

Today's Prelims Topics

Operation Chakra-V

Context

The Central Bureau of Investigation (CBI) has launched a new phase of Operation Chakra to combat Cybercrime.

About Operation Chakra-V

- It is the 5th phase of **Operation Chakra** (launched to target cybercrime and organized crime).
- Chakra-V is to combat Transnational Organized Cybercrime and **Digital Arrests**.
- **Previous phases (Chakra I to IV) focused on:** OTP frauds, Loan app scams, Job scam rackets & Fake investment schemes.
- **Objectives:**
 - Combating cybercrime and protecting citizens and global communities.
 - Working with international law enforcement agencies like FBI and Interpol to dismantle cybercrime networks.

Central Bureau of Investigation (CBI)

- **Established:** In **1963** on the recommendations of **Santhanam Committee**.
- **Legal Status:** It is **not** a statutory body
 - It derives its power to investigate from the **Delhi Special Police Establishment Act, 1946 (DSPE Act)**
- **Works under:** CVC (in corruption cases) and DoPT (for all other matters)
- **Appointment of CBI Director:** Appointed by the Appointment Committee on the recommendation of a Selection Committee, as per the **Lokpal and Lokayuktas Act, 2013**
 - **Selection Committee:** PM, LoP, CJI
- **Term of CBI Director:** 2 years
 - After completion of 2 years, he can be given **3** extensions of **1** year each.
- **General consent:**
 - **Section 6 of DSPE Act:** Requires CBI to obtain consent from the state government to investigate within its jurisdiction **unless it's a union territory or railway area**.
 - Since 2015, states like Chhattisgarh, Jharkhand, Kerala, Mizoram, Punjab, Rajasthan, Telangana, Meghalaya, and West Bengal have withdrawn their general consent
- **Case where Consent not needed:**
 - If an investigation is directed by the Supreme Court or High Court.
 - For Union Territories

Source:

- [The Hindu - Chakra V](#)

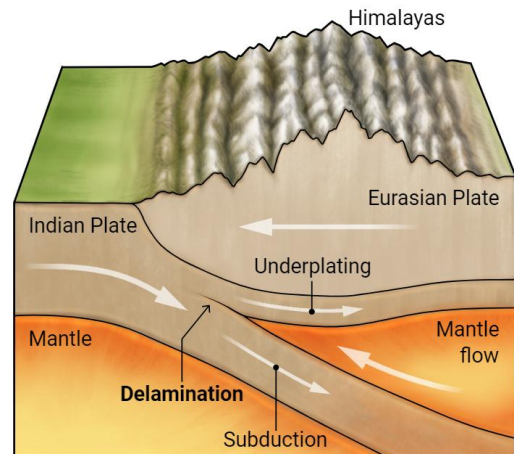
Indian Continental Plate is splitting apart

Context

According to a recent discovery, the Indian Plate is splitting into two, with a portion of it sinking into the mantle.

Indian Plate and Himalayan Formation

- The **Indian Plate** has been colliding with the **Eurasian Plate** for the last **~60 million years**.
- This ongoing collision is the primary cause of the **uplift of the Himalayas** and the formation of the **Tibetan Plateau**.
- Traditionally, tectonic plates were thought to be rigid, but this view is now being challenged.



Delamination of the Indian Plate

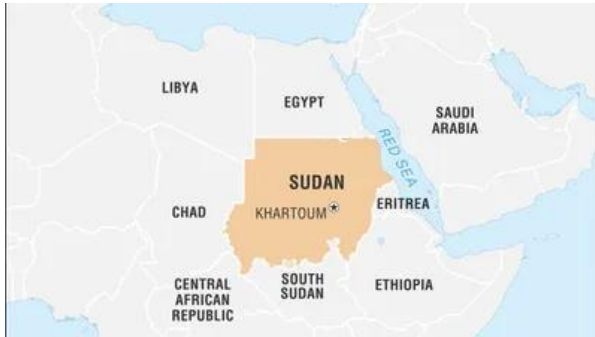
- **Delamination** refers to a **vertical tearing and peeling away of the dense lower layer** of a tectonic plate.
- The **lower part detaches and sinks into the Earth's mantle**, while the upper part may remain in place or move differently.
- Scientists discovered that **a portion of the Indian Plate is undergoing delamination**.
- This means the plate is **splitting into two**, and one part is **sinking into the mantle**.
- **Delamination increases earthquake risks** by changing how stress builds up in the Earth's crust.
- **Areas at Risk:**
 - **Tibetan Plateau** – already prone to earthquakes.
 - **Cona-Sangri Rift** – a deep geological fracture possibly caused by this ongoing tear; may become a new seismic hotspot.

Source:

- [IDR - India is splitting into two](#)

Places in News

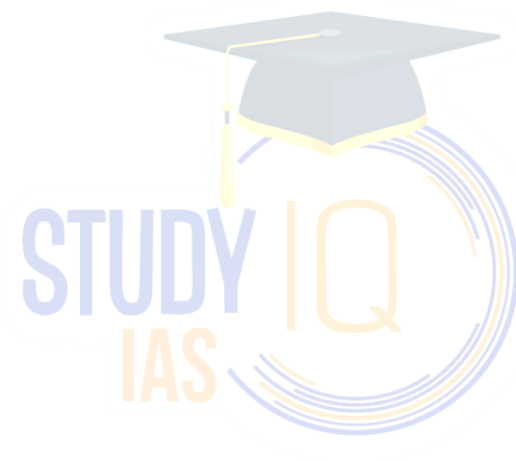
Tuti Island



- It lies at the confluence of the **Blue Nile and White Nile rivers in Khartoum, Sudan.**
- It is also Known as **“Khartoum’s Garden”.**
- **Bordering Countries of Sudan:** Egypt, Eritrea, Ethiopia, Red Sea, South Sudan, Central African Republic, Chad and Libya.

Source:

- [The Hindu - Tuti Island](#)



News in Shorts

Kargil Courier Service

- It is a specialized winter air mail and logistics operation managed by **India Post in collaboration with the Indian Air Force (IAF)**.
- It operates on the Kargil-Srinagar and Kargil-Jammu routes to facilitate the **passengers who are stranded due to the closure of the Srinagar-Leh national highway**.
- This year **3192** passengers were airlifted under this scheme.

Source:

- [Economic Times - KCS](#)

rt-LAMP Assay

- Indian Researchers have developed an indigenous, cost-effective and real-time LAMP (rt-LAMP) assay for early diagnosis of Tuberculosis.

About rt-LAMP Assay

- rt-LAMP assay is a molecular diagnostic test for tuberculosis (TB).
 - **rt-LAMP** stands for real-time Loop-Mediated Isothermal Amplification.
- It can be used to detect the bacteria **Mycobacterium tuberculosis (MTB)**.
- **Advantages:**
 - **Rapid results:** It can provide results within an hour.
 - **High sensitivity and specificity:** Studies have shown that rt-LAMP has high sensitivity and specificity, when compared to traditional methods like **smear microscopy**.
 - **Cost-effectiveness:** rt-LAMP is less expensive than other molecular tests like **GeneXpert** and it doesn't require sophisticated equipment, making it suitable for resource-limited settings.

Source:

- [The Hindu - rtLAMP](#)

STELLAR Model

- Recently the Central Electricity Authority launched STELLAR model for bringing efficiency in the power transmission sector.

About STELLAR Model

- It is a next-generation indigenously developed resource adequacy model for integrated planning of power generation, transmission, storage and demand response.
 - **STELLAR** - State of the art Totally indigenously developed Resource adequacy model.
- **Developed by: Central Electricity Authority (CEA)** in collaboration with The Lantau Group (TLG) and supported by the Asian Development Bank (ADB).
- **Purpose:** To help states and power distribution companies (Discoms) to prepare annual dynamic resource adequacy plans, ensuring uninterrupted power supply.
- It will be distributed **free of cost** to all **States, DISCOMs** and **Load Despatchers**.

Source:

- [PIB - STELLAR](#)

World's 1st unique platform Q-Shield

- Recently QNu Labs has launched the world's first unified platform for quantum-safe cryptography management.

About Q-Shield

- **Q-Shield** is the **world's first unique platform** designed to **secure critical infrastructure** using **quantum-safe cybersecurity solutions**.
- It was launched by **QNu Labs**, a startup supported by the **Department of Science and Technology (DST)** under the **National Quantum Mission (NQM)**.

Key Features of Q-Shield Platform:

- **Qosmos – Quantum Key Generation:**
 - It generates **quantum-random keys &** Ensures **unpredictable and secure** encryption foundations.
- **QConnect – Secured Connectivity:**
 - It provides **quantum-secured communication links &** Protects data in **transit** across networks and systems.
- **QVerse – Secured Collaboration:**
 - It enables secure digital collaboration and data exchange.

Source:

- [News on Air- Q Shield](#)

Accredited Social Health Activists (ASHAs)

- For over two months, ASHA workers in Kerala have been protesting on the streets, demanding better remuneration and retirement benefits.

About ASHA

- ASHAs are community health workers, who act as a bridge between the public health system and the community.
- They are trained and supported to work within their villages, promoting health awareness and improving community health through access to healthcare services.
- ASHAs are primarily women residents of the village selected through a rigorous process involving various community groups.
- The ASHA program was conceived and funded by the **National Rural Health Mission (NHRM)**.
 - NRHM was launched in **2005**, to strengthen India's healthcare delivery system, particularly for the poor and vulnerable in rural areas.
- States are required to employ **at least one ASHA worker per 1,000 people**.

Source:

- [The Hindu - ASHA](#)

Rare Earth Magnets

- Recently China has suspended exports of several critical rare earth elements, metals and magnets in response to US Tariffs.

What are Rare Earth Magnets ?

- **Rare earth magnets** are **strong permanent magnets** made from **rare earth elements**, like **neodymium, samarium and dysprosium**.
- They are **10–20 times stronger** than traditional magnets like ferrite or alnico.
- **Applications:**

- **Electric motors:** Used in hybrid vehicles and other applications requiring high efficiency.
- **Generators:** Used in wind turbines and other energy generation systems.
- **Hard disk drives:** Used in computer storage devices.
- **Audio speakers:** Enhancing sound quality and performance.
- **Medical devices:** Found in MRI machines and other imaging equipment.
- **Defense:** Used in precision-guided missiles, aircraft and electronic warfare systems.

Rare Earth Elements (REE)

- REEs are a group of 17 metallic elements that are essential for various modern technologies.
- E.g. Cerium (Ce), Yttrium (Y), Europium (Eu) etc.
- **China produces ~90% of the world's rare earth elements (REEs).**
- **Highest Reserves Worldwide: (1) China (2) Brazil (3) India (4) Russia (5) Australia**

Source:

- [NDTV world - REM](#)

Mantis Shrimp

- **Mantis shrimp** is a small, colourful crustacean (~10 cm long).
- It uses a **hammer-like appendage** called the **dactyl club** to strike prey at a speed of **23 m/s (82.8 km/h)**.
- This strike speed is **about 50 times faster than the blink of an eye**.
- The energy released is powerful enough to:
 - Create **shockwaves in water**.
 - Cause **cavitation bubbles** (tiny vapour bubbles) due to **low-pressure zones**.
 - Collapse of these bubbles releases **high-frequency shockwaves (hundreds of MHz)** — a **secondary blow** to the prey.
- **IUCN Status:** Least Concern.



Source:

- [The Hindu - Mantis Shrimp](#)

Editorial Summary

Hydrogen For Net-Zero

Context

For India to achieve a net zero economy, hydrogen is a promising substitute for future electricity needs.

Rising Power Demand in India

- **Development-driven consumption:** As India transitions into a developed economy by 2047, electricity demand is expected to grow significantly due to urbanization, industrial expansion, electric mobility, and digital infrastructure.
 - **E.g.,** According to the National Electricity Plan 2023-2032, published by the Ministry of Power, India's peak demand is forecast to reach **458 GW in 2032**—an **83% increase from 2024**.
- **Shift to electrification:** Sectors such as transport (EVs), cooking (electric stoves), and industry (electric arc furnaces, e-boilers) are increasingly shifting from fossil fuels to electricity, further increasing demand.
- **Net-zero commitment:** India's commitment to reach net-zero emissions by 2070 implies a cleaner, more electrified economy. This adds pressure to ensure sufficient, reliable, and low-carbon electricity generation.

Limitations of Conventional Renewable Sources

- **Intermittency of solar and wind:** While solar and wind are key to India's renewable push, they generate power only during specific hours or weather conditions, making them unreliable for continuous supply.
- **Hydro power limitations:** Large hydro projects face environmental, resettlement, and geographical constraints. In addition, climate change impacts water availability, affecting hydroelectric generation.
- **Flexibility challenges:** Currently, coal-fired plants provide flexibility to balance renewable intermittency, but this is not sustainable for a net-zero future.

Hydrogen as a Strategic Game-Changer ("Hydrogen Factor")

- **Industrial decarbonization:** Hydrogen can replace fossil fuels in hard-to-abate sectors like steel (as a reducing agent), cement (high-temperature heat), and fertilizers (as feedstock in ammonia production).
- **Grid balancing tool:** Hydrogen production through electrolysis can be timed during surplus solar/wind power generation, acting as a buffer to stabilize the grid and reduce curtailment of renewables.
- **Energy storage substitute:** Hydrogen can store excess renewable electricity in chemical form, offering longer-term and scalable energy storage compared to batteries.
- **Export potential:** With abundant solar potential, India could become a major exporter of green hydrogen and its derivatives like green ammonia, tapping into global demand from Europe and Japan.

Nuclear Power In India

- As of September 2024, India has 23 operational nuclear reactors with a total installed capacity of 8,180 MW, contributing approximately 3% to the country's electricity generation.



Expansion Targets

- Target:** 100 GW of nuclear installed capacity by **2047** (from ~8 GW today).
- Current Plan:** Setting up **26 new 700 MW PHWRs** across India (including those at Kakrapar, Rajasthan, Haryana).
- Launch of **Bharat Small Reactors (BSRs)** – 220 MW units for captive use in industries and PSUs like Indian Railways.

Challenges with Nuclear Power

Challenge	Description
High Capital Cost	Nuclear plants are expensive to build , with long gestation periods (10+ years).
Inflexible Operation	Not ideal for load-following — can't be easily scaled up/down like solar or hydrogen.

Safety and Public Perception	Long-standing concerns about radiation, nuclear accidents (e.g., Fukushima), and waste disposal.
Water Requirements	Nuclear plants require large quantities of water for cooling, which is a concern in water-scarce regions.

Government Push and Policy Support

- **National Green Hydrogen Mission:** Launched with a budget of ₹19,744 crore, the mission aims to produce 5 million tonnes of green hydrogen annually by 2030 and develop domestic electrolyser capacity.
- **Incentives and certification:** India offers production incentives and is working on a green hydrogen certification scheme.
 - There is also discussion to broaden the term to "low-carbon hydrogen" to include nuclear-based hydrogen.
- **Public-private collaboration:** Leading PSUs like NTPC, Indian Oil, and private firms are investing in pilot projects for green hydrogen production, storage, and use in transport and refineries.

Challenges Ahead

- **High cost of green hydrogen:** Green hydrogen is currently more expensive than grey (fossil-based) hydrogen due to the high cost of electrolysers and renewable electricity.
- **Infrastructure gap:** Hydrogen storage, transport pipelines, and refueling infrastructure are still underdeveloped in India.
- **Technology readiness:** Electrolysers and hydrogen-based industrial processes are still evolving; scaling them up efficiently is a major task.
- **Policy clarity needed:** Regulatory certainty, carbon pricing, and a well-defined taxonomy (e.g., distinguishing green, blue, and nuclear hydrogen) are needed to build investor confidence.

Conclusion

India's rising power demand, driven by development and decarbonization goals, creates both a challenge and an opportunity. Hydrogen—especially green and low-carbon variants—emerges as a key enabler in this transition. With the right mix of policy, technology, and infrastructure, the 'hydrogen factor' can help India not only meet its net-zero ambitions but also position itself as a global clean energy leader.

Source: [The Hindu: India, rising power demand and the 'hydrogen factor'](#)

The approach to regulating AI in India

Context

The governance and regulation of Artificial Intelligence (AI) have garnered significant global attention over the past year.

India's Approach to AI Regulation

India has opted for a **soft-regulatory, mission-driven model** rather than a hard legislative or enforcement-based approach. Unlike some countries that have enacted AI-specific laws or national AI strategies with implementation roadmaps, India's approach is **flexible, adaptive, and evolving**.

Key Elements of India's AI Approach

- **No dedicated AI regulation or law:** India lacks an AI-specific legal framework.
- **No formally endorsed National AI Strategy:** NITI Aayog's 2018 strategy document remains only a suggestive blueprint.
- **Mission-mode focus through IndiaAI:** Emphasis is on fostering innovation and AI ecosystem through the **IndiaAI mission**, backed by 7 pillars like compute infrastructure, datasets, research, and skilling.
- **Advisory frameworks under development:** Expert groups are working on governance frameworks, but adoption remains uncertain.
- **Leverage of existing digital laws:** India may build AI regulation on the backbone of the **Digital Personal Data Protection (DPDP) Act, 2023**.

IndiaAI Mission

- It is a government initiative to promote artificial intelligence (AI) innovation in India.
- **Aim:** To create a robust AI ecosystem in India by democratising access to computing resources, improving data quality and fostering industry partnerships.
- **Focus areas:** Healthcare, education, agriculture, smart cities and infrastructure.
- **Implementing Agency:** 'IndiaAI' Independent Business Division (IBD) under Digital India Corporation (DIC)
- **Key initiatives:**
 - **IndiaAI Application Development Pillar:** This initiative promotes AI solutions in critical sectors by developing, scaling and promoting AI applications.
 - **IndiaAI FutureSkills:** This initiative aims to break down barriers to AI education by offering fellowships to students in top engineering colleges.
- **INDIAai Platform:** This platform serves as a one-stop portal for AI-related development in India. It provides resources such as articles, news, interviews and investment funding news and events. It also offers AI courses, both free and paid.
- **Lead agencies for the mission:** NITI Aayog, the Department of Science and Technology (DST), the Ministry of Electronics and Information Technology (MeitY) and the Department of Biotechnology (DBT).

Merits of India's Current Approach

- **Flexibility & Adaptability:** No rigid law enables India to respond to **rapidly evolving technologies** and global AI geopolitics.
 - Allows policy experimentation and space for stakeholder consultations.
- **Focus on Ecosystem Development:** India is prioritizing building AI **capacity, infrastructure, skills, datasets, and public-private partnerships**.
 - Early-stage adoption requires enabling tools and not over-regulation.

- **Learning from Global Models:** India can **observe regulatory outcomes** in other countries (like EU's AI Act) before acting.
 - Provides time to **create indigenous frameworks** sensitive to local socio-economic realities.

Limitations and Gaps in India's AI Regulation

- **Lack of Coherent Vision and Roadmap:** Absence of an official AI policy means **unclear vision**, no fixed milestones, and **weak accountability**.
- **No Legal Guardrails:** Implementation of AI systems remains largely **voluntary and opaque**.
 - This creates risk of **privacy breaches, biased algorithms, and lack of redressal mechanisms**.
- **Public Unawareness and Lack of Debate:** Citizens are **largely unaware** about where and how AI is being used — in banking, health, education, or welfare delivery.
 - Civic discourse on **ethics, labour disruption, misinformation, and model safety** is limited.
- **Risks of Leadership Dependency:** Without institutionalized regulation, AI adoption risks becoming **personality- or ministry-driven**, lacking continuity.
- **Reactive, Not Proactive:** India has responded **after harm**, e.g., AI-generated content causing social unrest, instead of **anticipating and preparing**.

Global Models India Can Learn From

Country/Region	Model	Key Feature
EU	Centralized, binding	EU AI Act – risk-based, with clear bans and regulations.
China	Use-case specific	Focused rules on deep synthesis and generative AI .
USA	Decentralized	Sector-specific regulations, market-led innovation.
Canada, Korea, Peru	Draft laws introduced	Emphasis on AI transparency and accountability .
85+ countries incl. AU	National AI strategies	Define vision, roadmaps, and ethical guardrails.

Way Forward for India

- **Draft and Publish a National AI Policy:** Should outline:
 - Vision for AI in India
 - Priority sectors (health, agriculture, education, governance)
 - Capacity-building strategy
 - Ethical and legal frameworks
 - Public awareness, participation, and grievance redress
- **Pilot Regulatory Mechanisms:** Use **regulatory sandboxes** in key sectors (e.g., Fintech, HealthTech) to test AI systems in real-world conditions.

- **Strengthen Citizen-Centric Safeguards:** Mandate **algorithmic transparency, impact assessments,** and opt-out mechanisms in public services.
- **Integrate with DPDP Act, 2023:** Use India's centralised data protection law as a foundation for **cross-sector AI governance.**
- **Create an Independent AI Oversight Body:** Like a **"National AI Commission"** to audit high-risk models, set standards, and ensure responsible AI deployment.

Conclusion

India's current AI approach is **innovation-centric and adaptive**, but it lacks regulatory clarity and citizen protection mechanisms. As AI rapidly becomes embedded in socio-economic systems, India needs a **clear, inclusive, and enforceable framework.** A balanced strategy — combining **AI policy, legal guardrails, and ethical principles** — is essential to ensure AI in India is not only cutting-edge but also **safe, inclusive, and aligned with constitutional values.**

Source: [The Hindu: The approach to regulating AI in India](#)



Harnessing Spiritual Aastha for River Rejuvenation

Context

- Events like the **Maha Kumbh Mela**, where more than 60 crore people congregated in Prayagraj, represent the **epitome of India's riverine spirituality**.
 - This **deep-rooted spiritual reverence (aastha)** can be turned into a **pragmatic tool (astra)** for the **ecological rejuvenation of rivers**.

Understanding the River-Society-Spirituality Continuum

In the Indian civilisational ethos, rivers like the **Ganga, Yamuna, and Saraswati** are personified as goddesses. This reverence:

- Shapes **rituals** like *snan* (ritual bathing), *aarti*, and immersion ceremonies.
- Encourages **pilgrimages** to sacred riverbanks.
- Builds a **collective consciousness** around rivers as sacred living entities.
- This deep spiritual bond is often described as *aastha* — a multi-layered term denoting faith, devotion, emotional attachment, and ethical responsibility. However, the **material manifestations** of *aastha* (mass bathing, disposal of ritual materials, settlement on riverbeds) often **strain river ecologies**.

The Twin Narratives of the Kumbh Mela

Spiritual Spectacle and Cultural Legacy

- The Maha Kumbh turns the floodplain into an “**ephemeral megacity**” (Harvard study), built and dismantled within 2–3 months.
- It represents an extraordinary **logistical, spiritual, and political collaboration**.
- It reinforces the spiritual centrality of rivers in Indian life.

Environmental Pressures and Ecological Cost

- CPCB data from 2013 and 2024 reveals alarming spikes in **faecal coliform and organic pollutants** during bathing days.
- **Temporary sanitation infrastructure**, unmanaged **solid waste**, and **overcrowding** put intense pressure on the river.
- These events contradict the ecological ethic supposedly embedded in Indian spirituality.

Rethinking Rituals as Ecological Instruments

Rather than dismissing rituals as ecologically regressive, there is a compelling case to **reinterpret and mobilize them as ecological tools**.

- **Indigenous Practices as Ecological Ethos:** Indigenous knowledge systems, even when spiritual in form, often carry **conservation logic**.
 - **Example: Morari Babu's campaign** helped protect the endangered **whale shark** by framing it as a sacred entity — making the community a stakeholder in conservation.
- **Cultural Gatherings as Behavioural Change Platforms:** Mass religious congregations provide **unmatched access to millions**, making them ideal platforms for:
 - **Eco-awareness campaigns**
 - **Behavioral nudges** (e.g., switching to biodegradable ritual materials)
 - **Demonstration of sustainable practices** (eco-toilets, clean-up drives, zero-waste pilgrimages)

Challenges in Translating Aastha into Astra

- **Institutional Gaps: Namami Gange**, while effective at the national level, suffers from a **lack of institutionalization at state and local levels**.
 - Budget allocations and mandates for **district-level implementation** are still insufficient.

- **Non-point Source Pollution:** Much of the river pollution comes not from large industries but from **daily household waste, ritual remnants, and urban runoff.**
 - These sources are **diffuse and decentralized**, requiring **community-level behavioral change.**
- **Risk of Reinforcing Social Hierarchies:** Ritual practices are often mediated by **priests, ashrams, spiritual leaders**, who may wield **social and cultural power.**
 - Without inclusivity, efforts may **privilege dominant groups** and exclude marginalized voices.

Strategic Pathways: Turning Faith into Force

- **Engage Spiritual Networks as Stakeholders:** Work with **pandas, pandits, akharas, and popular preachers** to develop **ecological codes of conduct.**
 - Encourage **eco-spiritual leadership**, where faith leaders speak about sustainability from the pulpit.
- **Localize the Mission:** Embed Namami Gange-like efforts into **state water policies, urban planning, and gram panchayat actions.**
 - Incentivize local festivals like **Chhath Puja, Ganesh Visarjan**, etc., to adopt **eco-sensitive guidelines.**
- **Decode Rituals through the Lens of Ecology:** : Promote **ritual innovation:** biodegradable materials for immersion, use of designated zones, symbolic rituals instead of material offerings.
 - Encourage research into **historical ecological practices** embedded in regional traditions.

Conclusion

The idea of transforming *aastha* into *astra* is not utopian. It is a **strategic necessity**. Rivers like the Ganga will not be saved by infrastructure alone — they will be saved when **faithful behavior aligns with ecological responsibility.**

To make river rejuvenation truly enduring, we must go **beyond pipes and plants to people and practices.** The spiritual power of gatherings like the Maha Kumbh must be redirected — not away from the river, but **towards its revival.** This fusion of spirituality and sustainability may well be **India's greatest contribution** to the global quest for living harmoniously with nature.

Source: [Indian Express: The New Sangam](#)