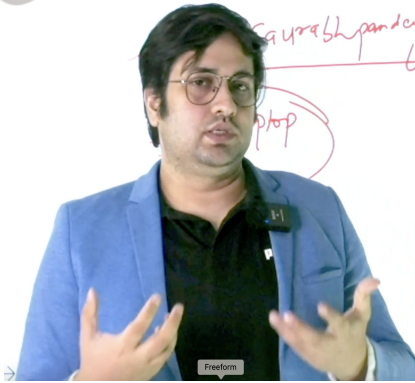
Topics - MINDS MAPS included (Daily current affairs 8th January 2025

- Target UPSC CSE Prelims 2025
- WHY EARTHQUAKE IN TIBET??
- India-U.S. Cooperation on Sonobuoys
- What is Bharatpol?
- →AI Governance in India:
- MicroRNAs
- The Atlantic Meridional Overturning Circulation (AMOC),
- The Tingry County Earthquake's Impact and Implications
- Exploring Greenland
- Mains



By saurabh Pandey

THE HINDU

Target Mains -2025/26 -

Q Explain the impact of The Atlantic Meridional Overturning Circulation (AMOC) on shaping climatic pattern of the region .

Q8. Rambhog recently seen in news is associated with which among the following. (DTE)

A) Banana variety

B) Coconut plantation

C) Paddy variety

D) Wheat variety

Schedule CRASH COURSE ON UPSC CSE Prelims 2025

(Upcoming week, 6th to 11th January)

Monday	6th January 2025	Indian Geography through Mapping of INDIA (Mountain)
Wednesday	8th January 2025	Indian GEOGRAPHY through mapping (Passes, Rivers)
Friday	10th January 2025	Agriculture for GS
Saturday	11th January 2025	Agriculture for GS

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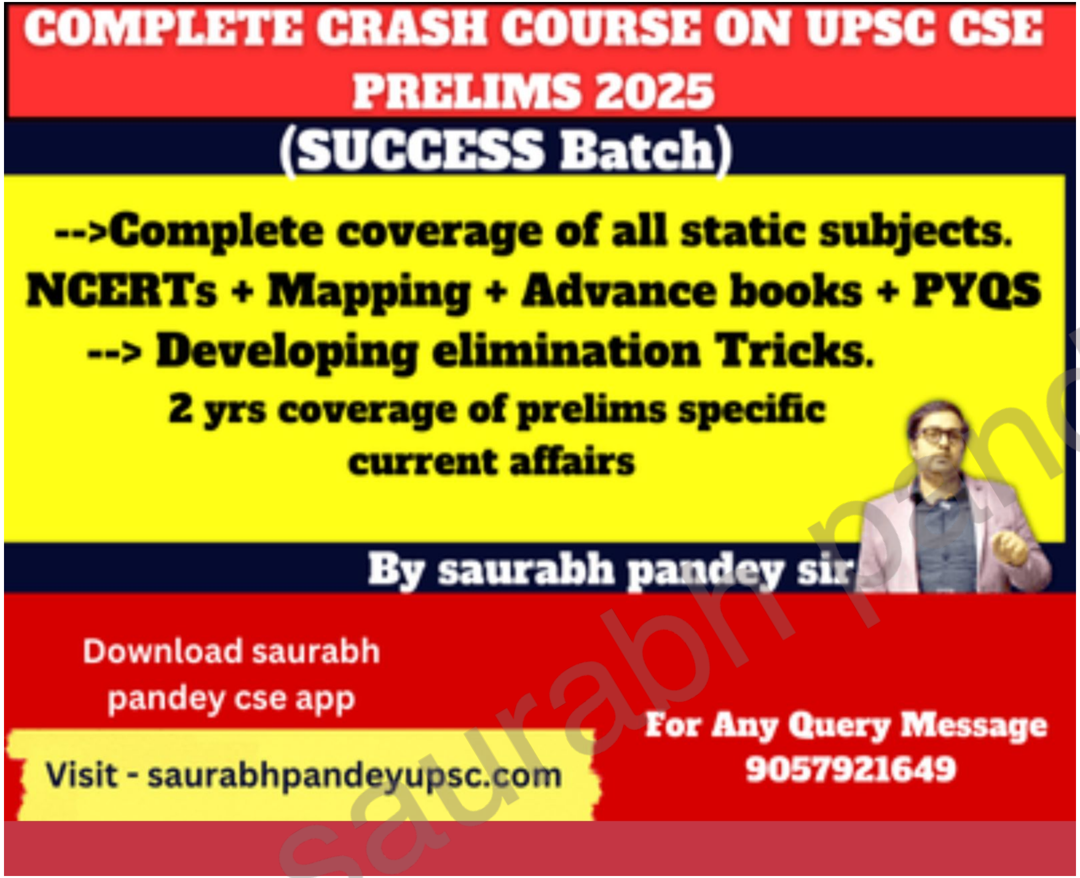

EVERYTHING IN ONE COURSE !!

Rubble remains: Damaged houses in Xigaze, Tibet, after the arthquake hit the area. AFP

Earthquake in Tibet kills 126, injures 188; tremors felt in India and Nepal

Agence France-Presse
BEIJING

A devastating earthquake in China's remote Tibet region killed at least 126 people on Tuesday, state media reported, with tremors also felt in neighbouring Nepal's capital Kathmandu and parts of India.

Around 188 people were injured as the earthquake struck the rural, high-altitude Tingri county.

The China Earthquake Networks Center (CENC) measured its magnitude as 6.8, while the U.S. Geological Survey reported it as 7.1.

A 6.8-magnitude earthquake struck near one of Tibet's holiest cities on Tuesday, killing at least 95 people and injuring 130 others with tremors also shaking buildings and forcing people to run to the streets in parts of neighbouring Nepal and India.

According to regional disaster relief headquarters, the earthquake jolted Tingri County in Xigaze of Tibet Autonomous Region in China at 9:05 a.m. on Tuesday(Beijing Time).

Xigaze, also known as Shigaste, is close to the border with India.

FULL REPORT
» PAGE 14

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FULL REPORT
» **PAGE 14**

Topic -- WHY EARTHQUAKE IN TIBET??

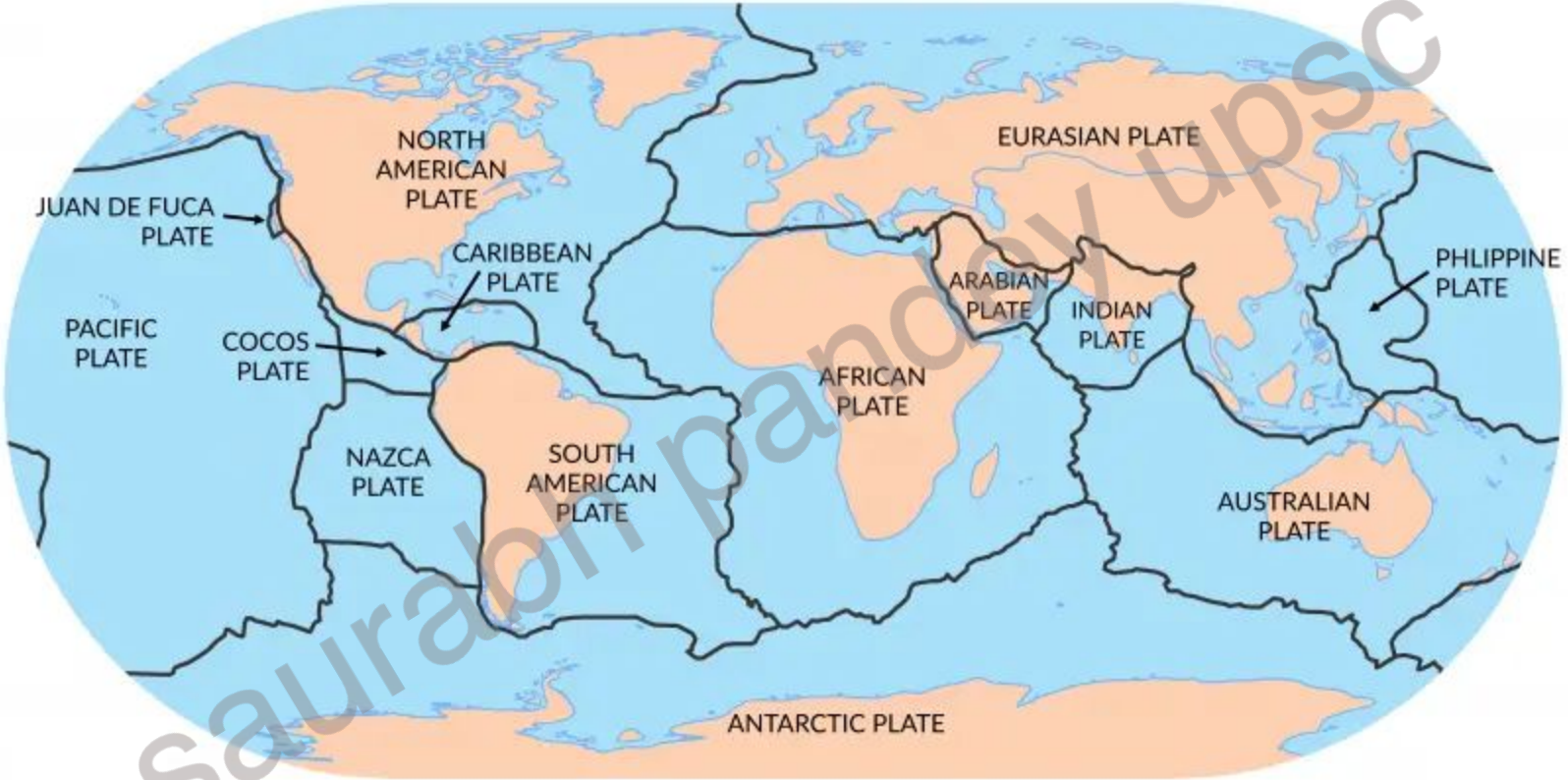
The earthquake was triggered by a rupture in the Lhasa block - an area under significant tectonic stress.

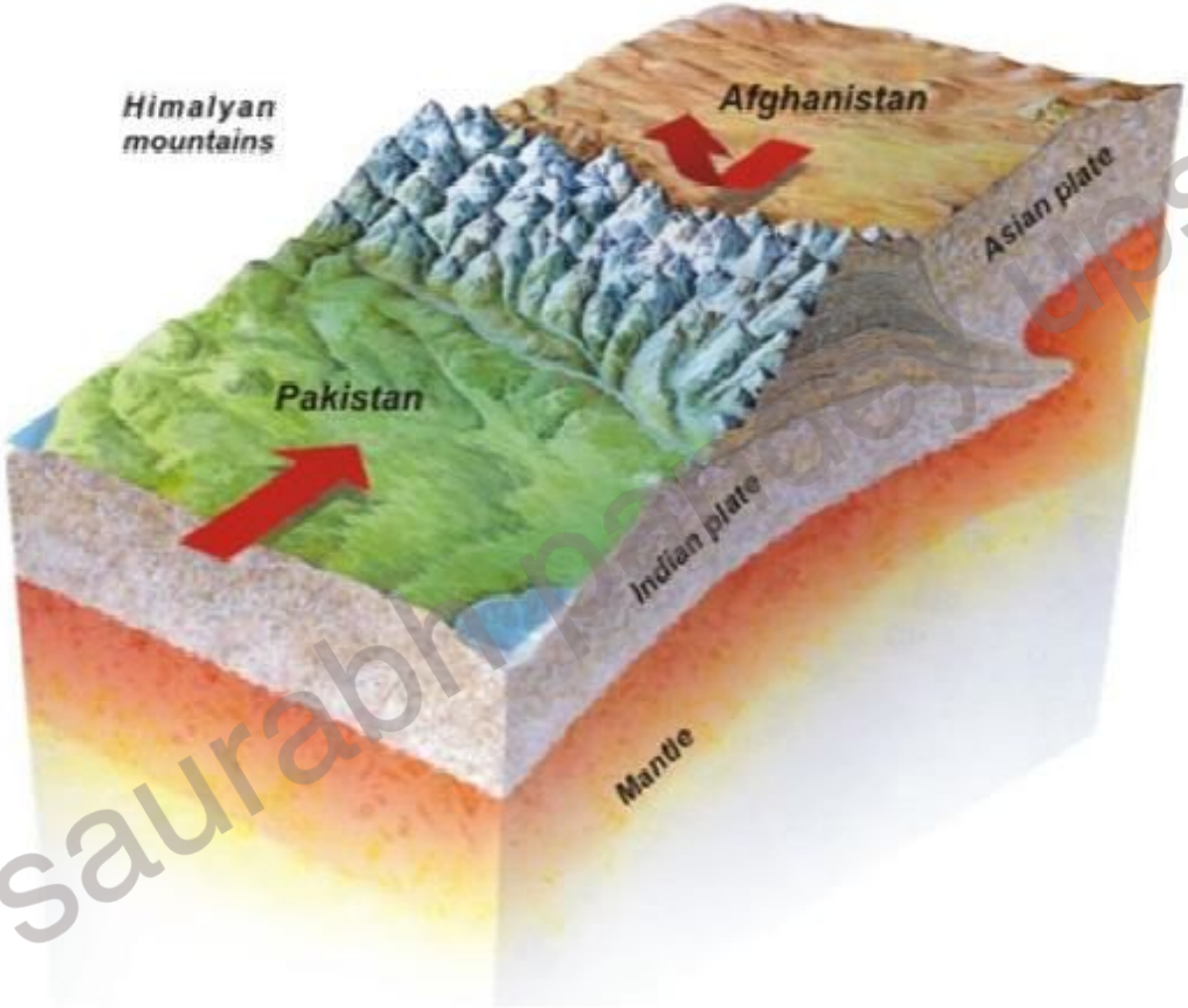
This area is a hotspot for seismic activity due to the ongoing collision of the Indian and Eurasian tectonic plates, a process that's been shaping the Himalayas for the past 60 million years. Tibet has seen several earthquakes in the past few decades, including a magnitude 8.6 quake in 1950.

The Indian plate, which collided with the Eurasian plate, is slowly peeling apart beneath Tibet, as per a study published last year.

This "slab tear" is a process where the upper crust of the Indian plate detaches from its denser lower layer, creating significant seismic activity in the region. This tearing process could divide Tibet into two parts, though it's not likely to cause a visible crack on the surface.

The tear comes deep beneath the Earth's surface and may influence seismic activity in the region. Scientists are studying earthquake waves, deep-layer earthquakes, and gas emissions to understand the potential impact of this tectonic behaviour.





India, U.S. to jointly manufacture interoperable sonobuoys for Navy

These undersea instruments are niche equipment effective in detecting submarines lurking deep in the oceans; both countries are cooperating on high-end technology amid rapid expansion of Chinese naval presence in the Indian Ocean

Dinakar Peri
NEW DELHI

State of the art: Discussions are on between Ultra Maritime and Bharat Dynamics Ltd. on a partnership for the co-production of sonobuoys . WIKIMEDIA COMMONS

In a significant development, India and the United States announced cooperation on co-production of U.S. sonobuoys for undersea domain awareness (UDA) for the Indian Navy, a high-end technology that allows tracking submarines in the deep seas and oceans.

This is the latest in a series of cooperation measures between the two countries as both grow wary of the rapid expansion of Chinese naval presence in the Indian Ocean Region.

"Welcoming the advancement of discussions between Ultra Maritime (UM) and Bharat Dynamics Limited (BDL) to enhance undersea domain awareness through a first-of-its-kind partnership on co-production of U.S. sonobuoys in support of the U.S. and Indian defence industrial bases," said a fact sheet titled 'The U.S. and India committed to strengthening strategic technology partnership" issued on Tuesday at the end of U.S. National Security Adviser Jake Sullivan's visit to India on the aspect of deepening defence innovation and industrial cooperation.

Mr. Sullivan, on his final trip to the region as NSA, held a capstone meeting with his Indian counterpart, Ajit Doval.

"In line with the U.S.-India Initiative on Critical and Emerging Technologies (iCET) launched in May 2022, the Ultra Maritime and BDL teams will also pursue new sonobuoy technologies to optimise their acoustic performance in the unique environment of the Indian Ocean, enabling wide area search through bespoke multi-static active solutions," Ultra Maritime, a U.S.-based world leader in the design and production of undersea warfare capabilities, said in a statement.

They will jointly manufacture and supply sonobuoys for the Indian Navy as per U.S. Navy standards, with production split across the U.S. and India, in accordance with "Make in India" principles, it stated.

"The announcement today by NSA Jake Sullivan reflects Ultra Maritime's commitment to the Indian Navy in partnering with BDL for production and delivery of world-class sonobuoys, and our resolute commitment to continue to develop forward leaning solutions to unique undersea challenges," said Ultra Maritime CEO Carlo Zaffanella in the statement.

BDL Chairman Commodore A. Madhavarao (retd.) said BDL was completely aligned with the Indian Navy to meet the operational demand for 'Make in India' sonobuoys and committed to joint production with Ultra Maritime in Visakhapatnam.

Highlighting the aspect of interoperability, a key focus area, Rear Admiral Mark Kenny (retd.), senior vice-president at Ultra Maritime for strategy and business development, said: "The UM sonobuoys co-produced in India are interchangeable and interoperable between U.S. Navy, Indian Navy and allied P-8, MH-60R and the MQ-9B Sea Guardian aircraft."

Significant move

This is particularly significant as India has over the years acquired a series of military platforms from the U.S. that are also operated by other countries in the region, especially Australia and Japan, all four of which comprise the Quad grouping and also hold the Malabar naval exercise.

The Indian Navy operates the P-8I long range maritime patrol aircraft, is inducting the MH-60R multi-role helicopters and has two MQ-9A armed High Altitude Long Endurance (HALE) Remotely Piloted Aircraft Systems on lease and signed a $3.5 billion contract in October 2024 for 31 MQ-9B - 15 Sea Guardians for the Indian Navy and 16 Sky Guardians, eight each for the Army and Air Force, with deliveries to begin from January 2029. After Maritime Domain Awareness, UDA has emerged as a key focus area for India and among the Quad.

Topic → India-U.S. Cooperation on Sonobuoys

Key Points

🇮🇳 India-U.S. Cooperation: Partnership for co-production of sonobuoys to enhance undersea domain awareness for the Indian Navy.

🌊 Technology for Tracking: Sonobuoys are crucial for tracking submarines, enhancing maritime security.

🛡️ Response to Chinese Expansion: Collaboration addresses concerns over Chinese naval presence in the Indian Ocean.

🤝 Joint Production: Manufacturing split between the U.S. and India, adhering to "Make in India" principles.

✈️ Interoperability: Compatible with various military platforms, enhancing operational synergy.

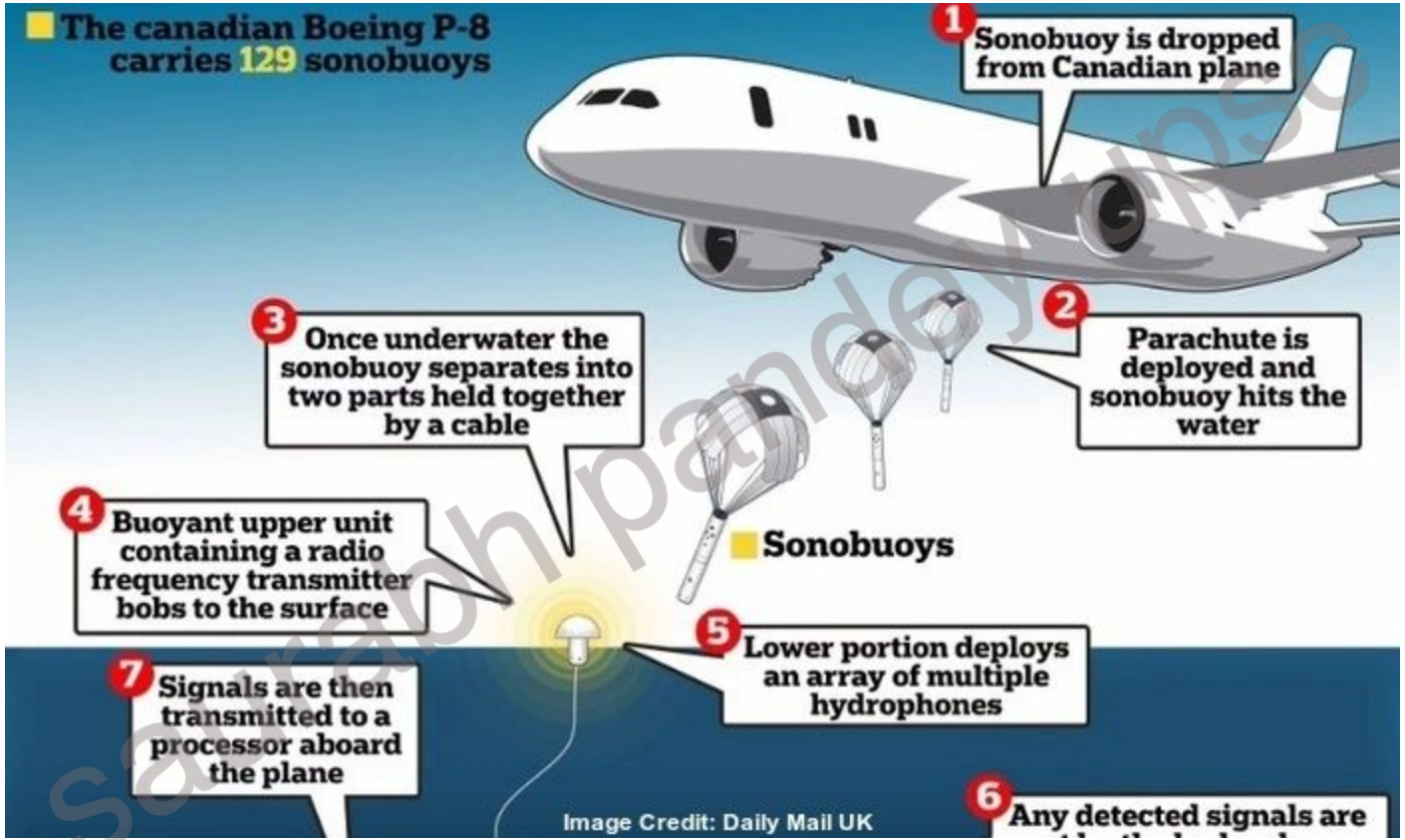
🚢 Quad Grouping: Strengthens defense ties among Quad nations (India, U.S., Australia, Japan).

📅 Future Contracts: India signed a $3.5 billion contract for MQ-9B drones, with deliveries starting in January 2029.

Summary: India and the U.S. are collaborating on the co-production of sonobuoys to bolster undersea domain awareness for the Indian Navy, amid growing concerns over Chinese naval activities

A **sonobuoy**

- A **sonobuoy** is a small expendable sonar buoy dropped from aircraft or ships for anti-submarine warfare or underwater acoustic research.
- Sonobuoys are typically around 13 cm (5 in) in diameter and 91 cm (3 ft) long. When floating on the water, sonobuoys have both a radio transmitter above the surface and hydrophone sensors underwater



Bharatpol to aid in nabbing fugitive criminals 'wherever they hide': Home Minister

The Hindu Bureau
NEW DELHI

Union Home Minister Amit Shah with CBI Director Praveen Sood at the launch of the 'Bharatpol' portal in New Delhi on Tuesday. PTI

Union Home Minister Amit Shah on Tuesday inaugurated the Bharatpol portal, which aims to provide police and security agencies in India with a seamless connect to Interpol, the international police organisation.

He said criminals committing crimes in India and fleeing to other countries had evaded the reach of Indian laws for years. However, with the implementation of modern systems such as Bharatpol, such criminals could now be brought within the ambit of justice.

Mr. Shah said the new criminal law enabled the prosecution of fugitive criminals through trials in absentia and, with the capabilities of Bharatpol, fugitives could be brought to justice "wherever they hide".

He said the new law would simplify the process of extraditing convicted criminals to India.

He urged the Central Bureau of Investigation (CBI) to take the lead in implementing Bharatpol and ensuring widespread training in its use at the grassroots level. The portal has been developed by the CBI.

The five key modules of Bharatpol – Connect, Interpol notices, References, Broadcast, and Resources – provide a technological platform to support all Indian law enforcement agencies, the Home Minister said.

He said that through Connect, all Indian law enforcement agencies would essentially function as an extension of Interpol's National Central Bureau (NCB-New Delhi). The system would ensure quick and structured transmission of requests for Interpol notices, enabling a scientific mechanism to swiftly locate criminals from India and across the globe.

Topic → What is Bharatpol?

Bharatpol is an online platform designed to connect Indian law enforcement agencies with Interpol, enabling swift communication and data exchange. Here are some key features of Bharatpol:

Centralized Database: A comprehensive repository of criminal information accessible by law enforcement across India.
Real-time Updates: Instant notifications regarding international criminal activities and alerts.
User-Friendly Interface: Designed for ease of use by law enforcement officials, ensuring quick access to necessary data.

This initiative represents a significant leap forward in the fight against transnational crime, positioning India as a proactive player in global law enforcement efforts

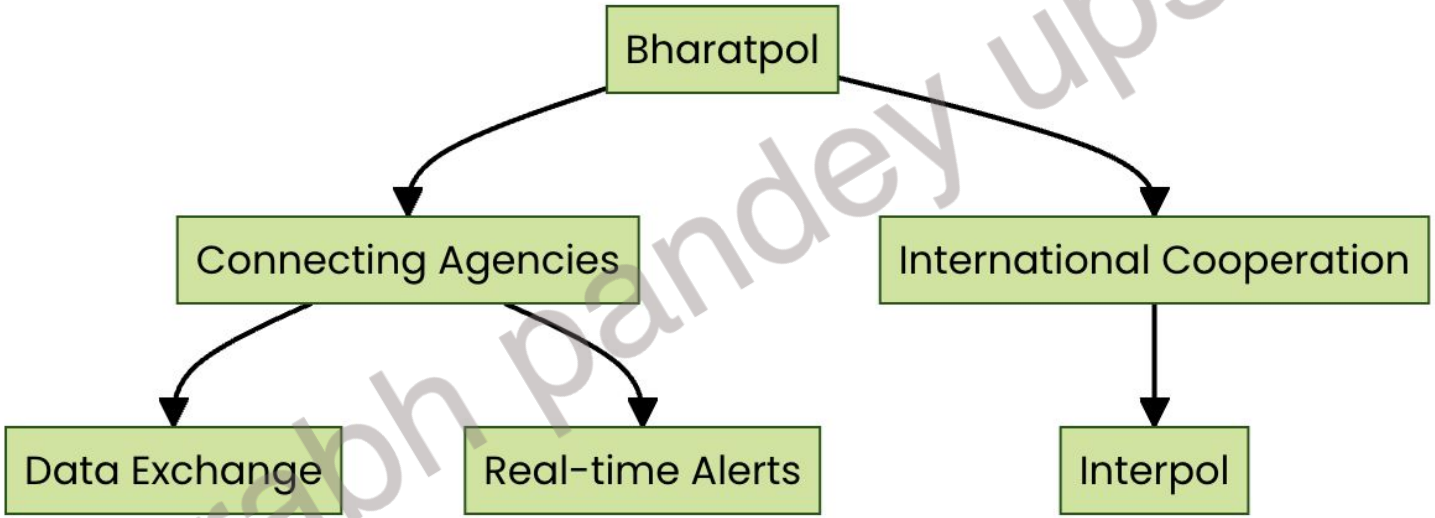


Image of Bharatpol Interface

Inter-ministerial committee is needed to strengthen AI governance: IndiaAI Mission

Aroon Deep
NEW DELHI

In a recognition that artificial intelligence (AI) has impact on a wide range of fields, a Union government panel mandated to develop AI guidelines has recommended that an inter-ministerial committee be set up to enforce AI rules and ensure effective governance of the country's emerging AI ecosystem.

An advisory group of the Union Ministry of Electronics and Information Technology's IndiaAI Mission, headed by the Principal Scientific Adviser, is seeking public feedback on a report released on Monday by its AI guidelines sub-committee.

The panel's report is notable as it is the most detailed articulation yet of the government's approach towards AI in India.

The IndiaAI Mission is seeking feedback on a report released on Monday. GETTY IMAGES

It appears that the Centre seeks to maximise gains from investments in AI, while having light regulatory frameworks to act as guardrails against any potential harm.

Apart from an inter-ministerial AI coordination committee or governance group to oversee AI in India, the panel recommended that the IT Ministry should house a "technical secretariat" to bring in officers on deputation from other departments and regulators. This would help to "pool together multi-disciplinary expertise", map stakeholders in the AI ecosystem, and assess risks, along with other research, it recommends.

The report outlines the following principles for AI governance: transparency of AI systems with "meaningful information on their development" and capabilities; accountability from developers and deployers of AI systems; safety, reliability and robustness of AI systems by design; privacy and security of AI systems; fairness and non-discrimination; human-centred values and "do no harm"; inclusive and sustainable innovation to "distribute the benefits of innovation equitably"; and "digital by design" governance to "leverage digital technologies" to operationalise these principles.

Topic →AI Governance in India: A Comprehensive Overview

Key Developments in AI Governance

🤖 AI Governance Panel: Establishment of a Union government panel to create guidelines for AI governance in India.

🏛️ Interministerial Committee: Recommendation to form a committee to enforce AI rules and ensure effective governance.

📊 Public Feedback: The IndiaAI Mission's advisory group is seeking public input on the AI guidelines report.

📜 Comprehensive Report: The report outlines the Indian government's approach to AI, focusing on maximizing investment gains with minimal regulation.

🏢 Technical Secretariat: Proposal for the IT Ministry to create a secretariat for pooling expertise and assessing AI risks.
🔍 Principles for AI Governance: Emphasis on transparency, accountability, safety, privacy, fairness, human-centered values, inclusive innovation, and digital governance.

🌍 Equitable Innovation: Stress on sustainable innovation that equitably distributes AI benefits across society

Summary: A Union government panel in India has proposed guidelines for AI governance, recommending an interministerial committee and emphasizing principles like transparency, accountability, and equitable innovation.

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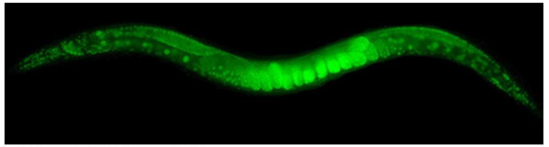
NEWS --V. Narayanan, spacecraft and rocket propulsion expert, appointed ISRO Chairman



An adult *C. elegans* worm glows after a GFP coding sequence was inserted into it. DAN DICKINSON, GOLDSTEIN LAB, UNC CHAPEL HILL, (CC BY-SA 3.0)

How curiosity-driven research into a worm won four Nobels

Advances in health often arise from solving fundamental biological problems. One difficulty is identifying the right place where the answer can be found. *Caenorhabditis elegans* provides such a setting: a versatile model whose results often reveal general principles with parallels in humans

Rohini Karandikar
Sandhya P. Koushika

miRNAs are molecules that turn off gene expression. This fundamental advance, which won Victor Ambros and Gary Ruvkun a Nobel Prize in 2024, is another example of an unexpected finding arising from curiosity

Victor Ambros and Gary Ruvkun won the 2024 Nobel Prize in Physiology or Medicine for discovering microRNAs and their role in controlling gene expression. This pioneering discovery was made using the roundworm *Caenorhabditis elegans*. This 1 mm long, slender, and transparent nematode has been the star of many pathbreaking discoveries in biology, four of which have won Nobel Prizes.

How did *C. elegans*, a tiny invertebrate, become such a crucial tool for biological research? What insights did this worm yield? What is the value of such research for society when one can argue that our focus should be on studying human biology?

Advances necessary for human health and welfare often arise from solving fundamental biological problems. One major difficulty isn't just finding the right question to ask but also finding the right place to ask it where it can be solved. *C. elegans* provides exactly such a setting: a relatively simple yet versatile model for biological investigations whose results often reveal general principles that remain valid or have parallels in other organisms, including humans.

The worm's story also highlights how breakthroughs can arise from research driven by curiosity.

Humble beginnings

In 1963, biologist Sydney Brenner wrote to his peer Max Perutz his thoughts on research in the fields of development and neurobiology. He believed that as the nature of problems in these areas wasn't clearly defined, there was a gap in identifying the right experimental approach that would lead to "defining [the] unitary steps of any given process."

Brenner suggested the use of genetic analysis in defining these steps in both animal development and the nervous system. He chose the nematode *C. elegans* for its simplicity and because it has several organ systems akin to those found in humans, allowing a chance to identify principles in development.

In 1963, Brenner requested another scientist, Ellsworth Dougherty, for a culture of *C. elegans* and sought his guidance on its growth conditions. This culture of sharing resources and unpublished information continues to this day.

Cell death

Brenner shared the 2002 Nobel Prize for medicine with H. Robert Horvitz and John Sulston "for their discoveries concerning genetic regulation of organ development and programmed cell death." In his award ceremony, Brenner said, "Without a doubt, the fourth winner of the Nobel Prize this year is *Caenorhabditis elegans*: it deserves all of the honour, but, of course, it will not be able to share the monetary award."

Brenner established *C. elegans* as a genetic model and demonstrated that genes in the worm could be mutated, resulting in observable changes in development and behaviour.

In 1976, Sulston elucidated the cell lineage of *C. elegans*, which is the developmental history of all cells of this nematode. He tracked cell divisions from the fertilised single cell to the final 959 cells in the adult organism. This was possible because of the worm's transparency but nonetheless was a daunting task.

Sulston showed that precisely 131 of the 1,090 cells born died during development and that cell death was genetically controlled. He described the steps involved in programmed cell death, where healthy cells killed themselves.

Horvitz identified the genes essential for cell death and the genes that prevented it. He found that the process of cell death arose from interactions among key genes and followed a specific molecular pathway.

An image of *Caenorhabditis elegans* WORMS. MEGHA RAJSEKHAR, ARRANGEMENT

His team's work in *C. elegans* showed that many genes involved in cell death also have counterparts in humans. Thus, research in *C. elegans* was particularly important in advancing understanding of the role of programmed cell death in human development, e.g., of fingers, the nervous system, and in some cancers.

Ageing and genome sequencing

Work in *C. elegans* also revealed insights into the pathways that regulate ageing. The early work of Michael Klass, Tom Johnson, and Cynthia Kenyon in the 1980s and 1990s identified some of the genes leading to longer lifespans than seen in normal worms. Further work in this direction led to the appreciation of the role of insulin signalling pathways in ageing. This has led to *C. elegans* being used as a key model for discovering the molecular mechanisms of ageing and as a test bed for drugs that might influence this process.

The genomic information of any organism is invaluable in linking the observable characteristics to a particular gene. Sequencing the *C. elegans* genome started in 1990 and was an exemplar for the larger Human Genome Project. The whole genome sequence of *C. elegans* was carried out by a consortium working together across continents. It was led by Robert Waterston at the Genome Sequencing Center at Washington University, U.S., and Richard Durbin at the Sanger Centre in the U.K.

The technology and the software tools developed to sequence the *C. elegans* genome led the way in achieving the scale and efficiency critical to sequencing larger genomes.

It was debated if human whole genome sequencing data should be publicly available, as private sequencing efforts wished to patent some of the genes. The open sharing of *C. elegans* data and community feedback provided a model for the public human genome sequencing effort.

Gene silencing

A geneticist's dream is to control gene expression, which is the ability to turn genes "on" or "off" in a controlled manner. Andrew Fire and Craig Mello discovered using *C. elegans* that providing double-stranded RNA could lead to destruction of a much larger amount of the corresponding cellular RNA, suggesting double-stranded RNA was a catalyst for RNA interference. For their work, Fire and Mello jointly received the 2006 Nobel Prize for medicine.

The discovery of RNA interference led to technologies for a highly specific approach to gene-silencing that work in all known organisms. They also have applications in therapeutics for cancer and some inherited gene disorders.

Glowing worms

A dream of biologists is to track biological processes and gene products in living cells. The green fluorescent protein (GFP) revolutionised our ability to do this. How this came about is another success story of curiosity-driven research.

Osamu Shimomura was trying to understand why jellyfish are fluorescent. In the 1960s, he identified bioluminescent proteins like GFP from the jellyfish *Aequorea victoria*. In 1994, Chalfie was able to introduce GFP into live *C. elegans*. The transparency of the organism meant he could see green glowing cells when the organism was illuminated by blue light.

GFP was soon widely used in many organisms and has transformed biological research. Together with Roger Tsien's success in making fluorescent proteins of multiple colours, scientists today can follow multiple processes and proteins simultaneously in a variety of organisms.

Shimomura, Chalfie, and Tsien received the 2008 Nobel Prize in chemistry for developing GFP.

The microRNA prize

The discovery of microRNAs (miRNA) challenged the central dogma, which said RNAs were mere conduits of information that flowed from DNA to proteins.

miRNAs are a class of molecules that turn off gene expression at the right time and place. This fundamental advance, which won Victor Ambros and Gary Ruvkun a Nobel Prize in 2024, is another example of an unexpected finding arising from curiosity. The clues discovered in *C. elegans* that miRNAs could bind corresponding cellular RNAs to reduce protein expression.

It is established that gene regulation by miRNAs is an essential process during development and for organisms to have normal physiological processes. There is increasing recognition of the value of miRNAs in diagnostics and therapeutics as well.

A prize for neuronal circuits

C. elegans has just 302 neurones, yet exhibits complex behaviour. Thus it offers a promising model to study a nervous system simple enough to analyse while still yielding valuable lessons about general principles.

Naturally, a useful step is to build a layout of all its neurones. Brenner began such a reconstruction of the *C. elegans* nervous system in the 1970s. It was a formidable challenge, never attempted before. John White, Brenner's PhD student, set up a computer system for neuron reconstructions from electron micrographs. He stayed on after his PhD to reconstruct the *C. elegans* connectome, a map of all neuronal connections.

This was well before sophisticated tools were available and was the first such effort for any organism. The connectome immediately opened the door to questions about how neural circuits function. For example, in the 1980s, Chalfie used laser-based neurone-killing experiments to determine the circuit for the escape response to touch.

Holding promise

We can ask questions about the relationship between the genetics of neural circuits and behaviour. The answers, when we can find them in specific contexts, are difficult to obtain, extremely complex, and yet vital for our understanding.

Cornelia Bargmann won the 2013 Breakthrough Prize in Life Sciences for her research on the olfactory system of *C. elegans*. The sense of smell is very important for many organisms. *C. elegans* has a large number of olfactory receptors and uses complex machinery to sense smells and respond, adapt, and learn.

Bargmann took on this complex problem and unearthed remarkable insights in all these aspects through elegant experiments. She identified smell neurones in *C. elegans*. Her lab also showed that despite there being a fixed template for sensing attractive and repulsive cues, individual genetic variation and an ability to integrate environmental cues allowed the olfactory circuit to be very flexible as well.

Many of these findings also hold true in organisms like mice, with promise for understanding the human brain.

Rohini Karandikar is a science communicator, educator, and facilitator. Sandhya P. Koushika is a cellular neurobiologist who works with C. elegans *at the Tata Institute of Fundamental Research, Mumbai. rohinikarandikar84@gmail.com, sandhyakoushika@gmail.com)*

Topic → MicroRNAs

What are microRNAs? MicroRNAs are small RNA molecules that regulate gene expression by binding to messenger RNAs and preventing protein production.

Why is C. elegans used in research? C. elegans is a simple, transparent organism with a well-defined genetic structure, making it an ideal model for studying biological processes.

What did Ambros and Ruvkun discover? They discovered the role of microRNAs in controlling gene expression, which has significant implications for biology and medicine.

How has C. elegans contributed to our understanding of aging? Research on C. elegans has identified genes that influence lifespan and aging processes, providing insights applicable to more complex organisms.

. **What are the future prospects for C. elegans research?** C. elegans will continue to be a valuable model for studying genetics, neural circuits, and potential therapeutic applications in human health.

MicroRNAs: Key Regulators in Gene Expression

Overview

🧬 MicroRNAs (miRNAs): Small, non-coding RNA molecules crucial for regulating gene expression.

📉 Function: Bind to complementary sequences on messenger RNA (mRNA), causing mRNA degradation or translation inhibition.

🔬 Biological Roles: Involved in development, cell differentiation, and apoptosis (programmed cell death).

Disease Association

🦠 Dysregulation: Linked to diseases such as cancer, cardiovascular diseases, and neurological disorders.

🌱 Therapeutic Potential: Applications in gene therapy and as biomarkers for disease diagnosis.

Research and Conservation

📊 Research Growth: A rapidly expanding field with ongoing studies to understand miRNA functions and mechanisms.

🌍 Conservation: miRNAs are conserved across many species, highlighting their fundamental role in biological systems

Summary: MicroRNAs are essential regulators of gene expression, influencing various biological processes and linked to numerous diseases

Lava erupting over the Mount Etna volcano in Sicily in July 2024. AFP

The latest science on climate change

Agence France Presse

After another record-breaking year for global temperatures in 2024, pressure is rising on policymakers to step up efforts to curb climate change. The last global scientific consensus on the phenomenon was released in 2021, but scientists say evidence shows the effects of global warming are unfolding faster than expected.

Here is some of the latest climate research.

The world may already have hit 1.5 degrees C of warming above the average pre-industrial temperature -- a critical but also arbitrary threshold beyond which it is at risk of irreversible and extreme climate change, scientists say.

A group of researchers made the suggestion in a study released in November based on an analysis of 2,000 years of atmospheric gases trapped in Antarctic ice cores.

Scientists have typically measured today's temperatures against a baseline temperature average for 1850-1900. By that measure, the world is now nearly 1.3 C warmer.

But the new data suggests a longer pre-industrial baseline, based on temperature data spanning the year 13 to 1700, which put warming at 1.49 C in 2023, the study published in Nature Geoscience said.

The Atlantic Meridional Overturning Circulation (AMOC), which transports warm water from the tropics to the North Atlantic, has helped to keep European winters milder for centuries. Research in 2018 showed AMOC has weakened by about 15% since 1950, while research published in 2024 in the journal Science Advances suggested it could be closer to a critical slowdown than previously thought.

Globally, forests appear to be struggling. A July 2024 study found that forests overall failed in the year before to absorb as much carbon dioxide from the atmosphere as in the past

In addition, with the world in the throes of a fourth and the largest mass coral bleaching event, scientists fear the world's reefs have passed a point of no return.

Ocean warming is causing storms to intensify faster, with some leapfrogging strength categories in just hours.

Likewise, global warming is drying waterways and sapping moisture from forests, creating conditions for bigger and hotter wildfires. Research published in October in *Nature Climate Change* calculated that about 13% of deaths associated with toxic wildfire smoke during the 2000s could be attributed to the climate effect on wildfires.

The Amazon in 2024 was in the grip of its worst, most widespread drought since records began in 1950. River levels sank to all-time lows while fires ravaged the rainforest. That added concern to findings last year that 10-47% of the Amazon will face combined stresses of heat and drought by 2050.

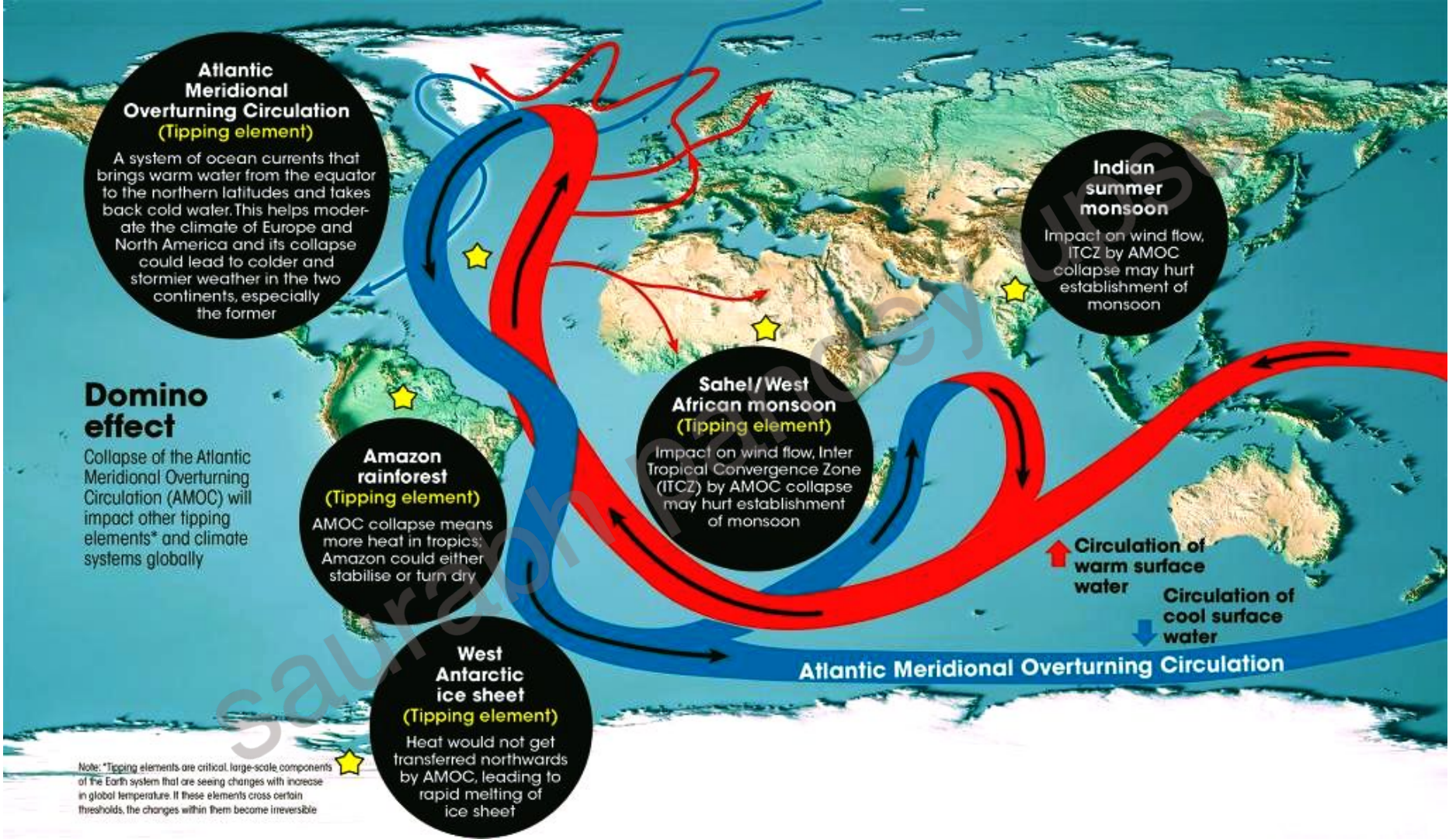
That could push the Amazon past a tipping point, with the jungle no longer able to produce enough moisture to quench its own trees, at which point the ecosystem could transition to degraded forests or sandy savannas.

Globally, forests appear to be struggling. A July 2024 study found that forests overall failed to absorb the year before as much carbon dioxide from the atmosphere as in the past.

Scientists fear climate change could even boost volcanic eruptions. In Iceland, volcanoes appear to be responding to rapid glacier retreat. As ice melts, less pressure is exerted on the earth's crust and mantle.

Topic →The Atlantic Meridional Overturning Circulation (AMOC),

- **The Atlantic Meridional Overturning Circulation (AMOC), which transports warm water from the tropics to the North Atlantic, has helped to keep European winters milder for centuries.**
- **Research in 2018 showed AMOC has weakened by about 15% since 1950, while research published in 2024 in the journal Science Advances suggested it could be closer to a critical slowdown than previously thought.**


Atlantic Meridional Overturning Circulation
(Tipping element)
A system of ocean currents that brings warm water from the equator to the northern latitudes and takes back cold water. This helps moderate the climate of Europe and North America and its collapse could lead to colder and stormier weather in the two continents, especially the former
Indian summer monsoon
Impact on wind flow, ITCZ by AMOC collapse may hurt establishment of monsoon
Domino effect
Collapse of the Atlantic Meridional Overturning Circulation (AMOC) will impact other tipping elements* and climate systems globally
Sahel/West African monsoon
(Tipping element)
Impact on wind flow, Inter Tropical Convergence Zone (ITCZ) by AMOC collapse may hurt establishment of monsoon
Amazon rainforest
(Tipping element)
AMOC collapse means more heat in tropics; Amazon could either stabilise or turn dry
Circulation of warm surface water
Circulation of cool surface water
Atlantic Meridional Overturning Circulation
West Antarctic ice sheet
(Tipping element)
Heat would not get transferred northwards by AMOC, leading to rapid melting of ice sheet
Note: *Tipping elements are critical, large-scale components of the Earth system that are seeing changes with increase in global temperature. If these elements cross certain thresholds, the changes within them become irreversible

The Atlantic Meridional Overturning Circulation: A Tipping Point for Our Climate?

What is the Atlantic Meridional Overturning Circulation (AMOC)?

The Atlantic Meridional Overturning Circulation (AMOC) is a major ocean current system that plays a crucial role in regulating the Earth's climate.

It consists of a network of currents that transport warm, salty water from the tropics to the North Atlantic, where it cools and sinks, creating a cycle that influences weather patterns across the globe.

Key Functions of AMOC:

Regulates temperature and climate in Europe and North America.
Influences marine ecosystems and weather patterns globally.
Acts as a key player in the carbon cycle by transporting heat and nutrients.

Recent Findings and Concerns

Recent studies have shown alarming evidence that the AMOC is weakening, raising concerns about its potential collapse. The implications of such a collapse could be catastrophic, leading to extreme weather events, rising sea levels, and disrupted ecosystems.

Recent Research Highlights:

A report by BBC indicates that the UK could face more severe weather as Atlantic currents slow down.

Scientists warn that the collapse of the AMOC is already happening, as detailed in a study from Earth.com.

Key findings suggest that the ongoing changes could impact global weather for centuries to come, stressing the urgency for further research and monitoring.

Impact of AMOC Changes on Weather Patterns

The changes in AMOC dynamics have profound effects on global weather patterns. Regions that rely on stable climates may experience drastic shifts, leading to unpredictable weather events.

Examples of Weather Impact:

Increased frequency of extreme winter storms in Europe.

Altered rainfall patterns in West Africa, potentially exacerbating drought conditions.

Changes in hurricane intensity in the Atlantic basin.

Future Outlook and Mitigation Strategies

The future of the AMOC hinges on our response to climate change. Mitigation strategies are essential to prevent further destabilization of this vital ocean current system.

Potential Strategies Include:

Reducing greenhouse gas emissions to limit global warming.

Promoting sustainable fishing practices to protect marine ecosystems.

Enhancing international cooperation to address climate change on a global scale

Mapping →Mt. Etna: A Geological Marvel

Overview

🌋 Mt. Etna is renowned as one of the most active volcanoes globally.

🇮🇹 Situated on the east coast of Sicily, Italy, it is a prominent geographical feature.

🌍 The volcano boasts a complex structure with numerous craters and vents.

🔥 Eruptions can range from mild lava flows to explosive events.

🏞️ Recognized as a UNESCO World Heritage Site for its geological importance.

🌱 The area around Mt. Etna is rich in biodiversity, supporting diverse ecosystems.
👩‍🔬 It serves as a significant site for scientific research and monitoring due to its frequent volcanic activity.

Significance

Geological Importance: Mt. Etna's frequent eruptions provide valuable insights into volcanic activity.

Biodiversity: The surrounding region supports a variety of plant and animal life.

Cultural and Scientific Interest: Attracts researchers and tourists alike.

Why the location of China's earthquake matters

What is a terrane? Was China's construction of the world's largest hydroelectric-power dam near the area where the 7.1 quake happened? What is the significance of the location?

The Hindu Bureau

The story so far:

At 6:35 am IST on January 7, an earthquake with a magnitude of 7.1 struck Tibetan China and Nepal. The epicentre was located 10 km below a spot around 80 km north of Mt Everest. As of 7 pm, Chinese state media had reported 95 people dead, 130 injured, and hundreds of houses flattened on its side of the border. Updates on damage and casualties from other areas, including Nepal, are awaited. There have also been reports of the tremors being felt as far away as Kathmandu, Thimphu, and Kolkata.

Where did the quake occur?

According to the China Earthquake Networks Centre, the point on the surface below which the epicentre lay was located in Tingry county in the Shigatse region of Tibet. This region lies 4-5 km above sea level on average and is home to some eight lakh people; the county itself is home to around 7,000 people.

The region's capital city is the seat of the important Panchen Lama of Tibetan Buddhism and thus bears considerable spiritual significance. The Dalai Lama issued a statement in which he said: "I offer my prayers for those who have lost their lives and extend my wishes for a swift recovery to all who have been injured." Tingry county is also a 'gateway' to Mt Everest and the surrounding terrain, which is a popular tourist destination. Local authorities have said however that the number of tourists is lower in winter. According to *Xinhua*, China has already closed tourists' access to the region since the earthquake struck.

Does the quake's location matter?

According to preliminary assessments, the quake's mainshock may have emerged in the Lhasa terrane. A terrane is a specific fragment of the crust.

The Lhasa terrane includes sites involved in China's construction of the world's largest hydroelectric-power dam. The Chinese government approved the project last month. Once completed, the project will straddle the Yarlung Tsangpo River and generate around 300 billion kWh per year.

The project has elicited expressions of concerns from India since the river subsequently flows into Arunachal Pradesh and Assam, where it becomes the Brahmaputra.

Experts have said the dam could affect the river's perennial status.

Second, the wider Himalayan region is considered to be the planet's 'third pole' for the amount of water it holds in its rivers, glaciers, and lakes and the effects their natural cycles have on the millions of people who depend on this water. Earthquakes have been known to force rivers to change course and to destabilise glaciers and lakes and increase the risk of flooding.

Third, the cause of the quake is also related to the significance of its location.

What caused the quake?

The tale of how the Himalayan mountains were created is well-known. Around 50 million years ago, the Indian plate collided with the Eurasian plate, causing rocks to fold and rise to create the mountains.

The tension between the two plates has continued to build as the Indian plate is still pushing in at around 60 mm/year. Earthquakes and tremors occur when the rock formations in the region shift ever so slightly as they adjust to the tension.

Since 1950, geologists have recorded more than 21 earthquakes of magnitude 6 or higher in the Lhasa terrane alone. The strongest of these occurred near Mainling in 2017 with a magnitude of 6.9, according to *Reuters*. Mainling is 960 km east of Tingry county.

To understand where the next quake might occur in the region and how powerful it might be, geologists need to understand the ancient plate collision in great detail, estimate how much tension is accumulating in different parts today, and how much of it has been released in past events.

THE GIST

- According to preliminary assessments, the quake's mainshock may have emerged in the Lhasa terrane. A terrane is a specific fragment of the crust.
- The Lhasa terrane includes sites involved in China's construction of the world's largest hydroelectric-power dam. The Chinese government approved the project last month. Once completed, the project will straddle the Yarlung Tsangpo River and generate around 300 billion kWh per year.
- The tension between the two plates has continued to build as the Indian plate is still pushing in at around 60 mm/year.

Topic →Understanding the Tremors: The Tingry County Earthquake's Impact a Implications

Where Did the Quake Occur?

Tingry County, located in the Shigatse region of Tibet, was the epicenter of a recent seismic event that shook the region. Here's what you need to know:

Geographical Context: Nestled at an elevation of approximately 4-5 km above sea level, Tingry County is not only a gateway to the majestic Mt. Everest but also a region steeped in cultural and spiritual significance.

Population: The county is home to around 7,000 residents, while the broader region supports nearly eight lakh people. This demographic aspect plays a crucial role in understanding the earthquake's impact.

Spiritual Significance: The capital city of Tingry is notably the seat of the Panchen Lama, making it a focal point for Tibetan Buddhism.

Does the Quake’s Location Matter?

The location of the earthquake is pivotal in understanding its implications:

Lhasa Terrane: Preliminary assessments suggest that the quake's mainshock originated within the Lhasa terrane, a fragment of the Earth's crust critical to ongoing geological studies.

Hydroelectric Project Concerns: Recent government approvals for a massive hydroelectric project on the Yarlung Tsangpo River have raised alarms both locally and internationally. Experts fear that this project could alter river patterns, impacting water flow into India, where it transforms into the Brahmaputra.

Himalayan Region's Water Resources: Known as the 'third pole' of the planet, the Himalayas hold significant freshwater resources. Disruption from earthquakes can lead to changes in river courses and increase risks associated with flooding and glacial destabilization

What Caused the Quake?

To understand this earthquake, we must delve into the geological history of the Himalayas:

Plate Tectonics: The Indian plate is colliding with the Eurasian plate at a rate of approximately 60 mm/year, accumulating tension that eventually releases as seismic events.

Historical Context: Since 1950, over 21 significant earthquakes have been recorded in the Lhasa terrane, with the most powerful occurring in 2017 near Mainling, registering a magnitude of 6.9.

Current Research: Geologists emphasize the need for ongoing studies to comprehend how the accumulated tension manifests in future earthquakes, particularly in relation to the historical collisions of tectonic plates

Impact on the Local Community

The repercussions of the earthquake extend beyond geology; they touch the lives of the residents:

Immediate Aftermath: Local authorities have reported various damages, prompting swift responses from emergency services.

Community Resilience: The Tibetan community, known for its resilience, has come together to support those affected. Local government initiatives have aimed at providing relief and recovery resources.

Tourism Impact: The earthquake has also affected tourism, with authorities restricting access to the region in the winter months, leading to a decline in visitors to this historically rich area

Future Implications

Looking ahead, the earthquake has significant implications for both the local community and scientific research:

Predicting Future Activity: Scientists are focused on understanding the ancient plate collisions and current tension accumulation to predict future seismic activity.

Preparedness Initiatives: Increased awareness and preparation strategies are being discussed among local communities to mitigate the impacts of future earthquakes.

Environmental Considerations: As the region continues to develop, the balance between natural forces and human endeavors will be critical to maintain

Trump refuses to rule out military action against Greenland and Panama Canal

Associated Press
PALM BEACH

U.S. President-elect Donald Trump on Tuesday said he would not rule out the use of military force to seize control of the Panama Canal and Greenland, as he declared U.S. control of both to be vital to American national security.

Speaking to reporters less than two weeks before he takes office on January 20 and as a delegation of aides and advisers that includes Donald Trump Jr. is in Greenland, Mr. Trump left open the use of the American military to secure both territories.

Bold remarks: U.S> President-elect Donald Trump speaks during a news conference at Mar-a-Lago in Florida on Tuesday. AP

Mr. Trump's intention marks a rejection of decades of U.S. policy that has prioritised self-determination over territorial expansion.

"I'm not going to commit to that," Mr. Trump said, when asked if he would rule out the use of the military. "It might be that you will have to do something. The Panama Canal is vital to our country." He added, "We need Greenland for national security purposes."

Greenland, home to a large U.S. military base, is an autonomous territory of Denmark, a longtime U.S. ally and a founding member of NATO. Mr. Trump cast doubts on the legitimacy of Denmark's claim to Greenland.

The Panama Canal has been solely controlled by the eponymous country for more than 25 years. The U.S. returned the Panama Canal Zone to the country in 1979 and ended its joint partnership in controlling the strategic waterway in 1999.

Topic →Exploring Greenland: A Land of Wonder and Opportunity

Introduction to Greenland

Greenland, the world's largest island, is a land steeped in mystique and wonder. With its expansive ice sheets, rugged terrain, and rich cultural heritage, it stands as a testament to the beauty of nature.

Geographic location: North Atlantic, between North America and Europe.

Cultural tapestry: Inuit heritage and modern influences.

Notable for its vast ice sheets, which play a critical role in global sea levels

Geographical & Natural Wonders

Greenland boasts stunning natural landscapes, from its colossal glaciers to its deep fjords. The island is a biodiversity hotspot, home to unique flora and fauna.

Glaciers & Ice Sheets: Cover approximately 80% of the island.
Fjords: Offer breathtaking views and are crucial for marine biology.
Wildlife: Polar bears, whales, and a variety of birds thrive in this unique environment.

Cultural Significance

The cultural landscape of Greenland is predominantly shaped by the Inuit. Their traditions and modern adaptations create a fascinating blend of the old and the new.

Inuit Culture: Rich in storytelling, art, and community values.
Language: Greenlandic is the primary language, reflecting the island's heritage.
Art: Traditional crafts and contemporary art showcase the island's vibrant culture


Saurabh pandey upso

Political Landscape and International Interest

Greenland's political status has garnered significant attention, especially in the context of global powers eyeing its resources and geographical position.

Historical Context: Greenland is an autonomous territory within the Kingdom of Denmark.

Recent Events: Interest from the United States and other nations in Greenland's resources.

Trump's Proposal: The former U.S. President's controversial interest in purchasing Greenland highlights its geopolitical importance.

Environmental Challenges

As the world grapples with climate change, Greenland faces its own set of challenges. The melting ice sheets contribute significantly to rising sea levels, impacting global ecosystems.

Climate Change Impact: Accelerated ice melt threatens biodiversity.

Environmental Initiatives: Local and international efforts to promote sustainability.

Future Outlook: Balancing development with environmental conservation

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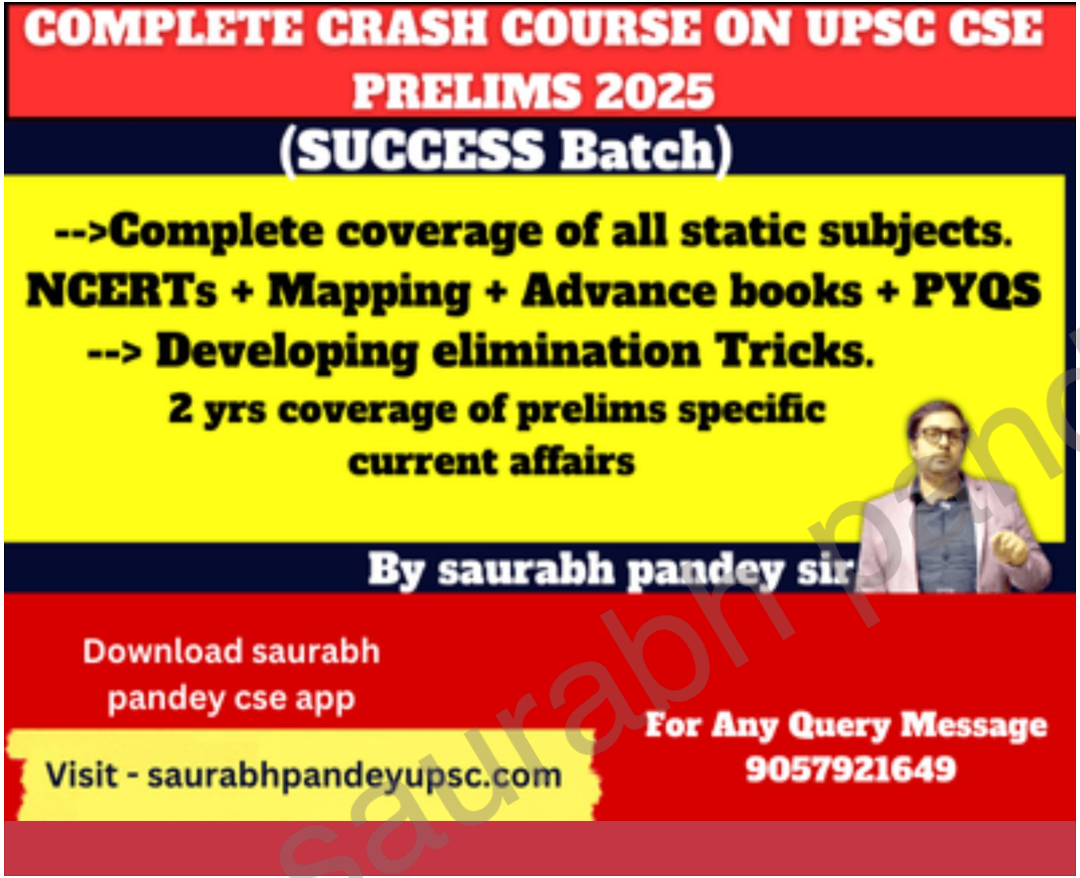

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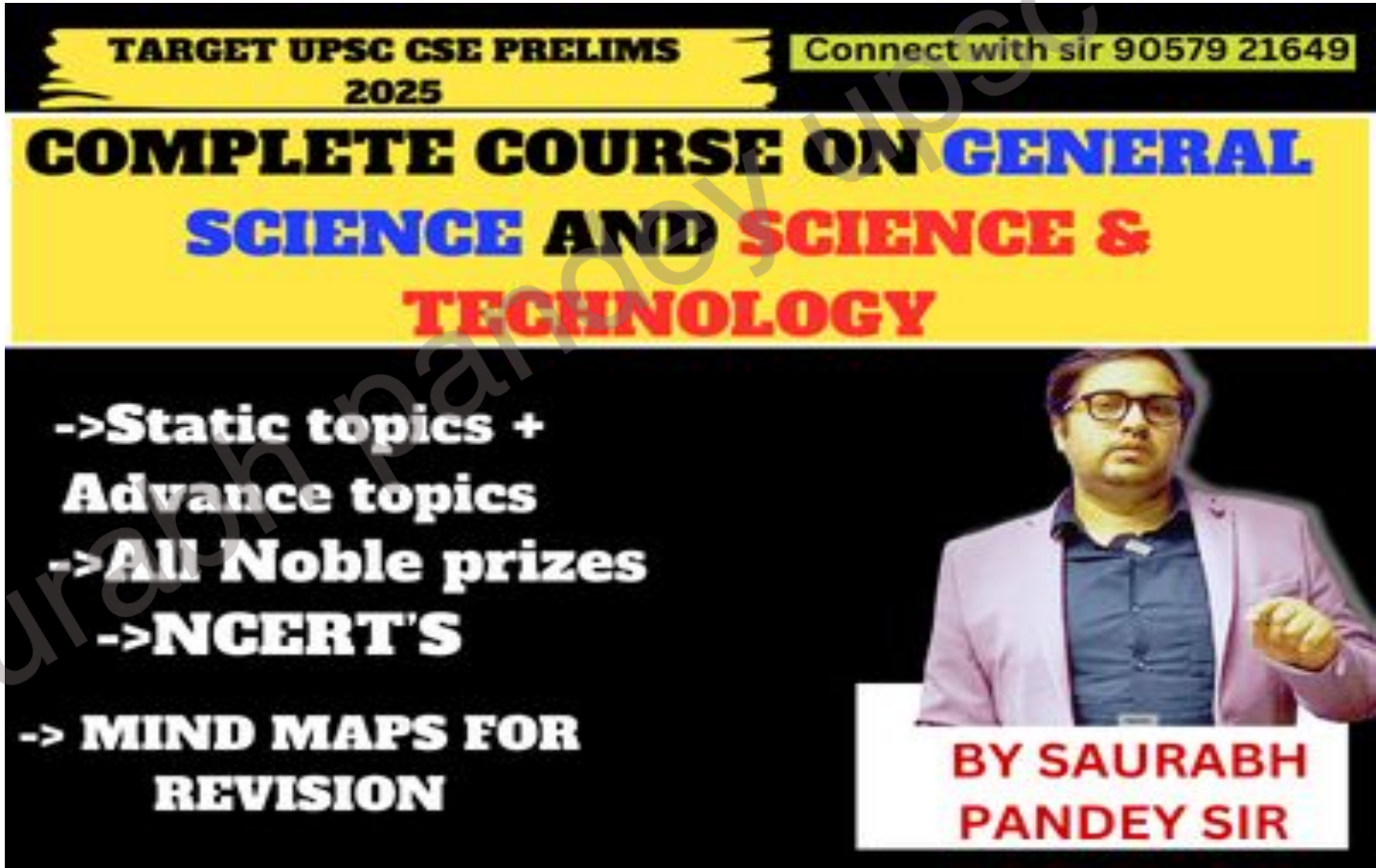

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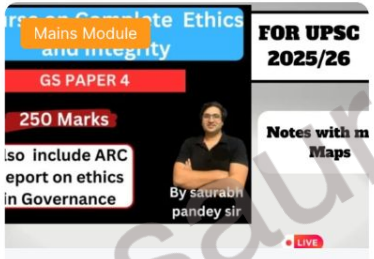

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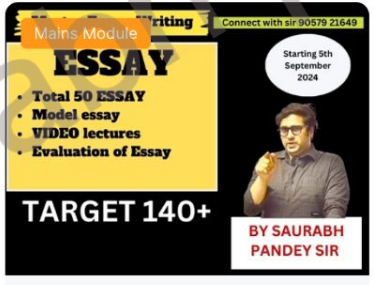

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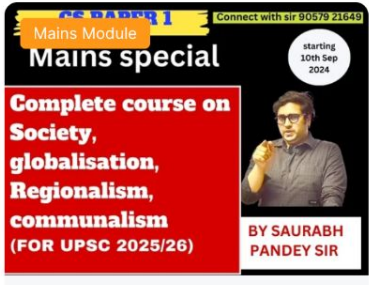

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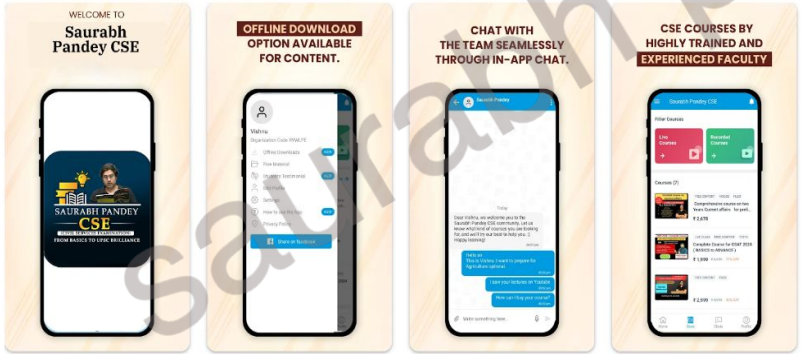

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Q. Rambhog recently seen in news is associated with which among the following. (DTE)

A) Banana variety

B) Coconut plantation

C) Paddy variety

D) Wheat variety

Ans: C

Target Mains -2025/26 -

Q Explain the impact of The Atlantic Meridional Overturning Circulation (AMOC) on shaping climatic pattern of the region .