marshall Biam of the North East Indigenous People's Federation registered a complaint accusing a "police-backed" coal gang of threatening him. Mining tragedies are not uncommon in coal-rich Meghalaya.

Illegal coal mining also allegedly receives tacit support from political leaders in areas where it is prevalent, making it difficult to curb. In 2023, the Assam-based political party Assam Jatiya Parishad (AJP) submitted a petition each to the President, Vice-President, Prime Minister, Chief Justice of India, the National Green Tribunal (NGT), the National Human Rights Commission and the Leader of the Opposition in the Rajya Sabha, alleging that some BJP leaders are behind illegal coal mining in the State. AJP president Lurinjyoti Gogoi and general secretary Jagadish Bhuyan said that illegal rat-hole coal mining has continued in Assam, as well as in Meghalaya and other north-eastern States, with the alleged patronage of BJP leaders and in collusion with officials despite a blanket ban on such mining by the NGT in 2014.

Illegal mining is often carried out using rudimentary techniques like surface mining and rat-hole mining, rather than the scientific methods required for legal operations on a larger scale. In areas where coal seams are closer to the surface, illegal miners access them with limited safety equipment. Minimal operational costs can also turn into significant profits, making illegal mining lucrative.

Why do so many workers die in illegal coal mines?

The lack of safety equipment and protocols is the primary reason for deaths during illegal coal mining. Miners face increased respiratory risks due to inhaling coal dust, and the lack of safety equipment significantly increases this risk. The miners in the Surendranagar incident also died of carbon monoxide poisoning. According to District Collector K.C. Sampat, 2,100 wells had been filled in recent times, but some of them might have been illegally reopened, where the incident happened.

Illegal mines lack proper structural support to carry out the extraction of coal, making working conditions hazardous and vulnerable to cave-ins, landslides, and explosions. Workers may also be exposed to high levels of toxic substances like lead and mercury, which can cause acute poisoning or long-term chronic medical conditions.

Several people who work in illegal coal mines are untrained for the job and for the risks it poses. There is a lack of proper training, quick response facilities, and knowledge in case of emergencies.

Operator negligence and worker exploitation are also rampant in illegal coal mining.

Why do governments struggle to cut down illegal coal mining in India?

Questions regarding illegal coal mining have been raised in the Parliament, but since it is a law and order issue, the Union government often shifts the blame to State authorities. A mix of economic, social, political, and regulatory factors makes it difficult for governments to shut down illegal coal mining in India.

Illegal coal mining, by any means, is not a novelty. It has existed since before coal was nationalised and continues to exist in pockets in coal-rich areas or near abandoned mines. The high demand for coal as a fuel makes illegal mining rampant and challenging to control. Local economies in many areas depend on mining, and once official operations run their course, illegal mining takes its place to support the local community.

The legal framework governing mining is complex, which can possibly lead to bureaucratic hurdles and inefficiency in governance, allowing illegal mining to exist.

THE GIST

- Three workers died of asphyxiation in an illegal coal mine in Gujarat's Surendranagar district on July 13 due to a lack of safety equipment.
- Illegal coal mining is widespread in India and has led to numerous worker deaths.
- Illegal mining is a law and order issue falling under State jurisdiction, making State governments responsible for addressing it.
- High demand for coal, poverty, unemployment, weak regulations, and alleged political support contribute to the prevalence of illegal coal mining.

Why is illegal coal mining rampant in India?

- According to the Ministry of Coal, illegal mining in India is mostly carried out in abandoned mines or shallow coal seams in remote or isolated places.
- Several factors contribute to illegal coal mining in India. Coal is the most abundant fossil fuel in India, accounting for 55% of the country's energy needs.
- The high demand for power in India translates into a high demand for coal, which often outstrips the legal supply, prompting illegal supply.
- Many areas that are rich in coal are also situated close to homes for populations struggling with poverty and

- In remote areas, mining regulations can be weak due to inadequate monitoring and lack of resources, leading to weaker enforcement.
- This can result in the rise of “coal mafias,” as has been alleged in multiple cases of illegal coal mining in India.
- For example, in 2018, activist Marshall Biam of the North East Indigenous People’s Federation registered a complaint accusing a “police-backed” coal gang of threatening him.
- Mining tragedies are not uncommon in coal-rich Meghalaya.
- Illegal coal mining also allegedly receives tacit support from political leaders in areas where it is prevalent, making it dicult

- **Illegal mining is often carried out using rudimentary techniques like surface mining and rat-hole mining, rather than the scientific methods required for legal operations on a larger scale.**
- **In areas where coal seams are closer to the surface, illegal miners access them with limited safety equipment.**
- **Minimal operational costs can also turn into significant profits, making illegal mining lucrative.**

KENCHO SHACHA GOZDI

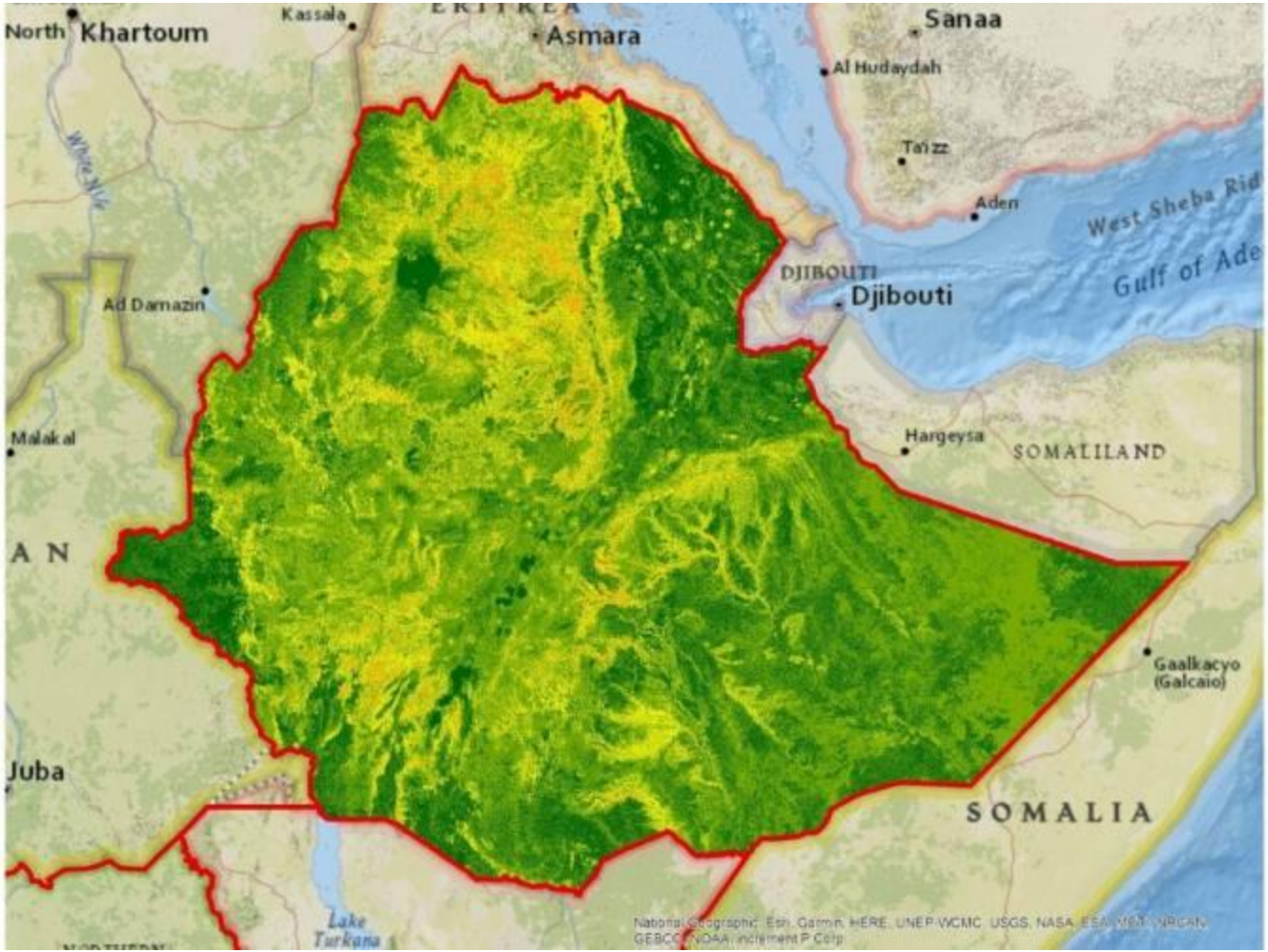
Death toll from Ethiopia landslip hits 257, could reach 500, says UN

AFP

The death toll from landslips in a remote region of southern Ethiopia has risen to 257, the United Nations said on Thursday, warning that the number of victims could soar to up to 500. Rescuers continue to press on with the grim search for bodies and survivors in the stricken locality of Kencho Shacha Gozdi. AFP

Why Landslide in ethiopia ??

- Landslides are particularly common in Ethiopia between July and September, which is the main wet season, as well as April and May when there is heavy seasonal rain.
- Millions of people in Ethiopia live in areas at risk from landslides.
- The soil in southern Ethiopia has been saturated by seasonal rains, making the area more prone to landslides.
- Rains from April to early May caused flooding and mass displacement,
- Recent Landslide in Kencho Shacha locality


North Khartoum
Kassala
ERITREA
Asmara
Sanaa
Al Hudaydah
Ta'izz
Aden
West Sheba Rid
Gulf of Ade
DJIBOUTI
Djibouti
Ad Damazin
White Nile
Malakal
Hargeysa
SOMALILAND
A N
Gaalkacyo
(Galcaio)
Juba
SOMALIA
Lake
Turkana
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, FSA, METI, NRCAN,
GEBCO, NOAA, increment P Corp


ERITREA
YEMEN
DJIBOUTI
ETHIOPIA
SOMALIA
Gofa Zone
UGANDA
KENYA
200 km
N
© OpenStreetMap contributors

Eye in the sky: U.S. and Canadian jet fighters are seen near the U.S. State of Alaska. REUTERS

Russian, Chinese bombers stage joint patrol near Alaska

Agence France-Presse
MOSCOW

Russian and Chinese jets staged a joint patrol over far eastern Russia and the Bering Sea near Alaska but Moscow and Beijing stressed it was not aimed at any "third party".

Wednesday's flights, with nuclear-capable bombers, came days after Moscow said the United States sent its own strategic bombers close to Russian airspace.

Russia said its "Tu-95MS strategic missile carriers and the Chinese air force's Xian H-6 strategic bombers carried out an aerial patrol over the Chukchi and Bering Seas and the north Pacific Ocean".

The joint U.S.-Canadian North American Aerospace Defence Command earlier said American and Canadian warplanes had intercepted two Russian and two Chinese bombers in international airspace near Alaska on Wednesday. It said the bombers "remained in international airspace" and were "not seen as a threat".

Moscow said the patrol observed international law and did not breach foreign airspace, adding that "at certain stages of the route, the aviation group was accompanied by fighter jets of foreign countries".

The patrol was part of "a plan of military cooperation for 2024 and not directed against third countries," Moscow said.

China's Defence Ministry also said that the patrol was "not aimed at a third party" and "has nothing to do with the current international and regional situation".

Russia's Defence Ministry posted images of planes taking off and landing as well as footage from the air.

The TU-95MS planes were developed in the Soviet era to carry long-range cruise missiles and are part of Russia's nuclear triad. The Xian H-6 planes are also nuclear-capable.

Defence in news

- **“Tu-95MS strategic missile carriers and the Chinese air force’s Xian H-6 strategic bombers carried out an aerial patrol over the Chukchi and Bering Seas and the north Pacific Ocean”.**
- **The joint U.S.-Canadian North American Aerospace Defence Command earlier said American and Canadian warplanes had intercepted two Russian and two Chinese bombers in international airspace near Alaska**


Beaufort Sea
Chukchi Sea
Point Barrow
Alaska
Bering Strait
Russia
St Lawrence Island
Bering Sea
70°
65°
60°
55°
50°
155°
160°
165°
170°
175°
180°
-175°
-170°
-165°
-160°
-155°

- **The TU-95MS planes were developed in the Soviet era to carry long-range cruise missiles and are part of Russia’s nuclear triad.**
- **The Xian H-6 planes are also nuclear-capable**

‘States have unlimited right to tax mineral-rich lands’

Constitution Bench, in an 8:1 verdict, holds that Parliament, through Mines and Minerals Act, cannot restrict States from legislating on the taxation of mining lands, quarries; any dilution will impact their ability to raise revenues; the verdict came in a batch of 86 appeals filed by different State govts., mining firms, and public sector undertakings

Krishnadas Rajagopal
NEW DELHI

A nine-judge Constitution Bench, headed by Chief Justice of India D.Y. Chandrachud, on Thursday held by an 8:1 majority that Parliament cannot limit the power of State legislatures to tax mineral-bearing lands and quarries. The judgment, freeing States from the restrictions imposed by the Centre, is in tune with the federalist principles of governance.

“Any dilution in the taxing powers of the State legislatures will necessarily impact their ability to raise revenues, which in turn will impede their ability to deliver welfare schemes and services to the people. The ability of the State governments to invest in physical infrastructure, health, education, human capacity, and research and development is directly correlated to the raising of government revenues... Fiscal federalism entails that the power of the States to levy taxes within the legislative domain carved out to them and subject to the limitations laid down by the Constitution must be secured from unconstitutional interference by Parliament,” the Chief Justice said.

The verdict noted how mineral-rich States such as Chhattisgarh, Jharkhand and Odisha continue to have per capita income below the national average.

The judgment said Parliament, through the Mines and Minerals (Development and Regulation) Act of 1957 cannot restrict the States from legislating on the taxation of mining lands and quarries.

> Fiscal federalism entails that the power of the States to levy taxes within the legislative domain carved out to them and subject to the limitations laid down by the Constitution must be secured from unconstitutional interference by Parliament
>
> **D.Y. CHANDRACHUD**
> Chief Justice of India

‘Royalty not a tax’

The court further held that royalty paid to the States by mining lease holders is not a tax.

“Royalty is not a tax. Royalty is a contractual consideration paid by the mining lessee to the lessor for enjoyment of mineral rights,” the Chief Justice Chandrachud said.

The judgment came in a batch of 86 appeals filed by different State governments, mining companies and public sector undertakings.

The case has its roots in a dispute between India Cements Ltd. and the Tamil Nadu government.

Chief Justice Chandrachud said State legislatures derive their power to tax mines and quarries under Article 246 read with Entry 49 (tax on lands and buildings) in the State List of the Seventh Schedule of the Constitution.

“Mineral-bearing lands fall within the description of ‘lands’ in Entry 49,” Chief Justice Chandrachud held.

In the sole dissenting opinion on the Constitution Bench, Justice B.V. Nagarathna said the States’ power to tax under Entry 49 of List II did not include “mineral-bearing lands”. However, Justice Nagarathna agreed with the majority on the Bench that royalty was not a tax.

The Centre had argued that Entry 50 in the State List had allowed the Parliament to impose “any limitations” on taxes on mineral rights through laws relating to mineral development, in this case, the MMDR Act.

However, the Chief Justice responded in the judgment to the argument by noting that Entries 50 and 49 of the State List “deal with distinct subject matters and operate in different fields”.

The limitations imposed by Parliament in a law like the MMDR Act, which related to mineral development, did not operate on or influence State taxation of mining lands under Entry 49 in the State List for the sole reason that “there is no specific stipulation in the Constitution to that effect”.

“Entry 50 of List II does not constitute an exception... The power to tax mineral rights vests in the State Legislatures. The Parliament does not have the legislative competence to tax mineral rights, with Entry 54 of the Union List (Regulation of mines and minerals development declared by parliamentary law to be expedient in the public interest) being only a general entry. Power to tax mineral rights is enumerated in List II. The Parliament cannot use its residuary powers with respect to that subject matter,” Chief Justice Chandrachud held.

Justice Nagarathna, however, agreed that the MMDR Act, especially the provision which allows the Centre to take “control of the regulation of mines and the development of minerals” on expediency in public interest, denuded or limited the scope of a State’s right to tax.

‘States have unlimited right to tax mineral-rich lands’

- **A nine-judge Constitution Bench, headed by Chief Justice of India D.Y. Chandrachud, held that Parliament cannot limit the power of State legislatures to tax mineral-bearing lands and quarries.**
- **The judgment, freeing States from the restrictions imposed by the Centre, is in tune with the federalist principles of governance.**
- **“Any dilution in the taxing powers of the State legislatures will necessarily impact their ability to raise revenues, which in turn will impede their ability to deliver welfare schemes and services to the people.**

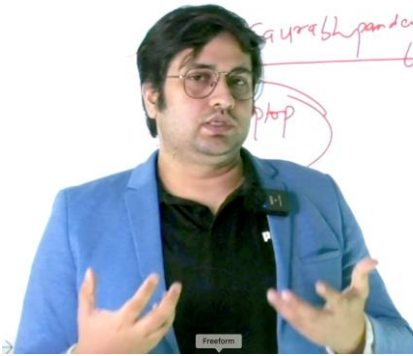
- **The ability of the State governments to invest in physical infrastructure, health, education, human capacity, and research and development is directly correlated to the raising of government revenues…**
- **Fiscal federalism entails that the power of the States to levy taxes within the legislative domain carved out to them and subject to the limitations laid down by the Constitution must be secured from unconstitutional interference by Parliament,**

- **The judgment said Parliament, through the Mines and Minerals (Development and Regulation) Act of 1957 cannot restrict the States from legislating on the taxation of mining lands and quarries.**
- **The court further held that royalty paid to the States by mining lease holders is not a tax.**
- **State legislatures derive their power to tax mines and quarries under Article 246 read with Entry 49 (tax on lands and buildings) in the State List of the Seventh Schedule of the Constitution.**

- **The Centre had argued that Entry 50 in the State List had allowed the Parliament to impose “any limitations” on taxes on minerals rights through laws relating to mineral development, in this case, the MMDR Act .**
- **The Mines and Minerals Act is an Act of the Parliament of India enacted to regulate the mining sector in India. It was amended in 2015 and 2016.**
- **This act forms the basic framework of mining regulation in India.**
- **This act is applicable to all mineral except minor minerals and atomic minerals**

Topics

- The Charaideo Moidams
- 2nd BIMSTEC Foreign Ministers' Retreat
- P-note or PN
- Oil spill in Manilla bay
- The Saint Hilarion complex
- 1954 Hague Convention
- Santorini
- Mains



By saurabh Pandey

THE HINDU

Royal burial mounds of Assam now on UNESCO World Heritage List

The Hindu Bureau
NEW DELHI/GUWAHATI

The Charaideo Moidams, a 700-year-old mound-burial system of the Ahom dynasty from Assam, were added to the UNESCO World Heritage List on Friday, making them the 43rd property from India to be included in the prestigious index.

The announcement was made at the 46th session of the World Heritage Committee being held in Delhi.

"This historic recognition brings global attention to the unique 700-year-old mound burial system of the Ahom kings at Charaideo, highlighting the rich cultural heritage of Assam and Bharat," Union Minister for Culture and Tourism Gajendra Singh Shekhawat told the media after the announcement.

An aerial view of the royal burial mounds built by the Ahom dynasty in Charaideo in eastern Assam. AP

Similar to the pyramids of Egypt, the Moidams are earthen burial mounds of the members of the Ahom royalty whose 600-year rule was ended by the British takeover of the region.

The Ahoms adopted the Hindu method of cremation after the 18th century and began entombing the cremated bones and ashes in Moidams at Charaideo.

The highly venerated Moidams make the Charaideo district a tourist destination.

The Moidams are the first from the notheastern States to be recognised as a World Heritage Site in the cultural category. Assam has two other such sites in the natural category - Kaziranga National Park and Manas National Park, both upgraded to tiger reserves.

"THIS IS HUGE. The Moidams make it to the #UNESCO World Heritage list under the category Cultural Property - a great win for Assam. Thank You Hon'ble Prime Minister Shri @narendramodi ji, Members of the @UNESCO World Heritage Committee and to the people of Assam," Chief Minister Himanta Biswa Sarma wrote on X.

He said the Charaideo Moidam embodies the deep spiritual belief, rich civilisational heritage, and architectural prowess of Assam's Tai-Ahom community.

The Moidams were nominated as India's official entry in 2023.

Of the 386 Moidams explored so far, 90 at Charaideo are the best preserved, representative, and most complete examples of this tradition.

The Charaideo Moidams

- The Charaideo Moidams, a 700-year-old mound-burial system of the Ahom dynasty from Assam, were added to the UNESCO World Heritage List.
- Similar to the pyramids of Egypt, the Moidams are earthen burial mounds of the members of the Ahom royalty whose 600-year rule was ended by the British takeover of the region.
- The Ahoms adopted the Hindu method of cremation after the 18th century and began entombing the cremated bones and ashes in Moidams at Charaideo.

- **The Moidams are the first from the notheastern States to be recognised as a World Heritage Site in the cultural category.**
- **Assam has two other such sites in the natural category – Kaziranga National Park and Manas National Park, both upgraded to tiger reserves.**

About The Ahom dynasty

- The Ahom dynasty (1228–1826) ruled the Ahom Kingdom in present-day Assam, India for nearly 598 years.
- The dynasty was established by Sukaphaa, a Shan prince of Mong Mao (present-day Yunnan, China) who came to Assam after crossing the Patkai mountains.
- The rule of this dynasty ended with the Burmese invasion of Assam and the subsequent annexation by the British East India Company following the Treaty of Yandabo in 1826.

A new push in the Bay of Bengal

Harsh V. Pant

Professor at King's College London and is Vice President for Studies and Foreign Policy at Observer Research Foundation, New Delhi

Sohini Bose

Associate Fellow, Neighbourhood Studies at ORF

India hosted the 2nd BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) Foreign Ministers' Retreat in New Delhi earlier this month with a focus on providing an "informal platform to discuss ways and means of cooperating and accelerating action in security, connectivity, trade, and investment within the Bay of Bengal." The retreat was held in preparation for the sixth summit meeting, scheduled for September, in which the BIMSTEC leaders will meet in person for the first time in the post-pandemic era. They are also expected to sign the BIMSTEC Agreement on Maritime Transport Cooperation to improve regional connectivity – a foundational aim of this grouping.

Strengthening ties with eastern neighbours

BIMSTEC is the regional organisation devoted to the Bay of Bengal, with a membership of five South Asian and two Southeast Asian countries, cooperating across seven diverse sectors. It allows New Delhi to engage multilaterally with the other countries of the Bay of Bengal region, which are its eastern neighbours and therefore vital for its economic development, security, and foreign policy imperatives. India also remains intent on solidifying relations with its eastern neighbours as China's growing presence in the Bay of Bengal poses a potential threat to regional stability and New Delhi's position as a preferred security partner in these waters.

Strengthening ties with Bangladesh and Myanmar accords India the advantage of providing its landlocked north-eastern region with access to the sea. Improved ties with Myanmar and Thailand will also lend India the opportunity to have a more profound presence in the Indo-Pacific, as it holds the ASEAN (Association of South East Asian Nations), in which these two countries are members, to be of central importance in its vision of the Indo-Pacific. Thailand reinforced this idea at the retreat by identifying itself as a bridge between BIMSTEC and ASEAN. These priorities were reflected in the opening address by the Minister for External Affairs, S. Jaishankar, when he stated that BIMSTEC represents the intersection of India's 'Neighbourhood First' outlook, the 'Act East Policy', and the SAGAR (Security And Growth for All in the Region) vision.

Two parts of the retreat

The retreat was divided into two parts. In the first segment, participants assessed the current state of regional cooperation within BIMSTEC, building on a presentation by India on the implementation of key outcomes of the 1st Retreat. Multiple ideas were shared by the member states including the establishment of Centers of Excellence in member states, focusing on Agriculture, Disaster Management, and Maritime Transport. India announced support for cancer research, treatment, and issuance of e-visas for patients of all BIMSTEC states, while Sri Lanka proposed the inclusion of kidney disease. The need for involving the private sector in trade and promoting young entrepreneurs was also highlighted, as was the importance of connectivity, cyber-security, and countering the trafficking of narcotics and illegal arms.

In the second session, the expectations of each country from the forthcoming summit were discussed. Sri Lanka underscored the need to map mineral resources found in abundance in the BIMSTEC countries and create opportunities for the vertical integration of stages of production within specific sectors in the economies of the countries, enabling them to diversify their production structure. Bangladesh highlighted the need for cooperation in the Blue Economy and urged member states to ban fishing during the breeding season to address the problem of depleting catch in the Bay. Bhutan expounded on the need for collaboration in tourism and cultural exchanges, while Nepal highlighted its 'whole of the region' approach to leverage synergies among member states and transform BIMSTEC into a results-oriented regional forum. Thailand underscored the need for cooperation in non-traditional security domains, and Myanmar added the need to combat online scamming to the list. These proposals will be presented to the heads of state before the September summit.

Bilateral merits

While the retreat was a multilateral milestone for India, it had its bilateral merits too. Mr. Jaishankar met several of his counterparts on the sidelines. He shared with Myanmar India's concerns over the flow of displaced persons, narcotics, and arms across the border and urged for the return of unlawfully detained Indians. He also held a meeting with the Bangladesh Foreign Minister, who requested him to ensure the smooth supply of daily essentials and send a technical team for the Teesta project, signifying another step towards easing this long-pending concern. At the end of the retreat, the Foreign Ministers called on Prime Minister Narendra Modi.

This year marks a decade of India's Act East and Neighbourhood First policies, and the thrust on BIMSTEC is a manifestation of New Delhi's efforts to continue nurturing collaborative growth for national and regional well-being. Thus, Mr. Jaishankar encouraged future collaborations through new energies, resources, and a renewed commitment to cooperation.

It remains to be seen how many of these proposals find culmination at the forthcoming Summit but the intent of the member states to push forth with a bold vision for the region was clearly evident at the retreat.

The intent of BIMSTEC member states to push forth with a bold vision for the region was evident at the 2nd Foreign Ministers' Retreat

2nd BIMSTEC Foreign Ministers' Retreat

- India hosted the 2nd BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) Foreign Ministers' Retreat in New Delhi.
- focus on providing an "informal platform to discuss ways and means of cooperating and accelerating action in security, connectivity, trade, and investment within the Bay of Bengal."

- **BIMSTEC is the regional organisation devoted to the Bay of Bengal, with a membership of five South Asian and two Southeast Asian countries, cooperating across seven diverse sectors.**
- **It allows New Delhi to engage multilaterally with the other countries of the Bay of Bengal region, which are its eastern neighbours and therefore vital for its economic development, security, and foreign policy imperatives.**

- India also remains intent on solidifying relations with its eastern neighbours as China’s growing presence in the Bay of Bengal poses a potential threat to regional stability and New Delhi’s position as a preferred security partner in these waters.
- Strengthening ties with Bangladesh and Myanmar accords India the advantage of providing its landlocked north-eastern region with access to the sea.

- **Improved ties with Myanmar and Thailand will also lend India the opportunity to have a more profound presence in the Indo-Pacific, as it holds the ASEAN (Association of Southeast Asian Nations), in which these two countries are members,to be of central importance in its vision of the Indo-Pacific.**
- **Thailand reinforced this idea at the retreat by identifying itself as a bridge between BIMSTEC and ASEAN**

Major Focus

- focusing on Agriculture, Disaster Management, and Maritime Transport.
- India announced support for cancer research, treatment, and issuance of e-visas for patients of all BIMSTEC states, while Sri Lanka proposed the inclusion of kidney disease.
- The need for involving the private sector in trade and promoting young entrepreneurs was also highlighted, as was the importance of connectivity, cyber-security, and countering the trafficking of narcotics and illegal arms.

- Bangladesh highlighted the need for cooperation in the Blue Economy and urged member states to ban fishing during the breeding season to address the problem of depleting catch in the Bay.
- Bhutan expounded on the need for collaboration in tourism and cultural exchanges, while Nepal highlighted its ‘whole of the region’ approach to leverage synergies among member states and transform BIMSTEC into a results-oriented regional forum.
- Thailand underscored the need for cooperation in non-traditional security domains, and Myanmar added the need to combat

BIMSTEC

WHAT YOU SHOULD KNOW

Stands for **The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation**

Founded in 1997 through **Bangkok Declaration**

7 MEMBER COUNTRIES

First summit held in Thailand

Sri Lanka is the current Chair

Importance of BIMSTEC

- Accounts for **22%** of the world's population
- Combined GDP of **$2.7 trillion**
- One-fourth of the world's traded goods cross the Bay every year
- Six focus areas- trade, technology, energy, transport, tourism and fisheries

BIMSTEC

The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation

Nepal | Bhutan | Bangladesh | India | Thailand | Myanmar | Sri Lanka

7 MEMBER COUNTRIES

Founded in 1997 through **Bangkok Declaration**

Objectives of BIMSTEC

- **To enable environment** for rapid **economic development.**
- **To collaborate and mutually** assist members on matters of common interest.
- To maintain **close and beneficial cooperation** with existing international and regional organizations.
- To endeavour to **eradicate poverty from the Bay of Bengal region.**
- To **establish multidimensional connectivity, promote synergy among connectivity frameworks** in the region.

No tax relief for non bank P-Note holders from Gift IFSC

Ashley Coutinho
MUMBAI

The Budget has failed to provide tax relief to non-resident holders of off-shore derivatives instruments (ODIs) or P-Notes, issued by non-bank entities from Gift IFSC.

In May, the International Financial Services Centres Authority (IFSCA) allowed non-bank entities registered with the Securities and Exchange Board of India as foreign portfolio investors (FPIs) to issue ODIs with Indian securities as underlying at Gift-IFSC. Till then, only foreign banks could issue them.

Advantage banks

At present, Section 10(4E) of the Income-Tax Act provides an exemption to non-resident ODI holders in the case of transfer or distribution of any income earned on derivative instruments contracts entered with IFSC banks.

"The omission of extending section 10(4E) tax exemptions to non-residents dealing with non-bank entities in IFSC creates disparity and uncertainty. Ensuring tax clarity akin to that provided for IFSC banks is very much needed to develop this product," said Jaiman Patel, Partner, EY India.

"Non-bank entities at Gift IFSC such as broker dealers and fund managers have been allowed to issue P-Notes to overseas investors. No corresponding amendment, however, has been made in this Budget to provide tax exemption to these subscribers.

"A relaxation in tax law should be considered soon in order to boost further investments via this route, especially in debt instruments," said Rajesh Gandhi, Partner, Deloitte India.

Relying on treaty

Tax relief will give certainty under domestic tax laws as against relying on treaty benefits for ODI structures done outside India that are subject to onerous conditions, experts said.

For instance, those writing an ODI from U.K. have to rely on the UK treaty to take the tax benefit on interest income and dividend. Tax authorities, at a later stage, can potentially deny the tax benefit on the pretext the investor is not the beneficial owner.

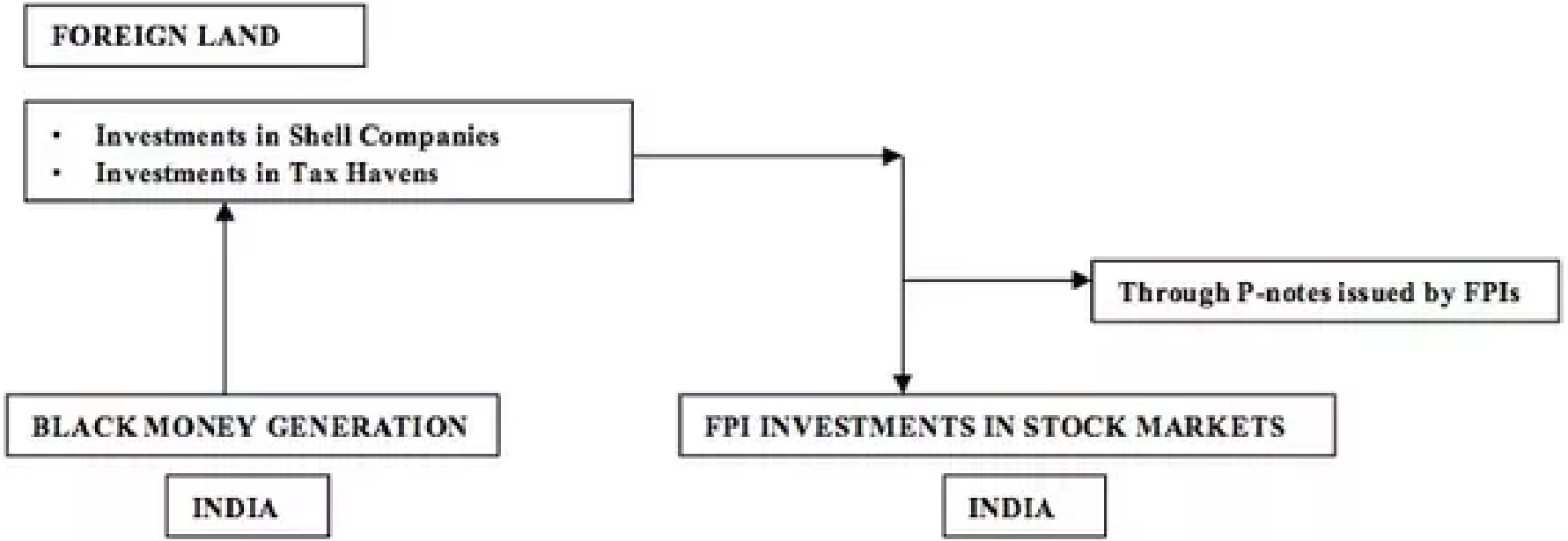
Coming through Gift IFSC, however, provides an added layer of certainty as treaty-abuse and indirect transfer provisions do not apply and there are no capital gains to be paid on the debt investment.

The Budget 2023 had amended Section 18A of Securities Contract Act, 1956, to provide ODI contracts issued by FPIs in GIFT IFSC and regulated by the IFSCA will be valid and legal contracts. P-Notes accounted for 2.14% of total assets under FPI custody at March end.

(The writer is with The Hindu businessline)

P-note or PN

- **A participatory note, commonly known as a P-note or PN, is an instrument issued by a registered foreign institutional investor to an overseas investor who wishes to invest in Indian stock markets without registering themselves with the market regulator, the Securities and Exchange Board of India.**


FOREIGN LAND
Investments in Shell Companies
Investments in Tax Havens
Through P-notes issued by FPIs
BLACK MONEY GENERATION
INDIA
FPI INVESTMENTS IN STOCK MARKETS
INDIA

LIMAY

Philippines races to avoid oil spill from sunken tanker off Limay

AFP

The Philippine Coast Guard on Friday raced to offload 1.4 million litres of industrial fuel oil from a sunken tanker and prevent an "environmental catastrophe" in Manila Bay. One crew member died when the *MT Terra Nova* sank in rough seas nearly seven kilometres off Limay municipality early on Thursday. AFP

Oil spill in Manilla bay

- **The tanker Terra Nova sank in Manila Bay with about 1.4 million liters (370,000 gallons) of industrial fuel oil stored in watertight tanks.**


Manila
PHILIPPINES
Pacific Ocean
South China Sea
Sulu Sea

Potential Oil Impacts on the Sea Turtle Life Cycle

A Oil on the shoreline can contaminate nesting females, nests, and hatchlings.

B Large turtles can inhale oil vapors, ingest oil in prey or sediment, and become coated in oil at the surface.

C Juvenile turtles ingest oil, inhale vapors, and become fatally mired and overheated.

D Wind and currents create ocean fronts, bringing together oil, dispersants, and *Sargassum* communities, causing prolonged floating oil.

E Prey that turtles would otherwise eat may also be killed by becoming stuck in heavy oil or by dissolved oil components.

F *Sargassum* fouled by oil and dispersants can sink, leaving *Sargassum*-dependent animals without food or cover and vulnerable to predators. Dead turtles may sink.

FIGURE 1. *Sea turtles in the Gulf of Mexico require many different types of habitat throughout their long lives, putting them at risk during oil spills. (Florida Sea Grant/Anna Hinkeldey, adapted from NOAA)*

A worker walks on scaffolding at the archaeological site of the Saint Hilarion Monastery in central Gaza Strip. AFP

4th century Gaza monastery put on endangered site list

Agence France-Presse
PARIS

The Saint Hilarion complex, one of the oldest monasteries in the West Asia, has been put on the UNESCO list of World Heritage sites in danger due to the war in Gaza, the body said on Friday.

UNESCO said the site, which dates back to the fourth century, had been put on the endangered list at the demand of Palestinian authorities and cited the "imminent threats" it faced.

"It's the only recourse to protect the site from destruction in the current context," Lazare Eloundou Assomo, director of the UNESCO World Heritage Centre, said, referring to the war sparked by Hamas's October 7 attack on Israel.

In December, the UNESCO Committee for the Protection of Cultural Property in the Event of Armed Conflict decided to grant "provisional enhanced protection" – the highest level of immunity established by the 1954 Hague Convention – to the site.

UNESCO had then said it was "already concerned about the state of conservation of sites, before October 7, due to the lack of adequate policies to protect heritage and culture" in Gaza.

The Hamas attack on October 7 resulted in the deaths of 1,200 people in Israel, most of them civilians, according to an *AFP* tally based on official Israeli figures.

Israel's retaliatory offensive against Hamas has killed at least 39,175 Palestinians in Gaza, according to the Hamas-run territory's Health Ministry,

The Saint Hilarion complex

- The Saint Hilarion complex, one of the oldest monasteries in the West Asia, has been put on the UNESCO list of World Heritage sites in danger due to the war in Gaza.
- UNESCO said the site, which dates back to the fourth century, had been put on the endangered list at the demand of Palestinian authorities and cited the “imminent threats” it faced

- **In December, the UNESCO Committee for the Protection of Cultural Property in the Event of Armed Conflict decided to grant “provisional enhanced protection” — the highest level of immunity established by the 1954 Hague Convention — to the site.**

1954 Hague Convention

- the Convention for the Protection of Cultural Property in the Event of Armed Conflict was adopted in 1954 under the auspices of UNESCO.
- Now widely referred as the 1954 Hague Convention, is the first and the most comprehensive multilateral treaty dedicated exclusively to the protection of cultural heritage in times of peace as well as during an armed conflict.
- The 1954 Hague Convention aims to protect cultural property, such as monuments of architecture, art or history, archaeological sites, works of art, manuscripts, books and other objects of artistic, historical or archaeological interest, as well as scientific collections of any kind regardless of their origin or ownership.

Greece's 'Instagram island' Santorini nears saturation point

Agence France-Presse
GREECE

One of the most enduring images of Greece's summer travel brand is the world-famous sunset on Santorini Island, framed by sea-blue church domes on a jagged cliff high above a volcanic caldera.

This scene has inspired millions of fridge magnets, posters, and souvenirs – and now the queue to reach the viewing spot in the clifftop village of Oia can take more than 20 minutes.

Santorini is a key stopover of the Greek cruise experience. But with parts of the island nearing saturation, officials are considering restrictions.

Of the record 32.7 million people who visited Greece last year, around 3.4 million, or one in 10, went to the island of just 15,500 residents.

"We need to set limits if we don't want to sink under overtourism," Santorini mayor Nikos Zorzos said. "There must not be a single extra bed... whether in the large hotels or Airbnb rentals."

As the sun set behind the horizon in Oia, thousands raised their phones to the sky to capture the moment, followed by scattered applause.

Overrun, overwhelmed: Tourists wait for the sunset in the village of Oia on the Greek island of Santorini. AFP

For canny entrepreneurs, the Cycladic island's famous sunset can be a cash cow.

One company advertised more than 50 "flying dresses", which have long flowing trains, for up to 370 euros ($401), on posters around Oia for anyone who wishes to "feel like a Greek goddess" or spruce up selfies.

But elsewhere in Oia's narrow streets, residents have put up signs urging visitors to respect their home.

'Respect Oia'

"RESPECT... It's your holiday... but it's our home," read a purple sign from the Save Oia group.

Shaped by a volcanic eruption 3,600 years ago, Santorini's landscape is "unique", the mayor said, and "should not be harmed by new infrastructure".

Around a fifth of the island is currently occupied by buildings.

In 2023, 800 cruise ships brought some 1.3 million passengers, according to the Hellenic Ports Association.

Cruise ships "do a lot of harm to the island", said Chantal Metakides, a Belgian resident of Santorini for 26 years. "When there are eight or nine ships pumping out smoke, you can see the layer of pollution in the caldera," she said.

In June, Prime Minister Kyriakos Mitsotakis floated the possibility of capping cruise ship arrivals to Greece's most popular islands.

"I think we'll do it next year," he told Bloomberg.

In an interview, Tourism Minister Olga Kefalogianni echoed this sentiment and said: "We must set quotas because it's impossible for an island such as Santorini... to have five cruise ships arriving at the same time."

Local officials have set a limit of 8,000 cruise boat passengers per day from next year. But not all local operators agree.

The modern tourism industry has also changed visitor behaviour.

"Instagram has defined the way people choose the places to visit," tourist guide Kostas Sakavaras said, explaining everybody wants the perfect Instagram photo to confirm their expectations.

Santorini

- **Santorini is one of the Cyclades islands in the Aegean Sea. It was devastated by a volcanic eruption in the 16th century BC, forever shaping its rugged landscap**e


United Kingdom
Ireland
London
Netherlands
Denmark
Berlin
Germany
Belgium
Paris
France
Poland
Warsaw
Lithuania
Москва
Belarus
Prague
Czech Rep
Vienna
Slovakia
Austria
Hungary
Ukraine
Moldova
Romania
Croatia
Serbia
Italy
Rome
Tyrrhenian Sea
Bulgaria
Portugal
Madrid
Spain
Greece
Turkey
Tunisia
Mediterranean Sea
Syria
Lebanon
Israel
Jordan
Morocco

SC will examine if Governors' actions 'subvert' federalism

The court's decision comes on a petition by Kerala over the Governor sitting on crucial Bills and eventually referring them to the President

Krishnadas Rajagopal
NEW DELHI

The Supreme Court on Friday agreed to examine if Governors, by indefinitely sitting on crucial Bills only to eventually refer them to the President who solely acts on the advice of the Centre, are opening the doors for Union interference in the legislative domain of States, thereby subverting federalism.

The decision of the court to intervene came in a petition filed by the State of Kerala which brought into focus the role of its Governor, who kept Bills pending for two years before reserving seven of them for the consideration of the President, who has no discretion and entirely depends on the aid and advice of the Centre. The President had subsequently withheld consent to four though none of the seven Bills had dealt with Centre-State relations.

Withholding assent

Kerala, represented by senior advocates K.K. Venugopal, Jaideep Gupta and advocate C.K. Sasi, said the Governor should have returned the Bills, which dealt with amendments to State cooperative societies, Lokayukta and university laws, to the State Legislative Assembly "as soon as possible" and given reasons for his objections.

Instead, the Governor had sat on them. He denied the people of Kerala the "benefits of the welfare legislation" before referring the seven Bills to the President in November last year without mentioning the time-lapse.

> The machinations of the Governor saw the Centre take decisions on issues exclusively coming within the ambit of the State's legislative domain
> **STATE OF KERALA IN THE SC**

Kerala said the Centre had withheld assent on four Bills without assigning any reasons.

Thus, the State said, the machinations of the Governor saw the Centre take decisions on issues exclusively coming within the ambit of the State's legislative domain.

It argued that the Governor's power to reserve a Bill for the consideration of the President is limited and confined to specific circumstances detailed in the proviso to Article 213 of the Constitution.

Chief Justice Chandrachud said the court would look into "when Governors can refer Bills to the President". The next hearing of the case has been posted on August 20.

The court issued notice to the Additional Secretary to the Kerala Governor and the Home Ministry.

"The actions of the Governor subvert the delicate balance envisaged by the Constitution between the three organs of State, by rendering the functioning of the elected executive, which has drafted and introduced the Bills, and then the State Legislature, which has passed the Bills, wholly ineffective and otiose. The actions of the Governor also subvert the federal structure of the Constitution, by reserving for the President (acting on the aid and advice of the Union Cabinet) Bills which are wholly within the domain of the State under the Constitution," the State of Kerala argued.

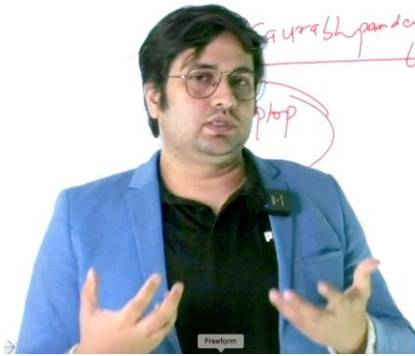
"This is a sad state of affairs. The Supreme Court should step in and tell the Governor when they can refuse Bills and when they can refer them to the President... Otherwise, the Constitution is being rendered otiose," Mr. Venugopal addressed the Bench.

The court similarly issued notice to the Home Ministry and the Secretary to the West Bengal Governor.

The Chief Justice asked Mr. Venugopal, Mr. Gupta and senior advocate A.M. Singhvi, appearing for the State of West Bengal along with advocate Astha Sharma, to meet and frame the legal issues to be decided by the court.

Topics

- **Agarwood**
- **Dark oxygen**
- **Deep sea mining**
- **The Clarion-Clipperton Zone (CCZ)**
- **Uranus's moon Ariel**
- Park fire
- **Climate change Bill in south Africa**
- **The Sortino Ratio**
- Natural farming
- Butterflies attract pollen



By saurabh Pandey

THE HINDU

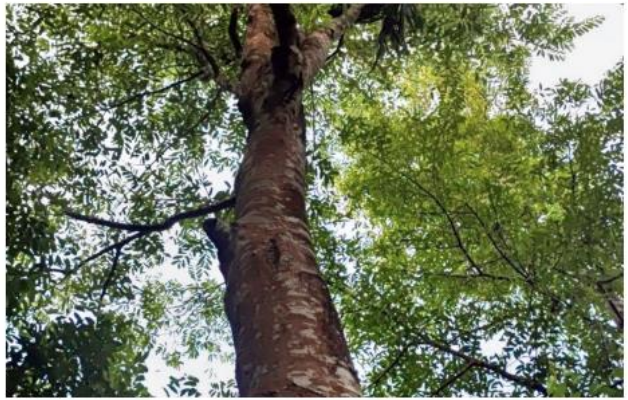
CITES eases norms for agarwood export; move to benefit lakhs of farmers from the Northeast

Shiv Sahay Singh
KOLKATA

India has successfully prevented the inclusion of agarwood (*Aquilaria malaccensis)* in the Review of Significant Trade (RST) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The CITES also notified a new export quota of the highly valuable and aromatic resinous wood and oil of the tree from India from April 2024.

Since agarwood is cultivated in different parts of India, especially in the northeastern States, this development is going to benefit lakhs of farmers in certain districts of Assam, Manipur, Nagaland, and Tripura.



Agarwood extract is used in the preparation of incense, air fresheners, purifiers as well as medicines. SPECIAL ARRANGEMENT

Aquilaria malaccensis was listed in Appendix II of the CITES (a category of species that are not necessarily threatened but whose trade must be controlled) for the first time in 1995 based on India's proposal at CoP9 in 1994.

The removal of India from the RST for *Aquilaria malaccensis* was achieved based on a non-detriment findings (NDFs) study of the plant species by the Botanical Survey of India (BSI) and the Ministry of Environment Forest and Climate Change (MoEFCC).

The NDF prepared by the BSI suggested that the harvest of plants should be allowed from home, community gardens, plantations on leased/*patta* lands, private or community plantations, or any other types of small-scale or large-scale plantations.

However, the NDF added that "harvesting of plants or collection of seeds/seedlings/saplings and other propagules should not be allowed from the existing wild populations or plants in the protected areas and reserve forests".

The export quota recommended by the NDF for 2024-2027 for agarwood chips and powder/sawdust is 1,51,080 kg a year and agarwood oil is 7,050 kg a year.

"The absence of an export quota for a long period and other trade-related restrictions in India caused an increase in informal trade/export of agar chips, oil, powder etc. to the Middle East and other foreign countries. It also caused an increase in costs of agarwood chips and oil in the global market as India is a major agarwood trading nation with which most importing countries have long trade records," the NDF report said.

Despite the export ban, the illegal trade of agarwood and its derivatives has continued in India, with more than 1.25 tonne of chips and six litres of oil/derivatives reportedly seized in six States between 2017 and 2021, a report by TRAFFIC, an NGO, said.

Agarwood

- Agarwood, also known as oud, aloeswood, eaglewood, or gaharu, is a fragrant dark resinous wood used in incense, perfume, and small carvings.
- It is formed in the heartwood of aquilaria trees when they become infected with a type of mold, which in response produces a highly aromatic resin.
- This process can take several years, and only a small percentage of infected trees produce the high-quality resin sought after by collectors and the fragrance industry
- The aquilaria trees are native to Southeast Asia, the Indian subcontinent, and East Asia.

- **The demand for agarwood has historically been high due to its use in religious ceremonies, traditional medicine, and luxury goods.**
- **It is considered one of the most expensive raw materials in the world on a weight-for-weight basis, with prices varying widely depending on the quality and source**

- **The most prized agarwood comes from trees infected with the mold in their natural habitat, as the infection process is unpredictable and the resulting resin varies greatly.**
- **Artificial cultivation and infection of trees are practiced in some areas, but the quality of the resulting agarwood may not match that of naturally infected wood**
- **Agarwood has a complex and rich fragrance profile, with notes that can range from sweet and floral to earthy and woody, depending on the source and the level of resin content. In perfumery, agarwood oil is highly valued for its ability to fix other fragrances and for its unique scent.**

- .
- **The trade in agarwood has historically been a significant driver of its depletion in the wild, leading to the classification of many aquilaria species as endangered.**
- **Conservation efforts and sustainable harvesting practices are crucial to preserving these trees and the traditional uses of agarwood.**

- India has successfully prevented the inclusion of agarwood (Aquilaria malaccensis) in the Review of Significant Trade (RST) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- The CITES also notified a new export quota of the highly valuable and aromatic resinous wood and oil of the tree from India from April 2024.
- Since agarwood is cultivated in different parts of India, especially in the northeastern States, this development is going to benefit lakhs of farmers in certain districts of Assam, Manipur, Nagaland, and Tripura

- **Aquilaria malaccensis was listed in Appendix II of the CITES (a category of species that are not necessarily threatened but whose trade must be controlled) for the first time in 1995 based on India’s proposal at CoP9 in 1994.**

Surprising 'dark oxygen' discovery could ensnarl deep-sea mining

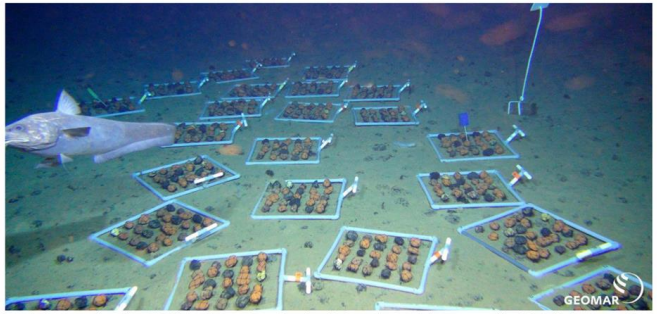
Deep-sea mining is expected to be a major marine resource extraction activity in the coming decades. The International Seabed Authority has established at least two 15-year contracts with the Government of India to look for polymetallic nodules and polymetallic sulphides in the deep seabed

The Hindu Bureau

An unknown process is producing oxygen deep in the world's oceans, where it is too dark for photosynthesis, scientists reported on July 22 in the journal *Nature Geoscience*. The finding has important implications because oxygen helps support life and the discovery implies the existence of previously unknown ecosystems.

Many governments are also bound to take notice since one explanation for the oxygen is that polymetallic nodules are transporting electric charges that split water molecules around them, releasing oxygen. Polymetallic nodules are lumps of iron, manganese hydroxides, and rock partially submerged in many parts of the ocean floor. If their concentration exceeds 10 kg per square metre, mining them is considered to be economically feasible – and many countries are planning to do so as a new resource.

On July 22, *Reuters* reported an unnamed "top government scientist" saying India is planning to "apply for licences to explore for deep-sea minerals in the Pacific Ocean". India's Ministry of Earth Sciences is also currently building a submersible vehicle that will look for and mine similar resources in the Indian Ocean as part of its 'Deep Ocean Mission'.



A studyunder way on the seafloor of the Clarion-Clipperton Zone to investigate the impact that potential manganese nodule mining in the deep sea would have on ecosystems there. ROV-TEAM/GEOMAR

Where was the study conducted?

The oxygen discovery raises questions about how deep-sea mining to extract polymetallic nodules will affect marine ecosystems.

The scientists behind the study, from Germany, the U.K., and the U.S., were studying the Clarion-Clipperton Zone, a part of the ocean floor off Mexico's west coast. Covering an area larger than India, the Zone is considered to have the world's highest concentration of polymetallic nodules, including 6 billion tonnes of manganese and more than 200 million tonnes each of copper and nickel.

When the scientists were conducting experiments at a depth of 4 km, they noticed the oxygen concentration in some places rapidly increased instead of decreasing. They conducted follow-up studies in 2020 and 2021. In each case, they released a device from the surface that would land on the ocean floor, where it would isolate a small volume of the floor along with some sea water and measure the oxygen levels.

This underwater region is called the abyssal zone. It receives too little sunlight for photosynthesis to be feasible. Instead, life-forms here get oxygen from water carried in by a global circulation called the 'Great Conveyor Belt'. Still, the amount of oxygen is low and without any local production, the device should have measured the oxygen levels dropping as small animals consumed it. But the scientists found the opposite: it increased, sometimes tripling in just two days.

They double-checked the finding by recreating the conditions on the ocean floor in their lab, and found the oxygen levels to increase up to a point before dropping.

What is the source?

When they measured the physical characteristics of the nodules, they found their surfaces to have a voltage of up to 0.95 V. Splitting one water molecule requires 1.5 V, but the researchers have suspected the voltage could build up if many nodules are close together, like the cells of a battery.

Andrew Sweetman, an ecologist with the Scottish Association for Marine Science in the U.K. and a coauthor of the study, told *Nature*, "We have another source of oxygen on the planet, other than photosynthesis." His team is calling it 'dark oxygen'.

Oxygen sources are valuable because they allow life to survive. But as the lab experiment indicated, the nodules could only produce oxygen as long as they could muster a sufficient voltage. The nodules' own energy source is also not clear.

What is deep-sea mining?

Given the quantity of polymetallic nodules on the ocean floor, deep-sea mining is expected to be a major marine resource extraction activity in the coming decades. The International Seabed Authority has established 15-year contracts with at least 22 contractors – including the Government of India – to look for polymetallic nodules, polymetallic sulphides, and cobalt-rich ferromanganese crusts in the deep seabed. China alone is expected to mine 17% of the Clarion-Clipperton Zone.

> The finding has important implications because oxygen helps support life and the discovery implies the existence of previously unknown ecosystems

The new finding raises the possibility of such mining damaging ecosystems that require 'dark oxygen' to survive. Experts have found deep-sea mining itself could be harmful to the marine environment, 'dark oxygen' or not.

In 1989-1996, scientists from Germany conducted the Disturbance and Recolonisation (DISCOL) Experiment in the Peru Basin as the world's "first large-scale impact assessment" to assess the "environmental impacts originating from the mining of polymetallic nodules". They built a device that disturbed the sea floor like a deep-sea mining exercise might have and collected data about how the disturbances changed local oceanographic and sedimentological profiles, among other things.

A 2019 study in the journal *Scientific Reports* reported that "the effects of simulated mining impacts induced during the DISCOL [Experiment] were still evident in the megabenthos of the Peru Basin after 26 years."

The affect on deep-sea mining

The same study also reported "significantly lower heterogeneity diversity in disturbed areas" and added that "if the results of this experiment ... can be extrapolated to the Clarion-Clipperton Zone, the impacts of polymetallic nodule mining there may be greater than expected, and could potentially lead to an irreversible loss of some ecosystem functions".

In November 2023, *Nature* reported based on a paper published then that deep-sea mining "for minerals could harm deep-sea jellyfish, according to the first study of mining impacts on animals living in the water column."

Scientists also know less about ecosystems in the abyssal zone than they do about many of those aboveground, which means the models scientists use to predict their fate and their role in global climate processes could be unreliable. With these and other issues in mind, on July 20, three major European insurance companies said they would exclude deep-sea mining from their underwriting portfolios.

'Dark oxygen' adds to these challenges. If deep-sea mining doesn't find sustainable ways to respond to them, it may be rendered altogether infeasible.

THE GIST

Polymetallic nodules are lumps of iron, manganese hydroxides, and rock partially submerged in many parts of the ocean floor. If their concentration exceeds 10 kg per sq.m, mining them is considered feasible. Many countries plan to do so

When many nodules are close together they could generate enough voltage to split one water molecule. According to one researcher, 'We have another source of oxygen on the planet.' His team is calling it 'dark oxygen.'

The finding raises the possibility of mining damaging ecosystems that require 'dark oxygen' to survive. Experts have found deep-sea mining itself could be harmful to the ocean, 'dark oxygen' or not

Dark oxygen

- **An unknown process is producing oxygen deep in the world's oceans, where it is too dark for photosynthesis.**
- **Many governments are also bound to take notice since one explanation for the oxygen is that polymetallic nodules are transporting electric charges that split water molecules around them, releasing oxygen.**
- **Polymetallic nodules are lumps of iron, manganese hydroxides, and rock partially submerged in many parts of the ocean floor.**
- **If their concentration exceeds 10 kg per square metre, mining them is considered to be economically feasible — and many countries are planning to do so as a new resource**

Deep sea Mining

- **Deep sea mining refers to the process of retrieving mineral deposits from the deep seabed, typically found at depths of 200 meters (656 feet) or more below sea level.**
- **The seabed contains vast quantities of minerals and metals such as copper, zinc, silver, gold, and rare earth elements, as well as non-metallic minerals like phosphates, sulfur, and sand.**

There are several types of deep sea mineral deposits that are of interest for mining:

Polymetallic Nodules: These are potato-sized lumps found on the deep ocean floor, particularly in the abyssal plains. They contain a mix of metals including manganese, nickel, copper, and cobalt.

Polymetallic Sulfides: These are mineral deposits formed from hydrothermal vents, which are commonly found near mid-ocean ridges. They contain a variety of metals such as copper, zinc, lead, and gold.

Cobalt-Rich Ferromanganese Crusts: These are found on seamounts (underwater mountains) and plateaus and are rich in cobalt, as well as other metals like nickel and platinum.

The Clarion-Clipperton Zone (CCZ)

- The Clarion-Clipperton Zone (CCZ) is a large area in the northeastern equatorial Pacific Ocean, approximately 5 million square kilometers in size, located roughly between Hawaii and Mexico.
- It is named after two seamounts, Clarion and Clipperton, that are found within this region. The CCZ is particularly notable for its mineral resources, especially the polymetallic nodules found on its seafloor.
- Polymetallic nodules, also known as manganese nodules, are potato-sized lumps that contain a variety of metals such as manganese, nickel, copper, and cobalt.
- These nodules are of significant interest for deep-sea mining because they are rich in elements that are crucial for modern technologies, including batteries and electronics.

- **The CCZ is under the jurisdiction of the International Seabed Authority (ISA), an autonomous international organization established under the United Nations Convention on the Law of the Sea (UNCLOS) to regulate the exploration and exploitation of mineral resources in the international seabed areas beyond the limits of national jurisdiction (the Area).**
- **Several countries and private companies have expressed interest in exploring the CCZ for its mineral resources.**

WHAT IS IT?

Ariel: another watery moon?

Vasudevan Mukunth

The Solar System has many mysteries. We don't know why the Sun's corona is so hot. We don't know why Saturn's moon, Titan, has such a significant atmosphere. We don't know why Triton rotates in the direction opposite to its host planet, Neptune, although a recent study found an answer: Triton and Pluto had a common origin before Neptune pulled Triton to itself.

Another mystery in the Solar System may be coming to a similar close. Astronomers have been curious why the surface of Uranus's moon Ariel has frozen carbon dioxide (CO_2). At that distance from the Sun, the CO_2 should have already vaporised into space — yet the ice covers the moon's surface. On July 24, NASA's James Webb Space Telescope (JWST) reported evidence of a liquid ocean buried under Ariel's surface, supplying CO_2 to the world above.

The people behind the finding came to this conclusion when they found carbon monoxide. If Ariel has to have this compound, it has to have a surface temperature around 18 degrees C less than what it is, or it could have a subsurface ocean producing carbon oxides. One side of Ariel has cracks and grooves through which icy slop and these compounds could be gushing out to the surface. JWST also found signs of carbonite minerals, which could be formed when water interacts with rocks.

More studies and space missions will be needed to confirm these details. If there are, we'll have yet another water-bearing moon out there.

This image of the complex terrain of Ariel was taken by Voyager 2 in 1986. NASA

For feedback and suggestions for 'Science', please write to **science@thehindu.co.in** with the subject 'Daily page'

Uranus’s moon Ariel

- **Astronomers have been curious why the surface of Uranus’s moon Ariel has frozen carbon dioxide (CO_2).**
- **At that distance from the Sun, the CO_2 should have already vaporised into space**

BIG SHOT

Embers blowing away from a burning tree near Payne Creek, California, as the Park Fire, which has grown to 1.4 lakh ha, continued to spread on Saturday. Strong winds and dried vegetation fueled the fire that destroyed 28,000 ha in the first 24 hours after a man allegedly pushed a burning car into a ravine. In 2018, more than 18,000 structures were destroyed and 85 people were killed in nearby Paradise when a camp fire entrapped thousands of people and became the most destructive in California history. AFP

Park fire

- A "park fire" typically refers to a wildfire that occurs within a park, usually a national park, state park, or a similar protected area.
- These fires can be naturally occurring, often started by lightning strikes, or they can be human-caused, such as from campfires, fireworks, or arson.
- Wildfires in parks can have both beneficial and detrimental effects.
- In some ecosystems, fire is a natural and necessary part of the ecological cycle, helping to clear dead vegetation, promoting the growth of new plants, and providing habitat for certain species.
- However, if a park fire gets out of control, it can pose significant threats to human life, infrastructure, and natural resources.

- Managing park fires involves a complex set of strategies, including controlled burns, firebreaks, and the use of firefighting crews and equipment.
- The goal is to minimize the damage caused by fires while also allowing for the natural role of fire in the ecosystem.

Mapping - Payne Creek, California

What is South Africa's new law on climate change?

What are the features of the law? Does India have an omnibus legislation on climate change?

Jacob Koshy

The story so far:

South Africa's President, Cyril Ramaphosa, signed into law a piece of legislation that will impose mandatory curbs on the emissions from large, fossil-fuel heavy industries and, require climate-adaptation plans from towns and villages. The President said this would enable South Africa to meet its emissions reduction commitments under the Paris agreement.

What is the significance of this law?

The Climate Change Bill was approved by South Africa's National Assembly last November. South Africa relies on coal as its primary fuel source for electricity generation and is one of the world's top 15 greenhouse gas (GHG) emitters. According to an official estimate, net emissions in 2017 were estimated at 512 million tonnes of carbon dioxide equivalent (Mt CO_2e), an increase of 14% from 2000. In 2022, this fell to 405 Mt CO_2e, a 3% fall from 2021, according to Statista. It is unclear if these numbers are strictly comparable and if the fall was linked to the worldwide, temporary dip in emissions following COVID-19. The energy sector represents roughly 80% of gross emissions, with energy industries (~60%) and transport (~12%). Being an economy which is dependent on agriculture and tourism, South Africa has faced increasing Western pressure to accelerate its transition away from fossil fuel.

What steps has South Africa taken?

Every country submits Nationally Determined Contributions (NDC), which are time-bound commitments to lower emissions. South Africa submitted its first NDC in 2016 and its updated NDC in 2021. The updated NDC commits to 31% reduction and a fixed target for GHG emissions levels of 398-510 MtCO_2e by 2025, and 350-420 MtCO_2e by 2030.

The NDC outlines an approach for a 'just transition,' – or the sustainable movement to jobs away from fossil-fuel dependent industries – to achieve targets, focusing on agriculture, forestry and other land use, energy, industrial processes and product use, and waste sectors. South Africa has estimated that it requires $8 billion per year by 2030. It has set an internal goal of reaching 'net zero emissions' by 2050 in its Low-Emission Development Strategy submitted in 2020. In addition, the Presidential Climate Commission released its Just Transition Framework in 2022, which aims to inform policy making at the nexus of climate and development to enable deep, just transformational shifts. These were the actions that preceded the signing of the Climate Change Bill.

What about India?

India does not have a comprehensive legislation on climate change. Priyanka Chaturvedi, the Rajya Sabha parliamentarian, had moved a Private Member's Bill, called the Council on Climate Change Bill, most recently in 2022. This proposed setting up a Council, chaired by the Prime Minister, for advising the Union government on all matters related to climate change but there has been no significant movement on this so far. However, climate change features in multiple Acts and subordinate legislation. These include the Environmental Protection Act, Forest Conservation Act, Energy Conservation Act, Water (Prevention and Control of Pollution) Act among others.

Are these enough?

In April this year, the Supreme Court ruled that citizens have a "right against the adverse effects of climate change," and referred to the fact that India did not have an omnibus legislation on climate change. "Despite Constitutional guarantees that give the citizens equality before the law and right to life and personal liberty, it was now necessary, in the Court's view, to explicitly link the impact of climate change as something which impedes these rights of liberty, life and equality." Prior to the UN Conference of Parties in Dubai last year, India communicated that the intensity of its energy emissions had reduced by 33% from 2005-2019, 11 years ahead of target. It also committed to revising its emissions intensity to 45% by 2030 in the updated set of NDC. Emission intensity refers to the total amount of GHG emitted for every unit increase of GDP. It is different from absolute emissions. India has also committed to source 50% of its electricity in 2030 from non-fossil fuel resources.

THE GIST

- South Africa's President, Cyril Ramaphosa, signed into law a piece of legislation that will impose mandatory curbs on the emissions from large, fossil-fuel heavy industries.
- South Africa relies on coal as its primary fuel source for electricity generation and is one of the world's top 15 greenhouse gas (GHG) emitters.
- Climate change features in multiple Acts and subordinate legislation of India. These include the Environmental Protection Act, Forest Conservation Act, Energy Conservation Act, Water (Prevention and Control of Pollution) Act among others.

Climate change Bill in south Africa

- South Africa’s President, Cyril Ramaphosa, signed into law a piece of legislation that will impose mandatory curbs on the emissions from large, fossil-fuel heavy industries and, require climate-adaptation plans from towns and villages.
- The President said this would enable South Africa to meet its emissions reduction commitments under the Paris agreement

- The Climate Change Bill was approved by South Africa's National Assembly last November.
- South Africa relies on coal as its primary fuel source for electricity generation and is one of the world's top 15 greenhouse gas (GHG) emitters.

What about India?

- India does not have a comprehensive legislation on climate change.
- climate change features in multiple Acts and subordinate legislation.
- These include the Environmental Protection Act, Forest Conservation Act, Energy Conservation Act, Water (Prevention and Control of Pollution) Act

Use Sortino Ratio for goal-based investment

THINKINVESTOR

Sortino Ratio (SR) is more appropriate for goal-based investments in mutual funds; It would be useful if Asset Management Companies (AMCs) also disclose this metric alongside IR

Venkatesh Bangaruswamy

Previously, in this column, we discussed SEBI's proposal for asset management companies (AMCs) to disclose Information Ratio (IR) for each of their funds. IR is appropriate for investing surplus cash as such investments do not have a time horizon nor the need to earn a required return to achieve a life goal. Sortino Ratio (SR) is more appropriate for goal-based investments in mutual funds. Here, we discuss why SR is a better measure and why it would be useful if AMCs also disclose this metric alongside IR.

Downside risk

For goal-based investments, you must define risk and required return. The required return is the minimum return your investment must earn over a given time frame to accumulate the money needed to achieve desired goal. Call this Minimum Acceptable Return or MAR. This is the expected post-tax compounded annual return.

The risk is goal-based investments can earn lower than MAR in any year during the time horizon for a goal. So, downside deviation is a better measure of risk than standard deviation, for the latter measures both the upside and downside deviation. To determine MAR, you must define the time horizon, the amount needed to achieve the goal and the amount you can save. If MAR is 8.5%, it means your combined investments in equity and bonds will need to earn 8.5% annually to achieve the goal.

Suppose the pre-tax expected return on equity is 12% and post-tax return is 10.5%. The SR is calculated as the excess return of the fund over the pre-tax equity MAR divided by downside deviation of returns below the equity MAR. This tells you about the risk of investing in the fund to achieve a goal as SR is related to MAR.

Conclusion

The MAR to determine SR is the expected pre-tax annual return on equity and is independent of the goal you pursue. Hence, AMCs can report SR for each fund alongside the IR. Importantly, AMCs must use uniform equity MAR for determining SR. Otherwise, comparing SR among peer funds may not be meaningful. It would be useful to have AMCs disclose SR over one-, three-, five- and 10-year periods and since inception. The time horizon is very specific to each goal. So, you must determine the

The Sortino Ratio

- **The Sortino Ratio is a financial metric used to evaluate the performance of an investment or a portfolio by comparing its return to its downside risk.**
- **It is similar to the Sharpe Ratio, but instead of considering the total risk (both upside and downside volatility), the Sortino Ratio focuses only on the downside risk.**
- **The formula for the Sortino Ratio is:**
- **Sortino Ratio = (Average Return - Required Return) / Downside Deviation**

Should India focus on natural farming?

What are the concerns on yields? What have been the findings on the ground? How did two studies on the yield potential of natural farming differ? What happened when Sri Lanka decided to ban chemical fertilizers, substituting it with natural ones?

Vikas Vasudeva

The story so far:

In her Budget proposals for 2024-25, Union Finance Minister Nirmala Sitharaman announced that in the next two years, one crore farmers across the country will be initiated into natural farming supported by certification and branding. Implementation will be through scientific institutions and gram panchayats, adding that 10,000 need-based bio-input resource centres will be established.

What is the mission?

As part of the National Mission on Natural Farming (NMNF), the government intends to motivate farmers to adopt chemical-free farming and draw them towards adopting natural farming willingly on the system's merit. The government believes that the success of the NMNF will require a behavioural change in farmers to shift from chemical-based inputs to cow-based, locally-produced inputs. The natural farming scheme under the 'Bharatiya Prakritik Krishi Paddhati' has a total outlay of ₹4,645.69 crore for six years (2019-20 to 2024-25).

What is natural farming?

In natural farming, no chemical fertilizers and pesticides are used. It promotes traditional indigenous practices which are largely based on on-farm biomass recycling with a stress on biomass mulching, use of on-farm cow dung-urine formulation; managing pests through diversity, on-farm botanical concoctions and exclusion of all synthetic chemical inputs directly or indirectly. The emphasis is on improving natural nutrient cycling and increasing organic matter in the soil. Grounded in agro-ecology, it is a diversified farming system that integrates crops, trees and livestock, allowing the optimum use of functional biodiversity. Those advocating natural farming believe that it holds the potential to enhance farmers' income while delivering many other benefits, such as restoration of soil fertility and environmental health, and mitigating and/or reducing greenhouse gas emissions.

'If we adopt natural farming for wheat and rice, which are India's staples, we shall be able to feed only around one-third of our population'

Hard at work: Workers transplanting paddy seedlings at a field in Palakkad, Kerala on July 13. K. K. MUSTAFAH

What are the challenges and concerns?

Agriculture and food experts have their reservations surrounding a large-scale transition from chemical farming to natural farming in a country like India, which has a huge population. Catering to its food-growing needs isn't an easy task, they point out. Recently, an academic paper titled, 'Zero Budget Natural Farming (ZBNF): Implications for Sustainability, Profitability, and Food Security', published by the National Bank for Agriculture and Rural Development and the Indian Council for Research on International Economic Relations, pointed out the "sheer disparity" in the outcomes of the two different experiments surrounding ZBNF (now renamed as Bhartiya Prakritik Krishi Paddhati), one conducted by the Centre for Economic and Social Studies (CESS) and Institute for Development Studies Andhra Pradesh, and the other by the Indian Council of Agricultural Research (ICAR) and the Indian Institute of Farming Systems Research (IIFSR).

Sandip Das, Mahima Khurana and Ashok Gulati write in the paper the importance of long-term experimentation before declaring natural farming as a nationwide agriculture practice. The paper, which delves into the promising yet contentious realm of natural farming, navigates through contrasting findings from the two studies, revealing divergent perspectives on ZBNF. While Andhra Pradesh emerges as a forerunner in adopting ZBNF with encouraging results, the IIFSR study raises concerns about the sustainability and yield (productivity) potential of this farming method.

For instance, the paper notes the CESS study has found that in the case of a variety of crops, lower cost of biological inputs suggested under ZBNF has led to improved yields of crops and farmers' incomes, thus increasing the food and nutritional security of farmers practising ZBNF. However, findings of agro-scientists of the ICAR-IIFSR, a government institute, show a 59% decline in wheat yields and a 32% decline in basmati rice yield compared to integrated crop management, adversely impacting food supply.

What are the lessons from Sri Lanka?

It's vital that before launching a large-scale transition from chemical to natural cultivation, extensive studies and assessments are conducted. A couple of years ago, neighbouring Sri Lanka went through economic and political turmoil after it decided to turn completely organic, and banned the import of chemical fertilizers. The government's policy shift had severe consequences with farmers struggling to get natural fertilizers; they faced a reduction in yields of key crops including rice, the staple, putting the country's food security at risk. A sharp price escalation was witnessed in the country, resulting in huge protests and unrest.

What is the way forward?

Noted economist and former professor at the Ludhiana-based Punjab Agricultural University, M.S. Sidhu, asserts that natural farming could be beneficial at a localised level, but in a populous country like India, adopting natural farming at a large scale may not be a successful model. "Food security is a major concern. If we adopt natural farming for cereals, which are mostly staples, we shall be able to feed only around one-third of our population. Wheat and rice are our staple foods, growing these crops through natural farming could result in lower yields, and hence it's not advisable unless scientific studies are conducted on yields". Supplementary foodstuffs may be grown through natural farming, he points out. "Rigorous scientific tests of natural farming, especially surrounding the crop yields should be held before its nationwide implementation to fend off the fear of potential risk to national food security," says Prof. Sidhu.

National Mission on Natural Farming (NMNF)

What is the mission?

- **As part of the National Mission on Natural Farming (NMNF), the government intends to motivate farmers to adopt chemical-free farming and draw them towards adopting natural farming willingly on the system's merit.**
- **The government believes that the success of the NMNF will require a behavioural change in farmers to shift from chemical-based inputs to cow-based, locally-produced inputs.**
- **The natural farming scheme under the 'Bharatiya Prakritik Krishi Paddhati' has a total outlay of ₹4,645.69 crore for six years (2019-20 to 2024-25).**

Natural farming

Natural farming, also known as nature farming or do-nothing farming, is an agricultural practice that seeks to cultivate food in a way that mimics natural ecosystems and processes, with minimal human interference.

It is a holistic approach that aims to enhance the natural fertility of the soil, foster biodiversity, and promote the health of crops, livestock, and the environment as a whole.

Key principles and practices of natural farming include:

- **No-till or Minimal Till: The soil is not tilled, or if tilled, it is done minimally to reduce soil disturbance and maintain soil structure, which helps in retaining moisture and nutrients.**
- **No Chemical Fertilizers or Pesticides: Instead of using synthetic chemicals, natural farming relies on the use of organic matter such as compost, manure, and crop residues to enrich the soil and control pests and diseases.**

Use of Indigenous Microorganisms (IMO): These are beneficial microorganisms found in the soil that are encouraged to proliferate, which helps in breaking down organic matter and making nutrients available to plants.

Crop Rotation and Polyculture: Planting a variety of crops in succession or in combination to improve soil health, suppress pests, and enhance biodiversity.

Natural Pest Control: Encouraging natural predators and beneficial insects to control pest populations, rather than using chemical pesticides.

Water Conservation: Using techniques such as mulching and water-saving irrigation methods to reduce water usage and maintain soil moisture.

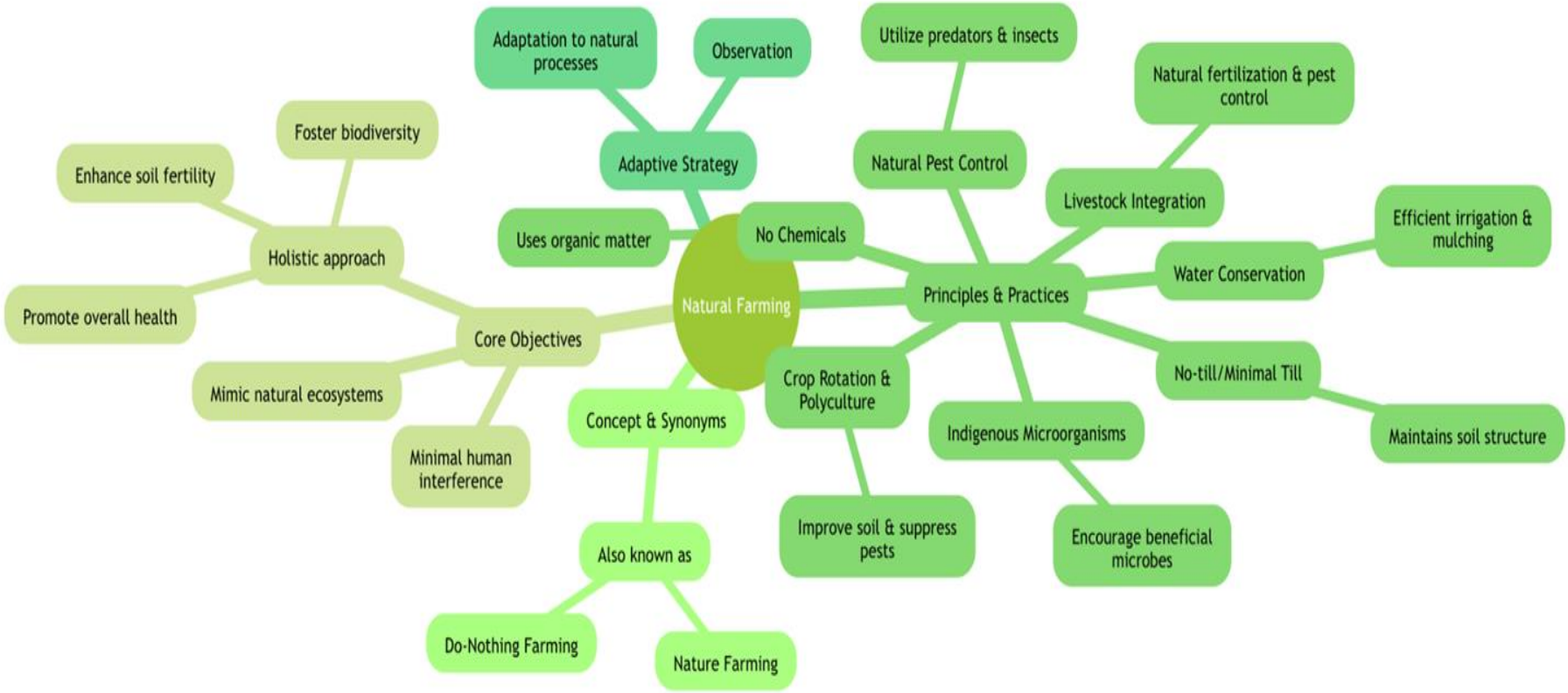
Livestock Integration: In some forms of natural farming, livestock are integrated into the farming system to provide natural fertilization and help control weeds and pests.

Observation and Adaptation: Farmers practicing natural farming closely observe natural processes and adapt their practices accordingly, aiming for a harmonious balance between human activity and the natural environment.

- **Natural farming is not only about producing food but also about restoring and maintaining the health of the land, water, and air.**
- **It is a sustainable approach that aims to reduce the environmental impact of agriculture and promote the long-term health of the planet**

figures:

figure 1.1 mindmap:



What are the challenges and concerns?

- Agriculture and food experts have their reservations surrounding a large-scale transition from chemical farming to natural farming in a country like India, which has a huge population.
- Catering to its food-growing needs isn’t an easy task.
- a government institute, show a 59% decline in wheat yields and a 32% decline in basmati rice yield compared to integrated crop management, adversely impacting food supply.

- A couple of years ago, neighbouring Sri Lanka went through economic and political turmoil after it decided to turn completely organic, and banned the import of chemical fertilizers.
- The government’s policy shift had severe consequences with farmers struggling to get natural fertilizers; they faced a reduction in yields of key crops including rice, the staple, putting the country’s food security at risk

Butterflies accumulate enough static electricity to attract pollen

The Hindu Bureau

Butterflies and moths collect so much static electricity whilst in flight, that pollen grains from flowers can be pulled by static electricity across air gaps of several millimetres or centimetres. The finding, published in the *Journal of the Royal Society Interface*, suggests that this likely increases their efficiency and effectiveness as pollinators.

The University of Bristol team also observed that the amount of static electricity carried by butterflies and moths varies between different species and that these variations correlate with differences in their ecology, such as whether they visit flowers, are from a tropical environment, or fly during the day or night. This is the first evidence to suggest that the amount of static electricity an animal accumulates is a trait that can be adaptive, and thus evolution can act upon it by natural selection.

That many animal species accumulate static electricity as they fly most likely through friction with the air is already known. What was not known is whether butterflies, moths, and other pollinators too accumulate sufficient static electricity, and if the accumulated static electricity can indeed attract pollen.

Testing process

To test this, the researchers studied 269 butterflies and moths across 11 different species, native to five different continents and inhabiting multiple different ecological niches.

"Butterflies and moths accumulate a net electrostatic charge. All individuals measured, from various phylogenetic, ecological and biogeographical groupings, carried a net electrostatic charge, suggesting that electrostatic charging is a universal trait among the Lepidoptera," they write.

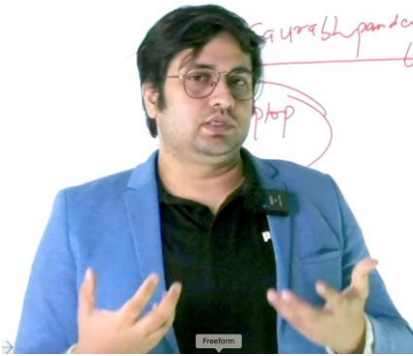
"This shows that despite their wingbeat frequency being about two orders of magnitude lower than most other insects, butterflies and moths are still capable of accumulating appreciable electrostatic charge." Importantly, the magnitude of the net electrostatic charge on the Lepidopterans measured is sufficient to facilitate contactless pollination, they note.

Butterflies attract pollen

- **Butterflies and moths collect so much static electricity whilst in flight, that pollen grains from flowers can be pulled by static electricity across air gaps of several millimetres or centimetres.**

Topics - MINDS MAPS included

- CRISPR Fncas9
- Can States tax mining activities?
- The Inflation Reduction Act (IRA) (International relations)
- The Yazidi community
- Mains



By saurabh Pandey

THE HINDU

Topic -1 CRISPR Fncas9 (science and technology

- Indian scientists build breakthrough gene-editor, are aiming for patent
- A CRISPR system built to use the FnCas9 enzyme was found to edit genomes more efficiently and with less unintended damage than existing technologies, researchers at CSIR-IGIB and the L.V. Prasad Eye Institute have reported
- Scientists from the CSIR-Institute of Genomics and Integrative Biology, New Delhi, have developed an enhanced genome-editing system that can modify DNA more precisely and more efficiently than existing CRISPR-based technologies.
- CRISPR's off-target problem

- Today, using CRISPR-Cas9, researchers can add, remove, or alter specific DNA sequences in the genomes of animals.
- This system has been used in various fields, including in agriculture – to improve the nutritional value of plants and increase their yield – and in healthcare to diagnose several diseases and treat genetic disorders.
- The CRISPR-Cas9 gene editing tool uses a guide RNA (gRNA) designed to find and bind to a specific part of the target genome.
- The gRNA directs an enzyme, Cas9, to the target site, which is followed by a short DNA sequence called the protospacer adjacent motif (PAM).
- Cas9 recognises and binds to the PAM sequence, and acts as a molecular scissor that snips some damaged DNA.

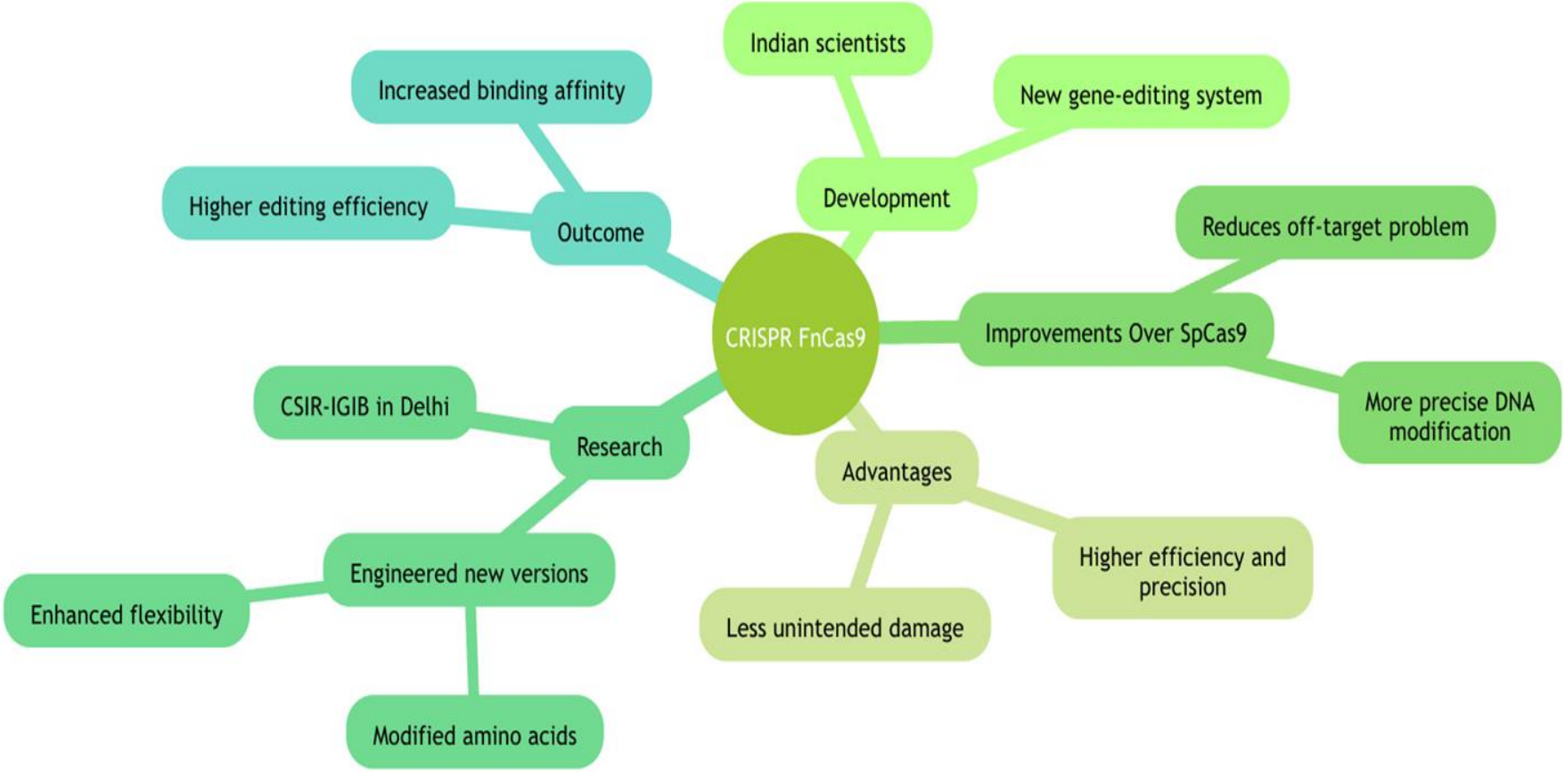
- This repair system triggers the cell's DNA automatically, which repairs the snipped part to insert the correct DNA sequence.
- But the CRISPR-Cas9 system can also recognise and cut parts of the genome other than the intended portion.
- Such "off-target" effects are more common when using the SpCas9 enzyme derived from Streptococcus pyogenes bacteria. Scientists have been able to engineer versions of SpCas9 with higher fidelity but only at the cost of editing efficiency.
- Switching SpCas9 with FnCas9

- To overcome these issues, researchers are exploring Cas9 enzymes from Francisella novicida bacteria.
- While it has low efficiency, is highly precise, this Cas9, called FnCas9 is well.
- To enhance it without compromising specificity, researchers at CSIR-IGIB in Delhi recently tested lab-modified and engineered new versions of FnCas9.
- The researchers tinkered with amino acids in FnCas9 that recognise and interact with the PAM sequence on the host genome. "By doing this, we increase the binding affinity of the Cas protein with the PAM sequence," Dr. Chakraborty said.

- **"The Cas9 can then sit on the DNA in a stronger configuration, and you've got editing moments much more efficient."**
- **The researchers also engineered the end regions of FnCas9 to be more flexible and released the PAM on the genome at the otherwise harder to access. "This opens up more avenues for gene editing**

figures:

figure 1.1 mindmap:



Topic-2 Can States tax mining activities? (Polity)

Why was an earlier judgment on the matter by a seven-judge Bench called into question? What are the provisions of the Mines and Minerals (Development and Regulation) Act, 1957? Are royalties the same as tax? What did the latest verdict on the issue state

- **The story so far:**
  - **In a landmark ruling on July 25, the Supreme Court affirmed that States have the legislative authority to impose taxes on minerals in addition to the royalty levied by the Centre.**
  - **Upholding the principles of federalism, the verdict clarified that the power of State legislatures to tax mineral activities within their respective territories is not constrained by Parliament's Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act).**

- **The case which has been pending for more than a quarter century was decided by an 8:1 ruling with Chief Justice of India (CJI) N.V. Ramana authoring the majority opinion.**
- **Justice B.V. Nagarathna gave a dissenting opinion where she cautioned that allowing States to impose additional levies could hinder the development of the nation's mineral resources and disproportionately advantage mineral-rich States.**

- **The Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act) provides the framework for the regulation of mining activities in India.**
- **It requires those who obtain leases to conduct mining activities to pay "royalty" in respect of any mineral removed to the individual or corporation who leased the land to them.**

What was the case?

- Section 9 of the MMDR Act requires those who obtain leases to conduct mining activities to pay "royalty" in respect of any mineral removed/ to the individual or corporation who leased the land to them.
- The key question for consideration was whether the royalties paid by mine leaseholders to State governments under the 1957 Act could be classified as "tax."
- Additionally, the court needed to determine whether or if the Centre could impose such charges the Centre States possessed the sole authority to levy them within their jurisdictions.

- **The case has its genesis in a dispute between Central Cement Ltd and the Tamil Nadu government which arose after the company incurred a mining lease in Tamil Nadu.**
- **Although the government already pegs a royalties, Indian Tax and was receiving an additional tax on the imposed payments, including royalties.**
- **The company challenged this in the Madras High Court contending that the taxes on royalties effectively constitute a tax on royalties, the imposition of which exceeded the State's legislative authority.**

- **In 1989, a seven-judge Bench of the Supreme Court in India Cement Ltd. v. State of Tamil Nadu decided in favour of India Cement by restraining the States to not impose taxes on mining activities and pointed out the tax on royalty payments likely overstepped the outer government control over the authority over the development of minerals by mineral regulation, as specified under §54 of the "Union list" under Entry 54 (in this case, the 1957 Act).**
- **Thus, States are not empowered to levy additional taxes on this subject.**
- **What is the difference between royalty and tax?**
    - **The majority ruling clarified the distinction between royalty and tax. It deemed royalty as "the contractual consideration"**

Can States tax mining activities?

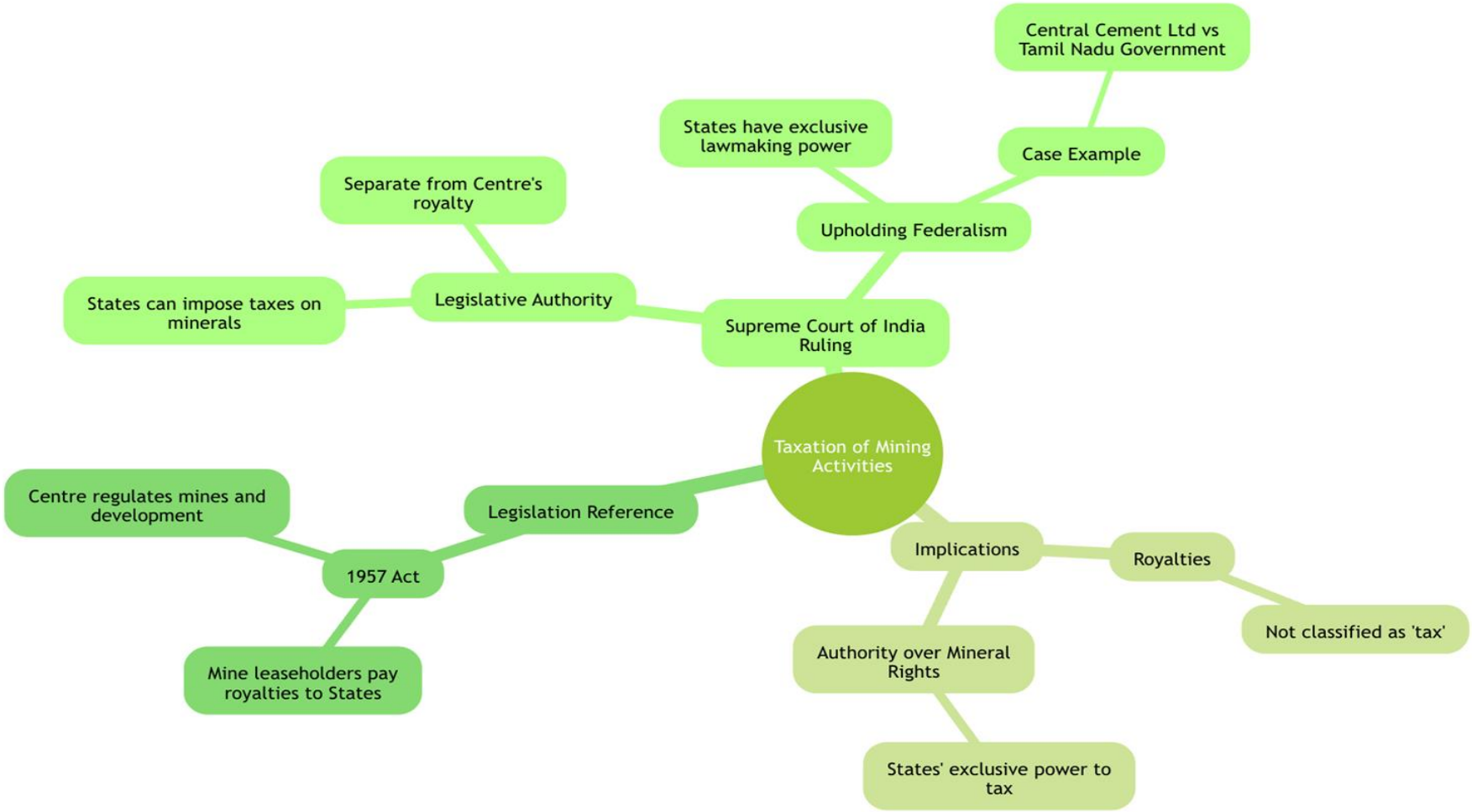
Entry 50 of the State List under the seventh Schedule of the Constitution gives States the exclusive authority to make laws regarding “taxes on mineral rights”, but this power is limited by any laws Parliament may pass concerning mineral development.

On the other hand, Entry 54 of the Union List gives the Centre the power to regulate “mines and mineral development,” especially when Parliament decides it is necessary in public interest.

.

- During the proceedings, the Centre argued that Entry 50 in the State List had allowed Parliament to impose “any limitations” on taxes on mineral rights through the promulgation of laws relating to mineral development — in this case, the 1957 Act.
- However, the majority reasoned that since royalties could not be classified as a tax, they do not fall within the category of “taxes on mineral rights” as defined in Entry 50 of the State List.
- As a result, it was held that the 1957 Act merely provided States with another source of revenue through royalties, without interfering with their authority to levy taxes on mineral rights under Entry 50

figure 1.1 mindmap:



Topic-3-The Inflation Reduction Act (IRA) (International relations)

- **The Inflation Reduction Act (IRA) is a significant piece of legislation in the United States that was signed into law on August 16, 2022.**
- **It is designed to address several key issues, including climate change, healthcare, and tax reform, with a primary goal of reducing inflation and improving the economy.**

Some of the key provisions and aspects of the Inflation Reduction Act:

Climate and Energy:

The IRA includes provisions that aim to combat climate change by investing in clean energy and reducing greenhouse gas emissions.

It provides subsidies and tax credits for consumers purchasing electric vehicles and home energy efficiency improvements, as well as incentives for renewable energy production and storage.

Healthcare: **The Act extends the Affordable Care Act subsidies through 2025, which helps reduce premiums for millions of Americans buying health insurance on the exchanges.**

- **It also allows Medicare to negotiate prices on certain prescription drugs for the first time, potentially leading to lower drug prices for Medicare beneficiaries**

Tax Reform:

- The IRA includes a 15% minimum tax on corporations with more than $1 billion in profits, aiming to ensure that large corporations pay their fair share of taxes.
- It also provides funding for the Internal Revenue Service (IRS) to improve tax enforcement, which is expected to lead to increased tax revenue from wealthy individuals and corporations who may have been underpaying their taxes.

Deficit Reduction: The Congressional Budget Office (CBO) estimated that the IRA would reduce the federal deficit by about $300 billion over ten years, which is one of the ways the Act is expected to help combat inflation.

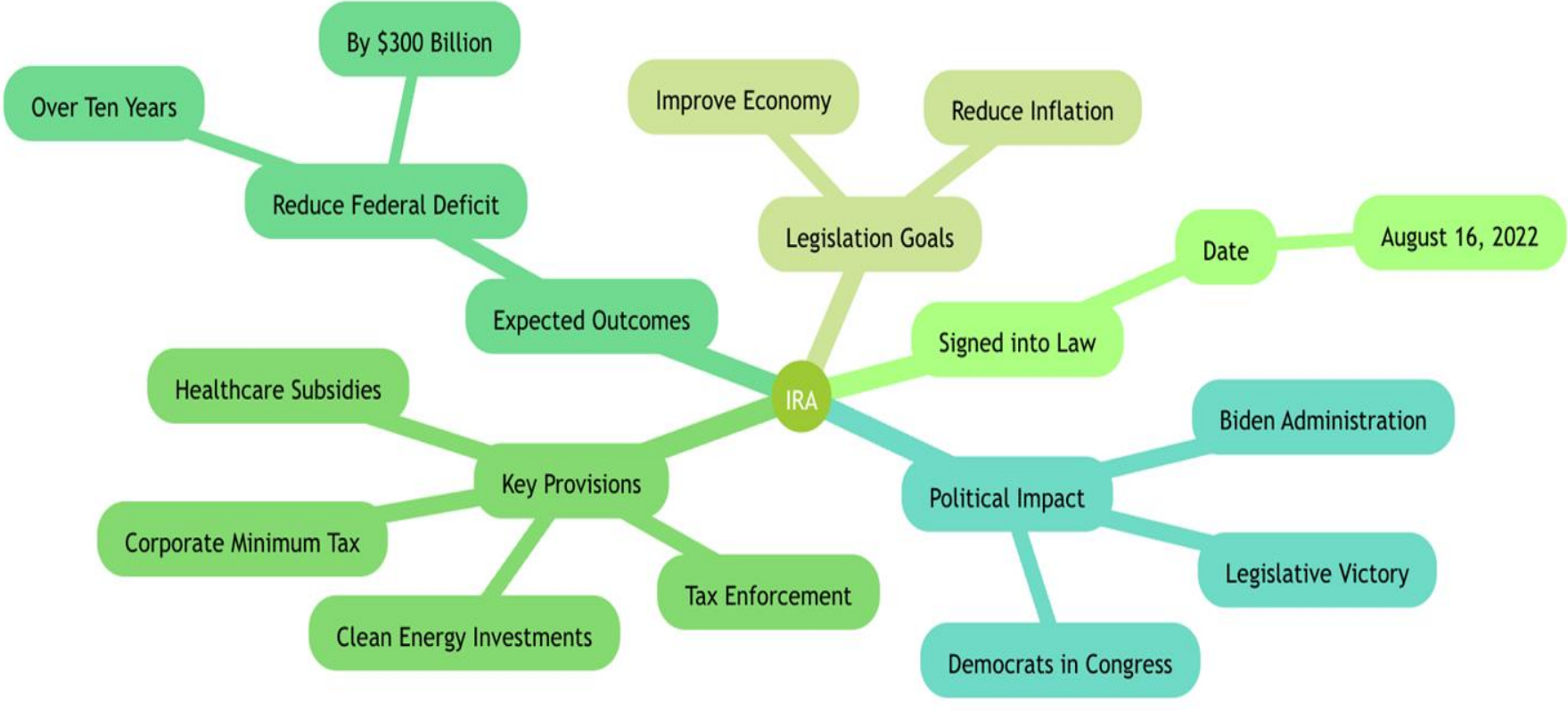
Inflation Targeting: While the Act is named the "Inflation Reduction Act," its impact on inflation is subject to debate.

Some economists believe that the measures taken to address climate change and healthcare will have a positive effect on the economy over the long term, potentially reducing inflationary pressures. Others argue that the short-term impact on inflation may not be as significant.

- **The Inflation Reduction Act is considered a major legislative victory for the Biden administration and Democrats in Congress, as it represents a significant step towards addressing some of the country's most pressing issues.**
- **The Act's long-term effects on the economy, inflation, and the environment will be closely watched in the coming years**

figures:

figure 1.1 mindmap:



Topic -3 The Yazidi community (Prelims)

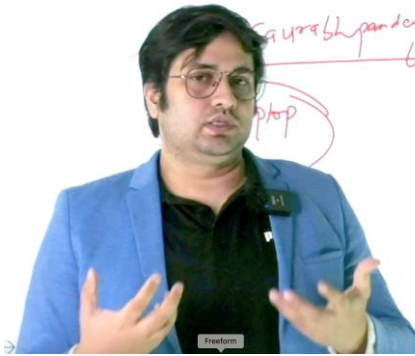
- **The Yazidi community is an ethnoreligious group indigenous to the Kurdish regions of Iraq, specifically the Nineveh Plain in the north of the country, with smaller communities in neighboring countries such as Syria, Turkey, and Armenia.**
- **The Yazidis are known for their unique religion, which is monotheistic but incorporates elements of angel worship and has a complex cosmology that includes several divine beings and spirits.**

Topics - MINDS MAPS included

- The Mettur Dam (Geography)
- The Gadgil Committee, officially known as the Western Ghats Ecology Expert Panel (WGEEP (Environment)
- Pangong Lake (Geography)
- The Chabahar Port (IR)
- Wood encroachment in open ecosystem

major separatist groups in Myanmar: (Internal security and IR)

- Mains



By saurabh Pandey

THE HINDU

Topic - 1 The Mettur Dam (Geography)

- The Mettur Dam, officially known as Stanley Reservoir, is a large reservoir located in the Salem district of the Indian state of Tamil Nadu.
- It is one of the most important dams in the state, serving multiple purposes including irrigation, hydroelectricity generation, and water supply.
- The dam is constructed across the Kaveri River, a major river in South India that is considered sacred and is an important source of water for irrigation and drinking in the region.

Construction: The construction of the Mettur Dam began in 1924 and was completed in 1934 under the British Raj. It was named after Sir Arthur Hope, 1st Baronet, who was the Governor of Madras Presidency at the time.

Purpose: The primary purpose of the dam is to provide irrigation water for the fertile delta regions of Thanjavur, Tiruvarur, Nagapattinam, and parts of Pudukkottai and Cuddalore districts. It also supports hydroelectric power generation and serves as a major source of drinking water for several towns and cities downstream.

Topic -2- The Gadgil Committee, officially known as the Western Ghats Ecology Expert Panel (WGEEP (Environment)

- The Gadgil Committee, officially known as the Western Ghats Ecology Expert Panel (WGEEP), was formed in 2010 by the Ministry of Environment and Forests (MoEF) of the Government of India.
- The committee was named after its chairman, Madhav Gadgil, a renowned ecologist and environmentalist.
- The primary objective of the committee was to recommend a strategy for the environmental conservation of the Western Ghats, a mountain range in the western part of India that is known for its rich biodiversity and is a UNESCO World Heritage Site.

The Gadgil Committee submitted its report in 2011, making several recommendations aimed at conserving the ecological integrity of the Western Ghats. Some of the key recommendations include:

Zonation of the Western Ghats: The committee proposed dividing the Western Ghats into three ecological zones based on their ecological sensitivity: Ecologically Sensitive Zones (ESZ), Ecologically Sensitive Sub-Zones (ESSZ), and a zone where development activities are permissible.

- **Restrictions on Development Activities:** The committee suggested imposing restrictions on development activities in the ESZ and ESSZ to protect the ecology of the region. This included limitations on mining, quarrying, thermal power plants, and other potentially harmful activities
- **Involvement of Local Communities:** The committee emphasized the importance of involving local communities in the conservation efforts. It recommended the establishment of Community Conservation Committees and the recognition of traditional rights of local people over forest resources.

Sustainable Development: The committee advocated for the promotion of sustainable development practices that do not harm the environment. This included encouraging eco-friendly tourism and the development of sustainable agriculture.

Compensation and Rehabilitation: The committee proposed a compensation and rehabilitation package for those displaced or affected by the conservation measures, ensuring their livelihoods are not adversely affected

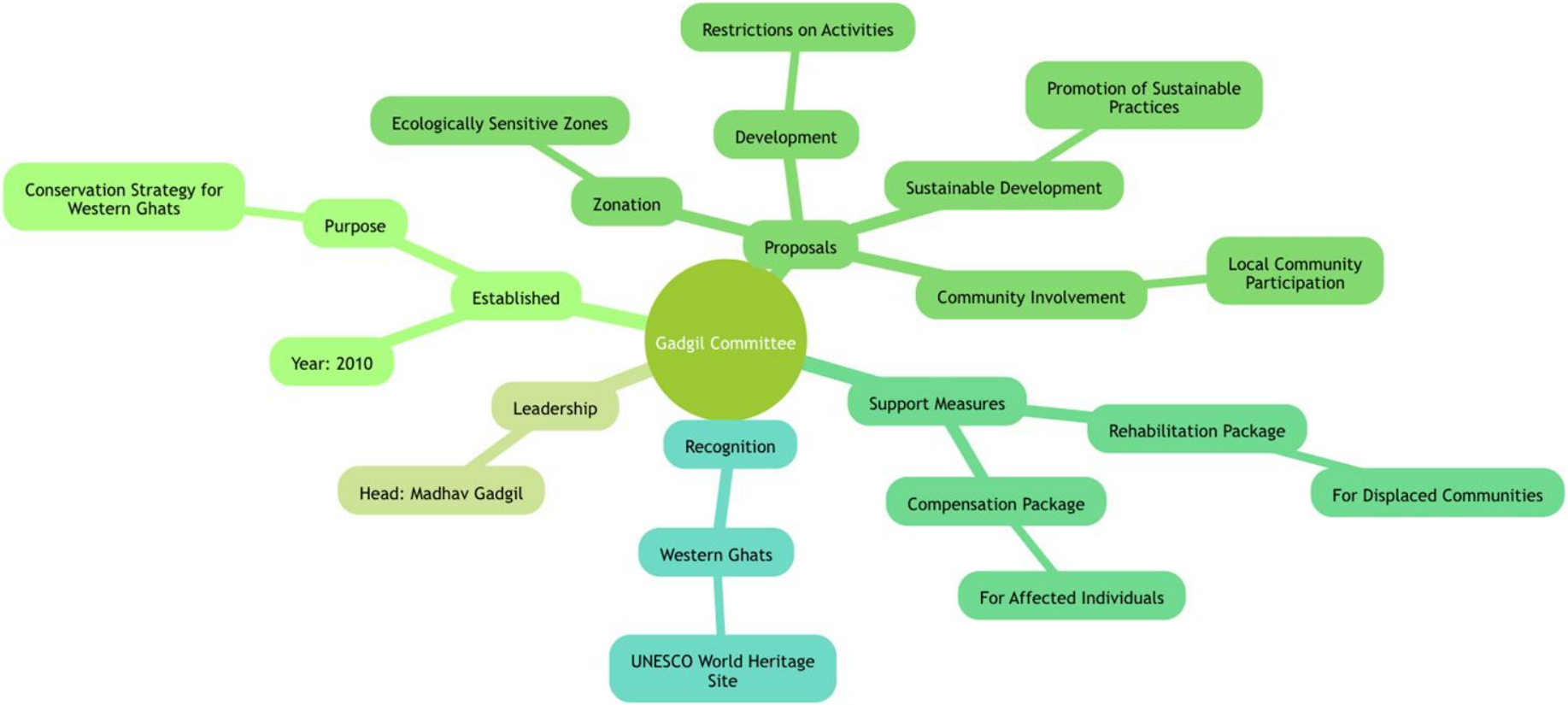
Topic- 3 Pangong Lake (Geography)

- **Pangong Lake, also known as Pangong Tso, is a long, narrow endorheic lake located in the Himalayas.**
- **It is situated at an altitude of approximately 4,350 meters (14,270 feet) and is renowned for its scenic beauty and crystal-clear waters.**
- **The lake is divided between India and China, with about two-thirds of its length in the Tibetan Autonomous Region of China and the remaining one-third in India. The Indian portion of the lake lies in the Ladakh region of Jammu and Kashmir.**

Key points about Pangong Lake include:

Geography: Pangong Lake is approximately 134 kilometers (83 miles) long and varies in width from 1 to 5 kilometers (0.6 to 3.1 miles). It is one of the highest lakes in the world.

Biodiversity: The lake is known for its rich biodiversity, including a variety of fish species. However, the biodiversity of the lake is under threat due to factors such as climate change and human activities


Gadgil Committee
Established
Purpose
Conservation Strategy for Western Ghats
Year: 2010
Leadership
Head: Madhav Gadgil
Proposals
Zonation
Ecologically Sensitive Zones
Development
Restrictions on Activities
Sustainable Development
Promotion of Sustainable Practices
Community Involvement
Local Community Participation
Support Measures
Rehabilitation Package
For Displaced Communities
Compensation Package
For Affected Individuals
Recognition
Western Ghats
UNESCO World Heritage Site

Topic -The Chabahar Port (IR)

The Chabahar Port is strategically important for several reasons, primarily due to its location in southeastern Iran, on the Gulf of Oman, which provides access to the Indian Ocean. Here are some of the key reasons for its importance:

Trade and Connectivity: Chabahar Port serves as a crucial transit point for trade between Iran, India, and Afghanistan, bypassing Pakistan.

This is particularly important for India, as it provides a direct sea route to Afghanistan, facilitating the transport of goods and aid to landlocked Afghanistan without relying on Pakistani routes, which have been subject to political tensions.

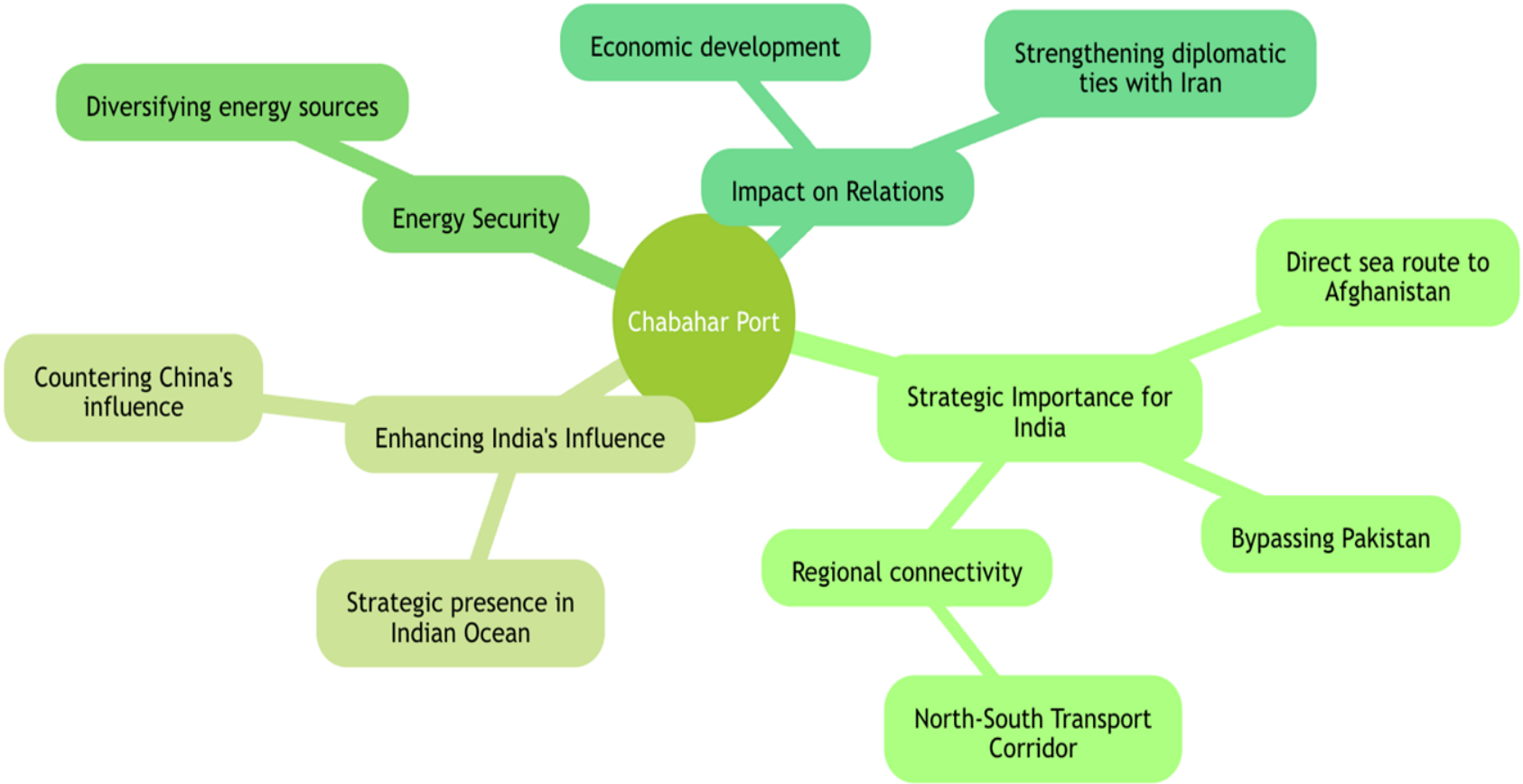

AFGHANISTAN
KABUL
IRAN
PAKISTAN
NEPAL
CHABAHAR PORT
GWADAR
INDIA
Saudi Arabia
Oman
Yemen
MUMBAI
Bay of Bengal
Myanmar
72 KM
Distance between the Chabahar &

- **Regional Connectivity:** The port is a key component of India's vision for regional connectivity, part of the North-South Transport Corridor, linking India to Russia through Iran. This route significantly reduces travel time and cost for cargo, making it an attractive alternative to the traditional route through the Suez Canal
- **Strategic Importance:** Chabahar Port has strategic significance for India, as it allows India to have a presence in the region and to counterbalance China's influence in Pakistan through the Gwadar Port. India's involvement in the development of Chabahar Port is seen as a way to enhance its strategic footprint in the Indian Ocean and to secure its energy and trade routes.

Economic Development: The development of the port is expected to boost economic development in the region, providing opportunities for investment, trade, and job creation. It can also serve as a gateway for Indian companies to access markets in Central Asia and the Middle East.

Energy Security: The port can play a role in India's energy security by facilitating the import of natural gas and oil from Iran and other Central Asian countries. This diversifies India's energy sources and can reduce its dependence on the Strait of Hormuz, a chokepoint for much of the world's oil trade.

- **Diplomatic Relations:** India's involvement in the development of Chabahar Port is a significant aspect of its diplomatic relations with Iran. It demonstrates India's commitment to enhancing ties with Iran and contributing to the development of the region.


Chabahar Port
Impact on Relations
Economic development
Strengthening diplomatic ties with Iran
Energy Security
Diversifying energy sources
Strategic Importance for India
Direct sea route to Afghanistan
Bypassing Pakistan
Regional connectivity
North-South Transport Corridor
Enhancing India's Influence
Countering China's influence
Strategic presence in Indian Ocean

Topic- Wood encroachment in open ecosystem

- Grasslands and savannahs are biodiverse habitats in tropical and temperate regions throughout the world.
- They cover nearly 40% of the earth's total landmass and are home to many endemic and at-risk species of plants and animals.
- From rhinoceroses and elephants in Africa to grassland birds like the bustards, Asian grasslands are prime habitats open for grasslands, and because of the dry conditions that limit their expansion, rapidly losing it all. However, we are activists have them.
- Ecosystems intervening in the function of grassland ecosystems, agriculture, deforestation, intensive conversion of lowland to erosion, large-scale loss due to projects, and overgrazing. But lurking among these usual suspects is also a highly unusual one: trees.

- **The increase in tree and shrub cover is called woody encroachment – and it is considered across most ecosystems.**
- **Woody encroachment entails that the dispersion of open habitats to habitats with greater tree cover and/or shrub density.**
- **The end result is the homogenization of an ecosystem, meaning a diverse, multi-layered ecosystem turns into a uniform layer of woody plants.**

- **This is a dire prospect because open ecosystems are characterized by a grassy understory and a scattering of native tree species.**
- **They are generally maintained by certain natural as well as human activities like grazing and fire, which are called disturbance regimes because they work in tandem to limit the growth of tree species.**
- **But once these regimes are disrupted, trees have the calm they need to establish themselves and start woody encroachment.**

When trees have ill-effects

- A higher concentration of carbon dioxide in the air due to ongoing climate change also encourages deep-rooted plants in grasslands to proliferate.
- "Increased atmospheric CO2 is likely to promote tree over grasses because the C3 photosynthesis pathway used by trees is preferred under high CO2 conditions,

The human hand

- Woody encroachment is a direct result of human-driven factors that are changing the disturbance regimes open ecosystems need to thrive.
- The suppression of the practices grasslands need to thrive stems from colonial conservation and management policies.
- Colonial officers in tropical countries were known to regard open ecosystems as “wastelands” because they took up space in which trees could grow instead and provide timber

- **Woody encroachment in open ecosystems has altered biodiversity in myriad ways. There has been a big decline in grassland birds due to woody encroachment.**
- **“Succession of woody species changes the soil conditions, which changes the grass species and faunal association. Woody species invite increased predation, especially of the specialist birds’ nests,”**
- **woody encroachment brought down the population of grassland specialist rodents in the Banni grasslands of Kutch.**

- In the Banni grasslands, studies have found that the spread of the invasive species Prosopis juliflora— which the Gujarat Forest Department planted in 1961 to combat desertification and provide firewood to communities — has since transformed swaths of the grasslands into a Prosopis woodland.
- In fact, most of India's open ecosystems have stories to tell of ruin led by artificially introduced plants. In the Shola grasslands, eucalyptus plantations have run amok, whereas the Malabar silk-cotton tree has been running riot in the wet Terai grasslands of the Himalaya.

Topic - major separatist groups in Myanmar: (Internal security and IR)

Kachin Independence Army (KIA): Representing the Kachin ethnic group in northern Myanmar, the KIA has been fighting for autonomy since the 1960s. The conflict in Kachin State has been particularly intense, with allegations of human rights abuses and significant humanitarian concerns.

Karen National Union (KNU) and Karen National Liberation Army (KNLA): The Karen people are one of the largest ethnic groups in Myanmar, and the KNU has been fighting for autonomy for over six decades. The KNLA is the armed wing of the KNU. The Karen conflict has led to significant displacement and suffering among the Karen population.

- **Shan State Army (SSA): The Shan people are another major ethnic group in Myanmar, and various factions of the SSA have been involved in armed conflict against the central government. The Shan States are rich in natural resources, and the conflict is also influenced by the control over these resources.**
- **Arakan Army (AA): Representing the Rakhine ethnic group, the AA has been involved in a conflict with the Myanmar military since 2018. The conflict has led to a large-scale humanitarian crisis in Rakhine State.**

- **United Wa State Army (UWSA):** The Wa are one of the largest ethnic groups in Myanmar's Shan State. The UWSA is considered one of the strongest ethnic armed groups in Myanmar, controlling a large area and engaging in ceasefire negotiations with the government.
- **New Mon State Party (NMSP):** Representing the Mon people, the NMSP has been involved in a long-standing conflict for autonomy in Mon State. The Mon conflict has seen periods of ceasefire and tension, with the NMSP seeking a political solution to achieve self-determination for the Mon people.

China’s influence

China has responded to the fluid political process by engaging with multiple actors.

Given its massive investments and economic interests in the region, China has often extended support to the Myanmar military on various international platforms.

Simultaneously, it has also kept substantive relations with many armed groups, including the Brotherhood Alliance and the United Wa State Army (UWSA).

It was Beijing which facilitated some ceasefires between the military and the EAOs, such as the Haigeng ceasefire agreement in January this year, which proved to be temporary.

- **Beijing’s policy towards Myanmar is also guided by emerging security threats, such as the activities of online criminal syndicates operating near the China-Myanmar border, which are targeting Chinese citizens.**
- **Over the years, the UWSA was purportedly the conduit through which some of the armed groups received Chinese weapons. The EAOs reportedly procured commercial drones from the Chinese market and used them in their operations against the military.**

- **If India, despite a lack of geographic contiguity, could construct massive infrastructure projects amidst the civil war in Afghanistan, there is no reason why it could not do more in neighbouring Myanmar for regional peace and prosperity**

Target Mains -2024/25 -

Q What is open ecosystem ?? Explain the impact of woody encroachment on such ecosystem.

Connect with sir 9057921649

send your answer - Saurabh pandey upsc telegram channel