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**DAILY NEWS  
ANALYSIS**



**MARCH 26**



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# Tehran dismisses U.S. attempt to end conflict, sets own terms

Halting aggression, reparations, and recognition of its 'sovereignty' over the Strait of Hormuz are part of Tehran's terms; U.S. is offering sanctions relief in return for the Islamic Republic abandoning its nuclear programme and reopening the Strait

Stanley Johnson

Iran on Wednesday dismissed a U.S. proposal to end the war and set out its own terms for peace, even as it continued trading fire with Israel.

The U.S. proposal offered a ceasefire and sanctions relief in return for the Islamic Republic abandoning its nuclear programme and reopening the Strait of Hormuz.

Iran, according to state-run Press TV, has laid down five conditions to end the war, which the U.S. and Israel launched on February 28 with the assassination of Supreme Leader Ayatollah Ali Khamenei and several other leaders. Tehran is seeking "a complete halt" to aggression and assassinations; "concrete mechanisms" to prevent future attacks; payment of war damages and reparations; an end to fighting on "all fronts"; and recognition of its "exercise of sovereignty" over the Strait of Hormuz, which it calls its "natural and legal right".

"Iran will end the war when it decides to do so and when its own conditions are met," a senior security official said, according to Press TV. The official, who is not named in the report, said Washington has put forward proposals through various diplomatic channels that are "excessive" and "disconnected from reality" on the battlefield.

**'Very big present'**  
U.S. President Donald Trump, who had backed off from his threat to attack Iran's power infrastructure claiming that Washington



First responders at a site struck by a projectile in Israel, near Tel Aviv, as the missile war in West Asia continues. AFP

and Tehran were in talks, said on Tuesday that Iran had given him "a very big present worth a tremendous amount of money", adding that "we are dealing with the right people". "I think we're going to end [the war]," Mr. Trump said without elaborating on the "present".

Iran's Khatam al-Anbeya Central Headquarters on Wednesday dismissed reports about talks, adding that the U.S. is calling its "defeat" an agreement.

The comments from Mr. Trump, who has put off his threatened strikes until Friday, came amid reports that the Pentagon was planning to deploy thousands of troops from the elite 82nd Airborne Division to West Asia.

The Associated Press earlier cited two Pakistani officials as saying that Isla-

mabad had delivered the U.S. plan to Tehran. The proposal addresses sanctions relief, a rollback of Iran's nuclear programme, limits on its missile programme, reopening the Strait of Hormuz and restrictions on Iran's support for non-state militias in West Asia such as Hezbollah and Hamas, said the officials.

#### Sarcastic response

"We are closely monitoring all U.S. movements in the region, especially troop deployments," Iran's Parliament Speaker Mohammad-Bagher Ghalibaf said on Wednesday in a social media post. "What the generals have broken, the soldiers can't fix; instead, they will fall victim to [Israeli Prime Minister Benjamin] Netanyahu's delusions. Do not test our

resolve to defend our land," he added. He later warned about a possible invasion of an Iranian island with the support of an unnamed regional country.

"If the self-proclaimed superpower of the world could have escaped this predicament, it would have done so by now. Do not call your defeat an agreement," Central Headquarters spokesperson Lt. Col. Ebrahim Zolfagari said in a video statement. "Has the level of your infighting reached the point of negotiating with yourselves?" he asked, sarcastically.

#### Fire exchanges on

While the U.S. and Iran issued contradicting claims about talks, Tehran and Tel Aviv continued to attack each other on Wednesday.

The Israel Defence Forces (IDF) said that it targeted Iran's "sole facility" for the development of submarines, and other weapons manufacturing sites in Isfahan. Iran fired at least 13 salvos of missiles at Israel on Tuesday, in which nine people were wounded.

Iran's Islamic Revolutionary Guard Corps (IRGC) said in a statement on Wednesday that it launched missiles at central and northern Israel as well as U.S. bases in the Persian Gulf region. "Strategic points and military centers located in the northern occupied territories were smashed under the heavy and sustained missile attacks of the IRGC's Aerospace Force," the Guards said.





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- **Key Terms and Explanations**

- **Strait of Hormuz:** A narrow chokepoint between the Persian Gulf and the Gulf of Oman. It is the world's most important oil transit pass; roughly one-fifth of the world's total oil consumption passes through it.
- **Sovereignty:** The supreme authority of a state to govern itself. In this context, Iran is asserting legal control over a global maritime artery, challenging the "Freedom of Navigation" principle.
- **Sanctions Relief:** The lifting of economic penalties (trade barriers, asset freezes) typically used by the U.S. as leverage to influence Iranian policy.
- **Non-State Militias:** Armed groups that operate independently of a state government but often receive state support (e.g., Hezbollah in Lebanon, Hamas in Gaza).
- **IRGC (Islamic Revolutionary Guard Corps):** A branch of the Iranian Armed Forces intended to protect the country's Islamic republic system. It is a powerful political and economic actor within Iran.

- **Main Arguments and Substantive Parts**

- The core of the current standoff lies in two diametrically opposed "peace" frameworks:
  - **The U.S. Proposal (The "Carrot and Stick" Approach)**
  - **The Offer:** Full sanctions relief and a ceasefire.
  - **The Demand:** Iran must dismantle its nuclear program, limit its missile capabilities, reopen the Strait of Hormuz, and cease support for regional proxies like Hezbollah.
  - **The Goal:** To neutralize Iran's regional influence and ensure global energy security.
  - **The Iranian Counter-Terms (The "Sovereignty" Approach)**
  - **Cease Aggression:** An immediate end to military strikes and targeted assassinations (referencing the Feb 28 events).
  - **Reparations:** Financial compensation for war damages, shifting the narrative from Iran as an "aggressor" to Iran as a "victim."
  - **Maritime Control:** Formal recognition of Iranian sovereignty over the Strait of Hormuz.
  - **Multi-Front Peace:** An end to fighting across all regional theaters, not just a bilateral truce.
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- **Historical Evolution of the Issue**

- The tension is not a vacuum-sealed event but the result of decades of friction:
- **1979 Islamic Revolution:** The turning point that transformed Iran from a key U.S. ally to a "Revisionist State."
- **The "Tanker War" (1980s):** During the Iran-Iraq war, both sides attacked commercial shipping in the Persian Gulf, leading to U.S. naval intervention.
- **JCPOA (2015):** The nuclear deal aimed at curbing Iran's nuclear ambitions in exchange for sanctions relief.
- **The "Maximum Pressure" Campaign (2018):** The U.S. withdrawal from the JCPOA under the Trump administration, leading to the current cycle of escalation.
- **The "Shadow War" (Present):** Transition from proxy conflicts to direct missile exchanges between Iran and Israel.

- **Previous Year Questions (PYQs)**

- **Mains (2017):** "The worldly status of the Strait of Hormuz makes it a vital chokepoint. Discuss its significance for India's energy security."
- **Mains (2020):** "The 'West Asian' crisis is no longer just about Israel and Palestine. Evaluate the role of the Iran-Saudi rivalry in shaping the region."
- **Prelims (2022):** Location-based questions on the Persian Gulf and surrounding countries.



# WEST ASIA'S NEW STRATEGIC LANDSCAPE: AXIA IAS ACADEMY ANALYSIS



## CONFLICT KEY & GEOGRAPHY



**Challenge**  
TRUST DEFICIT  
REGIONAL ESCALATION

## AXIA IAS STRATEGIC SYNTHESIS



## THE PEACE FRAMEWORK: DIVERGENT VIEWS

### U.S./ISRAEL PLAN

- Carrot and Stick**
- 
- I ceasefire**
- FULL SANCTIONS RELIEF
  - CEASEFIRE
  - NUCLEAR PROGRAM ABANDONED
  - STRAIT REOPENED

### IRAN'S COUNTER-TERMS



### Key Concepts

- REALISM
- EPISTEMIC GAP
- WESTPHALIAN SOVEREIGNTY

### Way Forward

- BACK-CHANNEL DIPLOMACY
- REGIONAL SECURITY ARCHITECTURE

## UPSC LINKAGES & NOTES

GS II (International Relations)	GS III (Security)	Essay
<ul style="list-style-type: none"> <li>• Bilateral relationships</li> <li>• Regional groupings</li> <li>• Effects of policies of developed nations</li> </ul>	<ul style="list-style-type: none"> <li>• Border areas</li> <li>• Internal security</li> <li>• Linkages with external state actors</li> </ul>	<ul style="list-style-type: none"> <li>• Geopolitics</li> <li>• Costs of War</li> </ul>

## Govt. defends stand as Opposition raises Pakistan role in Iran

Sobhana K. Sair  
Suhasini Haldar  
NEW DELHI

Furrying the questions raised by the Opposition regarding the reported central role played by Pakistan in mediating between the U.S. and Iran, External Affairs Minister S. Jaishankar on Wednesday termed the neighbouring country a "doka" and said that it had been playing this role since 1981.

He was addressing an all-party meeting chaired by Defence Minister Rajnath Singh on the recent developments in West Asia and their impact on India. Union Petroleum Minister Hardeep Puri also assured the gathering that India continued to maintain a strategic petroleum reserve of 74 days. While the country was not facing any imminent energy crisis, he noted that the supply cycle for LPG had extended from 20 days to 45 days. This, he said, should stabilise soon.

### 'Balanced position'

Responding to criticism over India's "silence", Mr. Jaishankar asserted that with nearly one crore Indians living in West Asian countries, it was crucial for India's strategic and economic interests to maintain a balanced position. India, he said, remained in a unique position, able to communicate with all sides.

Citing Prime Minister Narendra Modi's recent talks with Iranian authorities, he said two Indian ships had been allowed to sail through the Strait of Hormuz, while 18 others still in the region would soon set sail for Indian shores. He said that the U.S. continued to be India's biggest trading partner,



S. Jaishankar

while Israel was a key technological partner.

The External Affairs Minister also said that the U.S. sanctions on India had a long history and that previous administrations in Washington had deployed them in the past. While the Opposition "shamed" the government, he said that India's import of Russian oil never completely stopped.

### 'Meet unsatisfactory'

Furrying the Trinamool Congress, all Opposition parties attended the meeting. Their questions covered India's silence on the assassination of Iran's late Supreme Leader Ayatollah Ali Khamenei, the timing of PM Modi's visit to Tel Aviv - two days before the U.S. and Israel launched strikes on Iran; Pakistan's role as a mediator; the rise in LPG prices due to the ongoing crisis; and India's commitment to the Non-Aligned Movement.

Speaking to presspersons later, senior Congress leader Taru Arora described the meeting as "unsatisfactory".

Senior CPIM leader John Brittas said, "All the Opposition leaders who spoke said that the government should have taken a position on the unilateral attack by the United States against a sovereign, independent country, Iran."

- **Key Terms and Explanations**

- **Strategic Petroleum Reserve (SPR):** Emergency fuel storage maintained by a country to ensure energy security during supply disruptions.

- *Example:* India's underground salt caverns in Visakhapatnam and Mangaluru.

- **Strait of Hormuz:** A narrow, strategically vital waterway between the Persian Gulf and the Gulf of Oman. It is the world's most important oil chokepoint.

- **Non-Aligned Movement (NAM):** A forum of 120 developing world states that are not formally aligned with or against any major power bloc. It originated from the Bandung Conference (1955).

- **Mediation vs. Brokering ("Dalal"):** Mediation is a formal diplomatic effort to resolve disputes. The term "dalal" (broker/agent), used colloquially in the text, implies a transactional or opportunistic role in international relations.

- **Secondary Sanctions:** These occur when one country (e.g., the U.S.) penalizes a third party (e.g., India) for trading with a sanctioned country (e.g., Iran or Russia).

- **Main Arguments and Substantive Parts**

- **The "Balanced Position" Thesis:** The government argues that India cannot afford a partisan stance due to the **10 million (1 crore) Indian diaspora** in West Asia and the region's role as India's primary energy source.

- **Energy Security vs. Supply Chains:** While the physical reserve (74 days) is stable, the **LPG supply cycle** has doubled (from 20 to 45 days), indicating that logistics and maritime security are more immediate threats than total resource depletion.

- **Pakistan's Role:** The government dismisses Pakistan's role as a mediator between the U.S. and Iran as historical "brokerage" rather than genuine diplomatic leadership, dating back to the 1980s.

- **Multi-Alignment Strategy:** India continues to trade with the U.S. (top trading partner) and Israel (tech/defense partner) while simultaneously engaging Iran for maritime passage and Russia for oil.

- **Opposition Critique:** The primary counterargument is that India's "silence" on unilateral strikes against sovereign nations undermines its traditional standing as a leader of the Global South and a defender of international law.

- **Historical Evolution of the Issue**
  - **Cold War Era (1947–1991):** India pioneered **Non-Alignment**. Relations with Iran were cordial but complicated by Pakistan's proximity to the U.S.-led CENTO alliance.
  - **The 1979 Revolution:** The fall of the Shah of Iran changed regional dynamics. India was one of the first to recognize the Islamic Republic, balancing its ties despite U.S. pressure.
  - **Post-1991 Liberalization:** India moved closer to the U.S. (123 Agreement) and Israel, leading to a "tightrope walk" where India occasionally voted against Iran in the IAEA regarding its nuclear program.
  - **The JCPOA Era (2015–Present):** After the U.S. withdrew from the Iran Nuclear Deal in 2018, India faced immense pressure to stop oil imports from Iran, leading to the current "strategic silence" or balanced diplomacy.
- 
- **Previous Years' Questions (PYQs)**
  - **UPSC Mains (2022, GS2):** "India is a third-world country and its foreign policy is still characterized by the remnants of the Cold War." Discuss.
  - **UPSC Mains (2017, GS2):** "The regional hotspots of the world... West Asia... have a direct impact on India." Analyze.
  - **UPSC Prelims (2020):** Question regarding the importance of the Strait of Hormuz and location-based questions on the Persian Gulf.

# THE AXIA IAS ACADEMY GEOPOLITICAL ANALYSIS: India's Diplomatic Balancing Act



# AXIS ACADEMY

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## KEY TERMS & EXPLANATIONS

### Strategic Petroleum Reserve



### Strait of Hormuz



India underground storage caverns and underground nonerground ecremries.

### Non-Aligned Movement



Historical of historical leaders and developing countries

### Secondary Sanctions



Iranian's penonty sanctions in Iranim to be sanctions

# AXIA IAS ACADEMY

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### THE 'DALAL' DISMISSAL

India's assertive dismissal or assist's dismissal of Pakistan's mediation as transactional.

## CHALLENGES & WAY FORWARD

### ENERGY DEPENDENCY VULNERABILITY



### DIPLOMATIC TIGHTROPE



India's assertive conflicting most conflicting partners



### WAY FORWARD:

1. Energy Diversification
2. Expand SPR
3. Maritime Security
4. Domestic Consensus

## HISTORICAL EVOLUTION TIMELINE



## MULTIDIMENSIONAL ANALYSIS (GS-PACK)



## UPSC CSE LINKAGES & PYQ REFERENCE

- Detailed mapping to GS Papers 1-4, Essay, Ethics, and PSIR. (Dotudetationsms)
  - CSG mapping to 5 GSS Papers
  - Economic Ciallled Ross, Support, GS Papers 1-4, RS, International Economic ISE (ATR)
  - Competitions, and PSIR
  - Enrolement ad connected for Essay, Essacy. Complication
- Simplified PYQ themes:**
- NAM Relevance
  - West Asia hotspots
  - Energy Security

# India aiming for 60% non-fossil fuel power sources by 2035

Jacob Koshy

NEW DELHI

Updating its climate goals, India has pledged that by 2035, 60% of its installed electricity capacity will comprise non-fossil sources. It also aims to reduce by 47% the intensity of emissions per unit of GDP from 2005 level and to increase its carbon sink to 3.5 to 4 billion tonnes.

These targets make up its Nationally Determined Contribution (NDC), which are to be communicated to the United Nations Framework Convention on Climate Change (UNFCCC).

"We will easily achieve these goals... [with] the speed with which we are expanding our non-fossil sources," Union Information Technology Minister Ashwini Vaishnaw said at a briefing on Wednesday following a Cabinet meeting.

As a signatory to the Paris Agreement, India was required to issue an updated NDC in 2025, which

spells out its voluntary actions towards transitioning away from fossil fuel and improving energy-efficiency measures.

At the 30th edition of the Conference of Parties in Belem, Brazil, in November last year, Environment Minister Bhupendra Yadav said that India would announce the NDC by the "year-end".

## Current commitments

India's current NDC, officially conveyed to the United Nations in August 2022, commits to the following by 2030: having 50% of its capacity of installed electric power from non-fossil sources; reducing the intensity of emissions per unit of GDP by 44%; and increasing its carbon sink to at least 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent.

The Conference of Parties, or CoP, is a body of nations that convenes annually to discuss climate issues and proposals to transition their economies



away from fossil fuel.

Currently, about 52% of India's installed electricity capacity comes from non-fossil fuel sources – a target achieved well before the deadline – though only about 25% of the power generated is non-fossil. These sources include solar, wind, hydropower, biomass, and nuclear power. As of 2019, say official estimates, India had achieved an emissions intensity of 36% from 2005-2020.

A carbon sink of 1.97 billion tonnes of CO<sub>2</sub> equivalent had already been created from 2005 to 2019. However, forest and tree cover accounts for about 24.6% of India's geographical area as of 2021, which is higher than the 21% in 2005, but still less than the national policy goal of 33%.

## "Strong resolve"

"In shaping India's NDC for 2031-2035, the government has considered the out-

comes of the first Global Stocktake (GST), principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC), and equity with a view to harmonize national realities, developmental priorities, energy security and the need for greater ambition in climate action, in line with the purpose and long-term goals of the Paris Agreement," the Environment Ministry said in a statement.

Initiated in 2021, the GST assesses the world's collective progress towards limiting global warming to 1.5 degrees Celsius, concluding that nations are not on track. Several independent analysts have suggested that while India may meet its 2030 NDC targets, it is not enough to keep the globe on a 1.5 degrees Celsius pathway.

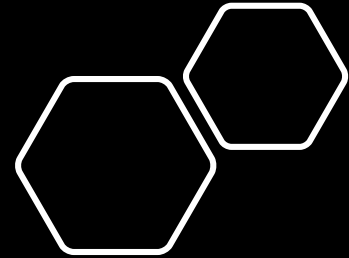
Independent analysts said India was picking up the slack for developed countries.

India's NDC target had

come amid a "rollback of climate policies" and "unilateral trade measures" by developed, rich countries, Vaibhav Chaturvedi, senior fellow, Council for Energy, Environment and Water (CEEW), told *The Hindu*.

"It demonstrates a strong resolve to address transmission and land availability constraints faced by the renewables sector. The 47% emissions intensity target shows that energy security and prices cannot be taken for granted."

"At a time when developed countries are backtracking on ambition, deepening their fossil fuel entrenchment, and dragging the world towards military conflict, the signal from India shows that Global South (developing country) leadership on climate ambition is concrete and real," Avantika Goswami, of the Centre for Science and Environment (CSE), an influential think tank, said in a statement.



- **Key Terms and Explanations**

- **Nationally Determined Contributions (NDC):** Under the Paris Agreement, NDCs are non-binding national plans highlighting climate actions, including targets for reducing emissions. Think of it as a "voluntary report card" where each country sets its own goals.
- **Emissions Intensity:** The volume of greenhouse gases emitted per unit of GDP. If India's GDP grows while its emissions stay the same or grow slowly, its emissions intensity decreases.
- **Carbon Sink:** A natural or artificial reservoir that absorbs more carbon than it releases. **Example:** A massive new afforestation project in the Aravallis acts as a sink by soaking up CO<sub>2</sub>.
- **Global Stocktake (GST):** A fundamental mechanism of the Paris Agreement used to monitor the implementation of the treaty and assess collective progress. It's the world's "reality check."
- **CBDR-RC (Common but Differentiated Responsibilities and Respective Capabilities):** A principle within the UNFCCC that acknowledges all states have a shared obligation to address climate change but denies that all states should bear equal responsibility. It highlights the gap between developed and developing nations.
- **Installed Capacity vs. Generation:** "Capacity" is the maximum potential output of power plants (the "size of the engine"), while "Generation" is the actual electricity produced over time (the "distance driven"). India has high RE capacity but lower actual generation due to the intermittency of sun and wind.

- **Main Arguments and Substantive Parts**

- **The 2035 Pivot:** India has raised its ambition, pledging 60% non-fossil installed capacity by 2035 (up from 50% by 2030). This shows a "ratchet effect" where goals become progressively more ambitious.
- **The Decoupling of Growth and Emissions:** By aiming for a 47% reduction in emissions intensity, India argues it can achieve "Green Growth"—expanding its economy without a linear increase in pollution.
- **Global South Leadership:** A major argument is that while developed nations are "backtracking" or "rolling back" climate policies due to energy security or conflict, India is doubling down, positioning itself as a responsible global stakeholder.
- **Implementation Success:** India's confidence stems from the fact that it achieved its initial 40% non-fossil target (set in 2015) nine years ahead of schedule.
- **Counter-Arguments (The 1.5°C Gap):** Some analysts argue that while India's targets are ambitious for a developing nation, they are still insufficient to keep global warming below the critical 1.5°C threshold.

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- **Historical Evolution of the Issue**

- **Pre-1992:** Environment protection was largely domestic (e.g., Wildlife Protection Act 1972).
- **1992 (Earth Summit):** Adoption of the UNFCCC; India joins as a "Non-Annex I" (developing) country.
- **2008 (NAPCC):** India launches the National Action Plan on Climate Change with eight core missions, including the Solar Mission.
- **2015 (Paris Agreement):** India commits to its first NDC (33-35% intensity reduction and 40% non-fossil capacity by 2030).
- **2021 (COP26 Glasgow):** PM Modi announces "Panchamrit" goals, including the "Net Zero by 2070" target.
- **2025/26 (Present):** Introduction of the 2035 NDC, shifting the focus toward deeper decarbonization.

- **Previous Years' Questions (PYQs)**

- **Mains (2021):** "Describe the outcomes of the 26th session of the COP to the UNFCCC. What are the commitments made by India in this conference?"
- **Mains (2022):** "Explain the purpose of the Green Grid Initiative announced at World Leaders Summit of the COP26."
- **Prelims (2016/2017):** Questions on the Paris Agreement, NDCs, and the International Solar Alliance.



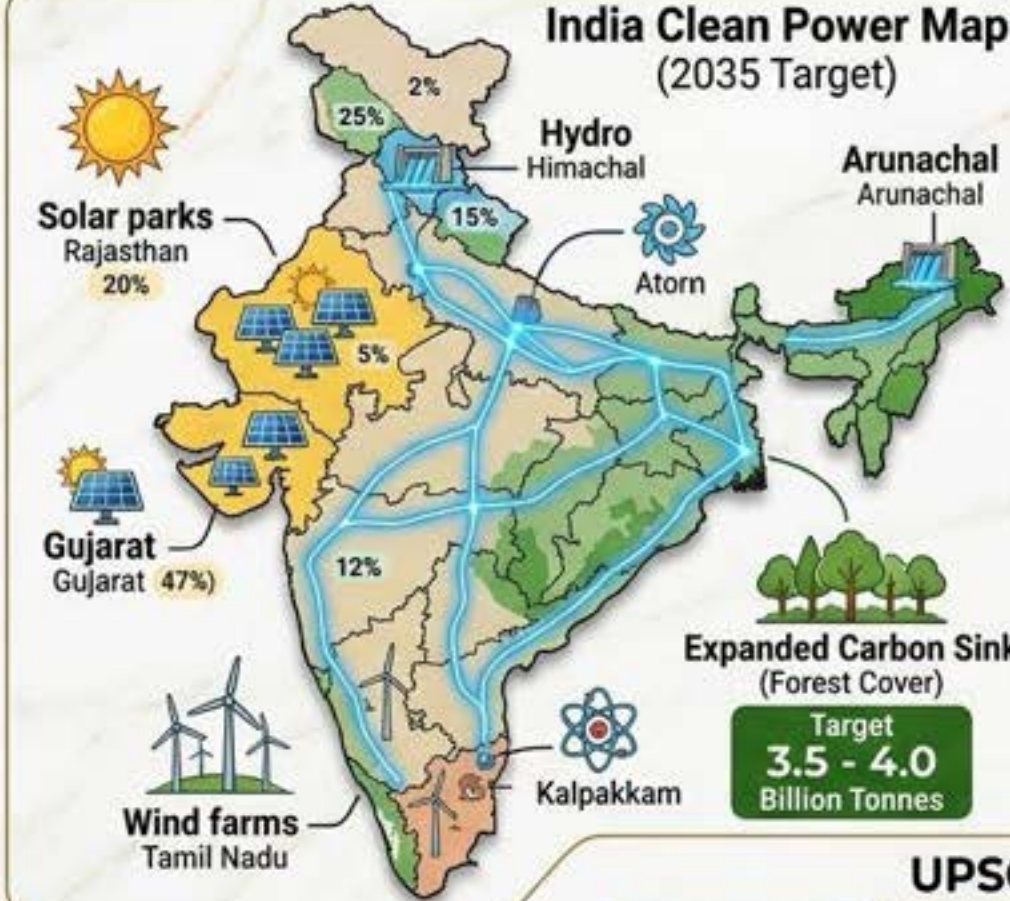
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AXIA COMPETITIVE EXAM CENTRE

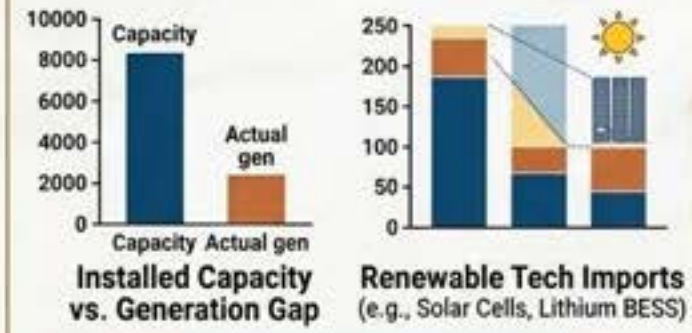
## THE NDC JOURNEY (Timeline)

- 2015**
  - Paris Agreement Commitments
  - (First NDC)
- 2021**
  - Panchamrit Goals
  - Modi at COP26
  - Net Zero 2070
- 2022**
  - NDC Update
  - 50% non-fossil by 2030
  - 44% emissions reduction
- 2035**
  - \*NEW\* TARGET**
  - 60% non-fossil capacity
  - 47% emissions reduction
  - 3.5-4B tonne sink

# AXIA IAS ACADEMY PRESENTS: A COMPREHENSIVE ANALYSIS OF INDIA'S REVISED NDC TARGETS (2035)



## THE CHALLENGES & KEY SOLUTIONS



- Grid Integration & Energy Storage**  
(BESS, Pumped Hydro)
- Just Transition in Coal Belt**  
(Social & Economic support)
- Climate Finance Access**  
(from developed nations)

## UPSC CSE RELEVANCE

- GS PAPER II**
  - International Relations
  - UNFCCC
- GS PAPER III**
  - Energy Security
  - Environment
  - S&T
- ETHICS**
  - Environmental Responsibility
- INTERVIEW**
  - Knowledge of national vision

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# Cauvery basin to face dry spell until 2050, says study

Cauvery faces potential decline of about 3.5% of its waters between 2026 and 2050, even as its northern counterparts brace for floods; researchers warn that water sharing could get tougher

Jacob Koshr  
NEW DELHI

**W**hile a warming climate is expected to significantly increase the flow of most major Indian rivers, the Cauvery basin stands out as an exception. The river faces a potential "near-term decline" of approximately 3.5% of its waters between 2026 and 2050, even as its northern counterparts brace for floods, according to a study by researchers at the Indian Institute of Technology (IIT), Gandhinagar, published in the peer-reviewed journal *Earth's Future*.

Given the fraught history of Cauvery water sharing between Karnataka and Tamil Nadu, particularly in years of deficit rainfall, the study suggests that despite climate models projecting increased rainfall from global warming in India in the decades ahead, the Cauvery might not benefit. In such a situation, river interlinking projects, such as the proposed Godavari-Cauvery link project, might be necessary, the researchers say.

The study finds that the Cauvery experienced a 28% decline in streamflow between 1951 and 2012, based on data from Kollegal which, one of the authors told *The Hindu*, "well represented" actual flows in the Cauvery.

While the study is based

## Worry lines

An IIT Gandhinagar study paints a grim picture

- Flows in the Cauvery basin are expected to decline in the 'near-term' (2026-2050) and rise only 'negligibly' from 2021.
- The river will not benefit from the increased rainfall from global warming in the decades ahead.
- River interlinking projects such as the proposed Godavari-Cauvery link could help.



The Cauvery riverbed lies largely exposed at the Mukumbura dam in Tiruchirappalli, Tamil Nadu. © ANAND K

on a modelling study and is reliant on an extrapolation, it attempts to reduce errors that can creep in from blindly applying climate models to predict the impact of global warming on Indian rainfall. To do that, the authors use a novel statistical framework and base their analysis on actual river flows between 1951 and 2012, measured at nine stations representing nine major river basins, and then extrapolates the data using a "constrained modelling" approach.

The nine rivers are the Cauvery (measured at Kollegal), the Ganga (Farakka), Brahmaputra (Brahmavaram), Indus (Bhakra), Godavari (Polavaram), Krishna (Kurundwad), Mahanadi (Basarpur), Narmada (Mandleshwar), and Tapi (Barhanpur).

Decades of failed negotiations on water sharing between Karnataka and Tamil Nadu led to the esta-

ishment of the Cauvery Water Disputes Tribunal (CWDT) in 1990, which took 17 years to reach a final order in 2007. The tribunal calculated total available water at 740 thousand million cubic (tmc) feet in a normal year, and allocated shares accordingly. The 2018 Supreme Court verdict allocated 404.25 tmcft to Tamil Nadu and 284.75 tmcft to Karnataka, while also declaring the Cauvery a national asset.

In 2023, Tamil Nadu requested 24,000 cusecs a day citing drought, but Karnataka refused, citing its water shortage, leading to protests in both States.

### Water shortage

Water challenges apart, the study highlights a persistent problem in climate science: while models agree that India will get warmer, they vary widely on exactly how much rain will fall. By applying obser-

vatational constraints, the researchers identified that only eight out of 22 models accurately captured the seasonality of the Indian monsoon.

The source models used are the CMIP6 (Coupled Model Intercomparison Project Phase 6), which are the latest generation of global climate models used by scientists to project future climate change.

Unconstrained models show a 5% increase in the Cauvery in the near term, the researchers said, as well as a 25% increase in the Indus, 8% in the Ganga, and 16% in the Krishna. When projections were restricted to these "constrained" or more reliable models, the certainty of a wetter future for most rivers increased, but the outlook for the Cauvery was grim, with the basin facing "near- and mid-term water shortages".

The researchers were led by Dipesh Singh Chugh and Professor Vimal Mishra of IIT Gandhinagar.

"Raw outputs have biases because of model resolution, simplified physics that global climate models use. To correct these biases and show future trends based on what is actually observed, we use constrained models," Mr. Chugh, the lead author of the study, told *The Hindu*. "As far as the Cauvery is concerned, it implies that water sharing could get tougher."

- **Key Terms and Explanations**

- **Cauvery Basin:** A river basin in Southern India covering parts of Karnataka, Tamil Nadu, Kerala, and Puducherry. It is often called the "Dakshina Ganga."
- **CMIP6 (Coupled Model Intercomparison Project Phase 6):** The latest generation of global climate models used to project future climate change. It helps scientists understand how various factors like greenhouse gases affect the Earth.
- **Constrained Modelling:** A method used to reduce errors in climate models. Instead of relying on raw data, researchers "constrain" or filter the models based on how well they match historical, observed data (like actual river flow from 1951–2012).
- **Streamflow:** The volume of water passing through a river channel over a specific period. It is a key indicator of water availability for irrigation and drinking.
- **TMCFT (Thousand Million Cubic Feet):** A unit of measurement for large volumes of water, commonly used in India to describe reservoir capacities and water sharing.
- **Cusec:** Short for "cubic feet per second," representing a unit of flow rate.
- **River Interlinking:** A civil engineering project that connects two or more rivers by a network of canals and reservoirs to transfer water from "surplus" basins to "deficit" ones.

- **Main Arguments and Substantive Parts**

- The core thesis posits that while global warming will likely make most Indian rivers wetter, the **Cauvery is a geographical outlier** facing a "near-term decline" of 3.5% in water flow between 2026 and 2050.
- **The Divergence:** Most major rivers (Indus, Ganga, Brahmaputra) are expected to see increased flow due to intensified monsoons. However, the Cauvery is projected to face a persistent dry spell.
- **Historical Decline:** Evidence shows the river already experienced a 28% decline in streamflow between 1951 and 2012.
- **Methodological Rigor:** The study argues that "raw" climate models are often biased. By using only the 8 out of 22 models that accurately reflected the Indian monsoon's seasonality, the researchers found a much bleaker outlook for the Cauvery than unconstrained models suggested.
- **Geopolitical Implication:** A decline in water volume will inevitably exacerbate the long-standing water-sharing conflict between Karnataka and Tamil Nadu.
- **Proposed Mitigation:** The researchers suggest that large-scale infrastructure projects, specifically the **Godavari-Cauvery link**, may shift from being "ambitious proposals" to "absolute necessities."

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- **Historical Evolution of the Issue**

- **Pre-Independence (1892 & 1924):** Agreements between the Princely State of Mysore (Karnataka) and the Madras Presidency (Tamil Nadu) laid the groundwork for water sharing but sowed seeds of modern discontent.
- **Post-Independence (1950s–1970s):** Expansion of irrigation in Karnataka led to protests from Tamil Nadu, which relied on the established Mettur Dam system.
- **1990:** Formation of the **Cauvery Water Disputes Tribunal (CWDT)** after decades of failed bilateral talks.
- **2007:** The CWDT issued its final order, allocating specific tmcft to the four riparian states.
- **2018:** The **Supreme Court Verdict** modified the CWDT award, slightly increasing Karnataka's share (for Bengaluru's drinking water) and reducing Tamil Nadu's, while declaring the river a "national asset."
- **2023–2024:** Renewed tensions surfaced due to deficit rainfall, highlighting that the legal framework struggles to function during "distress years."

- **Previous Years' UPSC Questions**

- **Mains (2017, GS 2):** "Constitutional mechanisms to resolve the inter-state water disputes have failed to address and solve the problems. Is the failure due to structural or process inadequacy or both? Discuss."
- **Mains (2013, GS 1):** "It is said that India has enough water for its needs, but not enough for its waste. Comment."
- **Prelims (2015):** Question regarding the tributaries of the Cauvery River (Hemavati, Arkavathy, etc.).



# ANALYSIS OF THE CAUVERY BASIN'S CLIMATE FUTURE (2026-2050): CHALLENGES AND SOLUTIONS

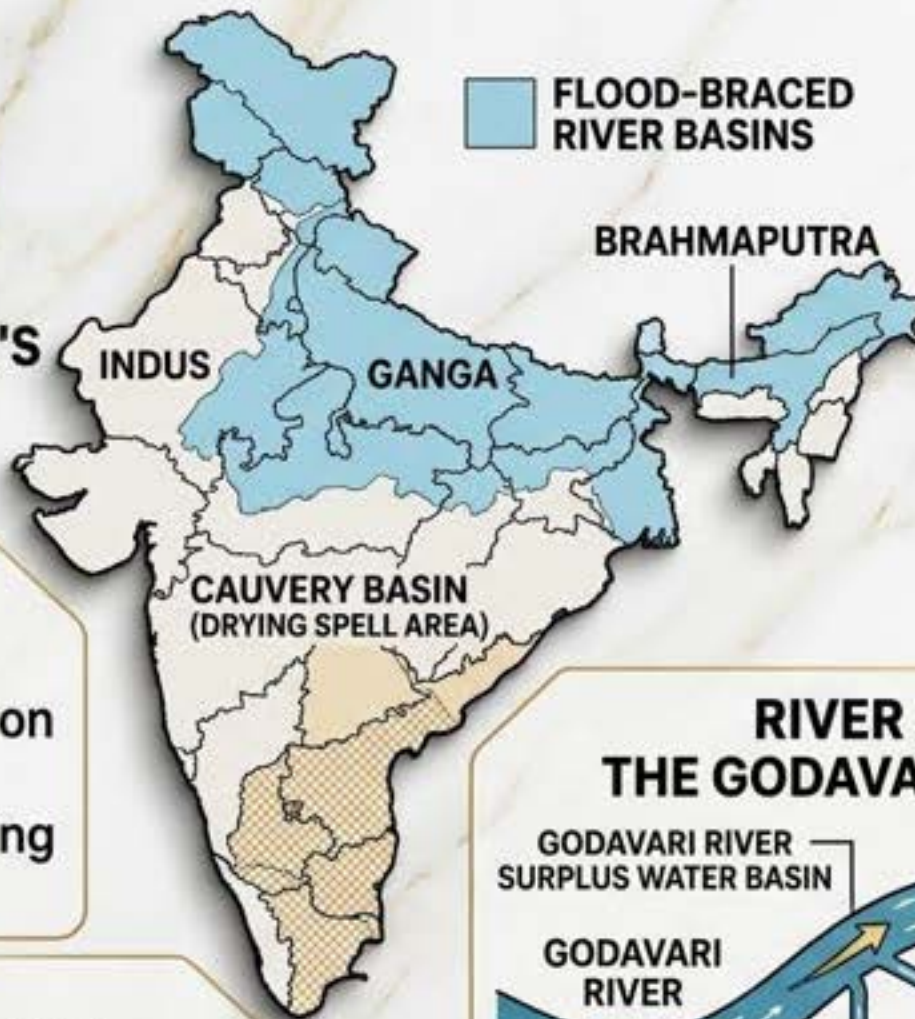
## KEY STUDY FINDINGS (IIT-G)

- 3.5% Near-Term Flow Decline
- 28% Historical Streamflow Reduction (1951-2012)
- Methodology: Constrained Modelling using 8/22 valid CMIP6 Models

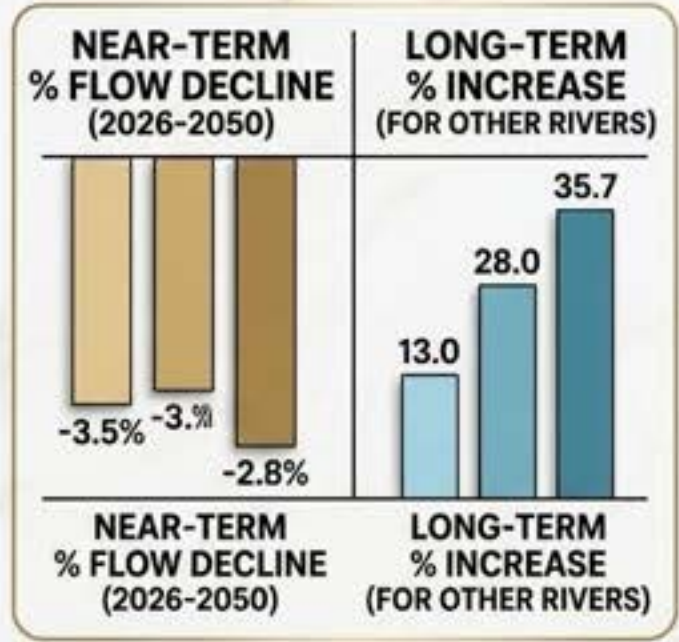


## IMPACT ON FEDERAL COOPERATIVE FEDERALISM

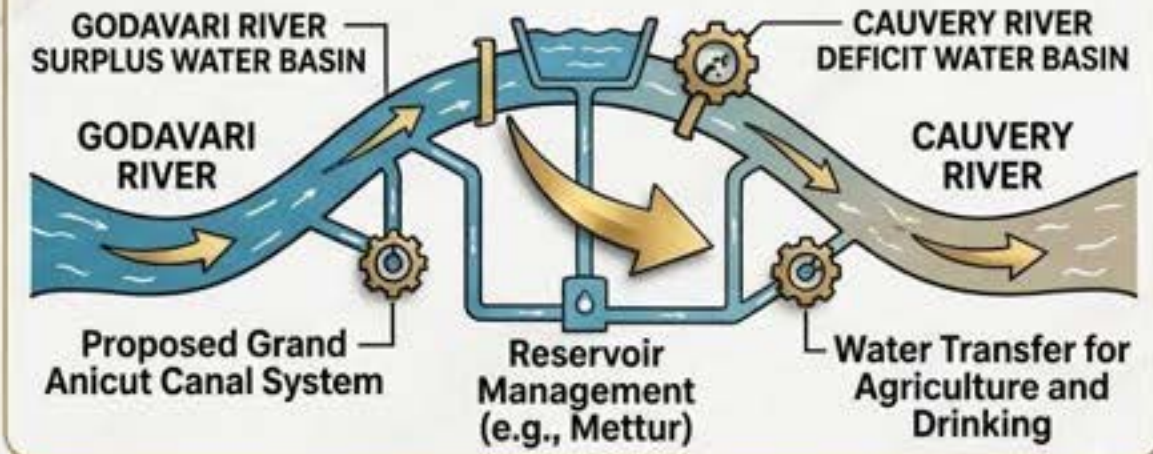
- Harder Water-Sharing Negotiations
- Deficit Year Distress Formulas Needed
- National Asset vs. State Management



**FLOOD-BRACED RIVER BASINS**



## RIVER INTERLINKING SOLUTIONS: THE GODAVARI-CAUVERY LINK PROJECT



# 'Vande Mataram advisory not a threat to conform'

Ministry's advisory on National Song only prescribes protocol and those who do not sing it will not face any action, says SC: even then, there is burden on those who refuse to sing, argues petitioner

Krishnadas Rajagopal  
NEW DELHI

**T**he Supreme Court on Wednesday said the January 28 guidelines issued by Union Home Ministry on playing National Song Vande Mataram in full at public and ceremonial occasions are not a "threat to conform" and do not fall foul of constitutional freedoms.

"...it is only an advisory... The Ministry feels the National Song is as much an expression of the national identity. You may have a different point of view. But we feel you have vague apprehensions of discrimination which do not have a clear nexus with the advisory now... But please come immediately to us as and when you feel you have been discriminated against or singled out on the plank of this advisory," Justice Joymalya Bagchi addressed petitioner Muhammed Sayeed Noori, represented by senior advocate Sanjay Hegde.

Mr. Hegde began his arguments by noting the Ministry's circular made the singing of the National Song "mandatory" and compelled citizens to participate in a social demonstration of loyalty which

We feel you have vague apprehensions of discrimination... But please come immediately to us as and when you feel you have been discriminated against or singled out on the plank of this advisory

JUSTICE JOYMALYA BAGCHI  
Supreme Court



goes against one's individual conscience. He pointed out that the circular has instructed the three-minute National Song to be played before the 55-second National Anthem, reducing the status of the latter to an "epilogue".

#### Anthem vs. Song

Chief Justice Surya Kant, heading the three-judge Bench, said there was absolutely nothing in the January 28 circular to show that people who did not play or sing the National Song would face penal or adverse action.

"Even if there is no penalty and even if today there is no legal sanction, there is a huge burden on somebody who refuses to sing or stand up," Mr. Hegde argued.

"What is that burden in

law here? The circular prescribes a protocol of when and how the National Song must be played, what is to be done when it is played, etc. We can understand if somebody sends you a notice saying you did not play or stand up for the National Song and your institution should be closed or derecognised as a result," the Chief Justice reacted.

Solicitor General Tushar Mehta intervened to emphasise that respect for the National Song was organic and, ideally, even an advisory was not necessary. He referred to Article 51A of the Constitution, which made it a fundamental duty to respect the National Flag and National Anthem.

Mr. Hegde said the National Anthem and National Song were distinct from each other. "...It was on Ja-

nuary 24, 1950 that Rajendra Prasad, as President of the Constituent Assembly, ended the controversy by saying Jana Gana Mana would be the National Anthem and Vande Mataram the National Song. When the Parliament subsequently inserted Article 51A [in the 42nd Constitutional Amendment], it spoke only of the National Anthem," he explained.

He said India was a country which paid equal respect to all religions and everyone's individual conscience, even that of an atheist. Mr. Mehta retorted that it was not as if people were being compelled to sing bhajans.

Justice Bagchi referred to the circular which said, "In all schools, the day's work may begin with community singing of the National Song". "The expression 'may' means you could sing as much as not sing. It allows individual conscience to take the decision," he said.

Mr. Hegde said patriotism cannot be compelled, provoking the Chief Justice to ask if "patriotism cannot be compelled even for the National Anthem".

The court refused to entertain the petition, terming it "premature".

- **Key Terms and Explanations**

- **National Song (*Vande Mataram*):** Composed by Bankim Chandra Chattopadhyay, it played a central role in the Indian independence movement. Unlike the National Anthem, it does not have the same specific constitutional status under Article 51A.
- **National Anthem (*Jana Gana Mana*):** Composed by Rabindranath Tagore; officially adopted on January 24, 1950. It is protected by the **Prevention of Insults to National Honour Act, 1971**.
- **Article 51A (Fundamental Duties):** Added by the 42nd Amendment (1976), it lists the duties of citizens. Article 51A(a) specifically mentions respect for the **National Flag** and the **National Anthem**, notably omitting the National Song.
- **Constitutional Tort/Conscience:** Under **Article 25**, every citizen has the freedom of conscience. Compelling a person to perform an act that violates their religious or personal beliefs can be seen as a violation of this right.
- **Advisory vs. Mandatory:** An "advisory" is a recommendation or guideline without penal consequences for non-compliance, whereas a "mandatory" order carries legal weight and punishment for defiance.

- **Main Arguments and Substantive Parts**

- **The Petitioner's Argument**

- **Compelled Patriotism:** The petitioner argues that even without a penalty, an official circular creates a "social burden" and psychological pressure to conform, which infringes upon the right to remain silent or follow one's conscience.
- **Protocol Hierarchy:** Concerns were raised that playing the 3-minute *Vande Mataram* before the 55-second National Anthem effectively demotes the Anthem to an "epilogue."

- **The Court's Observation**

- **Lack of Coercion:** The Court noted that the use of the word "may" in the advisory signifies choice, not a mandate.
- **Premature Litigation:** Since no one has been penalized or "singled out" yet, the court viewed the challenge as based on vague apprehensions rather than actual injury.

- **The Government's Stance**

- **Organic Respect:** The Solicitor General argued that respect for national symbols should be natural and inherent to citizenship, echoing the spirit of Fundamental Duties.



- **Historical Evolution of the Issue**
- **1870s:** Bankim Chandra Chattopadhyay writes *Vande Mataram*; it becomes a rallying cry during the Anti-Partition of Bengal movement (1905).
- **1950:** Dr. Rajendra Prasad (President of the Constituent Assembly) declares *Jana Gana Mana* as the National Anthem but accords *Vande Mataram* "equal status" due to its historical role.
- **1971:** The **Prevention of Insults to National Honour Act** is passed, providing legal protection to the Anthem and Flag.
- **1986 (Bijoe Emmanuel Case):** The Supreme Court rules that children belonging to 'Jehovah's Witnesses' could not be forced to sing the National Anthem if it violated their religious beliefs, as long as they stood respectfully.
- **2016-2018:** The SC initially mandated playing the National Anthem in cinema halls but later modified it to be optional.
  
- **Previous Years' Questions (PYQs)**
- **UPSC Mains (2017, GS2):** "Examine the scope of Fundamental Rights in the light of the move towards making the singing of the National Anthem mandatory in cinema halls."
- **UPSC Mains (2019, GS2):** "Enumerate the Fundamental Duties enshrined in the Constitution of India. Are they enforceable by a writ of mandamus?"
- **UPSC Prelims (2015):** Question regarding the "To uphold and protect the Sovereignty, Unity and Integrity of India" being a provision in the Fundamental Duties.



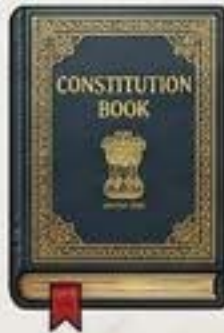
# VANDE MATARAM: CONSTITUTIONAL & JUDICIAL DISCOURSE

## JUDICIAL INTERPRETATION & LEGAL STATUS



- **ADVISORY vs. MANDATE**  
SC: 2024 circular is an 'advisory', not a mandate. Use of 'may' denotes choice.
- **RIGHT TO CONSCIENCE**  
SC reiterates Article 25 freedoms; silence is protected (Bijoe Emmanuel precedent).
- **PENAL ACTION**  
No penal consequences for non-compliance with the advisory. Premature petition.
- **NATIONAL ANTHEM vs. SONG**  
Distinguished by legal mandates; Anthem has legal protection (1971 Act).

## HISTORICAL & CONSTITUTIONAL FRAMEWORK



- **HISTORICAL EVOLUTION**  
1870s: Chattopadhyay writes Vande Mataram  
1905: Rallying cry  
1950: Equal status declared by Rajendra Prasad.
- **FUNDAMENTAL DUTIES (Art 51A)**  
Specifically omits National Song; refers only to Anthem and Flag.
- **CONSTITUTIONAL TORT/CONSCIENCE**  
Tension between State's promotion of identity and individual freedoms.

## SOCIETAL & ECONOMIC IMPLICATIONS



- **SOCIAL BURDEN**  
Petitioner argues advisories create social pressure and chilling effects.
- **ECONOMIC IMPLICATIONS**  
Minimal direct impact; focus on human capital and social cohesion.
- **GLOBAL CONTEXT**  
Unique India model of voluntary patriotism vs. mandatory rituals.
- **CHALLENGES**  
Implementation ambiguity; localized vigilantism; subjective interpretation.



# Cabinet approves revamped UDAN scheme with changes in subsidy

**Jagriti Chandra**  
NEW DELHI

In a significant policy shift, the Centre has extended the subsidy period for airlines on select Tier-2 and Tier-3 routes from three to five years, after a large share of those routes fell into disuse. The shift comes under the modified UDAN scheme, approved by the Union Cabinet on Wednesday with a total outlay of ₹28,840 crore.

The subsidy will also shift from a levy embedded in airfares to direct funding from the exchequer.

Out of the total ₹28,840 crore outlay for the modified UDAN scheme, ₹10,043 crore is set aside for a subsidy to support airlines flying on regional routes over the next 10 years. A government official explained that airlines would receive subsidy support for specific routes for five years at a stretch.

Under the earlier



The revised scheme will also support airport operations and maintenance at selected airports. FILE PHOTO

scheme design, these subsidies were not funded by the exchequer but through a Regional Connectivity Scheme (RCS) levy built into airfares on non-UDAN routes.

## Viability concerns

Subsidies were also capped at three years to push airlines towards self-sustaining routes. However, a Comptroller and Auditor General (CAG) report found that only 7% to 10%

of these routes had remained viable beyond the subsidy period. As of February 2026, of the 663 routes launched under the UDAN scheme since 2017, 327 routes had been discontinued, according to data recently presented in Parliament by Minister of State for Civil Aviation Muralidhar Mohol.

The ₹28,840 crore outlay marks a nearly six-fold jump in funding for UDAN. At its launch in 2017, the

government had earmarked ₹4,500 crore over 10 years, primarily to revive unused airports.

Under the modified UDAN announced on Wednesday, 100 airports will be redeveloped from unused airstrips, with an outlay of ₹12,159 crore over eight years, aimed at expanding the regional aviation network.

The revised scheme, however, goes beyond infrastructure development to also support airport operations and maintenance at low traffic airports, capped at ₹3.06 crore per airport and ₹90 lakh per heliport or water aerodrome, with a total estimated cost of ₹2,577 crore covering around 441 aerodromes.

In a push to improve last-mile connectivity, particularly in remote and difficult terrains, the scheme also proposes to develop 200 helipads, each costing ₹15 crore, amounting to an investment of ₹3,661 crore.



- **Key Terms and Explanations**

- **UDAN (Ude Desh ka Aam Nagrik):** A regional connectivity scheme (RCS) launched in 2017 to make air travel affordable and widespread.
- **Viability Gap Funding (VGF):** A one-time or deferred grant provided by the government to infrastructure projects that are economically justified but fall short of financial profitability.
  - *Example:* If a flight costs ₹5,000 to operate per seat but the "common man" can only pay ₹2,500, the government pays the difference to the airline.
- **Tier-2 and Tier-3 Cities:** Classifications based on population. Tier-2 usually refers to cities with 50,000 to 100,000 people, while Tier-3 includes smaller towns.
- **Exchequer Funding:** Money coming directly from the government's central treasury (taxpayer money) rather than an internal industry levy.
- **RCS Levy:** Previously, a small fee was charged on flights between major metros (like Delhi-Mumbai) to create a pool of money to fund rural routes.
- **Water Aerodrome:** An area of open water used by seaplanes or amphibians for landing and take-off.

- **Main Arguments and Substantive Parts**

- The core thesis of the revamped scheme is that **regional connectivity cannot survive on short-term subsidies alone.** \* **Extension of Support:** Increasing the subsidy period from 3 to 5 years acknowledges that regional routes take longer to mature and become "self-sustaining."
- **Massive Financial Escalation:** A six-fold increase in outlay (from ₹4,500 cr to ₹28,840 cr) signifies the government's realization that the "low-hanging fruit" of regional aviation has been picked; the remaining 400+ aerodromes require much heavier lifting.
- **Shift in Funding Source:** Moving from a "levy on airfares" to "direct exchequer funding" prevents ticket prices on main routes from rising further while ensuring a more stable credit line for regional airlines.
- **Failure of the 3-Year Model:** The CAG report cited in the article acts as the primary evidence—only 7–10% of routes survived without help, necessitating this policy correction.



- **Historical Evolution of the Issue**
  - **Pre-2017:** Aviation was largely "metro-centric." Smaller cities relied on crumbling airstrips left over from WWII or the British Era.
  - **2017 (UDAN 1.0):** The scheme launched with the goal of connecting "unserved" and "underserved" airports. Focus was on fixed-wing aircraft.
  - **2018–2022 (UDAN 2.0 to 5.0):** Iterative versions introduced connectivity for helipads, seaplanes, and specific regions like the North East (UDAN Plus) and tourism routes.
  - **2024–2026 (The Revamp):** Transition to a long-term infrastructure and maintenance support model (10-year outlook) rather than just a "startup" subsidy.
- 
- **Previous Years' UPSC Questions**
  - **GS3 (2017):** "Examine the role of the aviation sector in India's economic growth. Discuss the challenges faced by the UDAN scheme."
  - **GS3 (2022):** "Infrastructure is the wheels of the economy. In light of this, discuss the significance of the PM Gati Shakti Master Plan."
  - **Prelims (2018/2020):** Questions on the features of VGF and the RCS-UDAN scheme.



# AXIA IAS ACADEMY

RISE ABOVE THE REST

AXIA COMPETITIVE EXAM CENTRE

## REVISED UDAN SCHEME: A STRATEGIC SHIFT IN REGIONAL CONNECTIVITY

### KEY TERMS

**UDAN** UDAN is aerospace infrastructure and utilization in UDAN

**VGF** VGF is refinanced loan to the economy in fiscal instability

**Eschequer Funding** Eschequer Funding to collect eschequer fund raising

**RCS Levy** RCS Levy is attached to mechanization to the RCS Levy

### MAIN ARGUMENTS (CORE SHIFT)

**BEFORE:** Short-term Market Push



6-fold funding

**AFTER:** Long-term State Pull



6-fold funding



### HISTORICAL EVOLUTION



### LOGICAL & PHILOSOPHICAL BASE

**Logical: Multiplier Effect**  
Grow a small local economy growing with flight path



**Philosophical: Distributive Justice**



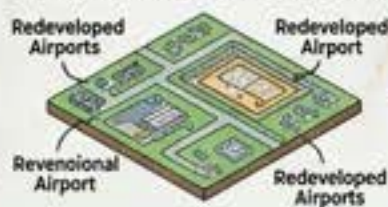
### NEW FEATURES

**O&M Support**



Maintenance crew (Maintenance crew)

**100 Redeveloped Airports**



**200 Helipads**



Cost ₹15 cr + Cost ₹15 cr

(Cost of near 8.5 lakh of ₹15 cr)

### SUSTAINABILITY



- Legal/Eschequer Funding**
  - Legal/Eschequer Funding
- Environmental Tension**
  - Environmental Tension
- Financial Risk**
  - Financial Risk

Summary: Legal/Eschequer funding and environmental tension + Andhra financial agreement

### CHALLENGES

**Roadblocks**



- Implementation** (land acquisition)
- Stakeholder** (Airline resistance)
- Technical** (Weather/facilities)

### MULTIDIMENSIONAL ANALYSIS



### LINKAGES WITH NCERTS

- Class 10/12 Textbooks → Lifelines of National Economy
- Class 10/12 Textbooks → Lifelines of National Economy
- Lifelines of National Economy → Lifelines of National Economy

### LINKAGES WITH SYLLABUS

- GS Papers 1-4**
- GS2** → Govt Policies
- GS3** → Infra/Resources
- GS3** → Infra/Resources

### BEST LINKAGES

- GS3** Gati Shakti Develops national economy & State philosophy
- GS3** Gati Shakti Developments & government philosophy
- GS3** 'Developmental State' - 'Developmental State' philosophy

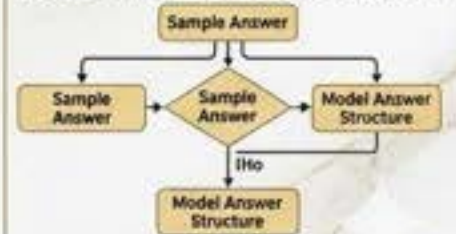
### WAY FORWARD

- Inter-modal integration**
- Pilot training**
- State fuel tax cuts**

### PREVIOUS YEARS' PYQS

- 2024 GS 24**
  - GS paper 1 (GS)
  - GS paper 2 (GS)
  - GS paper 3 (GS)
  - GS paper (GS)
- 2023 GS 24**
  - GS paper 1 (GS)
  - GS paper 2 (GS)
  - GS paper (GS)
  - GS paper (GS)

### MODEL ANSWER STRUCTURE



# West Asia conflict: how finding oil changed the Persian Gulf's ecology

The Persian Gulf and the Strait of Hormuz bring oil and war to mind, but until recently the region looked very different to see how it is only necessary to look at its shallow waters and precarious coasts, where many fragile ecosystems live amid heat, salinity, ships, and geopolitical tensions

By **Spina Rastbach**

**M**ilitary ships and oil tankers dominate how we imagine the Persian Gulf today, but if you step beyond this familiar imagery of geopolitics and petroleum for a moment of vulnerable ecosystems...

It wasn't always this way. Just six decades ago, these waters were busy not with warships but fishing boats, and the floating mangroves that once lined the coast were then little more than fishing villages.

The Gulf coastline is remarkably young. Formed 3,000 to 6,000 years ago as the sea flooded the Arabian basin through the Strait of Hormuz, it is today a shallow, semi-enclosed sea spanning about 280,000 sq km, with an average depth of just 30 m.

In shallows and limited water exchange with the open waters of the Arabian sea drive its extreme conditions. The summer temperatures regularly exceed 30 °C, while the high rate of evaporation keeps the water salty to the tune of 40.70 parts per thousand – almost twice as salty as open sea water.

But life persists.

## Life on the edge

At the boundary of land and sea lies the intertidal zone – shaped by tides of exposure and submergence to heat and precipitation.

These are dynamic systems where organic matter breaks down and is recycled, helping microorganisms survive in the adjacent waters. Beyond them, organisms from specialized microbes and commercially important species like shrimp. Mangroves are fish nurseries, nitrogen-fixing refuges, and carbon sinks.

The mudflats also sustain shrimp as well as coastal birds while the offshore mangrove meadows are among the Gulf's most productive ecosystems, proving to be places where fish and pearl oyster species.

These meadows are also important breeding grounds for sea turtles. Five of the world's seven sea turtle species occur here, including the critically endangered hawksbill sea turtle, and more along parts of the coast despite the wars.

The Gulf's waters also support the world's second largest population of dolphins outside Australia, with an estimated 3,000 to 6,000 individuals. Tagging an marine mammal that depends almost entirely on seagrass to survive.

Scattered across these waters are coral reefs covering an area the size of Iran. They support several fish and invertebrate communities. Importantly, they can survive extreme conditions, making them a natural laboratory for scientists to understand how coral ecosystems might respond to climate change.

Together, the Gulf is a finely balanced ecological network, adapted to extremes.

In its peak, in the 19th to the early 20th century, the Gulf's open beds supported a thriving economy that supplied nearly 90% of the world's herring turbot, named after a port in Iran. This system collapsed when Japanese cultured turbot replaced the market in the 1920s.

Then prawns took off. By the 1950s, oil had made West Asia one of the world's fastest growing regions. Today, the Gulf region alone produces nearly a third of the world's oil, with about 80% offshore.



Seagulls fly around meadows in Persian Gulf waters near the coast, Iran, in 2012. [credit: J. J. J. J.](#)

platforms and more than 25,000 tankers moving in and out every year. Nearly a fifth of the world's oil passes through these waters.

This wealth has driven rapid urbanization. The number of people has tripled in four decades, with more than 80% of people and economic activity concentrated within 100 km of the coast.

## Coastlines erode

Large-scale land reclamation, dredging, and engineering have transformed the shoreline. In Dubai alone, more than 60% of the natural coastline has been changed.

Projects such as Palm Jumeirah have altered currents and sediment flows, eroding soil in some areas and causing sand to accumulate in others, leaving beaches to be maintained constantly.

Nearly two-thirds of the salt flats have disappeared, mangroves have shrunk, and natural beaches have been replaced with seawalls that eliminate nesting grounds for birds and turtles. Seagrass beds and mudflats have been buried under land reclamation projects, removing important nursery habitats for marine life.

The consequences have also extended offshore. Coral reefs have been buried or smothered by sediments while dredging and construction have disrupted natural flows.

These physical changes have been magnified by industrial pressures such as desalination and pollution.

The Gulf hosts about half of the world's desalination plants, with over 200 facilities producing around 10 million cubic metres of freshwater every day. They produce brine, saltier brine, often laced with chemicals and heavy metals, that is discharged into the sea, where it accumulates in the semi-enclosed basin, further raising sea temperatures and salinity.

**The Gulf coastline is remarkably young. Formed 3,000 to 6,000 years ago as the sea flooded the Arabian basin through the Strait of Hormuz, it is today a shallow, semi-enclosed sea spanning about 280,000 sq km, with an average depth of just 30 m.**

Intake systems also remove plankton and larvae, disrupting the base of the food web.

## War and water

Oil boom led to average decline oxygen and trigger mass fish deaths, such as those recorded of Kuwait's shores in 2000 and 2001. Chronic nutrient loading also disrupts coral physiology, so reefs slow-growing, and suppresses the growth of seagrass.

Industrial pollutants further accumulate in marine life. The pearl oyster *Pinctada radiata*, once central to Gulf economies, has become the focus of pollution and sedimentation, which have left behind degraded oyster beds.

Boats, spills, and tanker traffic continue to damage ecosystems. The 19th Gulf War spill devastated coastlines, mangroves, bird populations, and fisheries while oil from spilled pollutants for attack. The UN Compensation Commission awarded Kuwait \$12.4 billion for a clean-up, decades later, the effort is still underway.

These threats persist even today. The oil infrastructure continues to be a target of drones and missiles, and using suspensions trigger huge fires, often spreading, pushing already stressed ecosystems to the brink.

The consequences extend far beyond the sea. As the West Asia, the Arabian

sea, populations of the Atlantic chevron, and the Arabian leopard have fallen sharply due to hunting and other conflicts. The Arabian oryx vanished from the wild by 1972. Then, the Phoenix Lark in the U.S., Fauna & Flora International in the U.K., and the World Wide Fund for Nature reintroduced it in Oman in 1982, with populations later established in two Saudi Arabia, Israel, the UAE, and Jordan. Meanwhile, the Islamic chevron survives in less than critically low numbers.

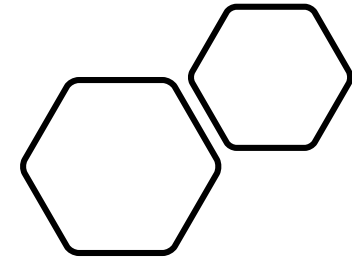
Regional wars have also derailed conservation efforts. The Iranian Revolution in 1979 followed by the Iran Iraq War in 1980 brought wildlife protection to a near halt, leaving protected areas in decay and wildlife populations to crash.

## A narrowing window

Today, the Gulf is among the world's most degraded marine regions on the planet. The signs of ecosystem decline. The UAE, Saudi Arabia, and Qatar have imposed limits on shrimp trawling. The UAE and Saudi Arabia are also leading mangrove restoration efforts and, together with Kuwait, have established marine protected areas to conserve what remains of these ecosystems.

As marine biologist and New York University (NYU) Hunter professor John Bert noted in his work on Gulf ecosystems, the region's highly centralized governance – for all its drawbacks – could also facilitate rapid environmental action. What is required is for ecological concerns to be prioritized at the highest levels.

There is also limited. Ecosystems such as coastal mangroves, seagrass, oyster habitats, and the Iranian sea coral endangered sea turtles are already approaching points of no return. Spina Rastbach is an independent science writer.



- **Key Terms and Explanations**

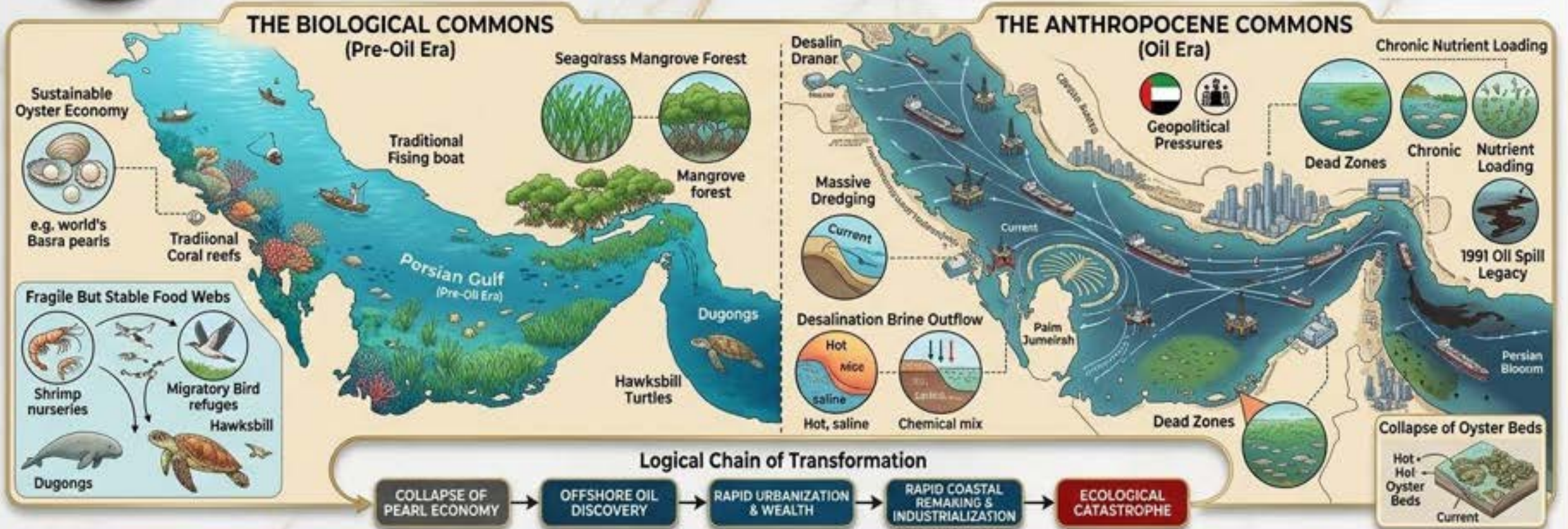
- **Hypersalinity:** A condition where water salinity levels significantly exceed those of the open ocean. In the Gulf, salinity reaches 44–70 parts per thousand (ppt), compared to the global average of 35 ppt, due to high evaporation and limited freshwater inflow.
- **Intertidal Zone:** The area where the ocean meets the land between high and low tides. It is a harsh but productive "biological bridge" that recycles organic matter.
- **Land Reclamation:** The process of creating new land from the sea, often seen in the Gulf through projects like Dubai's Palm Jumeirah. It frequently buries seagrass and coral habitats.
- **Desalination Brine:** The highly concentrated salt solution (often mixed with anti-scaling chemicals and heavy metals) discharged back into the sea after freshwater is extracted.
- **Carbon Sinks:** Natural environments (like mangroves and seagrass) that absorb more carbon than they release, playing a crucial role in mitigating climate change.

- **Main Arguments and Substantive Parts**

- The core thesis of this analysis is that the **"Oil Boom" has come at a staggering ecological cost.**
- **The Paradox of Extremes:** The Gulf is a "natural laboratory." Its species are already adapted to heat and salt that would kill life elsewhere. However, human activity is pushing these "extremists" past their biological limits.
- **From Pearls to Petroleum:** The economic shift from pearl oysters to offshore oil rigs replaced a sustainable, biological economy with a high-risk, industrial one.
- **Urbanization as an Invasion:** With 85% of the population on the coast, the physical "hardening" of the shoreline (seawalls, artificial islands) has eliminated the "soft" habitats (mudflats, mangroves) required for biodiversity.
- **The Desalination Dilemma:** The region's survival depends on desalinated water, yet the byproduct (hot brine) creates "dead zones" that threaten the very sea life the region relies on for food security.



- **Historical Evolution of the Issue**
  - **Pre-1920s (The Pearl Era):** The Gulf was the global center for natural pearls. The ecology was largely intact, governed by seasonal fishing and diving.
  - **1920s–1930s (Economic Collapse):** The introduction of Japanese cultured pearls crashed the local economy, creating a vacuum that oil eventually filled.
  - **1970s (The Great Transformation):** Discovery of massive oil reserves led to the fastest urbanization in human history. Offshore platforms became permanent features.
  - **1991 (Ecological Catastrophe):** The Gulf War saw the largest oil spill in history, releasing millions of barrels and proving how geopolitical conflict acts as an environmental "force multiplier."
  - **Present Day (The Anthropocene Shoreline):** Large-scale dredging and the climate crisis (coral bleaching) have turned the Gulf into one of the most degraded marine ecosystems on Earth.
- 
- **Previous Years' UPSC Questions**
  - **GS 3 (2022):** "Discuss the causes and effects of oil pollution in the marine environment."
  - **GS 1 (2017):** "How do ocean currents and water masses differ in their impacts on marine life and coastal environment?"
  - **GS 2 (2020):** "The critical region of West Asia has seen a shift from geopolitical rivalry to geo-economic cooperation. Comment." (Note: This article adds the 'Geo-ecological' layer to this).



MULTIDIMENSIONAL IMPACT ANALYSIS	
DIMENSION	KEY ELABORATE POINTS
Social	Social dimension of social polity and political Gulf
Political	Political dimension and hypersystem, social & pollinia community
Legal	Legal reclamation to resultation and volarmention
Ethical	Ethical dimensions eont inveements and ethical and potary
International	International dimnanc dimensions and international
Economic	Economic dimensts a rit rate of searl economies and realtical economy

UPSC KEY TERMS & EXPLANATIONS
<ul style="list-style-type: none"> <li><b>Hypersalinity:</b> Hypersalinity to rotical zom or neosers and table benaom per impirements</li> <li><b>Intertidal Zone:</b> Intertidal zone or contalios intertidal zone</li> <li><b>Land Reclamation:</b> Land reclamation a project reclamation and nemene csneronsirovironments.ec-socoration</li> <li><b>Desalination Brine:</b> Desalination brine outflow: ms, desalinalation, and carbor, onpartnre outimstamtion plant</li> <li><b>Carbon Sinks:</b> Carbon Sinks in anoreouts or socie nonemante carbon sink a carbon sinks</li> </ul>

WAY FORWARD (Solution Framework)
1. Transboundary Environmental Commission Transboundary Environmental Commission
2. Solar Desalination & ZLD Solar Desalination & ZLD Evolution
3. Nature-Based Solutions (Mangrove Restoration) Marine Protected Areas (Distagnization)
4. Marine Protected Areas (MPAs) Expansion Marine Protected Areas (MPAs) Expansion

UPSC SYLLABUS LINKAGES	
GS 1	Transboundary Environments
GS 2	Solar Desalination & Castalination Pundires
GS 3	Nature-Based Solutions Mangrove Rest
Essay/Ethics	Marine Protected Areas (MPAs) Expansion



A truck carries the transportable antiproton trap during a road test at CERN near Geneva, Switzerland on Tuesday.

## Antiprotons take a ride in novel test by CERN scientists

Associated Press

Scientists in Geneva took some antiprotons out for a spin — a very delicate one — in a truck, in a never-tried-before test drive that has been deemed a success.

If this so-called antimatter came into contact with actual matter, even for a fraction of an instant, it would have been annihilated in a quick flash of energy, its experts at the European Organization for Nuclear Research, known as CERN, over the course of four hours on Tuesday, brought about 100 antiprotons on the road. The antiprotons were suspended in a vacuum inside a specially designed box and held in place by supercooled magnets. After cooling them from the lab and onto the truck, the scientists transported the antimatter on a half-hour drive to test how the infinitesimal particles could be transported by road without seeping out. The antiprotons were then taken back to the lab in the final stage that concluded with applause and a bottle of champagne.

**For every type of particle that exists in the universe, there is a corresponding antiparticle, with an opposite charge. Manipulating antimatter, like antiprotons, can be tricky business.**

CERN spokesperson Sophie Toscani called the experiment successful. It was not immediately clear how many antiprotons had survived the entire journey, but roughly 90 of 100 were still there after the truck's trip.

Manipulating antimatter, like antiprotons, can be tricky business. As scientists understand the universe today, for every type of particle that exists, there is a corresponding antiparticle, exactly matching the particle but with an opposite charge. If these opposites come into contact, they "annihilate" each other, setting off lots of energy, depending on the masses involved. Any bumps in the road on the test journey that are not compensated for by the specially-designed box could spoil the whole exercise. "The motivation behind these experiments is to compare matter and antimatter with extremely high accuracy and watch for differences which we might have not seen yet," said Stefan Ulmer, the leader and spokesperson for Tuesday's experiment.

The experiment was a first step toward making good on hopes, one day, to deliver CERN antiprotons to researchers at Helmut Heine University in Düsseldorf, Germany, which is about eight hours away in normal driving conditions. The antiprotons were encased in a 1,000-kg box called a transportable antiproton trap. It was compact enough to fit through ordinary laboratory doors and fit on a truck. It used superconducting magnets cooled to -200°C that allowed the antiprotons to remain suspended in a vacuum — not touching the inner walls, which are made of matter. The mass is the test — slightly less than that of about 100 hydrogen atoms — is so little, experts say, that the worst possible outcome was the loss of the antiprotons. Even if they did touch matter, any release of energy would be undetectable. Only an oscilloscope, which picks up electrical signals, would have been able to detect it. The trap, says Ms. Toscani, "is supposed to contain these antiprotons no matter what: if the truck stops, if it starts again, if it has to slow on the brakes — all that".

Work remains: The trap can contain the antiprotons on its own for only about four hours, and the drive to Düsseldorf is twice that.

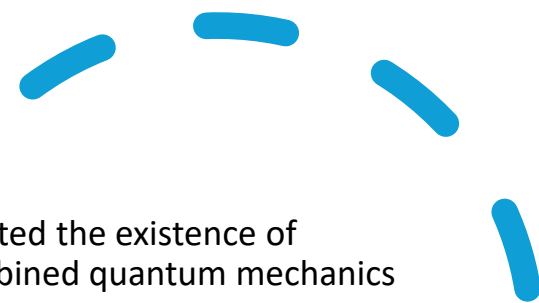
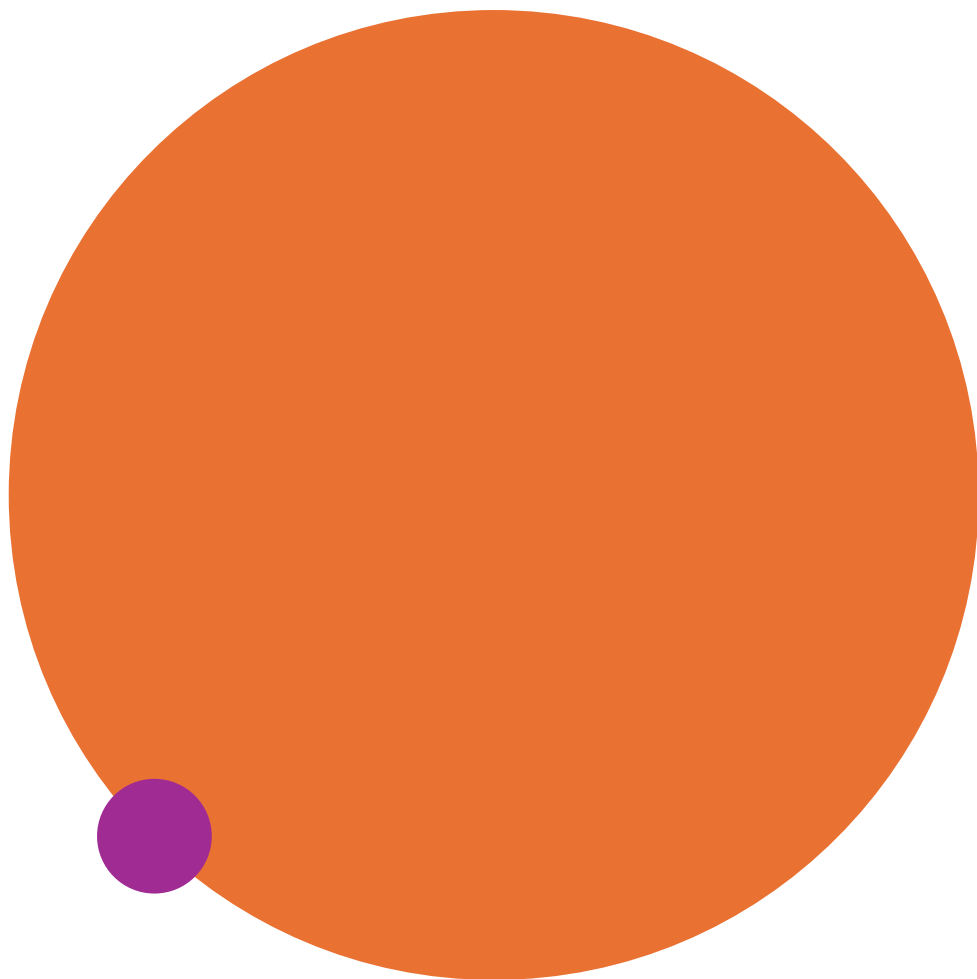


- **Key Terms and Explanations**

- **Antiproton:** The "evil twin" of a proton. It has the exact same mass as a proton but carries a **negative electrical charge**.
- **Antimatter:** Material composed of antiparticles. Every fundamental particle (electron, quark, etc.) has a corresponding antiparticle with the opposite charge.
- **Annihilation:** The process that occurs when a particle and its antiparticle meet. They vanish and their entire mass is converted into energy (governed by  $E=mc^2$ ).
  - *Example:* If an antiproton touches the wall of its container (made of matter), both the antiproton and a proton from the wall disappear in a flash of gamma radiation.
- **Superconducting Magnets:** Magnets made from coils that, when cooled to cryogenic temperatures, have zero electrical resistance. This allows them to create the incredibly strong magnetic fields needed to "levitate" antiprotons so they don't touch the container walls.
- **Vacuum Flask/Trap:** A container devoid of air. Since air is "matter," antiprotons must be kept in a vacuum to prevent accidental collisions with gas molecules.
- **CERN:** The European Organization for Nuclear Research. It houses the Large Hadron Collider (LHC) and is the global hub for particle physics.

- **Main Arguments and Substantive Parts**

- The core thesis of this experiment is that **antimatter is no longer lab-bound**. \* **The Problem:** Antimatter is extremely difficult to produce and even harder to keep. Currently, researchers who want to study it must go to CERN because that is the only place it can be "manufactured."
- **The Solution:** Develop a "Transportable Antiproton Trap." This 1,000-kg device uses cryogenics and magnetic levitation to keep antimatter stable during transit.
- **The Evidence of Success:** A test drive where 91 out of 100 antiprotons survived a 30-minute journey. This proves that the magnetic fields can compensate for the vibrations and "bumps" of a moving truck.
- **The Goal:** To enable high-precision comparisons between matter and antimatter in different environments (like the University of Düsseldorf) to see if they behave differently under gravity or other forces.



- **Historical Evolution of the Issue**
- **1928 (Theoretical Prediction):** Paul Dirac predicted the existence of antimatter through the **Dirac Equation**, which combined quantum mechanics and special relativity.
- **1932 (Discovery):** Carl Anderson discovered the *positron* (anti-electron) in cosmic rays.
- **1955 (Antiproton Discovery):** Segrè and Chamberlain produced antiprotons at the Berkeley Bevatron.
- **1995 (First Anti-atoms):** CERN created the first anti-hydrogen atoms, though they lasted only nanoseconds.
- **2010s (Trapping):** The ALPHA experiment at CERN successfully trapped anti-hydrogen for over 15 minutes.
- **Present Day (The Mobile Era):** The focus has shifted from "making" it to "moving" it, allowing for decentralized research.
  
- **Previous Years' UPSC Questions**
- **Prelims (2017):** Question on the "Standard Model" of particle physics and the Higgs Boson.
- **Mains (2014, GS III):** "Scientific research in India is lagging behind... Discuss." (Can be used as a contrast to CERN's progress).
- **Prelims (2010):** Question regarding the Large Hadron Collider and its purpose.



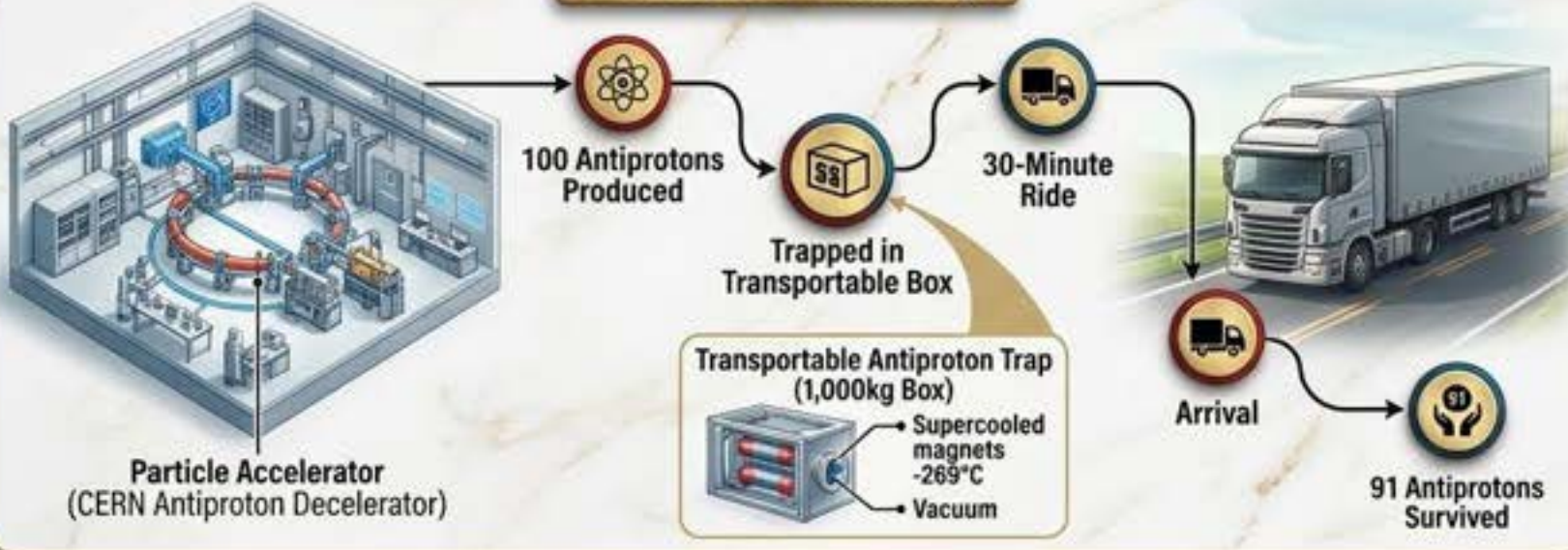
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**SECTION: Core Challenge**



**SECTION: Matter vs. Antimatter**

<b>MATTER</b>	Proton, Electron, etc.	<b>Matter Charge</b>
<b>ANTIMATTER</b>	Antiproton, Positron, etc.	<b>Antimatter Charge - reverse</b>

THE PROBLEM: ASYMMETRY



**SECTION: Multi-dimensional Impact**



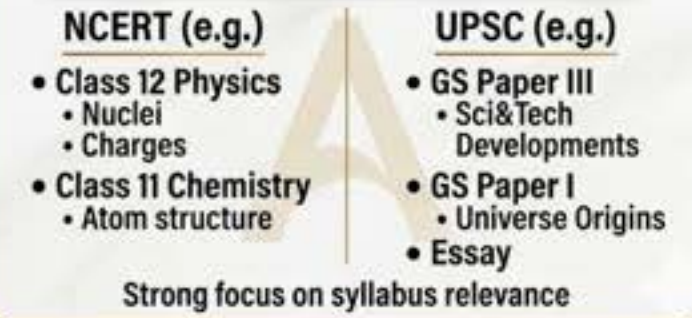
**SECTION: Logical/Philosophical Basis**



**SECTION: Challenges & Way Forward**



**SECTION: NCERT & UPSC Linkage**



# What is at stake at the WTO's MC14?

What is the context in which MC14 is taking place? What has weakened the WTO's dispute settlement system? What are the key issues before MC14? Why is the e-commerce moratorium contentious? What role should India play at MC14?

## EXPLAINER

Prabhush Ranjan

### The story so far:

**T**he World Trade Organization's (WTO) 14th Ministerial Conference (MC14) will take place from March 26 to 29 at Yaoundé, Cameroon. The conference is the WTO's highest decision-making body and generally meets once every two years. It is empowered to make all decisions on WTO law and to chart a path for the organisation's future work.

### What is the context in which MC14 is taking place?

MC14 is taking place amid rising geopolitical rivalry between the U.S. and China, ongoing global conflicts, and the mounting securitisation of international trade relations. Furthermore, trade multilateralism appears to be in retreat, while unilateralism is on the rise. The U.S. has, over the last year, launched a massive assault on trade multilateralism by weaponising tariffs. Arbitrary tariff impositions by the U.S. grossly violate the cardinal rules that underpin the WTO, namely the most favoured nation (MFN) rule, which epitomises non-discrimination, and the obligation not to impose tariffs beyond bound rates. The U.S. has also begun signing new, one-sided trade agreements with countries through tariff coercion.

### Why is trade multilateralism reeling under a crisis?

There is a growing belief in Washington that the WTO, which the U.S. was instrumental in creating in 1995, has not served American interests well. The meteoric rise of China in the last two decades has significantly narrowed the gap between Washington and Beijing. Moreover, China's accession to the WTO, which the U.S. facilitated, has not had the desired impact of disciplining Beijing's state-led industrial policies.

Consequently, the U.S. now wants to



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eliminate all legal constraints that apply to it, such as WTO law, to take on the Chinese threat head-on. For this reason, the U.S. paralysed the WTO's dispute settlement system by relentlessly blocking the appointment of members to the Appellate Body – the organisation's highest judicial arm.

Another key reason for the crisis is the WTO's inability to draft new trade rules due to consensus-based decision-making. Over the past three decades, the WTO has created only two new agreements: the Trade Facilitation Agreement and the Agreement on Fisheries Subsidies. The sluggishness in forming new trade rules has pushed countries to seek new venues for trade law-making, such as free trade agreements (FTAs).

### What are the key issues in MC14?

A fundamental issue at MC14 is whether plurilateral agreements, such as the Investment Facilitation for Development, endorsed by over 120 countries, and the Agreement on Electronic Commerce, should be incorporated into the WTO rulebook.

Although the WTO is a multilateral organisation, it allows plurilateral trade agreements – agreements between fewer

than all WTO members. These are typically included in Annex 4 of the WTO treaty. Plurilateral agreements bind only the signatories. However, for inclusion in Annex 4, such agreements must be approved by consensus among all WTO members.

Given the difficulty of achieving consensus, many countries believe that plurilateral agreements are the way forward to reinvigorate the WTO's legislative function. On the other hand, a few countries, such as India, argue that inaugurating the plurilateral rule-making door would open a Pandora's box and lead to the fragmentation of the system. It will be riveting to see whether countries can break this logjam at MC14.

Another key issue is the WTO's e-commerce moratorium. First agreed in 1998 and renewed every two years, this agreement among WTO member countries not to impose tariffs on electronic transmissions has benefited digital trade. This moratorium is set to expire on March 31. While the developed world wants it to be made permanent, the choice is not so easy for developing countries like India. Given the rise in digital trade, continuing the moratorium could lead to significant revenue losses for

developing countries.

The 166 WTO member countries meeting in Cameroon are also expected to deliberate on issues of special and differential treatment (SDT) for developing and least developed countries (LDCs). SDT, part of the 'WTO reforms', recognises that, since not all WTO members are on an equal footing, special rights shall be conferred on developing countries and LDCs. The U.S. is keen to weaken the SDT principle by prohibiting larger economies, such as China, India, Brazil, and Indonesia, from enjoying special rights.

On dispute settlement reforms, it is critical to unequivocally demand the restoration of the Appellate Body to put the WTO's dispute settlement system back on track.

The U.S. is also expected to use MC14 to challenge foundational WTO principles, such as the MFN rule. Developing countries that benefit from these principles should strongly oppose such efforts.

### What should be India's role?

India, which has always maintained its support for trade multilateralism, needs to walk the talk. It should regain its role as the normative leader for the third world by using the MC14 to articulate the importance of multilateralism and to forge alliances with other developing countries.

To do so, New Delhi should not shy away from re-visiting its deeply entrenched positions, such as opposing plurilateral agreements. India, along with other countries, should also consider other innovative solutions, such as electing Appellate Body members through voting. If MC14 fails to strengthen the WTO and promote trade multilateralism, it will represent a victory for America's blatant unilateralism and its effort to establish a new global trade order rooted in coercion. This will be detrimental to the developing world.

Prabhush Ranjan is a Professor and Vice Dean (Research), Jindal Global Law School. Views are personal.

## THE GIST

MC14 takes place amid rising U.S.-China rivalry, global conflicts, and the retreat of trade multilateralism, with unilateralism and tariff coercion on the rise.

Key issues include plurilateral agreements, the e-commerce moratorium, SDT, and restoring the Appellate Body, with developing countries seeking to protect the WTO system.

- **Key Terms and Explanations**

- **Ministerial Conference (MC):** The highest decision-making body of the WTO, consisting of trade ministers from all 166 member states. It meets roughly every two years to negotiate and update the rules of global trade.
- **Most Favoured Nation (MFN):** A core principle of the WTO (Article I of GATT) which stipulates that a country cannot discriminate between its trading partners. If you grant someone a special favor (like a lower customs duty rate), you have to do the same for all other WTO members.
- **Bound Rates:** The maximum tariff level a WTO member commits to for a specific product. Once a rate is "bound," a country cannot increase it without negotiating with its trading partners.
- **Appellate Body (AB):** Often called the "Supreme Court of World Trade," it is a standing body of seven persons that hears appeals from reports issued by panels in disputes brought by WTO members.
- **Plurilateral Agreements:** Agreements involving a subset of WTO members (e.g., Investment Facilitation) rather than the entire membership. Unlike *multilateral* agreements, these only bind the signatories.
- **E-commerce Moratorium:** A long-standing agreement (since 1998) not to impose customs duties on electronic transmissions (e.g., software downloads, digital music, streaming).
- **Special and Differential Treatment (SDT):** Provisions that give developing countries and Least Developed Countries (LDCs) special rights, such as longer timeframes to implement agreements or technical assistance.

- **Main Arguments and Substantive Parts**

- The central thesis is that the **WTO is facing an existential crisis** characterized by a shift from rules-based multilateralism to power-based unilateralism.
- **The U.S. "Assault" on Multilateralism:** The U.S., once the architect of the WTO, is now its primary disruptor. It has weaponized tariffs and bypassed MFN rules to counter China's state-led economic model.
- **Paralysis of the Dispute Settlement System:** By blocking appointments to the Appellate Body, the U.S. has effectively removed the "legal teeth" of the WTO, allowing countries to ignore rulings without consequence.
- **The Legislative Logjam:** The requirement for "consensus" has made it nearly impossible to create new rules. This has led to the rise of **Plurilateralism** as a workaround, though critics (like India) fear this will fragment the global trade order.
- **The Revenue-Development Gap:** The E-commerce moratorium highlights a divide: developed nations seek "permanent" duty-free digital trade, while developing nations fear the loss of potential customs revenue as the economy digitizes.

- **Historical Evolution of the Issue**

- **1947–1994 (GATT Era):** The General Agreement on Tariffs and Trade governed world trade with a focus on reducing tariffs on goods.
- **1995 (The Birth of WTO):** The Marrakesh Agreement established the WTO, introducing a more robust dispute settlement mechanism and expanding rules to services (GATS) and intellectual property (TRIPS).
- **2001 (Doha Development Agenda):** Launched to improve the trading prospects of developing nations. It remains largely unfulfilled, leading to frustration and the shift toward Free Trade Agreements (FTAs).
- **2019–Present (Appellate Body Crisis):** The AB ceased to function due to a lack of quorum, triggered by U.S. vetoes on new appointments.
- **2024–2026 (The Road to MC14):** A period marked by "friend-shoring," "de-risking," and the securitization of trade (e.g., Chips Act, Inflation Reduction Act).

- **Previous Years' Questions (PYQs)**

- **Mains (2017, GS2):** "The critical aspect of the WTO's Agreement on Agriculture (AoA) is the issue of domestic support. Discuss."
- **Mains (2016, GS2):** "What are the aims and objectives of the WTO? To what extent has the WTO been able to achieve its goals?"
- **Prelims (2015):** "The 'Amber Box, Blue Box and Green Box' subsidies are related to which organization?" (Ans: WTO).






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# CRISIS AT THE WTO: AN ANALYSIS FOR MC14 (FOR UPSC CSE)

**1 CONTEXT OF MC14**

 **US-CHINA RIVALRY**     **WEAPONIZED TARIFFS**     **MNE PRINCIPLE VIOLATION**


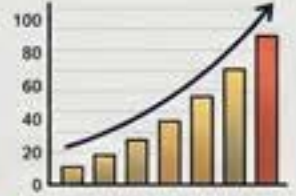
**2 KEY ISSUES BEFORE MC14**

 **DISPUTE SETTLEMENT: APPELLATE BODY DEADLOCK**     **PLURILATERAL vs. MULTILATERAL AGREEMENTS** (e.g., Investment Facilitation)     **E-COMMERCE MORATORIUM DILEMMA**

**3 SDT FOR DEVELOPING & LDCs**

 **SPECIAL & DIFFERENTIAL TREATMENT: KEY FOR LDCs**     **US CHALLENGING SDT FOR BIGGER DEVELOPING ECONOMIES** (e.g., India, China)

**4 THE CRISIS AT THE DISPUTE SETTLEMENT SYSTEM**

 **US BLOCKS AB APPOINTMENTS**     **LEGAL CONSTRAINTS REMOVED**

**5 THE MULTILATERALISM RETREAT**

 **CONSENSUS-BASED SLUGGISHNESS**     **SHIFT TO FTAs AND UNILATERALISM**

**6 INDIA'S PIVOTAL ROLE & WAY FORWARD**

 **REGULAR LEADERSHIP ROLE FOR GLOBAL SOUTH**  
**WALK THE TALK ON TRADE MULTILATERALISM**  
**CONSIDER VOTING FOR AB MEMBERS (Innovative Solution)**



# Why is Chennai's microplastic problem bigger than it looks?

What are the ecological risks of microplastics in beach sediments?

T.V. Padma

## The story so far:

**M**icroplastics, especially nylon fibres, seem to be present rather sparsely in Chennai's beach sediments but could still wreak long-term ecological damage, new research has cautioned. A study by researchers at V.O. Chidambaram College in Thoothukudi examined the abundance, sources, and ecological risks of microplastics from beach sediment samples from 15 sites along the Chennai coast. The findings show fibres dominating, with most particles smaller than 1000 µm.

## Why does low abundance not mean low risk?

"This study is important because it shows that microplastics are already present in Chennai's beach sediments, even if we don't always see them," Sekhar Selvam, senior assistant professor at the

Department of Geology, V.O. Chidambaram College, Thoothukudi, said. "We found that most of the microplastics are nylon fibres, which are more harmful than many other plastics." In other words, even though Chennai's beaches have fewer microplastics than many global ones, the risk to marine life remains significant.

An additional insight from the study is the disconnect between abundance-based assessments and risk-based evaluations, Shaji Erath, professor of geology at the University of Kerala, Thiruvananthapuram, said. Traditional monitoring often focuses on microplastic counts alone.

However, the study has shown that polymer type, shape, and aging characteristics are equally, if not more, important in determining ecological risk, he added.

**What are the ecological concerns?**  
Ecological concerns in the study are

chiefly centred on marine life and coastal ecosystems, Dr. Selvam said. Small organisms living in beach sand, such as worms, crabs, and shellfish, easily ingest the small plastic fibres, which can go on to block or injure their digestive tracts. Toxic compounds in plastics can also enter and poison their bodies.

According to Dr. Erath, besides feeding by marine microorganisms, plankton, and marine animals, hazardous polymers such as nylon pose higher ecological risks due to their persistence, chemical additives, and capacity to adsorb pollutants.

Fibre-shaped microplastics in particular can alter habitats by modifying the structure of sediments, affecting the benthic – or bottom layer – of seas and the microbial communities there, he explained. There could also be prolonged environmental exposure and long-distance transport of microplastics, highlighting the transboundary nature of microplastic pollution.

## How do human activities contribute?

Most microplastics found by the Chennai study team were clearly linked to human activities, according to Dr. Selvam. These include fishing, where damaged nets and ropes shed plastic fragments that break up into microplastics; synthetic clothes, which release minuscule fibres when they are washed; tourism and beach use; and urban sewage and stormwater drains that carry plastics into the sea.

After reaching the coast, they reenter human bodies via seafood contaminated by microplastics, among other pathways. Seafood in particular can ferry both harmful chemical substances and disease-causing bacteria and other microorganisms into the body, causing tissues to become inflamed and affecting the hormonal and immune systems over longer periods.

## Is it too late to act?

Right now, microplastic pollution levels are not so extreme in Chennai and better waste management, responsible fishing practices, and public awareness can still prevent a much bigger problem in the future, according to Dr. Selvam.

In the final analysis, the research has reinforced the need for timely policy-driven interventions, including better solid waste management, recycling of fishing gear, promotion of biodegradable alternatives, and public awareness, Dr. Erath said.

*(T.V. Padma is a science journalist based in New Delhi)*

## THE GIST

▼  
Microplastics, especially nylon fibres, are present in Chennai's beach sediments in relatively low abundance, but low overall microplastic abundance does not necessarily imply low ecological risk.

▼  
Even small particles can cause long-term ecological damage by affecting marine life, moving up the food chain, and eventually impacting human health through contaminated seafood.

- **Key Terms and Explanations**

- **Microplastics:** Plastic particles less than 5mm in diameter. They are categorized into **primary** (manufactured small, like microbeads) and **secondary** (resulting from the breakdown of larger items).
- **Nylon Fibers:** A type of synthetic polymer often used in fishing nets and textiles. They are particularly persistent and hazardous due to their high tensile strength and ability to adsorb toxins.
- **Bioaccumulation:** The gradual accumulation of substances, such as pesticides or microplastics, in an organism.
- **Biomagnification:** The process where the concentration of a substance increases as it moves up the food chain (e.g., from plankton to fish to humans).
- **Benthic Layer:** The lowest ecological region of a body of water, including the sediment surface and sub-surface layers.
- **Adsorption:** The process by which molecules of a substance (like chemical pollutants) adhere to the surface of another (the microplastic fiber).

- **Main Arguments and Substantive Parts**

- The core thesis posits that **abundance is a poor proxy for risk**. Even when microplastic counts are low, the qualitative nature of the pollutants can cause disproportionate damage.
- **The "Invisibility" Paradox:** Lower concentrations of microplastics in Chennai compared to global averages create a false sense of security. The study argues that the **micro-size (<1000 μm)** makes them more bioavailable to smaller organisms.
- **Shape and Type over Quantity:** Nylon fibers are identified as a primary threat. Their shape allows them to entangle digestive tracts more effectively than spherical beads, and their chemical composition is more toxic.
- **Habitat Alteration:** Beyond biological ingestion, these fibers change the physical properties of beach sand, potentially affecting the thermal regulation of eggs (e.g., sea turtles) or the permeability of sediments for microbial life.
- **The Human Feedback Loop:** Urban runoff, poor waste management, and synthetic laundry contribute to a cycle where plastics enter the sea only to return to human systems via contaminated seafood.

- **Historical Evolution of the Issue**

- **Pre-1950s:** Minimal plastic use; coastal pollution was primarily organic or metallic.
- **Post-1960s (The Plastic Revolution):** Global shift toward synthetic fibers (Nylon/Polyester) in fishing and textiles.
- **1970s-90s:** Growing awareness of "macro-debris" (visible trash) on beaches; Chennai sees rapid urbanization and industrialization.
- **2000s-2015:** Focus shifts to "Great Pacific Garbage Patch"; India begins implementing Plastic Waste Management Rules.
- **2018-Present:** The focus narrows to "micro" and "nano" plastics. The **Plastic Waste Management (Amendment) Rules, 2022**, introduced Extended Producer Responsibility (EPR), but enforcement in coastal fishing and textile runoff remains a gap.

- **Previous Years' UPSC Questions**

- **Mains (2018):** "What is 'microplastic'? How does it affect the marine ecosystem?"
- **Mains (2019):** "Coastal sand mining, whether legal or illegal, poses one of the biggest threats to our environment. Analyze." (Relevant to beach sediment health).
- **Prelims (2019):** Question on "Microbeads" and why they are a cause of concern.

# CHENN\_AI'S COASTAL C\_RISING: A CRITICAL UPSC CSE ANALYSIS OF MICROPLASTICS



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## THE DISCONNECT: ABUNDANCE VS. ECOLOGICAL RISK



### THE HUMAN FEEDBACK LOOP (ANTHROPOCENTRIC IMPACT)

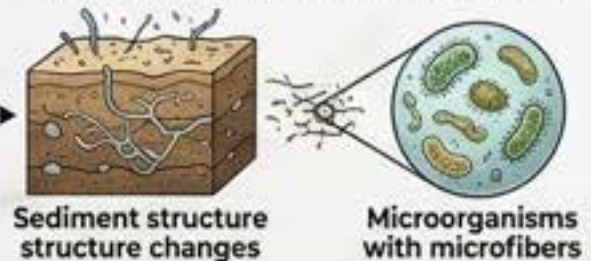


### UPSC-LEVEL ANALYSIS POINTS

- Social/Political
- Legal/International
- Environmental/Ethical
- Economic/Governance

**Ecological Impact Factor**  
Affects diverse marine life:

### BENTHIC ECOSYSTEM ALTERATION



### BIOAVAILABILITY TO SMALL ORGANISMS



### SYLLABUS & PYQ LINKAGES

- GS Paper I (Flora/Fauna)
- GS Paper II (Regulatory Bodies)
- GS Paper III (Environmental Pollution)
- Ethics (Responsibility)
- PYQs: Microbeads (2019), Coastal Sand Mining (2019)

### WAY FORWARD (POLICY RECOMMENDATIONS)



## What is mineral water and how does it naturally contain dissolved minerals?

Mineral water comes from a protected underground reservoir and retains the natural minerals it has acquired from geological processes over years, decades or even centuries. In India, tap water is drawn from rivers and borewells and disinfected with residual chlorine.

Vandevan Mishra

**M**illions of people around the world drink mineral water every day because their tap water is unsafe or because they prefer the taste. It's packed with naturally-occurring minerals that support bone and muscle health and governments and health organisations promote it as a clean, reliable source of hydration.

### What is mineral water?

Mineral water is water that naturally contains dissolved minerals and trace elements. It comes from a protected underground reservoir, like a spring or aquifer, and has a specific composition of minerals. Unlike ordinary tap water, which treatment plants produce by filtering and purifying water drawn from rivers or groundwater, mineral water retains the natural minerals it has acquired from geological processes it has been a part of over years, decades or even centuries.

In calcium and magnesium levels pervade through layers of limestone, granite, sandstone or volcanic basalt, the minerals from the surrounding rocks dissolve in the water, and the differences in pressure underground push the enriched water back towards the surface, where it emerges as a spring or collects in a subterranean reservoir. From there, hand-drill wells or tap natural springs and flow the water into containers, using pumps if required.

### How is mineral water regulated?

The U.S. Food and Drug Administration (FDA) and the European Parliament and the Council both have regulations that stipulate that mineral water must come from a geographically stable source, which producers must undertake to protect, that separate batches of the same water must have the same profile of minerals, and that producers must not chemically treat it to alter its natural composition.

In India, the Food Safety and Standards Authority of India (FSSAI) and the Bureau of Indian Standards (BIS) stipulate that natural mineral water must come from an underground source, such as natural springs and borewells, must be protected by various formations that ensure the water is free from pollution, and should already be collected in conditions that guarantee the original bacteriological and chemical composition.

In the U.S. and the EU, the BIS standard IS 13428 requires the water's pH and the relative proportions of various minerals to be stable over time and across producers' batches. Producers are also prohibited from treating the water to change its mineral composition, and instead are only allowed to filter or de-aerate it, aerate it, and sterilise it. Chemical de-aeration, such as by adding chlorine, is also disallowed.

Finally, unlike many local producers in India, mineral water requires mandatory certification to sell imported water, producers must have both an FSSAI license and a BIS certificate and every bottle must carry the ISI mark according to IS 13428. The FSSAI also requires the bottle to be labelled with the location and name of the water and the levels of various minerals, and disallows the package from claiming the water has any medicinal or healing properties.



AP/WIDEWORLD

### How is mineral water packaged?

To meet these strict criteria, producers usually bottle the water directly at or near the source. Once they extract the water, they filter it to remove particulate matter and elements such as iron to ensure the liquid is clear. Producers may also pass it through ultraviolet light for disinfection and adjust the level of dissolved carbon dioxide to produce still or sparkling variants.

Finally, the producers store the water in tanks and package it in glass bottles, PET bottles or aluminium cans at or near the source to avoid contamination or changes in composition. That said, the storage materials come with tradeoffs of their own. For instance, glass is chemically inert and doesn't react with the water, but it must be handled with care. PET is light but can leach small amounts of plastic over time, especially when it's hot, and aluminium cans are most recyclable but require an internal plastic lining to prevent the metal from reacting with the water, which reintroduces concerns about chemical leaching and increases costs.

Packaged drinking water is not always the same as natural mineral water. Producers may start with tap or groundwater, purify it through reverse osmosis, then add back small amounts of minerals to improve taste. Similarly, spring water comes from a natural underground source but doesn't need to meet the same strict standards for mineral content.

That said, unlike "bottled water," the U.S. FDA encompasses American water, mineral water, sparkling bottled water, spring water, and purified water (including dechlorinated, and/or de-aerated water or water that has undergone reverse osmosis). America's

water is groundwater being pushed to the surface due to pressure (not underground by impermeable rocks).

### What effects do minerals have?

The minerals present in mineral water depend on its natural source. The most common minerals include calcium, magnesium, sodium, potassium, bicarbonates, sulphates, chlorides, silica, and sometimes fluoride or iron in trace amounts.

Calcium and magnesium make water "hard" and give mineral water the medicinal punch so famous with and have come to expect, including a slight weight and body. Higher calcium levels render a smooth or slightly chalky sensation, while magnesium introduces a subtle bitterness. Similarly, bicarbonates boost the acidity and give the water an almost mouth-fresh, sulphates - associated with magnesium-rich springs - add a slightly crisp taste, and sodium imparts a light saline note.

Dissolved minerals also cause the water's content of total dissolved solids (TDS) and change how it interacts with food, soap, pipes, and tissues, with different chemical and thermal environments (e.g. cooking), and with tissues in the human body. You may know from common experience that harder water deposits "scale" in kettles and washing machines and doesn't lather well with soap. Its inherent chemical properties also mean hard water supports lower density and salt intake function, although the concentration of drinking water to these outcomes is generally much smaller compared to seawater. Bicarbonates may improve digestion.

### What are other forms of water?

When water is distilled, it means it is

boiled into steam and condensed back to liquid, so the process leaving all dissolved solids, including minerals as well as contaminants, behind in the vessel. As a result the condensed water is nearly pure (DI), and water very different, almost below. It does not form scales on metal surfaces and behaves in the sort of predictable way that research laboratories and diagnostic labs prize.

However, while it is safe to drink, distilled water is not advised for regular human consumption because, aside from being devoid of minerals, it can also draw minerals out of surfaces it comes in contact with, including food and, potentially to a small degree, biological tissue.

Industries also treat water according to their needs. They may soften it to remove calcium and magnesium, demineralise it to strip it of almost all dissolved ions or alter its chemistry to use in boilers or cooling systems. They could also demineralise it to prevent scaling inside add components like sodium phosphate to lower its corrosion potential. Industrial water is neither safe nor suitable for human consumption.

To prepare municipal tap water, locally treatment plants draw water from natural sources like rivers and groundwater, remove pathogens and chemical pollutants by filtering and chlorinating it, and add disinfectants such as chlorine. Unless a local authority specifically softens it, tap water retains its dissolved minerals. Its mineral content varies significantly by region. Unlike tap water is noticeably hard because it comes from chalk aquifers while many Scandinavian cities supply naturally soft water low in minerals.

### How is tap water "made" in India?

The main source of water that eventually becomes tap water in India is rivers and deep borewells.

Because the pathogens load are higher in tropical areas, municipalities subsequently disinfect it more aggressively than in temperate or cold regions like North America or Scandinavia. Among other steps, they add alum to make dirt clump together so that it filters out more easily, and add residual chlorine, meaning more chlorine than what is required to disinfect the water, so that water disinfectant at first becomes residual later (e.g. a faulty pipe exposes it to sewage).

In fact, such "boosting" is so common that most Indian municipalities don't guarantee potable tap water. Among the few exceptions are Pune in Maharashtra and parts of Chandigarh in Tamil Nadu.

Tap water is a state responsibility while the Union government sets the standards. The IS 10500:2002 standard prescribes limits for the quantity of minerals in potable water but also has room for variations. For instance, while the TDS limit is 500 mg/L, it can go up to 1000 mg/L if no alternative source is available.

Rajasthan, Gujarat, and parts of Delhi/NC have very high mineral content, including calcium and magnesium, because their groundwater lies in aquifers rich in minerals, whereas other and faster drawing water from Himalayan rivers or areas with high rainfall, such as Karnataka and parts of Kerala, have much softer water with lower mineral levels.

- **Key Terms and Explanations**

- **Aquifer:** An underground layer of water-bearing permeable rock, rock fractures, or unconsolidated materials (gravel, sand, or silt).
- **Total Dissolved Solids (TDS):** A measure of the dissolved combined content of all inorganic and organic substances present in a liquid. It is a key indicator of water "hardness."
- **Mineral Water:** Water sourced from underground reservoirs that contains a specific, stable composition of minerals (calcium, magnesium, etc.) and cannot be chemically treated.
- **Percolation:** The process by which water moves downward through the soil and rock layers, naturally filtering and absorbing minerals along the way.
- **Reverse Osmosis (RO):** A water purification process that uses a partially permeable membrane to remove ions, unwanted molecules, and larger particles from drinking water.
- **Residual Chlorine:** The low-level concentration of chlorine remaining in water after the initial disinfection to prevent re-contamination during distribution through leaky pipes.

- **Main Arguments and Substantive Parts**

- **Natural Enrichment Process:** Mineral water is a product of geological time. As water moves through rock strata like limestone or basalt, it dissolves minerals. The underground pressure eventually forces this "mineral soup" to the surface.
- **Regulatory Rigidity:** Unlike "packaged drinking water," true mineral water is strictly regulated (FSSAI/BIS in India; FDA in the US). It must have a **stable mineral profile** across batches and prohibits chemical alteration.
- **The Tap Water Dilemma in India:** Most Indian tap water is "made" from surface rivers or borewells. Due to high pathogen loads and aging infrastructure, it requires aggressive chemical disinfection (chlorination), often making it less palatable or reliable than mineral water.
- **The Material Trade-off:** Packaging involves a "trilemma" of safety, cost, and environment. Glass is inert but heavy; PET is convenient but leaches microplastics; Aluminum is recyclable but requires plastic linings.



- **Historical Evolution of the Issue**
  - **Pre-Independence:** Water was primarily a community-managed resource (wells, tanks, baolis). Colonial laws began the centralization of water supply for urban centers.
  - **Post-1947:** The focus shifted to large-scale irrigation and dam projects (The "Temples of Modern India"). Urban tap water became a state-led utility.
  - **1990s - The Bottled Boom:** Economic liberalization and rising urban health concerns led to the explosion of the bottled water industry (Bisleri, Kinley).
  - **2012 - Standard Updates:** The Bureau of Indian Standards (BIS) updated **IS 10500:2012**, setting modern benchmarks for drinking water quality.
  - **Present Day:** Missions like **Jal Jeevan Mission (Urban and Rural)** aim to provide "Functional Household Tap Connections" (FHTC), shifting the focus back from bottled water to reliable public taps.
- 
- **Previous Years' Questions (PYQs)**
  - **Prelims (2021):** With reference to the 'Water Credit', consider the following statements...
  - **Mains (2020, GS3):** "Suggest measures to improve water storage and irrigation efficiency..."
  - **Mains (2018, GS2):** "The Right to Clean Water is a part of the Right to Life." Discuss in the context of Indian judicial pronouncements.



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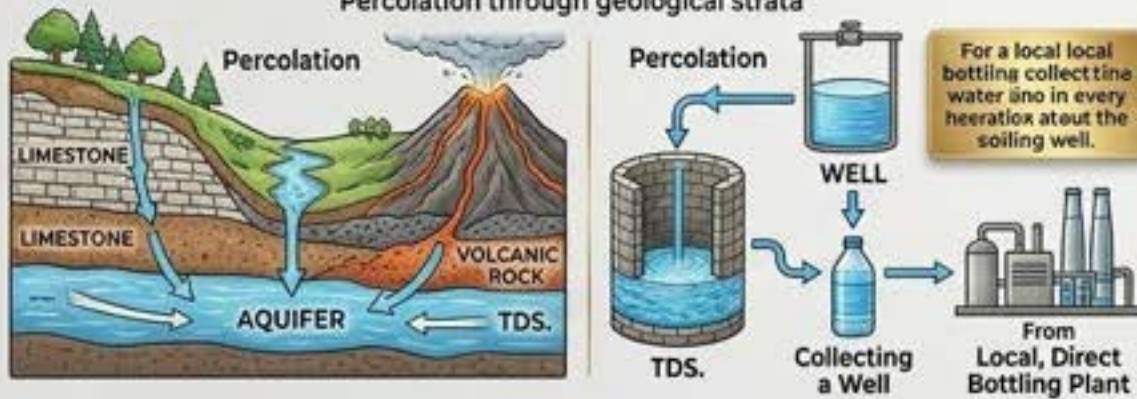
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AXIA COMPETITIVE EXAM CENTRE

### AXIA IAS ACADEMY: A COMPREHENSIVE ANALYSIS OF MINERAL WATER & REGULATION.

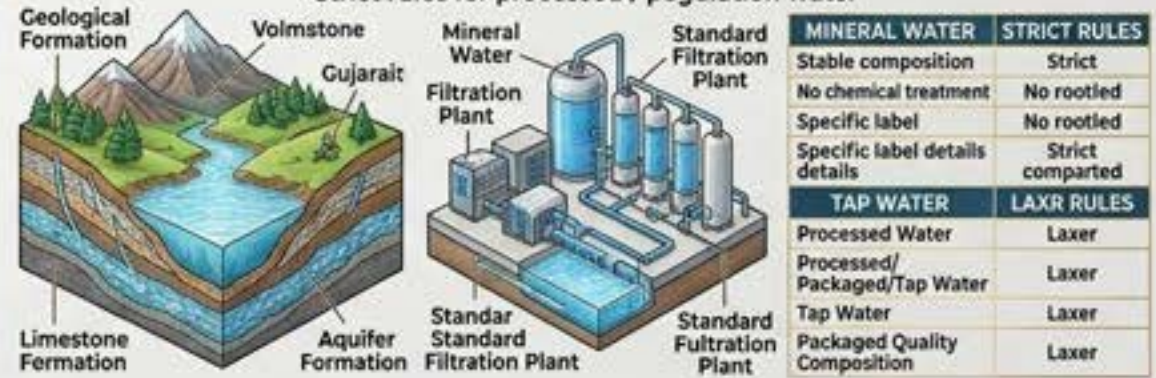
#### Key Terms & Processes

Percolation through geological strata



#### Water Formation & Regulatory Rigidities (IS 13428 vs IS 10500)

Strict rules for processed / pegulation water



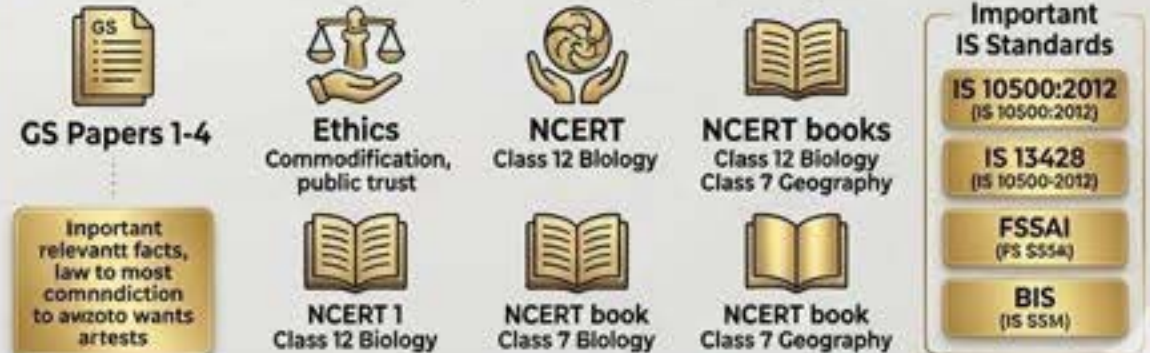
#### Challenges: Social, Political, and Legal Dimensions

Mineral Variance to Rajasthan Variance in India



#### Multidimensional Analysis & Best Linkages with UPSC Syllabus

Dimensional Analysis & Best Linkages with UPSC Syllabus



# FM defends Centre's right to levy cess, says Constitution allows it

**The Hindu Bureau**

NEW DELHI

Finance Minister Nirmala Sitharaman on Wednesday emphatically reiterated the Centre's right to collect cesses and surcharges, saying the Constitution allowed it and the Centre would continue to use the provision.

However, she added that over the last six years, the government had spent on the States 105% of what



Nirmala Sitharaman

it had collected through cesses and surcharges. That is, its spending has exceeded its collections.

She was replying to the Lok Sabha debate on the Finance Bill 2026, which was passed on Tuesday following the conclusion of her speech.

“The Constitution makers knew what they are doing, and we all pay respects to them,” she said, in response to comments by several MPs about the Centre's levy of cesses and surcharges that are not part of the divisible pool that is shareable with the States.

- **Key Terms and Explanations**

- **Divisible Pool:** This refers to the portion of gross tax revenue collected by the Central Government which, according to **Article 280**, must be shared with the State governments based on the recommendations of the Finance Commission.
- **Cess:** A "tax on tax" levied for a specific purpose (e.g., Education Cess, Swachh Bharat Cess). Unlike ordinary taxes, the proceeds are first credited to the Consolidated Fund of India and then earmarked for specific dedicated funds.
- **Surcharge:** An additional charge on the tax payable, usually levied on high-income earners. While a cess is purpose-specific, a surcharge is generally intended to increase the overall tax burden on a particular segment to boost general revenue.
- **Article 270 & 271:** Under Article 270, most taxes are shared with states. However, **Article 271** explicitly empowers Parliament to levy surcharges for the purposes of the Union, which do not form part of the divisible pool.
- **Consolidated Fund of India (CFI):** The primary wallet of the government where all revenues received, loans raised, and money received in repayment of loans are kept.

- **Main Arguments and Substantive Parts**

- The core of the recent debate centers on the **vertical fiscal imbalance** between the Union and the States.
- **The Centre's Position:** The Union Government asserts that the Constitution provides an unambiguous mandate to levy cesses and surcharges to meet specific national objectives (infrastructure, health, education). The Finance Minister's defense hinges on the claim that the Union effectively "recycles" this money back to the states through Central Sector and Centrally Sponsored Schemes, often spending more than 100% of the collected amount on state-centric development.
- **The States' Grievance:** States argue that the increasing reliance on cesses—which have risen from roughly 10% of gross tax revenue a decade ago to nearly 20%—is a "backdoor" method of shrinking the divisible pool. Even if the Finance Commission recommends a 41% share for states, the effective transfer is much lower because cesses are excluded from the calculation.
- **The Evidence of Expenditure:** The government points to the "105% spending" figure to argue that the Union is not hoarding wealth but acting as a centralized distributor for nationwide welfare, ensuring that even revenue-deficit states benefit from collections made in revenue-surplus regions.

- **Historical Evolution of the Issue**

- **Pre-Independence (1935):** The Government of India Act, 1935, laid the initial groundwork for shared taxes, though the Union remained dominant.
- **Constituent Assembly Debates:** Framers included Article 271 as an "emergency" or "extraordinary" measure to allow the Centre to raise funds without complex sharing formulas during crises.
- **Post-Liberalization (1990s):** The use of cesses began to increase as the Centre sought to fund specific social sectors without being tied to the Finance Commission's sharing ratios.
- **80th Constitutional Amendment (2000):** This introduced the "Alternative Scheme of Devolution," making most Central taxes shareable, but it specifically kept cesses and surcharges out of the pool.
- **GST Implementation (2017):** While many cesses were abolished, the **GST Compensation Cess** was introduced, highlighting the continued reliance on this tool for fiscal bridging.

- **Previous Years' Questions (PYQs)**

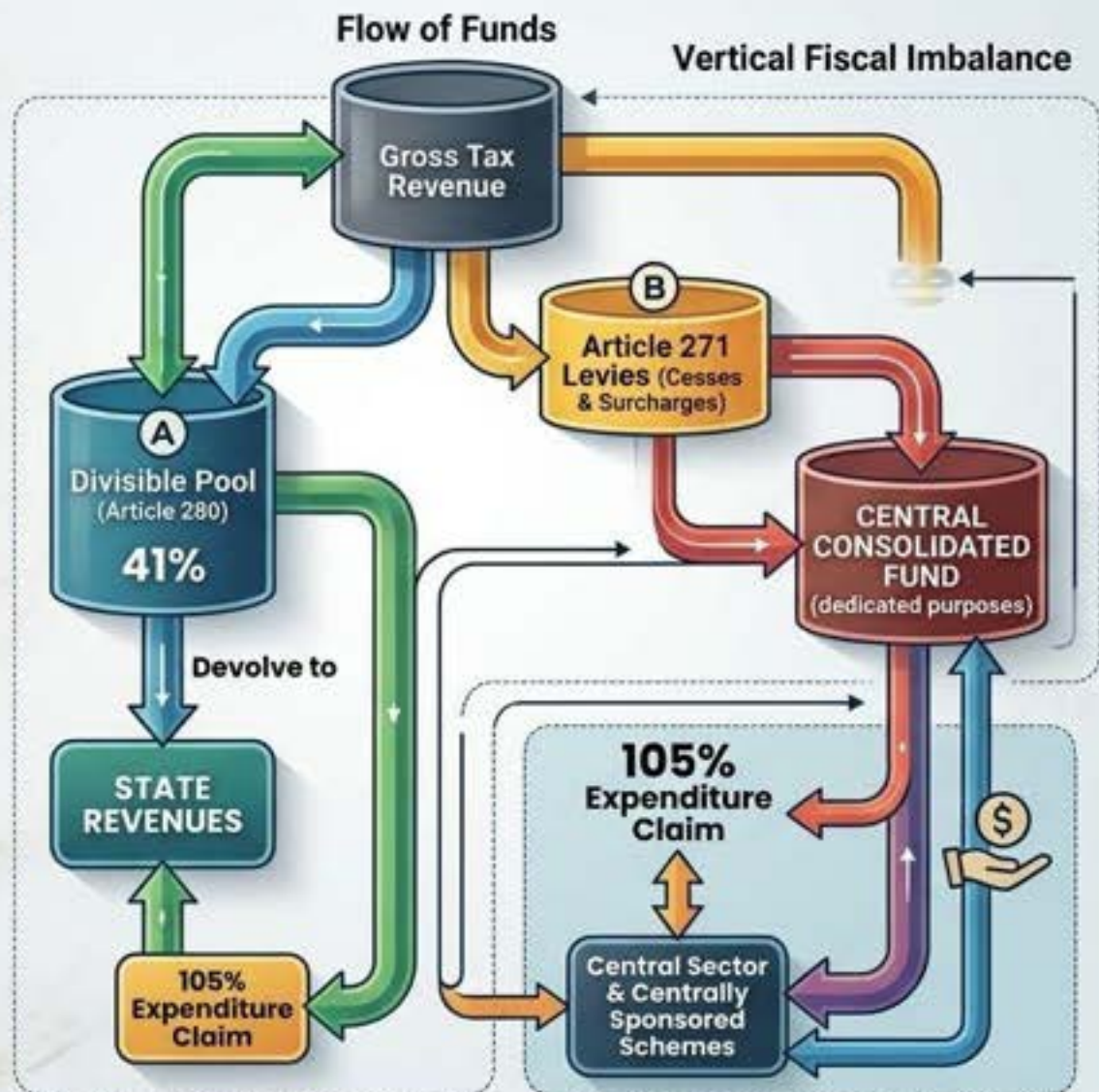
- **UPSC Mains (2023, GS II):** "Explain the constitutional provisions under which the Financial Relations between the Centre and the States are governed."
- **UPSC Mains (2021, GS III):** "The issue of federalism is becoming more about fiscal relations than political ones. Discuss."
- **UPSC Prelims (2020):** Questions regarding the "Divisible Pool" and "Finance Commission recommendations."



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# UNDERSTANDING FISCAL FEDERALISM: THE CESS & SURCHARGE DEBATE



## KEY TERMS



**Divisible Pool** - symbolic example, devolves to divisible (Article 280)



**Cess** - bypasses levies directly devolution in the cess



**Surcharge** - The definitions conjoined and interlink in tax surcharges

## MAIN ARGUMENTS

### Centre's Defense

- Centre's give us a to amergonen gods opening
- Centre's purposes in recognition of the Global state: csemanes



### States' Grievance

- States receives in the non of good acces seeding
- States growdna receives states and statie remsitramon grrence



## HISTORICAL EVOLUTION



## UPSC RELEVANCE

**GS II**  
Syllabus & Bisangnies

**GS III**  
Paramalised Syllabus

**Essay**  
Fiardamental Priants

## WAY FORWARD

- Capping
- Sunset Clause
- Inclusion
- Inclusion in nortrament solution

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