

The Hindu Important News Articles & Editorial For UPSC CSE

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India is set to procure 87 Medium Altitude Long Endurance (MALE) drones under the Make in India initiative, aimed at boosting surveillance and operational capabilities along its sea and land borders.

Govt. fast-tracks procurement of MALE class drones to enhance border surveillance

Saurabh Trivedi
NEW DELHI

In a bid to enhance surveillance along its sea and land borders, India has accelerated the procurement of 87 Medium Altitude Long Endurance (MALE) drones from local manufacturers.

The move is aimed at bolstering real-time monitoring and operational readiness across critical areas.

A source close to the project said that the drones worth over ₹20,000 crore will be procured under the Make In India initiative. The aim is promoting indigenously developed drone technology and reduce dependence on foreign suppliers. The project is in its final stage before it is placed before a high-level committee of the Defence Ministry for clearance.

There are several private defence manufacturers



Trials were held to determine if designs and proposals matched the requirements of the military. SPECIAL ARRANGEMENT

involved in drone design and development who have shown interest in the project. Trials were held to determine that designs and proposals matched the requirements of the military.

The MALE class drones will be equipped with advanced surveillance and combat capabilities: including real-time intelligence, surveillance, and reconnaissance in all kinds of terrain. It should have the capability to fly for over 30 hours at an altitude of at least 35,000 feet. The

essential requirement is that it should be 60% indigenous, said an official.

The official added that it was the first time Indian manufacturers have been asked to supply MALE drones. An Israeli company had been supplying these drones previously.

“The induction of MALE class drones will enhance the surveillance capabilities of all three services, especially the Indian Air Force to monitor the Eastern and Western Border,” the official added.

Significance of the Move:

1. Strategic and Tactical Surveillance:

- Enhances real-time Intelligence, Surveillance and Reconnaissance (ISR) along critical regions like the Western border (Pakistan) and Eastern border (China).

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- Facilitates monitoring of difficult terrains including deserts, mountains, and coastal areas.

2. Strengthening National Security:

- Crucial in the context of heightened threats across the LAC and LoC, cross-border terrorism, and illegal infiltration.
- Also vital for maritime domain awareness in the Indian Ocean Region (IOR).

3. Boost to Indigenisation:

- Part of the ₹20,000 crore project under 'Aatmanirbhar Bharat'.
- Reduces dependence on foreign players like Israel, previously the main supplier.
- Mandate of 60% indigenous content spurs domestic innovation and R&D.

4. Defence Industrial Development:

- Provides opportunities for private Indian defence manufacturers.
- Encourages growth of a domestic drone ecosystem, including startups, MSMEs, and tech firms.

5. Tri-services Integration:

- Enhances interoperability across the Army, Navy, and Air Force.
- Supports network-centric warfare and integrated theatre commands.

Challenges:

- **Technological Constraints:** Ensuring indigenous drones meet global standards in endurance, payload, and stealth.
- **Private Sector Capacity:** Domestic firms may need additional support in terms of testing infrastructure, funding, and export opportunities.
- **Clearances and Bureaucracy:** Though fast-tracked, delays in high-level committee approvals and procurement bottlenecks may persist.

Way Forward:

- **Policy Push:** Strengthen policies that support private sector participation in defence (like Innovations for Defence Excellence - iDEX).
- **R&D Investment:** Invest in long-term indigenous R&D to reduce reliance on imported components (sensors, engines).
- **Export Strategy:** Position India as a global drone exporter, particularly to the Global South.
- **Human Resource Development:** Build a trained workforce in UAV technologies, AI, and aerospace engineering.

Conclusion:

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The procurement of indigenous MALE drones marks a significant shift towards self-reliance in defence and technological sovereignty. It holds promise not only for securing India's borders but also for transforming India into a global hub for cutting-edge drone technology. However, success will depend on timely execution, sustained policy support, and long-term capacity building.

UPSC Prelims Practice Question

Ques: Which of the following statements best describes MALE drones recently mentioned in Indian defence news?

- A) Low-altitude drones used primarily for civilian agriculture monitoring
- B) Medium Altitude Long Endurance drones used for surveillance and combat
- C) High Altitude Long Endurance drones used for space research
- D) Drones exclusively used for logistics and cargo transport

Ans: B)



India significantly contributed to the Financial Action Task Force (FATF)'s "Comprehensive Update on Terrorist Financing Risks" report, which, for the first time, officially recognises state sponsorship of terrorism as a method of terror financing.

India played key role in bringing out FATF report on terrorist financing

Devesh K. Pandey

NEW DELHI

India was one of the key contributors to the Financial Action Task Force (FATF) project for putting together the "Comprehensive Update on Terrorist Financing Risks" report that was released on Tuesday.

It is learnt that the United Nations Security Council Counter-Terrorism Committee Executive Directorate and France were the co-leads for the project. India also played a significant role in bringing out the report, which has for the first time recognised state sponsorship as a means to fund and support terrorism.

"We have long identified Pakistan as a state that sponsors terrorism. India's



The FATF has for the first time recognised state sponsorship as a means to fund terrorism.

2022 National Risk Assessment (NRA) on Money Laundering and Terror Financing flagged state-sponsored terrorism – particularly from Pakistan – as a major concern. Accordingly, all financial institutions, including banks, are required to do enhanced due

diligence with respect to any transaction related to Pakistan," said a government official.

The findings highlighted in the FATF report are expected to reflect in the framing of subsequent NRAs of all the other countries. The United States, in its 2024 National Terrorist Financing Risk Assessment, has already noted that it faced terrorism threats from terror groups in Pakistan, apart from Afghanistan, Southeast Asia, and East Africa.

"Being an NRA, it is followed by all U.S. banks while adhering to their KYC guidelines. They are cautious about transactions with Pakistan, and this increases the cost of doing business for Pakistani establishment and busi-

nesses. After this FATF Risk report – which carries higher precedence over NRAs – the U.S. and other countries will have to acknowledge the sources of state-sponsored terrorism in their risk assessments," the official said.

In the FATF report, the global money laundering and terror financing watchdog has considered the inputs received from delegations and publicly available sources of information.

"Among the various suspect modus operandi adopted for state sponsoring of terror outfits is the ongoing smuggling of oil from Iran to Pakistan. There is a high risk of funds so generated being used to finance terrorist activities," said another official.

Key Highlights of the Report:

1. State Sponsorship of Terrorism Recognised:

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- A first-of-its-kind acknowledgement by FATF of state actors aiding terrorism through financing.
- Highlights Pakistan's role, as flagged by India and supported by findings from the UNSC Counter-Terrorism Committee Executive Directorate and France.

2. India's National Risk Assessment (2022):

- India's NRA explicitly identified state-sponsored terrorism, especially from Pakistan, as a major threat.
- Financial institutions in India are directed to conduct enhanced due diligence for transactions involving Pakistan.

3. Global Impact:

- The findings in the FATF report are expected to influence global NRAs (National Risk Assessments).
- The U.S. 2024 NRA already notes threats from Pakistan, and will now have to align with FATF's broader recognition.

4. Modus Operandi Highlighted:

- Smuggling of oil from Iran to Pakistan is flagged as a mechanism used to generate illicit funds for terrorist organisations.

Significance for India:

- **Diplomatic Victory:**
 - Reinforces India's longstanding position on Pakistan's sponsorship of terrorism at a global platform.
 - Enhances India's credibility and leadership in shaping global counter-terror financing norms.
- **Strategic Leverage:**
 - Makes it more difficult for Pakistan to access global financial systems, raising costs for its economy and diplomatic capital.
 - Builds pressure for compliance and monitoring through enhanced KYC norms by global financial institutions.
- **Counter-Terrorism Policy Strengthening:**
 - Helps in refining India's domestic and international financial intelligence frameworks like FIU-IND, RBI, and Enforcement Directorate protocols.
 - Encourages more inter-agency coordination and technology adoption for tracing illicit flows.

Challenges and Concerns:

- **Enforcement Gaps:**
 - Despite recognition, actual enforcement of sanctions and restrictions on states sponsoring terrorism remains uneven.

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- **Geopolitical Complexity:**
 - Some countries may resist naming or penalising strategic allies like Pakistan due to geo-political considerations.
- **Evolving Methods of Terror Financing:**
 - Shift towards cryptocurrencies, NGOs, and informal networks makes tracking harder.
 - Continuous innovation in terrorist tactics calls for real-time intelligence sharing.

Way Forward:

- **Strengthen Global Alliances:**
 - Work with likeminded nations to push for greater FATF compliance and enforcement mechanisms.
- **Improve Domestic Capacity:**
 - Enhance data analytics, AI-driven surveillance, and inter-operability among Indian intelligence and enforcement agencies.
- **Push for Grey/Blacklisting When Needed:**
 - Use FATF platform to press for greylisting or blacklisting of nations with proven involvement in terror financing.
- **Leadership in Global Forums:**
 - As a major stakeholder, India should continue to provide technical and policy leadership in bodies like FATF, G20, and UNSC Counter-Terrorism Committee.

Conclusion:

India's proactive role in shaping the FATF report marks a strategic and diplomatic milestone in its global counter-terrorism efforts. By bringing state-sponsored terror financing into international focus, India not only strengthens its own security narrative but also contributes to shaping a more accountable global financial architecture.

UPSC Prelims Practice Question

Ques: Consider the following statements regarding the Financial Action Task Force (FATF):

1. FATF is a legally binding body under the United Nations.
2. It deals with money laundering and terrorist financing issues.
3. India is a full member of FATF.

Which of the statements given above is/are correct?

- A) 1 and 2 only
- B) 2 and 3 only
- C) 1 and 3 only
- D) 1, 2 and 3

Ans: B)



Prime Minister Narendra Modi's visit to **Namibia** marks a significant step in India's renewed diplomatic and economic outreach to **Africa**, particularly within the larger framework of cooperation with the **Global South**. He reiterated India's commitment to **cooperative development**, **digital innovation**, and **historical solidarity** with Africa, especially Namibia.

India, Africa must work side by side, says PM in Namibia

India seeks to cooperate, not compete, with Africa, says Mr. Modi; he also congratulated Namibia for adopting UPI digital payment system; Modi given the country's highest civilian honour

Kallol Bhattacharjee
NEW DELHI

Continuing his diplomacy focused on the Global South, Prime Minister Narendra Modi on Wednesday highlighted India's support to Namibia's decolonisation, "not just in words, but in action".

Addressing a special session of the Namibian Parliament, Mr. Modi congratulated the African nation for adopting India's UPI digital payment system. The Prime Minister also highlighted the country's wider Africa policy, emphasising that India does not aspire to "compete" with anyone in the African continent, but rather seeks to "build together".

"India is proud to have stood with Namibia - not just in words, but in action. Like the tough and elegant plants of Namibia, our friendship has stood the test of time. And, just like your national plant *Welwitschia mirabilis*, it only grows stronger with age and time," Mr. Modi told the joint session of the Parliament of Namibia, highlighting the historic support that India extended to Namibia's freedom from



Close links: Prime Minister Narendra Modi with Namibia President Netumbo Nandi-Ndaitwah in Windhoek. SPECIAL ARRANGEMENT

the 1940s. According to the records of the Ministry of External Affairs, India was among the first countries to raise the cause of Namibia's independence at the United Nations in 1946.

Africa must lead

Africa should not just be a source of raw materials and minerals, but should "lead in value creation and sustainable growth", the Prime Minister said.

"With Africa, we seek not to compete, but to

cooperate. Our goal is to build together. Not to take, but to grow together," he added.

Mr. Modi met with Namibian President Netumbo Nandi-Ndaitwah and signed several agreements, including MoUs to set up an Entrepreneurship Development Centre in Namibia and to cooperate in the field of health and medicine.

Namibia also completed the formalities to join the India-led Coalition of Dis-

aster Resilient Infrastructure and the Global Biofuel Alliance.

The launch of a digital payments system in Namibia later this year was also announced as an outcome of the UPI technology licensing agreement signed between the National Payments Corporation of India and the Bank of Namibia in April 2024.

Mr. Nandi-Ndaitwah also conferred Mr. Modi with the Order of the Most Ancient Welwitschia Mirabilis, Namibia's highest civilian award.

Earlier, Mr. Modi paid homage to the hero of Namibia's freedom movement Sam Nujoma, describing him as "a great friend of India". He recollected Dr. Nujoma's role during the establishment of diplomatic relations between India and Namibia in 1986.

The first diplomatic mission of the South West Africa People's Organisation (SWAPO) was established in India, which provided the organisation with material support as it led the efforts for the liberation of Namibia. India's support to SWAPO is remembered fondly, the Prime Minister said.

Key Highlights of the Visit:

1. Historical Ties and Decolonisation Support:

- India supported **Namibia's independence** from as early as **1946** at the **United Nations**.
- India provided material and diplomatic support to **SWAPO** during its struggle for independence.
- First diplomatic mission of SWAPO was established in India in 1986.

2. Digital Diplomacy:

- **Namibia to adopt India's UPI (Unified Payments Interface)** — a milestone in India's **Fintech diplomacy**.
- A licensing agreement between the **NPCI** and **Bank of Namibia** was signed in April 2024.
- Reflects India's soft power through **technology transfer and digital public goods**.

3. Economic and Development Cooperation:

- Agreements signed to establish an **Entrepreneurship Development Centre**.
- MoUs in **health and medicine**, indicating people-centric development cooperation.

4. Global Climate and Energy Collaboration:

- **Namibia joins:**
 - **Coalition for Disaster Resilient Infrastructure (CDRI)**
 - **Global Biofuel Alliance (GBA)** — showcasing shared commitment to green growth.

5. Symbolic Recognition:

- PM Modi awarded **Namibia's highest civilian honour**, *Order of the Most Ancient Welwitschia Mirabilis*.
- Reinforces mutual respect and long-term friendship.

Significance of the Visit:

1. Strengthening India-Africa Relations:

- Reinforces India's **Africa Policy**, based on **mutual respect, South-South cooperation**, and **capacity-building**.
- Moves away from extractive models of development; emphasizes **value creation, entrepreneurship**, and **technology-driven growth**.

2. Strategic Counter to China's Influence:

- Without directly naming China, PM Modi stressed **"cooperation not competition"**, subtly signaling India's **alternative approach to African engagement**.

3. Soft Power and Digital Influence:

- Export of India's **Digital Public Infrastructure (DPI)** like UPI strengthens its **tech diplomacy** and **global branding**.
- Enhances **trust in Indian systems**, and opens up potential for future economic linkages.

4. Global South Leadership:

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- Visit aligns with India's ongoing **Global South advocacy**, as seen in G20 and BRICS platforms.
- Promotes **equitable global governance**, resilience, and sustainability.

Challenges in India-Africa Engagement:

- **Limited Investment Capacity** compared to China.
- **Logistics and connectivity bottlenecks.**
- Need for deeper people-to-people contacts and **awareness of Indian assistance** in Africa.
- Some African nations may view India's growing presence with **pragmatic caution.**

Way Forward:

- **Institutionalise India-Africa Summits** and strengthen **Pan-African engagement frameworks.**
- Expand **digital and financial cooperation** with more African countries under **India Stack licensing.**
- Prioritise **local capacity-building, education exchange, and infrastructure development** in Africa.
- Promote **triangular cooperation** with other donors like Japan, EU, and multilateral institutions.

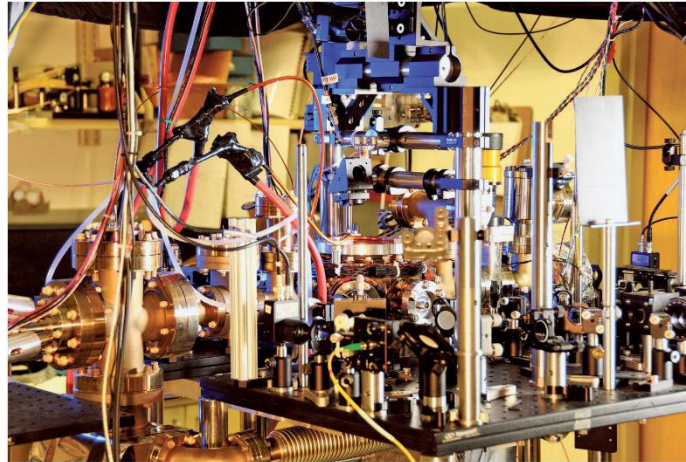
Conclusion:

PM Modi's Namibia visit underscores India's **principled, partnership-driven approach** toward Africa. Rather than extractive ties, India offers a **model based on mutual empowerment**, digital inclusion, and historical solidarity. It marks a crucial milestone in India's bid to emerge as a **leader of the Global South** and a **trusted development partner** in a multipolar world.

UPSCMains Practice Question

Ques: India's engagement with Africa reflects a shift from transactional relations to a partnership-based developmental approach." In the light of recent developments, critically examine India's evolving Africa policy. (250 Words)

A global team of scientists has conducted the most precise intercontinental comparison of optical atomic clocks to date, laying the groundwork to redefine the SI unit of time — the second — by 2030 using optical lattice clocks, which are vastly more accurate than current cesium-based atomic clocks.



An ultra-stable ytterbium lattice atomic clock at the USIST in 2013. NIST/C. GONAL

Intercontinental clock comparison sets stage to redefine the second

Because they can enumerate one second up to 18 decimal places, scientists expect optical clocks will become the world's new time standard around 2030. Until then, however, optical clocks will have to pass rigorous tests attesting to their ability to work in step from different parts of the world

Yasudevan Mukundh

Researchers around the world have completed the world's largest, most demanding head-to-head comparison of clocks in history to build confidence for the upcoming redefinition of the second.

The duration of a single second is currently defined by caesium (Cs) atomic clocks. Lasers "cool" the radiation emitted by Cs atoms in these devices to measure one second, give or take a few billionths. As the applications of atomic clocks have expanded — including GPS navigation, climate science, and radio astronomy — expectations of their performance have also increased, necessitating the more advanced optical clocks.

Scientists around the world have been studying and testing these new generation devices, because they can enumerate one second up to around 18 decimal places, scientists expect optical clocks will replace Cs atomic clocks as the world's new time standard around 2030. Until then, however, optical clocks will have to pass rigorous tests attesting to their ability to work in step from different parts of the world.

The new effort presents the largest, most sophisticated such test to date. It involved 10 optical atomic clocks on three continents and 65 researchers.

SI unit of time

To measure the passage of time, strike up a conversation with the person next to you. If it's riveting, time will fly. But if it advances in painstaking steps, time will slow to a crawl.

For better or for worse, this isn't good enough for scientists. To understand how much time one second denotes, they use natural phenomena. In the early 20th century, the definition of a second was one-86,400th of a mean solar day. The first quartz crystal clocks that appeared in the late 1940s could measure time more accurately than the earth's rotation. So scientists switched to the earth's revolution around the sun. In 1965, one second became equal to one 31,556,925.9747th of the time the earth took to go once around the sun from January 6, 1900.

Since then, scientists have been building better clocks that, at each step, also incentivised them to refine the time standard. The current standard is based on atomic clocks. These clocks don't directly measure time. Instead, they are complicated setups scientists put together to generate radiation of a fixed frequency. (Frequency is nothing but the inverse of time.)

In 1967, the SI unit of time was defined thus: "the duration of 9,192,631,770 periods of the radiation corresponding to

the transition between the two hyperfine levels of the ground state of the caesium 133 atom". This verbose definition really communicates a simple meaning.

Pass the last one

An atom's internal energy comes in fixed steps, like curbs on a ladder. It can jump up a rung by absorbing the right amount of energy and jump back down by giving that energy up again.

In a Cs atomic clock, the energy that makes the jump is supplied by a finely tuned microwave signal. The atoms react most strongly when the microwave frequency is 9,192,631,770 Hz. Electronics watch how many atoms make the jump. If that number slips below a peak, the equipment nudges the microwave setting until the jump rate is back to the maximum. When that happens, the microwave signal itself is guaranteed to be exactly 9,192,631,770 Hz, i.e. composed of 9,192,631,770 waves per second.

Chips called frequency dividers count these microwave waves and pass on only every 9,192,631,770th one. This wave comes along every one second — and is the SI definition of the second.

Around the world, many countries have set up their own Cs atomic clocks to define their respective national time standard. In India, the National Physical Laboratory in New Delhi maintains five Cs atomic clocks. The clocks' output is disseminated to various applications around India via the INSAT satellites, telecommunication signals, and fibre links. Scientists, however, are already at work refining the next big thing — the optical atomic clock.

Good for 15 billion years

The wall clock hanging in your house is likely powered by two AA batteries and uses a quartz crystal oscillator. After a few months, the clock will start losing a few seconds. The Cs atomic clock that defines the US national time standard loses only one second every 300 million years, however.

This is stupendous, yet in some cases it isn't good enough. As their application in defining the time standard suggests, atomic clocks are used in many technologies that we encounter every day. The American GPS network, Russia's GLONASS, Europe's Galileo, and India's NavIC constellation use atomic clocks onboard satellites to accurately measure distance and location data for both civilian and military use. Astronomers use it in radio-astronomy to piece together signals received on different parts of a large telescope. This is how they captured history's first photograph of a black hole in 2019. Climate scientists use atomic clocks for ultra-precise measurements of the earth's gravity that reveal where ice and water have been lost.

As these applications have expanded,

In India, the National Physical Laboratory maintains five Cs atomic clocks. Their output is disseminated around India via satellites, telecommunication signals, and fibre links

the expectations of atomic clocks have, too. The definitive emission in Cs atomic clocks, of 9,192,631,770 Hz, is in the microwave range of the electromagnetic spectrum. In optical atomic clocks, it's in the optical (or visible) range. The radiation emitted when a strontium atom jumps between two particular energy levels is 429,228,064,488,000 Hz. When a ytterbium ion jumps between two levels, the radiation has frequency 642,121,496,772,047 Hz. Because this radiation contains 10,000-times more waves per second, a device that can count them out can also measure one second more precisely.

The frequency of the radiation emitted is also proportional to the clock's stability. In 2014, one optical atomic clock that used strontium atoms would reportedly drift by less than one second in 15 billion years. This is why optical atomic clocks are set to become the next global time standard.

But ahead of the milestone, scientists must prove that clocks in different countries agree with one another to the 18th decimal place.

Across three continents

Enter: the new test. It involved 10 optical clocks based on five atoms: strontium-87 (Sr), ytterbium-171 (Yb), charged ytterbium-171 ions in two states (Yb⁺ E2 and Yb⁺ E3), charged strontium-88 (Sr⁺), and indium-115 ions (In⁺). The clocks were located at six national metrology institutes in Finland, France, Germany, Italy, the U.K., and Japan.

The two clocks participating from Germany were in the same building, so the scientists linked their outputs through short optical fibres. The clocks across France, Germany, and Italy were linked with telecommunication fibres that already run through these countries. To prevent any noise or distortion from corrupting the data, scientists installed bespoke repeaters and amplifiers. Finally, to link the clocks across the English Channel, the Baltic Sea, and all the way to Japan, the teams used an advanced GPS technique called integer precise point positioning (IPPP).

Because optical clocks occasionally take breaks for maintenance, the teams set up simpler backup clocks that stepped in temporarily to keep time using GPS data. When the optical atomic clocks were back in operation, the backups would handover and step back.

In this way, all the clocks ran for 45 days between February 20 and April 6,

2022. Every time two different clocks were running and connected, the researchers divided their laser frequencies to make a ratio. In total the teams reported 38 independent optical-frequency ratios, far more than any earlier project. Four of these ratios — Yb (E3) to Yb, In to Yb, Sr to Sr, and Sr to Yb — had never before been measured directly. The tightest single result was the ratio between the In and Yb (E3) clocks in Germany, measured locally with an uncertainty of just 4×10^{-19} .

The teams found that the fibre and satellite links told the same story for most ratios. For example, the Sr clocks in Germany and France differed by a factor of less than 2×10^{-18} via both technologies, showing that long fibres and IPPP could both support ultra-precise timing in good conditions. Similarly, same-atom ratios — Sr to Sr, Yb to Yb, and Yb to Yb — confirmed that many clocks were healthy. The Germany and the U.K. clocks were compared by GPS across the North Sea and matched within 3×10^{-18} even after accounting for downtime.

Combine results responsibly

The researchers were also able to reveal gaps they will have to fix before 2030. Every GPS-based ratio that involved the Italian Yb clock was off by about 4×10^{-18} compared with fibre measurements, pointing to a previously unnoticed signal distribution glitch at the Italian facility. The strontium clocks in France and Germany showed small but real offsets, up to 2×10^{-18} , when the teams checked them against other clocks and each other. These shifts were large enough to matter for a future definition of the second and will need further study.

The authors of the paper describing the test, published in *Optica* on June 12, noted that recognising such hiccups is exactly why laser, redundant campaigns are valuable.

Because many ratios shared the same clocks, fibres, backups or GPS receivers, the teams noted that their errors were correlated. To address this, they developed a 38×38 matrix capturing 242 non-zero correlation coefficients. These coefficients captured the degree to which any two variables were related, e.g. it was 0.94 when two ratios shared a common clock on the same fibre. The teams said publishing these correlations will allow future analyses combine results responsibly instead of double-counting information.

In the final analysis, by showing that 10 heterogeneous clocks across three continents could agree with each other to within a factor 10^{18} to 10^{19} , and by identifying the rare cases when they didn't, the test has cleared many obstacles en route to redefining the SI second with optical atomic clock standards.

(mukundh.s@thehindu.co.in)

Background:**1. Current Definition of a Second (since 1967):**

- Based on the microwave frequency (9,192,631,770 Hz) emitted during a hyperfine transition in Caesium-133 atoms.
- Accurate to ~1 second in 300 million years.

2. Emergence of Optical Atomic Clocks:

- Use optical frequencies (hundreds of trillions of Hz), which are 10,000 times higher than microwave frequencies.
- Can measure time to a precision of 18 decimal places.
- Examples: Strontium (Sr), Ytterbium (Yb), Indium (In) based clocks.
- Expected to redefine the second by 2030.

About the New Study:

- **Scale:**
 - 10 optical clocks across three continents.
 - 65 researchers from national metrology institutes in Germany, France, Finland, Italy, Japan, and the U.K.
- **Atoms Used:** Sr, Yb, Sr^+ , Yb^+ (in two states), and In^+ .
- **Connectivity Techniques:**
 - Optical fibre links (within and across countries).
 - GPS-based IPPP (Integer Precise Point Positioning) to connect distant clocks like those in Japan and the U.K.
- **Duration of Study:**
 - 45 days (Feb 20 – Apr 6, 2022).
- **Precision Achieved:**
 - Most comparisons agreed within 10^{-16} to 10^{-18} .
 - The tightest ratio: In^+ to $\text{Yb}^+(\text{E3})$ with uncertainty of 4.4×10^{-18} .
- **New Contributions:**
 - First-time direct measurements of 4 frequency ratios.
 - Large-scale publication of a correlation matrix to avoid double counting errors in future analyses.

Why Redefine the Second?

- **Limitations of Caesium Clocks:**
 - Though highly accurate, newer applications demand ultra-stability and precision.
- **Applications Needing Higher Precision:**

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- GPS and satellite navigation systems.
- Climate science — measuring changes in Earth's gravity and mass (e.g., glacial melt).
- Radio astronomy — synchronizing massive telescopic arrays.
- Quantum computing, deep space navigation, fundamental physics experiments.

India's Position:

- India's National Physical Laboratory (NPL) maintains five cesium clocks.
- Time dissemination through INSAT, telecom signals, and fibre links.
- India must invest in optical clock development and participate in future global standards.

Challenges Identified:

- Minor frequency shifts between some clocks (e.g., France and Germany's Sr clocks).
- Technical glitches in GPS signal distribution at Italy's facility.
- Need for redundant verification mechanisms across technologies (fibre vs GPS).

Way Forward:

1. Infrastructure Investment:

- Countries including India need to build their own optical atomic clock systems.

2. Global Cooperation:

- Collaborative testing and calibration among national metrology institutes.

3. Data Transparency:

- Publish calibration errors and correlation matrices to ensure scientific integrity.

4. Policy Implications:

- A redefinition will affect telecom, financial transactions, navigation, research, etc. — necessitating global synchronization.

Conclusion:

The redefinition of the SI second is not just a scientific milestone but a technological leap. The success of this largest intercontinental clock comparison signifies global readiness for the change. As the shift to optical atomic clocks advances, it reflects humanity's pursuit of precision, collaboration, and innovation, with wide-reaching implications across science, technology, and global standards.

UPSC Mains Practice Question

Ques: Discuss the significance of the global effort to redefine the SI unit of time using optical atomic clocks. **(250 Words)**

As climate change accelerates the frequency and intensity of natural disasters, traditional insurance mechanisms are proving inadequate. In this context, Catastrophe Bonds (Cat Bonds) emerge as a powerful financial innovation to pre-arrange disaster funding and transfer risk to global financial markets.

How can cat bonds plan for a natural disaster?

How do catastrophe bonds operate? Who issues and sponsors them? Why should a financial investor add catastrophe risk to their portfolio? Can cat bonds offer financial relief during extreme weather events? Could India be a lead sponsor for a South Asian cat bond?

EXPLAINER

Safi Ahsan Rizvi

The story so far:

While life insurance is a ubiquitous term in India, disaster risk insurance is not. A low penetration of disaster risk insurance for individual property and livelihoods leaves much of the population exposed to irretrievable damage and loss. Most peoples' assets and means of income remain largely uninsured. Globally, after the hurricanes of the late-1990s in the U.S., when even re-insurers suffered losses, catastrophe risk was farmed out to financial markets through catastrophe bonds (cat bonds).

What is a cat bond?

Cat bonds are a unique hybrid insurance-cum-debt financial product that transforms insurance cover into a tradable security. These bonds transfer hazard risk from the at-risk state to not just the limited stock of global re-insurers, but to deep-pocketed global financial markets through securitisation, opening up a much larger quantum of funds for post-disaster relief and reconstruction. Cat bonds are effective in transferring pre-defined risk to bond investors, ensuring quicker payouts and a much-reduced counter-party risk.

Players that create cat bonds are sovereign nations, which sponsor the bond and pay the premium, with the principal being the sum insured. The sponsor requires an intermediary to issue the bond to reduce counter-party risk. Intermediaries can include the World Bank, the Asian Development Bank or a reinsurance company. If a disaster does occur, the investor runs the risk of losing a part of the principal – a key reason for higher coupon rates of such bonds, compared to regular debt instruments. There is much variation in coupon rates for a cat bond depending on the risks – earthquakes garner lower premiums, as



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low as 1-2%, compared to hurricanes or cyclones.

Are cat bonds profitable?

Nobel Prize-winner Harry Markowitz has famously stated that risk diversification is "truly the only free lunch in finance". Risk-seeking investors find the disaster risk curve most attractive for diversification, since climate or geological hazards are historically not related to financial market movements, being mutually exclusive and independent of the financial risk curve. Probabilistic and deterministic financial risk curves move differently from cat-risk curves, in effect de-risking the entire portfolio of an investor. Leading the pack of cat bond investors are pension funds, with a minority share being occupied by hedge funds and family offices, seeking to de-risk their market-centric risk profiles for sovereign-sponsored cat bonds.

Observers assess that since the onset of

cat bonds, there have been \$180 billion worth new issuances of cat bonds globally with about \$50 billion currently outstanding.

Does India need a cat bond?

In these times of climate change, disaster risk can become unprofitable for insurers and re-insurers, as is increasingly evident in the U.S. with the rising intensity of hurricanes and forest fires. This causes premiums to rise and demand to fall, leading to risk ratcheting back to the harried victim of disasters. This is where governments can step-in, sponsoring instruments like cat bonds. The unpredictability and increase in frequency of extreme weather events like cyclones, floods, forest fires and devastating earthquakes in South Asia have increased India's exposure to disaster-risk. India needs to ring-fence its public finances for post-disaster reconstruction. Given the credit standing

of the Indian sovereign and the scale of India's hazard risk profile, it could be cost-effective to sponsor such an instrument, through an intermediary like the World Bank, utilising its established bond curves. Apart from assessing the existing risk curve, insurance companies typically build clauses requiring disaster mitigation into contracts with countries, in the absence of which coupon rates rise. On that count, the Indian government is far ahead, having already demonstrated pro-active risk reduction by allocating mitigation and capacity building funds worth \$1.8 billion per annum since FY21-22.

Given India's size and financial stability, India could be lead-sponsor for a South Asian cat bond, given that most such regional risks remain unhedged. In addition, the regional hazard matrix reveals an interesting variety of hazards, each with their own risk curve and a different flavour of history, vulnerability, and exposure. Imagine a regional cat bond for high-impact hazards like an earthquake in Bhutan, Nepal and India; or for a supra-cyclone or tsunami in India, Bangladesh, Maldives, Myanmar and Sri Lanka. A South Asian cat bond would spread risk, reduce premium costs and over time, make the region financially stronger to face disasters.

What are the disadvantages?

A defectively designed cat bond could lead to no payout despite a significant disaster. For example, an earthquake cat bond designed for a magnitude threshold of 6.6M for a certain grid may fail if a 6.5M event occurs and causes extensive damage. In addition, despite a contract if a disaster doesn't occur, it could lead to questions on the desirability of such expense. Hence, comparison of premium to be paid discovered through transparent government procedure, with historical annual costs of post-disaster reconstruction could be the best way forward.

Safi Ahsan Rizvi is an IPS officer and adviser to the NDMA.

THE GIST

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What Are Catastrophe Bonds?

- **Hybrid insurance-debt instrument:** Transfers disaster risk from a sponsoring country to global investors.
- **Structure:**
 - Issued via intermediaries (e.g., World Bank).

Daily News Analysis

- Investors receive high coupon rates but risk losing part of the principal if a pre-defined disaster occurs.
- Used for earthquakes, floods, cyclones, forest fires, etc.

Global Status and Benefits

- \$180 billion worth of issuances since inception.
- Cat bonds offer:
 - Diversification from market-linked risks.
 - High returns for investors.
 - Quick payouts for affected countries.
- Major investors: Pension funds, hedge funds, family offices.

Why Cat Bonds Are Relevant for India

- High disaster exposure: Floods, cyclones, quakes.
- Low insurance penetration for livelihoods and property.
- Government already spends ₹1.8 billion/year on disaster mitigation.
- Cat bonds can help:
 - Pre-fund relief and reconstruction.
 - Protect public finances from climate shocks.

India as a Regional Leader

- **India can lead a South Asian cat bond covering:**
 - Earthquakes (India, Nepal, Bhutan).
 - Cyclones/Tsunamis (India, Sri Lanka, Maldives, Bangladesh, Myanmar).
- **Benefits:**
 - Spreads risk, reduces premiums, strengthens regional resilience.

Challenges

- Trigger design risk: Minor differences in event magnitude may prevent payout.
- Perception issues if no disaster occurs.
- Requires transparent procedures and technical expertise.

Conclusion

Daily News Analysis

Cat bonds present a forward-looking disaster risk financing mechanism. India, with its financial strength and disaster exposure, is well-positioned to utilize and lead this model — ensuring a resilient, climate-ready economy and region.

UPSC Mains Practice Question

Ques: In the context of increasing climate-related disasters, examine how catastrophe bonds can strengthen India's disaster risk management strategy. Also discuss the feasibility of India leading a regional catastrophe bond framework. **(250 Words)**



Page : 08 Editorial Analysis

End custodial brutality, begin criminal justice reform

In the dark corners of police stations in Tamil Nadu, justice often dies before it is delivered. The recent custodial death of Ajith Kumar, a 27-year-old temple guard in Sivaganga, should shake the conscience of every citizen. But, tragically, his case is not an exception. It is part of a grim pattern.

Between 2021 and 2025, there have been a series of custodial deaths. Vignesh, a 25-year-old, who was detained in Chennai in 2022, died within hours, with his autopsy revealing multiple injuries. In 2024, Raja, a Dalit cook from Villupuram died in police custody after a petty theft allegation; his three children and wife still await compensation. A 30-year-old autorickshaw driver in Tiruchi died of injuries in 2023 under suspicious circumstances. And now, Ajith, whose autopsy revealed 44 wounds, cigarette burns, and forced exposure to narcotics. His last words to his mother were haunting: "I didn't steal."

A normalisation of the use of force

These are not aberrations. They are the outcomes of a system that has normalised force over fairness. But beyond the moral horror lies another fundamental concern – we are failing citizens and the police force by investing in enforcement without investing in reform.

Each year, the Tamil Nadu government allocates thousands of crores towards policing. Yet how much of this goes into welfare, training and psychological care? A disproportionate amount is funnelled into hardware such as vehicles, surveillance systems, and crowd-control



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India is failing
its citizens and
its police force
by investing in
enforcement
without
investing
in reform

gear while the human element is left neglected. We equip officers with lathis and law books, but deny them the emotional tools to deal with stress, trauma and moral ambiguity. Policing cannot merely be about control. It must be about conscience.

Reforms to undertake

A sensible reallocation of the policing budget is long overdue. Even 5% of the current annual spend, redirected toward setting up district-level mental health units, mandatory quarterly counselling, and refresher sensitisation courses, would result in exponentially better outcomes – for detainees, for officers, and for public trust. We pour money into deterrence, but ignore the cost of dysfunction.

It is time to institutionalise mental wellness within law enforcement, not as a luxury, but as a necessity. Officers are human. They deal with domestic abuse cases in the morning, gang violence by afternoon, and politically fraught complaints by night. Without psychological support, that pressure metastasises; burnout becomes brutality. The baton does not punish alone, it often expresses accumulated trauma.

Parallely, police training needs transformation. A curriculum designed in the pre-liberalisation era cannot address the needs of modern India. Ethics, human rights jurisprudence, trauma-informed investigation methods and community policing models should be at the core, and not cosmetic.

Moreover, our criminal justice architecture

must include enforceable accountability. It is not enough to suspend a few constables after every tragedy.

What Tamil Nadu, and India at large, needs is legislative clarity; a comprehensive anti-custodial violence law with time-bound investigation mechanisms, mandatory video documentation of interrogations, and civil society involvement in oversight.

Technology must serve as a safeguard, and not be a silent spectator. CCTV cameras in areas where people are in custody should be operational, tamper-proof, and subject to real-time audits. Digital systems can help, but only if we are willing to confront the uncomfortable truths that they reveal.

A new path for law enforcement

Finally, we must reimagine the police uniform – not as a symbol of unyielding authority, but of service, restraint, and human responsibility. Ajith Kumar's death, like those of Vignesh, Raja, and so many others, tells us that power without empathy is violence by another name.

To break this cycle, we must invest not just in policing but also in the emotional, ethical, and structural reform of law enforcement. Until then, every custodial death will not just mark the end of one life but also the failure of the state's moral contract with its people.

Let us not wait for the next young man to cry out "I didn't steal" before dying in silence. The time for justice is not post-mortem; it is policy, and it is now.

Paper 02 Polity & Governance

UPSC Mains Practice Question: Custodial deaths reflect systemic failure in India's criminal justice system." Discuss with reference to recent incidents and reforms required. (250 words)

Context :

"Power without empathy is violence by another name." – **Apsara Reddy**

The recent **custodial death of Ajith Kumar** in Tamil Nadu has reignited the debate over **police brutality**, misuse of power, and lack of structural reform in India's criminal justice system. His death, along with

others like **Vignesh (2022)** and **Raja (2024)**, reflects not isolated incidents but a **systemic pattern of custodial violence**, especially targeting the poor and marginalized.

Key Issue: Custodial Deaths in India

- India reports dozens of **custodial deaths annually**, yet **few lead to convictions**.
- According to the **National Human Rights Commission (NHRC)**, over **500 custodial deaths** were reported in 2022–23 alone.
- Most such deaths involve:
 - **Torture during interrogation**
 - **Fabricated charges or false confessions**
 - **Negligence in providing medical care**
 - **Targeting of Dalits, minorities, and the poor**

Case Examples: Tamil Nadu's Pattern

1. **Ajith Kumar (2025)** – temple guard; autopsy revealed 44 injuries and signs of torture.
2. **Vignesh (2022)** – 25-year-old man detained for petty offense; died within hours.
3. **Raja (2024)** – Dalit cook accused of theft; death in custody, no compensation to family.
4. **Tiruchi auto-driver (2023)** – died from suspicious injuries in police custody.

These cases highlight **brutality, impunity, and absence of deterrent punishment**.

Core Problems in Policing

1. Normalisation of Force Over Fairness

- Custody becomes a space for **coercion** rather than correction.
- Officers are rewarded for **"results"** (confessions, recoveries) rather than process or legality.
- Moral justification for using violence is rooted in **institutional and political culture**.

2. Skewed Budget Priorities

- **Thousands of crores spent on:**
 - Hardware: surveillance, drones, riot gear, vehicles.
 - But **negligible investment** in:
 - Officer welfare
 - Mental health support
 - Ethics and rights-based training

3. Mental Health and Burnout

- Police often work under **extreme stress**: long hours, poor infrastructure, political pressure.
- Exposure to trauma (domestic abuse, violence, death) leads to **psychological fatigue**, which can turn into **brutality**.

4. Obsolete Police Training

- Many training modules are **decades old**, with **little focus on human rights, community policing, or empathy**.
- Law enforcement is seen through the lens of **control**, not **service**.

Reforms Needed

A. Reallocation of Police Budget

- Even **5% of police spending** redirected toward:
 - **District-level mental health units**
 - **Quarterly counseling for police**
 - **Sensitivity and ethics workshops**
- This can transform both **custodial behavior** and **public trust**.

B. Modernize Training Curriculum

- **Include:**
 - **Human rights jurisprudence**
 - **Trauma-informed investigation**
 - **Community policing**
 - **Gender and caste sensitivity**
- Move beyond lathi and law books — build conscience.

C. Legal and Structural Accountability

- Enact a **Comprehensive Anti-Custodial Violence Law:**
 - **Mandatory video recording** of interrogations.
 - **Time-bound investigation of custodial deaths.**
 - **Independent judicial oversight.**
 - **Civil society monitoring committees** at state and district levels.

D. Use Technology as Safeguard

- CCTV in lock-ups and custody areas:
 - Must be **tamper-proof, audited**, and have **real-time monitoring**.
- Digital forensics and cloud data storage can prevent manipulation.

E. Rehumanize the Police Force

- Change the perception of the **police uniform**:
 - From a symbol of fear → to a symbol of **service and responsibility**.
- Recognition of **police rights, work-life balance**, and **psychological safety** will reduce misuse of authority.

Ethical Dimensions

| Issue | Ethical Concern |
|-------------------------|--|
| Use of force | Abuse of power, lack of empathy |
| Custodial torture | Violation of Article 21 (Right to Life) |
| Mental stress in police | Ignoring human dignity and emotional wellbeing |
| Lack of transparency | Absence of accountability |
| Political interference | Compromising public duty for vested interests |

Conclusion

Custodial deaths are **failures of justice, governance, and morality**. Reforming the criminal justice system requires not just policy changes, but a **cultural transformation of policing** — from control to compassion, from coercion to conscience. India must act now to **protect both its citizens and its police force**, by **investing in reform, not just enforcement**.

