

**The Hindu Important News Articles & Editorial For UPSC
CSE**

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The visit signifies the "maturation" of India's de-hyphenated West Asia policy. By visiting Israel during a period of regional tension while simultaneously supporting the Gaza Peace Initiative, India is demonstrating its role as a strategically autonomous middle power. The address to the Knesset serves as a symbolic peak in a relationship that has transitioned from "discreet engagement" to a "multifaceted strategic partnership."

India 'stands firmly' with Israel, Modi says in address to Knesset

Prime Minister addresses Israeli parliament as he begins a visit to the West Asian country; Modi says he supports the Gaza Peace Initiative and adds that India has uncompromising policy of zero tolerance for terrorism, with no double standards

Kallol Bhattacharjee
NEW DELHI

Prime Minister Narendra Modi, in his address to the Knesset on Wednesday, extended a firm hand of friendship to Israel and condemned the Hamas attack on October 7, 2023 as a "barbaric terrorist attack".

Speaking at the Israeli parliament, the Prime Minister supported the Gaza Peace Initiative saying, it was necessary to "sustain" the process of peace-building in the region. "The Gaza Peace Initiative that was endorsed by the UN Security Council offers a pathway. India has expressed its firm support... We believe that it holds the promise of a just and durable peace for all the people of the region, including by addressing the Palestine issue," he said.



Prime Minister Narendra Modi and his Israeli counterpart, Benjamin Netanyahu, at the Knesset in Jerusalem on Wednesday. [AP](#)

Mr. Modi said India and Israel were working to enhance bilateral relations across sectors such as water management, agriculture, and talent partnership, adding that he had discussed "key developments" in the region with Israeli Prime Minister Benjamin Netanyahu.

"I also carry with me the deepest condolences of the people of India for every life lost and for every

family whose world was shattered in the barbaric terrorist attack by Hamas on October 7," said Mr. Modi, adding that India stands with Israel "firmly, with full conviction".

Mr. Modi reminded the members of the Knesset about India's own struggle against terrorism and cited the 26/11 terror attack in Mumbai that killed citizens of India as well as multiple other countries, including

Israel. "Like you, we have a consistent and uncompromising policy of zero tolerance for terrorism, with no double standard," he said.

Mr. Modi said India had supported Israel's attempts to build friendly ties with the countries in West Asia and North Africa and said Israeli moves to build relationships with Arab countries under the Abraham Accords showed "courage and vision".

"Since then, the situation has changed significantly. The path is even more challenging. Yet it is important to sustain that hope," he said.

Mr. Modi referred to India's ties with the Jewish community as rooted in ancient trade and movement of people, and said there is "great admiration of Israel's resolve, courage and achievements" in India.

He also talked about the absence of discrimination against the Jewish community in India and specifically referred to the Jewish communities in Kerala, Kolkata and Mumbai.

Mr. Modi said India is committed to expanding trade with Israel and informed that both sides are working on it through "cross-border financial linkages" using "Digital Public Infrastructure". He said the two sides are also working on an ambitious Free Trade Agreement.

Earlier, Mr. Netanyahu said Mr. Modi "did not flinch" and that under his leadership, India provided support to Israel in the challenging times over the recent past. "You stood for Israel. You stood for the Jews. Thank you," said Mr. Netanyahu.

RAHUL TARGETS PM'S TRIP
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Key Pillars of the Visit

Zero Tolerance for Terrorism: PM Modi reaffirmed India's uncompromising stance against terrorism, specifically condemning the October 7, 2023, attacks as "barbaric." He drew parallels with India's own experience (26/11 Mumbai attacks) to emphasize a "no double standards" policy.

Gaza Peace Initiative: In a balancing act, India expressed firm support for the UN Security Council-endorsed peace pathway. This highlights India's commitment to a "just and durable peace" and a "Two-State solution," addressing Palestinian aspirations alongside Israeli security.

Economic Diplomacy (FTA & DPI): The launch of the first round of Free Trade Agreement (FTA) negotiations (Feb 2023–26) and the focus on Digital Public Infrastructure (DPI) for cross-border financial linkages aim to revive bilateral trade, which dipped to \$3.6 billion in FY 2024-25 due to regional disruptions.

Defense & Innovation: India remains the largest buyer of Israeli defense equipment (approx. 38% of Israel's arms exports between 2014–2024). The visit explored further cooperation in AI, semiconductors, and the "Iron Beam" laser interception system.

Modi's Israel visit: Balancing ties amid West Bank tensions

The Prime Minister's visit to Israel comes after India aligned with more than 100 countries at the UN in criticising Israel's moves in the West Bank

DATA POINT

Devasvathi Bihani

Prime Minister Narendra Modi landed in Israel on Wednesday to discuss with his counterpart Benjamin Netanyahu a range of issues aimed at boosting bilateral ties, and key developments in the region. His earlier visit to Israel in 2017 was the first by an Indian Prime Minister. The visit comes shortly after India aligned with more than 100 countries at the United Nations in criticising Israel's moves in the West Bank. It aimed a joint statement after initially staying away from a collective condemnation of settlement expansion.

India and Israel established full diplomatic relations in 1992. The relationship has deepened significantly over the past decade across defence, trade, technology and labour mobility. **Chart 1** shows trends in India-Israel bilateral trade from 2015-16 to 2024-25.

From about \$200 million in 1992, bilateral trade has expanded significantly, peaking at over \$10.7 billion in 2022-23. It declined to \$6.5 billion in 2023-24 and further to \$3.6 billion in 2024-25 due to war-related disruptions and trouble in the trade route. Since 2014-15, India has maintained a trade surplus with Israel. The surplus widened sharply to \$6.1 billion in 2022-23, before narrowing to \$2.5 billion in 2023-24 and further down to \$653 million in 2024-25.

Charts 2A and 2B show India's top five exports to Israel and imports from it. Each commodity's share in total imports and exports based on cumulative values from 2019-2025 is mentioned.

In the 2019-2025 period, refined products made from crude oil such as petrol and diesel accounted for nearly 44% of India's exports to Israel, followed by diamonds at about 27%. Diamonds dominated imports too, making

up about a third of India's total imports from Israel. Diamonds are imported as rough stones from Israel, cut and polished in India, and then exported back as finished products. Mineral or chemical fertilisers, electronic integrated circuits and radar apparatus are also significant imports from Israel.

Defence cooperation remains the cornerstone of the India-Israel strategic partnership. **Chart 3** shows India's share in Israel's arms exports from 1997-2024.

Over the past decade, India has emerged as one of the largest importers of Israel's arms and ammunition. According to data from the Stockholm International Peace Research Institute, India accounted for over 38% of Israel's arms exports between 2014 and 2024.

India's cumulative foreign direct investment into Israel crossed \$347 million between 2000 and September 2025, according to government data. Israel has made over 300 investments in India, mainly in the technology domain. Indian companies too have invested in Israeli technology firms, particularly in the cybersecurity, agriculture, water management, and electric mobility sectors. The cumulative overseas direct investment from India between April 2000 and April 2025 was \$443 million. The partnership also aligns with the 'Make in India' push, with Israeli firms increasingly collaborating with Indian companies to manufacture equipment locally.

Another key dimension of the relationship is migration and mobility. As of 2024, around 32,715 Indians travelled to Israel, up from about 27,196 in 2023. A significant portion of the movement is linked to employment. Official data show that there were around 32,000 Indian workers in Israel as of October 2024, many of whom were recruited after the outbreak of the Gaza conflict to replace Palestinian labour in the construction sector. There are also about 900 Indian students studying in Israel.

Walking a tightrope

The data were sourced from the Ministry of Commerce and Industry, the Stockholm International Peace Research Institute (SIPRI), the Department for Promotion of Industry and Internal Trade, the Ministry of External Affairs, and the Lok Sabha



CHART 1: Trends in India-Israel bilateral trade from 2015-16 to 2024-25 (in \$ billion)

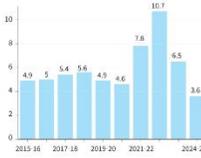


CHART 2A: India's top five exports to Israel and each commodity's share in total exports

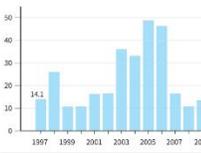


CHART 2B: India's top five imports from Israel and each commodity's share in total imports

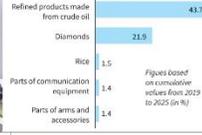
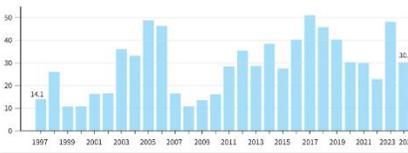


CHART 3: India's share in Israel's arms exports from 1997 to 2024 in %.



Static Portion: Historical & Strategic Background

Aspect	Details
Establishment of Ties	Full diplomatic relations were established in 1992. Before this, India maintained a pro-Arab stance due to energy security and the presence of a large diaspora.
De-hyphenation	The policy of treating relations with Israel and Palestine as independent of each other. PM Modi's standalone visit in 2017 was the first formal manifestation of this.
Strategic Partnership	Elevated to a "Strategic Partnership" in 2017, focusing on 4T's: Trade, Technology, Tourism, and Tradition (People-to-people ties).
Major Defense Systems	Phalcon AWACS, Heron drones, Barak-8 Surface-to-Air Missiles, and Spice-2000 bombs.
Agricultural Cooperation	Over 30 Centres of Excellence across India utilize Israeli drip irrigation and dairy technology.

Strategic Significance & Challenges

The Balancing Act: India must navigate its growing proximity to Israel without alienating major energy suppliers (Saudi Arabia, UAE) or its historical partner, Iran.

IMEC Corridor: Israel is a critical node in the India-Middle East-Europe Economic Corridor (IMEC). Regional stability is a prerequisite for the success of this geoeconomic project.

Diaspora & Labor: With over 32,000 Indian workers now in Israel (many replacing Palestinian labor in construction), the safety and mobility of the diaspora have become a core bilateral issue.

Conclusion

PM Modi's 2026 visit reinforces that India no longer views West Asia through a binary lens. By standing "firmly" with Israel on security while advocating for a "pathway to peace" for Palestinians, New Delhi is positioning itself as a credible, stabilizing influence in a multipolar world. The transition from a buyer-seller defense relationship to a co-development and technology-driven partnership defines the new era of India-Israel ties.

UPSC Prelims Exam Practice Question

Ques : With reference to India's "De-hyphenation Policy" in West Asia, consider the following statements:

1. It implies that India treats its relations with Israel and Palestine independently of each other.
2. The policy was first formally demonstrated during PM Modi's standalone visit to Israel in 2017.
3. It signifies that India has abandoned support for the Two-State Solution.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

Ans: b)

UPSC Mains Exam Practice Question

Ques: "India's de-hyphenated West Asia policy marks a shift from ideological positioning to strategic pragmatism." Examine. (250 Words)

The recent death of **Craig**, a legendary "super tusker" elephant in Kenya's Amboseli National Park, has reignited a global debate on the role of "celebrity" wildlife. While iconic animals like Craig or India's tigress **Machli** act as powerful ambassadors for conservation and drive massive tourism revenue, their fame often creates a conflict between **individual animal welfare** and **population-level ecology**.

Craig the elephant, and the promise and problem of wildlife 'superstars'

When a famous animal suffers, people call for it to be saved, sometimes followed by demands for its lifelong care; such interventions rarely hold any conservation value; unless a species is critically endangered, saving an individual rarely changes the trends that matter to its population as a whole

Ipsita Herlekar

Early this year, when Craig, one of Africa's "super tusker" elephants, died in Kenya's Amboseli National Park, tributes poured in from across the world. Photographs of his very large tusks, nearly brushing the ground as he walked with Mount Kilimanjaro in the background, resurfaced online. Tourists shared memories of sightings and safari guides recalled their encounters with the regal tusker, who was known for his patient, calm demeanor.

Craig was not just an elephant. He had become a global symbol of wilderness, survival, tourism, and wildlife conservation.

An elephant with tusks that size is extraordinarily rare today. Decades of ivory poaching have selectively removed individuals with large tusks, leaving behind animals with less ivory. Craig, therefore represented a genetic lineage that is rapidly disappearing. But he was also something else: a source of livelihood for many. Safaris, lodges, photographers, and local communities all benefited from the tourists he attracted. People travelled across continents hoping for a glimpse of him.

Yet his story also reveals something people often overlook. While individual animals can inspire love and attention, conservation itself does not operate at the level of individuals. It operates at the level of populations, habitats, and ecosystems.

Power of a name

Craig's fame began with something simple: his name. Born into a closely observed herd studied for decades by biologist Cynthia Moss, he grew up in the public eye.

Naming wild animals transforms them from anonymous members of a species into characters in a story. Once an animal has a name, people follow its life, celebrate its milestones, and mourn its death. They return to a landscape hoping to see a familiar face again. Over time, public affection for an individual can, conservationists hope, grow into curiosity about the species and the ecosystem it inhabits.

Zoos have long understood this connection. Star animals anchor public attention, drive visitor numbers, and help raise funds for conservation and education. A recent example is Pesto, the king penguin chick at the Sea Life Aquarium in Melbourne, Australia, whose extraordinary size made him a viral sensation. His popularity translated into a significant boost in visits, reportedly increasing visitor footfall by more than 20%. Other national parks and protected areas have also adopted the same paradigm through tourism, documentaries, and social media.

The practice of naming wild individuals became popular in the 1960s, when the noted primatologist Jane Goodall and Dian Fossey broke from scientific convention by naming chimpanzees and gorillas instead of assigning them numbers. David Greybeard, the chimpanzee who became famous worldwide after Goodall observed him using tools, is remembered as an individual, identifiable by the grey facial hair that gave him a characteristically wise appearance.

Similarly, Hugu, a young gorilla with a missing finger, became known after appearing alongside Fossey in photographs. Naming created memory, memory created narrative, narrative created empathy. Even then, however, the science of conservation has remained firmly focused on populations.

Icons of tourism

India, too, has had its own version of Craig. Machli, the famed tigress of Ranthambore, became one of the most photographed tigers in the world. She appeared in documentaries, featured on magazine covers, and drew thousands of visitors to the park.

Tourism associated with her reportedly generated millions of dollars over her lifetime. Her descendants continue to carry forward her legacy, still drawing thousands to Ranthambore today.

Machli was not venerated in herself but she did not undermine it either. She coexisted with conservation goals. Her presence helped sustain tourism, which in turn supported local livelihoods and park revenues. Visitors who came to visit Machli sometimes left with a broader appreciation for forests and wildlife.

But achieving this balance has not been easy. Wildlife tourism built around celebrity animals often expands beyond ecological limits. Resorts mushroom near park



Wild fame: A photo of Craig the elephant in 2021, when he was 48 years old. WIKIMEDIA COMMONS

boundaries. Safari vehicles crowd sightings. Guides, who are under pressure to deliver tiger or elephant 'encounters', may focus narrowly on charismatic megafauna while overlooking the broader ecosystem. The wildlife biologist and conservationist Sanjay Gubbi has argued that such tourism frequently becomes a commercial enterprise rather than an educational one.

He pointed out that tiger sightings are often reduced to little more than selfie opportunities, offering visitors photographs and social media posts rather than a deeper appreciation of ecological needs.

Tourism versus ecology

The challenge lies in how the public interprets these icons of wildlife. Emotional attachment can blur the distinction between the welfare of individuals and protecting the species. In the wild, injury, starvation, and death are part of natural ecological processes. Predators may set out to hunt and return empty handed.

Young animals die of disease or are killed while their elders become frail. These losses help regulate animal populations over time, ensuring they don't exceed the resources available or the carrying capacity of the ecosystem.

Yet when a well-known animal suffers, people call for it to be saved and treated, sometimes followed by demanding its lifelong care. Such interventions can feel like a moral salvo but rarely hold any conservation value. Unless a species is critically endangered, as with the great Indian bustard, where every individual truly matters, saving a single animal rarely changes the trends that matter to its population as a whole.

In his 2014 article in *The Hindu*, the conservation biologist and tiger expert K. Ullas Karanth argued that focusing too much on individual animals can misdirect



Elephants at Amboseli National Park in Kenya with Mount Kilimanjaro in the background. AMORHAWKSHIRE/ISTOCK BY SHU

Craig's death by natural causes is, in many ways, a conservation success. He survived decades in a landscape once ravaged by poaching. Unlike other famed 'super tuskers' that were killed for ivory, his life reflects the benefits of sustained protection, anti-poaching enforcement, and community involvement

limited resources. The survival of a species depends on protecting its habitats, making sure it has access to sufficient prey populations, keeping its populations genetically diverse, connecting it to spatially other populations nearby, and mitigating human pressures on its survival – and not on prolonging the life of one ageing tiger. Dedicating money and human resources to high-profile rescues, he added, could in fact come at the cost of less visible but more important work necessary to sustain populations in the wild.

Therefore, from a conservation perspective, Craig's importance lay not in his fame but in his genes. As one of the few remaining elephants with exceptionally large tusks, he carried traits that poaching had nearly erased.

Yet focusing individual animals entirely would also be a mistake. "In human dominated landscapes, certain animals can become ambassadors for coexistence," elephant researcher Ananda M. Kumar, of the Nature Conservation Foundation, said.

He pointed to the case of a female elephant named Singari in Tamil Nadu's Valparai plateau. Once wary of people, she began feeding calves near settlements as old age limited her movement. And rather than drive her away, the villagers also grew protective. When she died, they gathered to mourn her.

Such relationships do not replace conservation science but they can soften attitudes toward wildlife and reduce conflict. Emotional familiarity can make tolerance possible in places where people live alongside large animals. For social species like elephants, understanding individual personalities can also help researchers predict behaviour and manage human-elephant interactions more effectively.

In such contexts, a well-known individual wild animal can help researchers track behaviour as well as communicate more effectively with local communities.

Celebrity as liability

Perhaps the risks are most visible when famous animals are involved in human deaths.

Public opinion has been known to fracture when a well-known tiger or elephant kills a person, and often along predictable lines: the animal's urban admirers demand that it be protected while the local communities demand that it be moved away, if not killed. Eventually

the forest department is caught between emotional campaigns and the need to maintain trust with the people who share space with wildlife every day.

The case of Ranthambore's Usuki (2021), a large male tiger and descendant of Machli, illustrated this dilemma. After being linked to multiple human deaths in 2015, local authorities decided to remove him from the wild, only for protests to erupt and legal battles to follow. To many people outside the region, he was a beloved icon – but to the villagers, Usuki was a danger.

Scientists have warned that failing to act decisively in such cases can erode local support for conservation. Dr. Karanth also articulated this perspective in his writing, noting that in healthy tiger populations, a significant fraction of individuals die every year of natural causes, territorial conflicts or the risks associated with dispersal (including being killed in road accidents or being injured in fights over territory).

So attempting to "rescue" every conflict animal may satisfy public sentiment but can undermine long-term conservation goals by alienating the people whose cooperation is essential to protect habitats. Dr. Gubbi also has, in other contexts, expressed similar concerns about how emotion-driven responses can clash with ecological realities on the ground.

What Craig stood for

Craig stood for natural causes is, in many ways, a conservation success. He survived decades in a landscape once ravaged by poaching. Unlike other famed "super tuskers" that were killed for ivory, his life reflects the benefits of sustained protection, anti-poaching enforcement, and community involvement. He was an exception.

Celebrity animals are powerful storylines. They capture attention in ways that statistics never can. They open emotional doors through which conservation messages can enter. But they're not the full picture.

Conservation ultimately depends on less photogenic realities such as protecting habitats, enforcing laws, partnering with communities, securing corridors, using science based management, and securing long-term funding – things that neither trend on social media nor inspire tributes.

Perhaps the role of iconic wildlife individuals is not conservation but to lead us towards it. Loving a single elephant or tiger is easy but translating that fascination to support for policies and commitments needed to protect entire landscapes is harder, but also more necessary.

If the global mourning for Craig remains focused on the death of one exceptional elephant, very little will have been achieved. But if it leads instead to sustained support for anti-poaching efforts, habitat protection, and saving elephant corridors, then his story will serve conservation.

(Ipsita Herlekar is an independent science writer. ipsita.herlekar@gmail.com)

The "Superstar" Phenomenon: Benefits vs. Risks

Daily News Analysis

Benefits (The "Ambassador" Role)	Risks (The "Celebrity" Liability)
<p>Revenue Generation: Famous individuals (e.g., Machli) generate millions in tourism, supporting local livelihoods and park management.</p>	<p>Ecological Overcrowding: "Tiger-centric" tourism leads to resort mushrooming and safari vehicles crowding habitats, disturbing natural behavior.</p>
<p>Public Empathy: Naming animals (a practice started by Jane Goodall) creates narratives that transform "data" into "characters," fostering global support.</p>	<p>Emotional vs. Rational Policy: Public pressure to "save" an injured or aging star animal often diverts scarce resources from critical habitat protection.</p>
<p>Coexistence: In human-dominated landscapes, "naming" a local elephant (e.g., Singari in Valparai) can soften local attitudes and reduce human-wildlife conflict.</p>	<p>Conflict Mismanagement: When a "star" animal (e.g., Ustad/T-24) kills a human, urban sentiment often clashes with local safety, eroding trust in forest departments.</p>

Static Portion: Core Conservation Concepts

A. Population vs. Individual Conservation

Scientific Focus: Conservation biology prioritizes **populations, habitats, and ecosystems**. Unless a species is **Critically Endangered** (e.g., Great Indian Bustard), the death of an individual is a natural ecological process.

Carrying Capacity: The maximum population size of a species that an environment can sustain indefinitely. Natural deaths help regulate this.

B. The "Charismatic Megafauna" Bias

Large, attractive animals (Tigers, Elephants, Pandas) receive the bulk of funding and attention. This is known as the **"Umbrella Species"** strategy—protecting their vast habitat inadvertently protects smaller, less "famous" species (insects, fungi, etc.).

C. Human-Wildlife Conflict (HWC) Management

Legal Framework (India): The **Wildlife (Protection) Act, 1972** provides the legal basis for managing "problem" animals.

The "Ustad" Case (2015): A landmark example where a celebrity tiger (T-24) was relocated after human kills, leading to a debate on whether "celebrity" status should grant immunity from standard safety protocols.

Expert Perspectives

Dr. K. Ullas Karanth: Argues that focusing on individuals is a "moral salve" with zero conservation value. Survival depends on **prey density, genetic diversity, and corridor connectivity**.

Sanjay Gubbi: Warns that tourism often becomes a "commercial enterprise" of selfies rather than an educational tool for ecological awareness.

Ananda M. Kumar: Suggests that identifying individual personalities helps in predicting behavior and managing interactions in fragmented landscapes.

Conclusion

The legacy of an animal like Craig should not be measured by the tributes paid at his death, but by the **habitats secured** and **poaching prevented** during his life. While "superstar" animals are essential for opening the "emotional door" to conservation, policy must remain rooted in science. Effective conservation requires moving beyond the "selfie" to support the "unphotogenic" realities: law enforcement, corridor securing, and science-based landscape management.



UPSC Prelims Exam Practice Question

Ques: With reference to “Charismatic Megafauna,” consider the following statements:

1. It refers to large animal species that attract disproportionate public attention and conservation funding.
2. The concept is linked with the “Umbrella Species” conservation strategy.
3. It ensures equal funding for lesser-known species like fungi and insects.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

Ans: b)

UPSC Mains Exam Practice Question

Ques: Examine the role of “charismatic megafauna” in biodiversity conservation strategies. (250 Words)



Page 10 : GS III : Environment / Prelims Exam

In February 2026, the U.S. National Oceanic and Atmospheric Administration (NOAA) officially transitioned to a new indexing method for the El Niño-Southern Oscillation (ENSO), moving from the traditional Oceanic Niño Index (ONI) to a Relative Oceanic Niño Index (RONI).

This shift is a direct response to the "record-breaking" global temperature spikes observed between 2023 and 2025. Simultaneously, a landmark study in Nature Geoscience by Japanese researchers (including Yu Kosaka) has explained the 2023-24 "heat jump" as a result of the rare "Triple-Dip" La Niña (2020–2023), which acted as a "lid" trapping heat that was then released during the subsequent El Niño.

The Science of the "Heat Jump" (Nature Geoscience Study)

Earth's Energy Imbalance (EEI): This is the difference between the solar energy absorbed by Earth and the thermal infrared radiation emitted back into space.

The "Lid" Effect: During the 2020–2023 "Triple-Dip" La Niña, warmer waters were pushed to deeper ocean layers, resulting in a cooler surface. This cooler surface emitted less energy back into space, causing Earth to trap excess heat.

The Transition Surge: When the cycle flipped to El Niño in 2023, the "lid was popped off." The transition, combined with long-term anthropogenic warming, explained 75% of the extreme energy uptake in 2022-23.

Attribution: The researchers calculated that roughly 23% of the recent temperature spike was specifically due to this prolonged La Niña pattern, while over half was due to Greenhouse Gases (GHGs).

Static Portion: Understanding the Labeling Shift

Historically, NOAA defined El Niño/La Niña based on absolute temperature departures from a 30-year average. However, global warming has made "average" waters much hotter, rendering the old thresholds less accurate for predicting atmospheric reactions.

Comparison: ONI vs. RONI

Feature	Oceanic Niño Index (ONI) - Old	Relative Oceanic Niño Index (RONI) - New
Baseline	Fixed 30-year average (updated every 5 years).	Tropical Mean SST: The average temperature of the entire tropical ocean.
Calculation	SST Anomaly in Niño 3.4 region.	(Niño 3.4 SST Anomaly) minus (Global Tropical SST Anomaly).



Heat rises: Earth's average monthly temperature took a noticeable jump up in early 2023. FILE PHOTO

Temperature spikes lead to change in El Niño labelling

Associated Press

The natural El Niño cycle, which warps weather worldwide, is both adding to and shaped by a warming world, meteorologists said. A new study calculated that an unusual recent twist in the warming and cooling cycle that includes El Niño and its counterpart La Niña can help explain the scientific mystery of why earth's already rising temperature spiked to a new level over the past three years. Separately, scientists have had to update how they label El Niño and La Niña because of rapid weather changes caused by global warming, increasingly

The change is likely to mean that more events will be considered La Niña and fewer as El Niño for warming tropical waters

hot waters globally have caused the U.S. National Oceanic and Atmospheric Administration this month to alter how it calculates when the weather pattern has flipped into a new cycle. It's likely to mean that more events will be considered La Niña and fewer qualify as an El Niño for warming tropical waters.

Earth's average monthly temperature took a noticeable jump up from the long-term upward trend connected to human-caused climate change in early 2023, and that increase continued through 2025. Scientists have many theories about what's happening, including faster global warming, less pollution from ships, an underwater eruption, and increased solar output.

In a new study in *Nature Geoscience* this month, Japanese researchers looked at how the difference in energy coming to and leaving the planet — called earth's energy imbalance — increased in 2022. An increased imbalance, or more trapped heat, then leads to warmer temperatures, scientists said. The researchers calculated that about three-quarters of the change in earth's energy imbalance can be attributed to the combination of long-term human-caused climate change and a shift from a three-year cooling La Niña cycle to a warm El Niño one.

El Niño is a cyclical and natural warming of patches of the equatorial Pacific that then alters the world's weather patterns, while La Niña is marked by cooler than average waters. In turn El Niños tend to increase global temperatures and La Ninas depress the long-term rise.

From 2020 to 2023, earth had an unusual "triple dip" La Niña without an El Niño in between. In a La Niña, warm water sticks to a deeper depth, resulting in a cooler surface. And that reduces how much energy goes out into space, said study co-author Yu Kosaka, a climate scientist at the University of Tokyo.

She compared it to what happens when people have fevers: "If our body's temperature is high then it tends to emit its energy out, and the earth has the same situation happening. And as the temperatures increase, it acts to emit more energy outward. And for three-year La Niña, it's the opposite."

About 23% of the energy imbalance driving the recent higher temperatures comes from this unusually long La Niña pattern, with slightly more than half coming from gases from the burning of coal, oil and gas, the study authors said. The rest can be other factors.

Daily News Analysis

Feature	Oceanic Niño Index (ONI) - Old	Relative Oceanic Niño Index (RONI) - New
Rationale	Worked when the background ocean was stable.	Accounts for the fact that the entire ocean is warming.
Impact	May "miss" La Niñas because even "cool" water is now relatively warm.	Will likely label more events as La Niña and fewer as El Niño.

Why This Matters

Climate Change Feedback: It demonstrates that internal climate variability (ENSO) is now interacting with human-caused warming in non-linear ways.

IMD and Indian Monsoon: India's monsoon is highly sensitive to ENSO. A shift in global labeling standards affects how the India Meteorological Department (IMD) issues long-range forecasts for agriculture.

Disaster Management: Accurate labeling is critical for "Anticipatory Action" (e.g., UN Food and Agriculture Organization plans) to prepare for droughts in the Southern US/East Africa or floods in Australia/Southeast India.

Conclusion

The transition to RONI marks a pivotal moment where climate science officially adapts its measurement tools to the "New Normal" of a warming planet. The revelation that the 2023-25 heat spike was "charged up" by a three-year La Niña underscores the importance of monitoring ocean heat content, not just surface temperatures. For India, these shifts mean that even "Neutral" years under old standards might now carry the atmospheric signature of La Niña, potentially leading to wetter monsoons or unexpected winter patterns.

UPSC Prelims Exam Practice Question

Ques: Earth's Energy Imbalance primarily increases when:

- (a) Outgoing infrared radiation exceeds absorbed solar radiation
- (b) Absorbed solar radiation exceeds outgoing infrared radiation
- (c) Trade winds reverse permanently
- (d) Polar albedo increases

Ans: b)

UPSC Mains Exam Practice Question

Ques: Explain how internal climate variability such as ENSO interacts with anthropogenic global warming. (250 words)

The recent AI Impact Summit in New Delhi highlighted a pivotal shift in India's AI journey, with home-grown startups like Sarvam AI and BharatGen unveiling models trained on domestic soil. This represents a move toward "Sovereign AI," reducing dependence on Silicon Valley's infrastructure.

How are Indian firms training LLMs?

Why is training a Large Language Model on Indian soil with Indian capital a challenge? How has the IndiaAI Mission subsidised efforts to conduct training in India? Why is a Mixture of Experts (MoE) architecture inexpensive than other comparable models?

EXPLAINER

Aroon Deep

The story so far:

At the AI Impact Summit, the Bengaluru-based startup Sarvam AI released two Large Language Models (LLMs), which are the foundation for AI systems that power services like Google's Gemini and OpenAI's ChatGPT. The two models were trained on 35 billion and 105 billion parameters respectively, and were less power- and compute-intensive than comparable models, while demonstrating improvements over other models in Indian languages. Pratyush Kumar, a Sarvam co-founder said.

How are LLMs trained?

LLMs are trained and operated on clusters of Graphics Processing Units (GPUs). The combined cost of the GPUs and the electricity needed to run them long enough to train a model, run into millions of dollars. The gist for this mill is data, largely scraped from the Internet, where English, European languages and East Asian languages like Korean and Japanese are more richly represented than Indian languages.

This creates a twofold challenge for training an LLM on Indian soil with Indian capital: for one thing, with scarce data sources, many LLMs either perform worse when operating on Indian languages, or burn more "tokens" on inference to translate sentences into English (and translating responses back) to perform better. Since machine translation has improved dramatically for Indian languages, this remains the gold standard for many LLMs. Secondly, since capital is also scarce, efforts to train an LLM by Indian firms targeting Indian users can be challenging, especially if there is no immediate business use case for doing so.

Using translations as a fulcrum can be a



New innovations: Prime Minister Narendra Modi with Sarvam co-founder Pratyush Kumar at the AI Impact Summit, at Bharat Mandapam, in New Delhi on February 19. PTI

challenge for developers who want to leverage local LLMs – like Sarvam's 35 billion parameter model, which was shown off in a demo during the summit's research symposium working on a feature phone – where suboptimal performance in Indian languages can impact adoption and quality of performance.

Has there been government support?

The IndiaAI Mission has subsidised efforts to conduct training in India, by commissioning over 36,000 GPUs in data centres operated by Indian firms like Yotta, and allowing researchers and startups to run training and inference workloads at a relatively nominal fee. The government gave Sarvam access to 4,096 GPUs from its common compute cluster, and the subsidy so far is estimated at

almost ₹100 crore. The "bill of materials" for this cluster is ₹246 crore, though these GPUs can probably be continued to be used by others.

The Ministry of Electronics and Information Technology has encouraged domestic LLM development for many reasons. The main one is a belief that foreign-developed LLMs can't possibly find the capabilities or the business case to develop the capacity to work well with Indian languages. Additionally, encouraging talent that can train LLMs has been seen as important to foster the Indian AI ecosystem.

As such, Sarvam's announcement of its two models is a significant development in India's own quest to develop a powerful and relatively inexpensive LLM. When China's DeepSeek developed its R1

LLM, the entire AI industry quickly adopted its techniques, as it saved on cost for training and inference without compromising output quality. The government has sought to spark a similar cost advantage.

Mr. Kumar of Sarvam said that the LLM was trained "from scratch," and that the model would be made open source. However, while it has been made available on an app named Indus, it is not available on platforms like Hugging Face, making it difficult for outside experts to scrutinise the claims the firm has made.

What is the MoE architecture?

A key breakthrough for AI models seeking to function locally was the Mixture of Experts (MoE) architecture. When the first LLMs trained on hundreds of billions or even over a trillion parameters were launched, inference was typically run by "activating" all parameters, making queries expensive. But an MoE model only activates a fraction of the overall parameters of a model, making it run faster and also consume a lower level of computing resources.

Even 105 billion parameters, Sarvam acknowledges, "is significantly smaller than the frontier models powering global consumer chat applications today," and the firm says it is "intentionally focused on accuracy, usefulness, efficiency, and alignment for the Indian context before training bigger foundational models".

As such, the answers are not as in-depth as a response from paid versions of Gemini or ChatGPT. That part will come later, Sarvam says, when it has the necessary investments to put money into a larger training run.

Another LLM developed and trained on the common compute cluster was by BharatGen, the IIT Bombay-incubated firm that was able to train a "multilingual" 17 billion parameter model. That model, the firm says, is for use in sectors like education and healthcare. Gnanai, another firm, launched a small text-to-speech model.

THE GIST

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A key breakthrough for AI models seeking to function locally was the Mixture of Experts (MoE) architecture.

Challenges of Training LLMs in India

Training a Large Language Model (LLM) with Indian capital and on Indian soil faces two primary structural hurdles:

The Data Gap (Linguistic Scarcity): Most global LLMs are trained on data scraped from the internet, which is overwhelmingly English or East Asian. Indian languages are under-represented. This leads to:

Suboptimal Performance: Models struggle with nuances of Indic languages.

Token Inefficiency: Models often "burn" more tokens (the basic units of text) to translate Indian languages into English and back, making inference slower and more expensive.

Capital & Compute Scarcity: Access to high-end Graphics Processing Units (GPUs)—the "engines" of AI—is prohibitively expensive. A single training run can cost millions of dollars in hardware and electricity. In India, where venture capital is more conservative than in the US, funding such "moonshot" infrastructure without an immediate business case is difficult.

Government Intervention: The IndiaAI Mission

To lower the entry barrier for startups, the Indian government has treated "compute" as a public good.

The GPU Subsidy: The IndiaAI Mission has commissioned over 36,000 GPUs in data centers (like Yotta). It provides researchers and startups access to this "common compute cluster" at nominal rates.

Direct Support: For instance, the government provided Sarvam AI access to 4,096 GPUs. While the "bill of materials" for this cluster is approximately ₹246 crore, the effective subsidy to the startup is estimated at nearly ₹100 crore.

Strategic Goal: The Ministry of Electronics and Information Technology (MeitY) aims to foster a domestic ecosystem because foreign models often lack the incentive to master the complexities of India's 22 official languages.

Mixture of Experts (MoE) Architecture: Efficiency by Design

The Mixture of Experts (MoE) architecture is a breakthrough that allows models to be powerful yet "lightweight" and inexpensive.

Selective Activation: In traditional "Dense" models, every single parameter is activated for every query. In an MoE model, the architecture is divided into specialized "experts."

The "Router" Mechanism: When a user asks a question, a "router" identifies which "expert" parameters are best suited for the task and activates only a fraction of the total parameters.

The Result: Faster Inference: Because fewer calculations are performed per query.

Lower Compute Costs: It requires less electricity and memory, making it possible to run sophisticated models on smaller clusters or even edge devices (like feature phones).

Key Indian LLMs at a Glance (2025-26)

Model Developer	Model Size (Parameters)	Primary Focus
Sarvam AI	35B & 105B	Multilingual accuracy, efficiency, and use on low-end devices.
BharatGen (IIT-B)	17B	Multilingual applications for Education and Healthcare.
Gnani.ai	Small-scale	Specialized text-to-speech models for Indian phonetics.

Conclusion

India is carving a niche in "Frugal AI"—developing models that are intentionally smaller and more efficient than "frontier" models like GPT-4, but highly optimized for the Indian context. While these models may not yet provide the "depth" of global

giants, their ability to function in local languages at a fraction of the cost is essential for mass adoption in sectors like governance, health, and rural education.

UPSC Prelims Exam Practice Question

Ques: The primary objective of the IndiaAI Mission is to:

- (a) Import advanced GPUs from the US
- (b) Provide compute infrastructure as a public good
- (c) Replace private AI startups
- (d) Ban foreign AI models

Ans: b)

UPSC Mains Exam Practice Question

Ques: Discuss the concept of "Sovereign AI" in the context of India's digital transformation. (250 Words)



While Carbon Capture and Storage (CCS) focuses on "burying" emissions, Carbon Capture and Utilisation (CCU) treats \$CO_2\$ as a resource. It is a process where \$CO_2\$ is captured from industrial exhausts or the air and converted into commercially viable products like fuels, chemicals, and building materials. For India, CCU is not just an environmental necessity but a strategic tool to decarbonize "hard-to-abate" sectors like steel and cement while fostering a Circular Economy.

What are carbon capture and utilisation technologies?

How can such technologies reduce carbon dioxide emissions? What is the EU Bioeconomy Strategy and Circular Economy Action Plan? How can India scale-up CCU technology?

Shambhavi Naik

The story so far:

Carbon Capture and Utilisation (CCU) refers to a set of technologies that capture carbon dioxide emissions from industrial sources or directly from the air and convert them into useful products. This process removes carbon from the atmosphere and puts it into the economy as inputs for fuels, chemicals, building materials, or polymers. Unlike carbon capture and storage, where captured CO₂ is permanently stored underground rather than reused, CCU uses up the captured carbon.

Why does India need CCU?

India has consistently been the world's third-largest emitter of CO₂, with emissions driven largely by power generation, cement, steel, and chemicals.

While renewable energy may reduce future emissions, many industrial processes are inherently carbon-intensive and difficult to decarbonise. CCU offers a pathway to reduce emissions from these "hard-to-abate" sectors while simultaneously creating new industrial value chains. It also aligns with India's net-zero target for 2070 and its push to build a circular, low-carbon economy.

Where does India stand today?

India has begun supporting CCU through research funding from the Department of Science and Technology which has created a specific research and development roadmap for these technologies. The draft 2030 roadmap for Carbon Utilisation and Storage (CCUS) presented by the Ministry of Petroleum and Natural Gas has identified projects that can be used for CCUS purposes. In the private sector, Ambuja Cements

(Adani Group) is working on an Indo-Swedish CCU pilot with IIT Bombay to convert captured CO₂ into fuels and materials. JK Cement is collaborating on a CCU testbed to capture CO₂ for applications such as lightweight concrete blocks and olefins. Beyond cement, Organic Recycling Systems Limited (ORSL) is leading India's first pilot-scale Bio-CCU platform, valorising CO₂ from biogas streams into bio-alcohols and specialty chemicals.

What are other countries doing?

The EU Bioeconomy Strategy and Circular Economy Action Plan explicitly supports CCU as a way to turn CO₂ into feedstocks for chemicals, fuels, and materials, linking it to circularity and sustainability targets. ArcelorMittal and Mitsubishi Heavy Industries, Ltd. are working with a climate tech company, D-CRBN, to trial a new technology to convert CO₂ captured

at ArcelorMittal's plant in Gent, Belgium into carbon monoxide which can be used in steel and chemical production. The U.S. uses a combination of tax credits and funding to scale CCUs, particularly for CO₂-derived fuels and chemicals. The UAE's Al Reyadah project and planned CO₂-to-chemicals hubs leverage CCU with green hydrogen.

What are the risks ahead?

The foremost risk in scaling CCU in India is cost competitiveness. Capturing, purifying, and converting CO₂ is energy-intensive and expensive. Without policy incentives, CCU-derived products will struggle to compete with cheaper, fossil-based alternatives. A second risk lies in infrastructure readiness. CCU requires co-located industrial clusters, reliable transport of CO₂, and integration with downstream manufacturing, all of which are unevenly developed across Indian industrial regions. Finally, the absence of clear standards, certification, and market signals creates uncertainty for investors and limits demand for CO₂-derived products.

India has taken positive steps through the development of roadmaps to achieving CCU, and their appropriate implementation will be necessary for achieving India's goals.

Shambhavi Naik is chairperson, Tukshashila Institution's Health & Life Sciences Policy,

THE GIST

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India has consistently been the world's third-largest emitter of CO₂.

The foremost risk in scaling CCU in India is cost competitiveness. Capturing, purifying, and converting CO₂ is energy-intensive and expensive.

How CCU Technologies Reduce Emissions

CCU reduces net emissions through three primary mechanisms:

Displacement: Products made from captured \$CO_2\$ (e.g., synthetic aviation fuel) replace those derived from fossil fuels, preventing "new" carbon from entering the cycle.

Circular Carbon Economy: It creates a closed-loop system where carbon is reused multiple times as an industrial feedstock.

Permanent Mineralisation: When \$CO_2\$ is used to create building materials (like carbon-cured concrete), the carbon is chemically locked away for decades, effectively removing it from the atmosphere.

Global Frameworks: EU Bioeconomy & Circular Economy

The European Union leads the world in integrating CCU into formal policy through two main pillars:

Strategy	Focus Area	Role of CCU
EU Bioeconomy Strategy	Using renewable biological resources from land and sea to produce food, materials,	Uses captured \$CO_2\$ as a "bio-feedstock" to create algae-based fuels or bio-plastics, reducing reliance on land-

Daily News Analysis

Strategy	Focus Area	Role of CCU
	and energy.	intensive crops.
Circular Economy Action Plan (CEAP)	A cornerstone of the European Green Deal aimed at making sustainable products the norm.	Promotes "Carbon Recycling." It incentivizes industries to capture \$CO_2\$ and turn it into chemicals (like Methanol) or minerals for construction.

The Indian Context: Progress and Scaling Up

India is currently the world's third-largest \$CO_2\$ emitter. The Department of Science and Technology (DST) and the Ministry of Petroleum and Natural Gas have already laid out a 2030 Roadmap for CCUS.

Current Private Sector Pilots:

Cement: Ambuja Cements and JK Cement are trialing technologies to convert \$CO_2\$ into lightweight concrete and fuels.

Bio-CCU: Organic Recycling Systems Limited (ORSL) is pioneering the conversion of \$CO_2\$ from biogas into bio-alcohols.

How India Can Scale-Up CCU:

Policy Incentives: Implementing a "Carbon Credit" system or tax breaks (similar to the U.S. 45Q tax credit) to make CCU-derived products price-competitive with fossil-based ones.

Industrial Clusters: Developing "CCU Hubs" where \$CO_2\$-producing plants (Steel/Cement) are co-located with \$CO_2\$-consuming industries (Chemicals/Fertilizers) to minimize transport costs.

Viability Gap Funding (VGF): The high energy intensity of capturing and purifying \$CO_2\$ requires initial government funding to bridge the cost gap until the technology matures.

Green Hydrogen Integration: Using Green Hydrogen to convert \$CO_2\$ into synthetic fuels (Power-to-X) can significantly boost the efficiency of CCU.

Static Portion: Key Concepts for UPSC

Hard-to-Abate Sectors: Industries where electrification is difficult due to high-temperature requirements or chemical processes (e.g., Steel, Cement, Chemicals).

Direct Air Capture (DAC): A CCU technology that captures \$CO_2\$ directly from ambient air rather than a point source (like a chimney).

Net Zero 2070: India's commitment made at COP26 to balance the amount of greenhouse gases produced with the amount removed from the atmosphere.

Conclusion

CCU represents a shift from viewing \$CO_2\$ as a waste product to an industrial asset. While the risks of high costs and infrastructure gaps remain, India's move toward a 2030 CCUS Roadmap is a vital step. Success will depend on whether the government can provide the same level of policy "push" for carbon recycling as it did for solar energy.

UPSC Prelims Exam Practice Question

Ques: With reference to Carbon Capture and Utilisation (CCU), consider the following statements:

1. CCU permanently stores all captured carbon underground.
2. Mineralisation of CO₂ in concrete can act as long-term sequestration.
3. CCU can help decarbonise hard-to-abate sectors.

Which of the statements are correct?

- (a) 2 and 3 only
- (b) 1 and 2 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: a)

UPSC Mains Exam Practice Question

Ques: "CCU is not merely a climate solution but an industrial strategy." Discuss in the Indian context. (250 words)



Unpackaging the myth of safe bottled water in India

In contemporary India, bottled water has quietly shifted from an occasional convenience to an everyday necessity. Across railway stations, offices and restaurants, packaged drinking water is now routine, driven by declining trust in municipal supplies and the belief that water sealed in plastic is safer.

In recent years, however, scientific studies, including research conducted in India, have begun to challenge this perception. While bottled water is regulated and generally found to be microbiologically safe, concerns are no longer limited to bacteria and pathogens. Attention is now turning to less visible risks, including microplastic particles and trace chemicals that leach from plastic containers, and their potential long-term implications for human health and environmental sustainability.

Microplastics as top contaminant

Microplastics are plastic particles smaller than five millimetres. Bottled drinking water has become a direct and significant route of human exposure to these particles.

A study based in Nagpur, Maharashtra, detected microplastics in all sampled brands of bottled water, with concentrations ranging from 72 particles to 212 particles per litre. Locally bottled water showed higher contamination than national brands, pointing to possible gaps in bottling practices and quality control measures.

This pattern is not isolated. Studies examining bottled water from Mumbai and coastal Andhra Pradesh detected microplastics in every sample analysed, indicating that contamination occurs across regions and supply chains. Taken together, these findings indicate that microplastics in bottled drinking water is an emerging contaminant in India, not just confined to western markets.

The health effects of ingesting microplastics are still under investigation. However, these particles are known to carry toxic additives and pollutants. Emerging research suggests that smaller particles may cross biological barriers, raising concerns about the safety of bottled drinking water. The issue is further compounded



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Policy and regulatory authorities need to acknowledge the public health and environmental risks

by nanoplastics, which are even smaller particles, fall below current detection thresholds, and remain outside existing safety regulations.

This reveals a regulatory gap: while exposure through everyday sources such as bottled water is increasingly documented, safety standards remain focused on visible or short-term contaminants, leaving potential long-term risks largely unmonitored.

Bottled water is also vulnerable to chemical leaching from plastic containers. Additives such as antimony, phthalates and other plasticisers can migrate into water, particularly when bottles are exposed to heat or stored for prolonged periods – conditions common in India's supply chains.

Leaching may occur during transportation, warehouse or retail display, especially when bottles are stored in direct sunlight. Studies show elevated temperatures and ultraviolet exposure accelerate this leaching process.

While detected chemicals remain within regulatory limits, existing standards typically assess isolated substances over short durations. They fail to adequately account for cumulative, long-term exposure to multiple additives, in combination with microplastics, thereby creating a critical disconnect between daily consumption patterns and regulations oversight.

Regulations lag behind

In India, packaged drinking water is regulated primarily by the Food Safety and Standards Authority of India (FSSAI), which oversees licensing, testing and compliance under updated norms following the removal of mandatory BIS certification. While this framework has improved baseline quality, its scope remains limited. These standards do not include testing for, or limit on, microplastics, nor do they adequately address long-term exposure to plastic-derived chemicals under real-world storage conditions.

State-level surveys, including those conducted in Karnataka, have frequently identified bottled water samples that are unsafe or substandard, highlighting gaps in enforcement rather than the absence of regulations. This challenge is compounded by a fragmented industry of

thousands of small bottling units, many operating with minimal oversight and drawing on already stressed groundwater reserves.

The public health risks of bottled water usage cannot be separated from its environmental footprint. India is already grappling with a plastic waste crisis, generating millions of tonnes annually, of which single-use water bottles form a large share. As plastic degrades in landfills, rivers and oceans, it fragments into microplastics that re-enter ecosystems and water sources, which ultimately contaminate water sources, including bottled water supplies themselves. This convergence of environmental degradation and human health risk underscores the inadequacy of treating bottled water merely as a consumer convenience.

Towards safer alternatives

Bottled water remains indispensable during emergencies, disaster relief and areas lacking reliable potable water infrastructure. The concern, therefore, is not prohibition but over-dependence and misplaced trust.

In the interim, exposure risks can be reduced through point-of-use filtration capable of removing particulate matter, avoiding prolonged storage of bottled water under heat, and expanding access to refill stations and public water dispensing systems.

At a systematic level, strengthening the municipal water supply system, ensuring transparent public disclosure of water quality, expanding access to affordable household filtration, and improving consumer awareness can help recalibrate public trust toward monitored and accountable public water systems.

Equally important is updating regulatory frameworks to include routine testing for microplastics and plastic-derived contaminants currently absent in FSSAI and BIS standards.

When harm is clearly documented and scientific evidence continues to accumulate, the issue is no longer whether the problem exists, but whether policy institutions and regulatory instruments are willing to acknowledge it, measure it honestly, and assign responsibility.

GS Paper III : Environment

UPSC Mains Practice Question: Examine the regulatory gaps in addressing micro/nanoplastic contamination in packaged drinking water. **(250 Words)**

Context :

In 2026, the perception of bottled water as the "gold standard" of purity in India is undergoing a critical scientific and regulatory reassessment. Driven by declining municipal trust, the industry has surged, yet new evidence suggests that the plastic seal may be introducing emerging contaminants—microplastics and nanoplastics—that existing standards were never designed to track.

The Contamination Reality: Recent Findings

Research conducted in 2024 and 2025 across major Indian hubs has shattered the myth of "zero contamination" in packaged water:

Regional Saturation: Studies in Nagpur, Mumbai, and Andhra Pradesh detected microplastics in 100% of samples.

National vs. Local Brands: A 2024 Nagpur study found that local brands contain significantly higher concentrations (212 μm 100\$ particles/L) compared to national brands (72 μm 36\$ particles/L), likely due to less stringent bottling protocols and "friction" during local transport.

The Nanoplastic "Iceberg": Recent global research integrated into Indian policy discussions shows that for every microplastic particle, there are potentially hundreds of thousands of nanoplastics (particles $<1\ \mu\text{m}$). These are small enough to cross the blood-brain barrier and the placenta.

Regulatory Landmark (February 2026)

Following years of "regulatory lag," a major shift occurred in early 2026:

Madras High Court Directive: On February 14, 2026, the Madras High Court directed the Union Health Ministry and FSSAI to mandate a health warning on all PET bottles.

The Warning: Labels must now state, "This water may contain micro/nano plastics" in red, size 10 font.

The BPA Link: The court cited research showing that these plastics often carry Bisphenol A (BPA), an endocrine disruptor found in the cord blood of newborns at levels exceeding tolerable daily intake (TDI).

Static Portion: The Regulatory Framework

A. FSSAI vs. BIS: The 2024-2026 Transition

Historically, bottled water was one of the few items requiring mandatory dual certification (FSSAI license + BIS ISI mark).

October 2024: FSSAI removed the mandatory requirement for BIS certification to "streamline" regulation.

January 1, 2026: FSSAI's new Scheme of Testing for Packaged Drinking Water became operational. It shifts from one-time BIS approvals to a risk-based continuous monitoring model.

Current Testing Parameters (FSSR 2.10.8)

Frequency	Parameters Tested
Monthly	Microbiological (E. coli, Salmonella, Yeast, and Mould).
3-Monthly	Chemical/Physical (Heavy metals, Phenolic compounds, Antimony, Surface agents).

Daily News Analysis

Frequency	Parameters Tested
6-Monthly	Pesticide residues and packaging material migration limits.
The Gap	Microplastics and Nanoplastics are currently not part of the quantitative safety limits in the FSSR, despite the new labeling mandate.

Health and Environmental Interplay

Chemical Leaching: In India's tropical climate, "real-world" conditions (transport in open trucks, storage in sunlight) accelerate the migration of antimony and phthalates from the PET bottle into the water.

Environmental Loop: Bottled water is a primary driver of single-use plastic waste. As these bottles degrade in landfills, they fragment into microplastics that re-enter the groundwater, contaminating the very source water used by bottling plants—a vicious cycle of contamination.

Conclusion

The "bottled water myth" is being deconstructed by a combination of judicial activism and environmental nanoscience. While bottled water remains a vital stopgap during emergencies, its daily use carries a "chronic toxicity" risk. Scaling up refill stations and restoring faith in municipal supply (through transparent quality disclosures) are the only sustainable pathways to water security.

