CURRENTLY — 16 &17 AUGUST 2026

1. Saptadhara: Seven Streams of Strength — Prime Minister's Independence Day Address — GS-III
2. Odisha's Coastal Erosion: Measures to Save Lives & Livelihoods — The Indian Express — Explained — GS-III
3. How AI Can Be Optimised for Better Healthcare — The Hindu — Page 9 — GS-II, GS-III
4. Green India Mission: From Ambitious Targets to Implementation Gaps — The Hindu — Sunday — GS-III
5. Groundwater Contamination with Hexavalent Chromium in Uttar Pradesh — The Hindu — Page 6 — GS-II, GS-III
6. Over 300,000 Rohingya Refugees Verified for Repatriation: Myanmar — The Hindu — Page 16 — GS-II
7. Ukraine–Russia War: Strategic Geography of the Recent Strikes — The Hindu — Sunday — GS-II, GS-III

“

The Seven Streams of Strength - Sapta Dhara

- Manufacturing Sector
- Agriculture & Food Processing
- Technology & Innovation
- Gati Shakti
- Defence Power
- Green Economy & Blue Economy
- Soft Power

नरेन्द्र मोदी

PM Modi in his Independence Day Speech from the Red Fort, 15 August 2026

UnderStand UPSC
What we UnderStand, We Conquer

SAPTADHARA: SEVEN PILLARS FOR VIKSIT BHARAT

Saptadhara, highlighted in the Prime Minister's Independence Day 2026 address, presents seven interconnected drivers of India's transformation into a developed, self-reliant, technologically advanced and sustainable economy.

1. **Manufacturing Power** — From "Make in India" to "Make for the World"
   Scale + quality + cost competitiveness → jobs, exports, import substitution and global value-chain integration.
2. **Agricultural & Food-Processing Power** — From Production to Value Addition
   Productivity + processing + storage + supply chains → higher farm incomes, reduced wastage and agri-exports.
3. **Technology & Innovation Power** — From Technology Consumer to Technology Creator
   Research & Development + Artificial Intelligence + semiconductors + emerging technologies → productivity, innovation and technological sovereignty.
4. **Connectivity Power** — Gati Shakti as a Growth Multiplier
   Multimodal infrastructure + integrated logistics → lower logistics costs, faster movement and competitive supply chains.
5. **Defence Power** — From Import Dependence to Strategic Autonomy
   Indigenous production + critical technologies → national security, defence exports and high-tech industrialisation.
6. **Green & Blue Power** — Growth with Sustainability
   Renewable energy + green hydrogen + clean technologies + ocean resources → energy security, climate resilience and new economic opportunities.
7. **Soft Power** — From Civilisational Strength to Global Influence
   Culture + heritage + yoga + tourism + knowledge traditions → diplomatic influence, global goodwill and economic opportunities.

• CLIMATE

Odisha's coastal erosion: The measures to save lives, livelihoods

Sujit Bisoyi
Bhubaneswar, August 16

UNION MINISTER for Ports, Shipping and Waterways Sarbananda Sonowal, in a recent reply tabled in Rajya Sabha, said that about 28% of Odisha's 564-km coastline is undergoing erosion.

This is based on a study by the National Centre for Coastal Research (NCCR), which carried out a comprehensive assessment and mapping of shoreline change analysis along the Odisha coast from 1990 to 2022. The NCCR monitors long-term shoreline changes across the Indian coastline.

Citing the NCCR study, Sonowal said approximately 28.3% of the coastline is undergoing erosion, 17.6% remains stable (no significant shoreline change), and 54.1% is experiencing accretion or growth. His reply came in response to a query by Rajya Sabha member from Odisha, Sasmit Patra.

Shoreline change in Odisha

Shoreline changes refer to the dynamic process where the boundary between land and water shifts over time owing to natural forces like waves, tides, storms, and human activities like port construction, unplanned infrastructure development, and sand mining. Factors like global sea-level rise also contribute to coastal erosion and shoreline change.

According to a 2021 piece "Shoreline Change Along Odisha Coast" published in the *Journal of Earth System Science*, coastal structures such as sea walls, breakwaters, and jetties result in modification of the shoreline and beach morphology. The effects are even more significant with hard structures raised for the development of ports and harbours. Besides, natural hazards such as tsunamis and cyclone storms along the India coast, too, result in drastic changes. The paper said that as things stand, Odisha is most prone to cyclones.

At least six coastal districts in Odisha — Ganjam, Puri, Jagatsinghpur, Kendrapada, Bhadrak, and Balasore — are facing coastal erosion and shoreline changes. As per the NCCR study, Jagatsinghpur has emerged as the most erosion-prone, with 47.6% of its total 55.8-km coastline facing erosion. It is followed by Ganjam (45.7% of 60.18-km shoreline affected), and Kendrapara (45% of 149.36 km-shoreline affected). Among other coastal districts, erosion has affected 23.8% of Balasore's 88-km coastline, 10.2% of Puri's 138-km coastline, and 4.6% of Bhadrak's 72-km coastline. The NCCR has also identified several coastal areas in the six districts as "vulnerable stretches" based on long-term shoreline analysis.

Geotextile tube

- This is a large, cylindrical container made from high-strength, porous synthetic fabrics and filled with a sand slurry, to form an artificial coastal structure.
- These tubes, used to form sea walls, absorb the impact of waves when they hit the shore and help minimise erosion.
- One such embankment is being developed at Pentha village in Kendrapara.

Impact, and measures taken

Official sources in Odisha's Forest, Environment and Climate Change Department said rising sea level and coastal erosion owing to climate change has already submerged as many as 16 villages in Kendrapara district, displacing several hundreds of people. The affected villagers lost not just their land but also their livelihood. The Odisha government has developed a resettlement colony, touted as India's first climate resettlement colony, to accommodate the people hit by coastal erosion.

Similarly, Podampeta in Ganjam, once a village of nearly 500 households, has been deserted as the marauding Bay of Bengal swept inland. Several other settlements in the district, too, have been affected, forcing people to leave their homes. Several other coastal villages in Ganjam such as Ramayapatna have also been witnessing the advancing of the sea towards the landmass, rendering residents homeless.

Department officials said that to protect coastal villages from sea erosion, steps are being taken, such as developing a geotextile tube embankment at Pentha village in Kendrapara. A geotextile tube is a large, cylindrical container made from high-strength, porous synthetic fabrics (such as polypropylene) and filled with a sand slurry, to form an artificial coastal structure. These tubes, which are used to form sea walls, generally absorb the impact of waves when they hit the shore and help minimise erosion.

Similarly, sea wall-cum-serving roads are being developed across parts of Balasore district and Ramayapatna beach in Ganjam district. These roads are dual-purpose coastal structures: while the outer tier acts as a defensive barrier against strong tidal waves and coastal erosion, the inner tier operates as an operational roadway or service path for local transport and public access.

Which of the following best explain(s) the rationale for protecting mangrove ecosystems in the context of climate resilience ?

1. Mangroves reduce tidal energy and store freshwater, making them ideal sites for paddy cultivation in saline estuarine belts.
2. Their salt-sensitive roots filter seawater, making mangroves key to converting coastal land into freshwater aquaculture zones.
3. By withstanding tidal surges and offering biomass resources, mangroves function both as natural bio-shields and livelihood bases for rural communities.

Select the answer using the code given below :

(a) 1 only

(b) 1 and 2

(c) 2 and 3

(d) 3 only

Context [GS-III: Environment & Ecology & Disaster Management]

About 28% of Odisha's 564-km coastline is undergoing erosion, according to the National Centre for Coastal Research (NCCR) assessment of shoreline changes during 1990–2022. Coastal erosion is increasingly threatening land, settlements, livelihoods and infrastructure, requiring both protective and adaptive measures.

1. Coastal Erosion

- **Coastal erosion is the gradual loss or retreat of coastal land as the shoreline shifts landward.**
- **It results from both natural and human factors — waves, tides, storms and cyclones, sea-level rise, port construction, coastal infrastructure and sand mining.**
- **Odisha is particularly vulnerable because of its long, cyclone-prone coastline and exposure to the Bay of Bengal.**

2. Extent of the Problem in Odisha

- **28.3% of Odisha's coastline is undergoing erosion, 17.6% is stable, while 54.1% is experiencing accretion.**
- **Jagatsinghpur: Most erosion-prone — 47.6% of its 55.8-km coastline.**
- **Ganjam: 45.7% of 60.18 km affected.**
- **Kendrapara: 45% of 149.36 km affected.**
- **Erosion is also reported in Balasore (23.8%), Puri (10.2%) and Bhadrak (4.6%).**

3. Why It Is Increasing

- **Climate change: Sea-level rise increases coastal vulnerability.**
- **Extreme events: Cyclones, storm surges and high waves accelerate shoreline retreat.**
- **Human interventions: Ports, seawalls, breakwaters and jetties can alter natural sediment movement.**
- **Unsustainable activities: Sand mining and unplanned coastal development disturb coastal morphology.**

4. Impact & Odisha's Response

- Erosion causes loss of land, houses and livelihoods, forcing coastal communities to relocate.
- Climate-resettlement colonies: Odisha has developed a rehabilitation model for communities displaced by coastal erosion.
- Geotextile tube embankments: High-strength porous synthetic tubes filled with sand slurry act as artificial coastal barriers and absorb wave energy.
- Sea-wall-cum-service roads: Being developed in vulnerable areas; the outer structure protects against storm surges and erosion, while the inner section provides road connectivity.

5. Sustainable Approach

- Coastal protection should combine engineering solutions with ecosystem-based measures such as mangrove restoration, dune protection and regulated coastal development.
- Coastal Regulation Zone (CRZ) norms and scientific shoreline mapping should guide infrastructure development.
- Shift from only "protecting the coast" to "protecting coastal communities" through early warning, resilient infrastructure, planned relocation and livelihood rehabilitation.

How AI can be optimised for better healthcare

Suneeta Reddy

Managing Director, Apollo Hospitals Enterprise Ltd.

Modern medicine has built an extraordinary depth of knowledge. However, how much of that knowledge can reach the patient who needs it now? The answer has traditionally depended on the number and distribution of trained clinicians, the institutions in which they work, and the systems that connect them to patients. All three are difficult to expand quickly. For India, which is still expanding its healthcare capacity while its disease burden becomes more complex, the question of how far health expertise can reach is particularly consequential.

Here, Artificial Intelligence (AI) introduces a new dimension. It offers a way of taking the accumulated knowledge and making more of it available at the point of care. The change is visible across major health systems. In January 2025, the U.S. Food and Drug Administration (FDA) said it had authorised more than 1,000 AI-enabled medical devices. These include tools used in radiology, cardiology, and other areas of diagnosis. In the U.K., the NHS issued a guidance in April 2025 for the use of AI-enabled ambient scribing. By January 2026, the country was developing a national programme to support wider adoption, with early evidence suggesting that the technology could give doctors up to a quarter more time with their patients.

These examples point to a wider change. AI is moving out of innovation teams and into consultations, diagnostic workflows, and hospital operations. The real work now lies in making it dependable enough for routine use.

The economic benefits

India has its own set of challenges. Specialist care remains concentrated in larger cities, while chronic conditions require patients to be monitored over many years. Hospitals are also managing rising volumes without being able to increase clinical capacity at the same pace.

An AI tool that helps prioritise a radiology scan, alerts a care team to a deteriorating patient or supports a physician handling a complex case in a smaller city can make existing capacity work more efficiently.

The country has already built much of the digital foundation required for this shift. By May 2026, more than 100 crore health records had been linked to the Ayushman Bharat Health Accounts, twice the number recorded in February 2025. A July 2026 government update reported that the Ayushman Bharat Digital Mission (ABDM) Scan and Share service had reduced outpatient registration waits at participating hospitals from around an hour to between two and five minutes. These improvements did not require a dramatic reinvention. It came from removing friction from a familiar hospital process. AI can extend the same principle to appointment scheduling, clinical documentation, claims, inventory planning, and discharge management. Each task takes time away from care if handled poorly.

Additionally, the financial benefits from using AI is becoming harder for healthcare providers to ignore. A January 2026 McKinsey analysis estimated that applying AI across healthcare revenue-cycle operations could reduce the cost to collect by 30% to 60%. For hospitals, these gains can free resources for clinical teams, equipment and capacity. They can also reduce administrative work that contributes to staff fatigue.

There is yet another part related to the business side that receives less attention. AI can help providers offer services that were previously difficult to deliver at scale. Remote monitoring can extend care beyond discharge. Risk-based preventive programmes can identify people who need attention before symptoms become severe. Virtual specialist support can connect smaller hospitals with expertise located elsewhere. Diagnostics can be taken closer to communities, while hospitals maintain an ongoing relationship with patients managing diabetes, cardiac disease or cancer.

A January 2026 McKinsey analysis estimated that applying AI across healthcare revenue-cycle operations could reduce the cost to collect by 30% to 60%

Judicious use

These models create revenue, but their value does not come from selling more technology. It comes from reaching patients earlier and avoiding preventable deterioration. This is also where restraint matters. A system that performs well in one hospital or population may not work equally well across India's States, disease patterns, and care settings. Clinical validation, representative data, and human oversight also need to be seriously considered. The FDA's September 2025 call for better methods to evaluate AI-enabled devices in real-world settings reflects a concern that every health system will have to confront. The tools' performance at launch does not guarantee performance over time.

Healthcare does not need AI everywhere. It needs it where delays can be reduced, clinicians can make better-informed decisions, and more patients can receive appropriate care. As India marks another year of Independence, there is a larger dimension to this conversation. The economic strength of a nation ultimately rests on the capabilities of its people. Healthcare therefore belongs within the architecture of economic development. India has built considerable physical and digital infrastructure over the decades; the next phase of development will depend increasingly on the health, longevity and productivity of its population. AI can contribute by making expertise widely available and by shifting healthcare towards earlier detection and continuous management.

The economic return on AI in healthcare will be measured not by the number of systems deployed, but by the number of lives touched and its impact on human life and happiness.

Context: India's healthcare challenge is increasingly one of access, specialist availability and continuity of care. Artificial Intelligence (AI) can act as a capacity multiplier by extending medical expertise, enabling earlier diagnosis and reducing the administrative burden on healthcare professionals.

1. AI as a Healthcare Capacity Multiplier

- **Clinical decision support**: AI can assist in medical imaging, diagnosis and risk assessment, particularly where specialist doctors are scarce.
- **Early detection**: Predictive tools can identify patients at risk of deterioration → shift from reactive treatment to preventive intervention.
- **Remote & continuous care**: AI-enabled monitoring and virtual specialist support can extend healthcare beyond hospitals, particularly for chronic diseases.
- **Administrative efficiency**: AI can automate documentation, appointments, claims, inventory and hospital workflows, allowing doctors and nurses to devote more time to patients.

2. India's Digital Foundation

- **Ayushman Bharat Digital Mission (ABDM)**: By May 2026, more than 100 crore health records had been linked to Ayushman Bharat Health Accounts (ABHA), creating a large digital-health foundation for AI applications.
- **Scan and Share**: Digital registration reduced outpatient registration time in participating hospitals from around one hour to 2–5 minutes, demonstrating how digital tools can improve health-system efficiency.
- **Economic potential**: A 2026 McKinsey analysis estimated that AI applications in healthcare revenue-cycle operations could reduce collection costs by 30–60%.

3. What AI Can Deliver

- **Wider access**: Specialist-level assistance can reach smaller towns and underserved regions without requiring every location to have a full specialist workforce.
- **Better resource utilisation**: AI can optimise hospital capacity, workforce, equipment and supply chains.
- **Personalised care**: Patient data and predictive analytics can support more targeted treatment and continuous monitoring.
- **Systemic shift**: Healthcare can move from "treating illness" → "predicting, preventing and managing illness."

4. Key Challenges

- **Data bias**: AI trained on non-representative datasets can produce inaccurate or unequal outcomes across populations.
- **Real-world reliability**: A model validated in one hospital or population may not perform equally well elsewhere.
- **Human oversight**: AI should augment rather than replace clinical judgement, particularly for high-risk medical decisions.
- **Privacy & cybersecurity**: Large-scale health-data use increases risks of breaches, misuse and unauthorised access.
- **Accountability**: Clear responsibility is needed when an AI-assisted decision causes harm.

5. Way Forward

- **Adopt a "judicious AI" approach**—deploy AI where it produces demonstrable clinical value.
- **Build representative, high-quality health datasets** and interoperable digital systems.
- **Mandate clinical validation**, real-world testing and continuous monitoring.
- **Strengthen privacy, cybersecurity, transparency** and accountability.
- **Retain human-in-the-loop decision-making** for consequential medical decisions.

EDITORIAL TO MAINS ANSWER | DAY 8

10 Marks | 150 Words

Artificial Intelligence can act as a capacity multiplier for India’s healthcare system, but its benefits depend on responsible and judicious deployment. Discuss.

आर्टिफिशियल इंटेलिजेंस भारत की स्वास्थ्य सेवा प्रणाली की क्षमता को बढ़ाने में सहायक हो सकता है, लेकिन इसके लाभ इसके जिम्मेदार और विवेकपूर्ण उपयोग पर निर्भर करते हैं। चर्चा कीजिए।

CAG audit highlights major gaps in Green India Mission

The report flags inadequate convergence with other schemes, insufficient funding and weak monitoring; GIM is one of eight missions under the National Action Plan on Climate Change

Jacob Koshy
NEW DELHI

The Comptroller and Auditor General (CAG) has flagged major shortcomings in the implementation of the Green India Mission (GIM), including inadequate funding, weak coordination between government schemes, poor monitoring, and failure to meet key targets for improving forest cover and its quality.

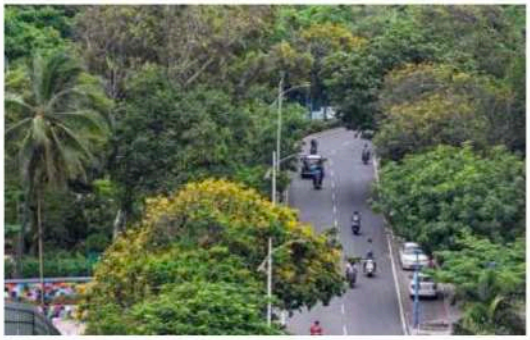
The Union Ministry of Environment, Forest and Climate Change launched the GIM in 2014 with the aim of protecting, restoring, and enhancing the country's forest cover.

The CAG's audit examined the planning, implementation and monitoring of GIM interventions in 16 States and Union Territories between 2015-16 and 2024-25.

According to the audit report, while the target was to improve the quality of forest cover over 1.4 million hectares, improvement was observed only in 0.11384 million hectares – a "shortfall of 91.87%".

Similarly, an increase in forest cover was recorded over only 0.03409 million hectares against a target of 1.4 million hectares, representing a 97.57% shortfall.

The GIM is one of eight missions under India's National Action Plan on Climate Change. Its objectives include improving ecosystem services such as biodiversity, water and carbon sequestration, as well as increasing means of forest-based livelihood. The mission envisages increasing forest and tree cover over 5 million hectares and improving the quality of forest and tree cover over another 5 million hectares.



Forest failings: Green India Mission is one of the key programmes to support India's long-term low-carbon strategy. FILE PHOTO

Tree cover

The mission is particularly important to India's climate commitments because enhancing forest and tree cover is a central component of India's Nationally Determined Contribution (NDC) under the Paris Agreement. India has committed to creating an additional carbon sink of 2.5-3 billion tonnes of CO2 equivalent by 2030 through additional forest and tree cover.

The government's long-term low-carbon strategy identifies the GIM as one of the key programmes supporting this target.

The CAG attributed the shortcomings to several factors, including inadequate convergence with other programmes, insufficient funding, deficiencies in planning and weak monitoring mechanisms.

The report found that the mission's planned convergence with programmes such as the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) and the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) was not effectively achieved. Other programmes, including Nagar Van Yojana and School Nursery Yojana, were also found to be operating largely in silos.

This lack of convergence also affected financing, the report said. The audit noted that the mission failed to secure ₹10,600 crore in proposed funding support. Against ₹2,000 crore approved by the Cabinet Committee on Economic Affairs for the initial four years of the scheme, along with ₹400 crore from the 13th Finance Commission grants towards the States' share, only ₹1,149.14 crore, or 47.88%, was received through budgetary support during the 10 years examined, the audit found.

The audit also found weaknesses in financial controls: eight States and Union Territories did not maintain annual accounts, while accounts in other cases were often unaudited or contained discrepancies.

Opposition's criticism

The Congress criticised the government over the issues flagged by the CAG, with Rajya Sabha MP and former Environment Minister Jairam Ramesh calling the GIM a "gigantic fraud". He said on X, "The Green India Mission has been a comprehensive failure – actually not just a failure but a gigantic fraud on the people of India."

"When the Green India Mission was conceived in 2010 as part of (then) Prime Minister Manmohan Singh's National Action Plan on Climate Change (NAPCC), it placed strong emphasis on monitoring, planning, and effective implementation. It was never meant to be another greenwashing exercise, but a genuine effort towards sustainable environmental change," Mr. Ramesh said.

33. Which of the following best describes/ describe the aim of 'Green India Mission' of the Government of India?

1. Incorporating environmental benefits and costs into the Union and State Budgets thereby implementing the 'green accounting'
2. Launching the second green revolution to enhance agricultural output so as to ensure food security to one and all in the future
3. Restoring and enhancing forest cover and responding to climate change by a combination of adaptation and mitigation measures

Select the correct answer using the code given below.

(a) 1 only

(b) 2 and 3 only

(c) 3 only

(d) 1, 2 and 3

Context: The Comptroller and Auditor General (CAG) has highlighted major gaps in the implementation of the Green India Mission (GIM), including severe shortfalls in forest-cover targets, inadequate funding, weak convergence and poor monitoring.

1. Green India Mission

- Launched in 2014 as one of the eight missions under the National Action Plan on Climate Change (NAPCC).
- Focuses on protecting, restoring and enhancing forest/tree cover, biodiversity, water security, carbon sequestration and forest-based livelihoods.
- Supports India's target of creating an additional 2.5–3 billion tonnes CO_2-equivalent carbon sink by 2030 through additional forest and tree cover.

2. CAG Findings — The Implementation Gap

- Forest-cover quality: Target — 1.4 million hectares; achievement — 0.11384 million hectares → 91.87% shortfall.
- Increase in forest cover: Target — 1.4 million hectares; achievement — 0.03409 million hectares → 97.57% shortfall.
- Funding: Against proposed support of ₹10,600 crore, only ₹1,149.14 crore was received through budgetary support during the audited period.
- Weak convergence: Limited coordination with CAMPA, MGNREGS, Nagar Van Yojana and School Nursery Yojana.

3. Why Implementation Fell Short

- Planning deficiencies: Weak prioritisation of vulnerable landscapes and inadequate bottom-up planning.
- Monitoring gaps: Poor verification and reporting of outcomes weakened accountability.
- Financial-control weaknesses: Several States/UTs had deficiencies in maintaining and auditing accounts.
- Outcome deficit: Focus on activities and targets did not adequately translate into measurable ecological improvement.

4. Way Forward

- Shift from "trees planted" to "trees surviving and ecosystems restored" through outcome-based monitoring.
- Strengthen convergence with CAMPA, MGNREGS and other afforestation/urban greening programmes.
- Use GIS, satellite imagery, geo-tagging and independent field verification to measure actual ecological outcomes.
- Ensure predictable funding and stronger financial accountability.
- Empower Gram Sabhas and forest-dependent communities through participatory forest restoration and livelihood programmes.

SPOTLIGHT

Groundwater that glows yellow-green

Decades of industrial waste dumping have contaminated groundwater with hexavalent chromium across parts of three districts in Uttar Pradesh, exposing villagers to unsafe water and serious health risks

Nikhil M. Babu

Patches of earth streaked a fluorescent greenish-yellow flank National Highway 19 that connects Kanpur Nagar and Fatehpur districts in Uttar Pradesh. Off the highway, a culvert also has yellow leaching on it. On the dirt road towards Chhiwali village in Fatehpur, the markings persist. They lead to Daya Devi's home, down a mud path.

Part of the concrete roof of 40-year-old Devi's two-room house is falling in. That's not her only problem though. The mother of two is more worried about her stomach pains and digestion.

"The doctor told me it is a liver infection. That was a month ago, and I'm still taking medicines," she says, touching her abdomen. "My stomach doesn't feel alright and I have to use the toilet about three times a day."

She also has rashes running along the length of both her hands, which she says "itch a lot". Many others in the village have similar health problems.

In the inner courtyard of Devi's house, her son works a hand pump. Fluorescent yellow water flows into a white plastic bucket.

"Yahan poora chemical hi aata hai (Here, only chemical flows)," a woman outside Devi's house says.

She and Devi blame the water for their health conditions.

In about a dozen areas of three districts of Uttar Pradesh – Fatehpur, Kanpur Dehat, and Kanpur Nagar – the groundwater has been contaminated by the chemical chromium (VI) or hexavalent chromium, as per State government data.

Over the last five years, the government has collected blood samples from people living in the affected areas. A 2025 government report on these tests reveals that 73-96% have above-permissible levels of chromium (VI).

Chromium is a naturally occurring hard greyish metal found in rocks and soil. But chromium (VI) compounds are produced by the chemical industry and are used in a wide range of applications like in electroplating and wood preservation. Hexavalent chromium is bright yellow-green and highly reactive.

Factories manufacture chromium sulphate in the area, which is used by tanning industries to make leather stronger. Kanpur and surrounding areas have had tanneries since the 19th century.

Green tribunal orders

In 2005, the U.P. Pollution Control Board identified six factories in Kanpur Dehat that were dumping polluting waste, untreated or improperly treated sludge and run-off. The units were shut down that year, as per a National Green Tribunal (NGT) report. In 2017, the NGT passed an order for the removal of chromium dumps in Kanpur Nagar.

While the government has been adding areas impacted by the chromium contamination to the list of places where environmental action is needed, the prompts often come only after the NGT orders.

Chemical in garb of water: Fluorescent yellow water flowing into a plastic container as a boy works a hand pump at Chhiwali village in Uttar Pradesh's Fatehpur district. SHASHI SHEKHAR KASHYAP

About 15-20 years ago, the factories started sending *mitti* (sand) out to villagers in Chhiwali. "They would ask people if they wanted to fill their fields to build houses or if we needed cattle shed, and would dump the *mitti* for free. Many villagers used it to fill their land," Devi says.

"Back then, we had no idea that it was poisonous."

Devi's neighbour, Puttilal Pal, 60, says he filled his land using the *mitti* that the factories dumped.

"But after some time we started to notice that the skin on our buffaloes' legs was getting burnt and our children's nails were also getting affected. That is when we realised that there was something wrong with the *mitti*, and we stopped them from supplying it," he says.

At the time, they didn't realise that the chemical was seeping into the groundwater. "About five-seven years back, we started seeing a faint yellow in the water, but we continued to drink it for about a year. Then we couldn't drink it any more. It tasted too bitter," she says.

Now, water comes home through pipelines laid by the government. "The pipelines are damaged and many times we get sewage-mixed water. We have even seen *keeda* (worm) in the supply water, and now we use it only after straining it," she says. "But when there is no supply, we are again dependent on hand pumps."

The houses in the neighbourhood have hand pumps that spew water with different intensities of the yellow-green colour.

Devi's village, Chhiwali, is not part of the areas identified as chromium-affected by the government.

The earliest and largest chromium dump came up around 1976 in Rania, Kanpur Dehat, say NGT reports. As much as 62,225 metric tons of chromium waste was found there. It was removed only about a year ago, following NGT orders and missed deadlines. There are still patches of yellow-green at the site.

There is an NGT direction to erect a boundary wall around it to minimise the dust from flying out, but it is open. The International Agency for Research on Cancer has classified chromium (VI) as a carcinogen when inhaled.

About 500 metres from the dump, in Shivnath Purwa village, a village identified by the government as affected, Roshni Devi, 30, who has four children, still remembers the day about six years ago when she drank the water from the hand pump.

"I vomited immediately. It tasted really bad even though it was not as yellow as it is now," she says. "I never drank it again. Now, even petrol will fail in front of it," she says. Her father, who is visiting, is washing his clothes with the fluorescent water from the hand pump. "We use water from our relatives' bore well, which is deeper, for drinking. But we still use this water for washing and bathing," she says.

Raj Kumar Yadav, 50, says the government should at least supply safe piped drinking water to the village. His house was also built with chemical-laden soil from the factory. Pointing to the faint yellow tint on the walls, he says, "If you wash it, the water will still be yellow even after all these years."

While Yadav pays ₹20 every day to buy a 20-litre bottle of RO water, many labourers who work in the factories nearby are not able to afford that. "We drink water directly from hand pumps," says Rajesh Kumar, 42, who earns ₹10,400 a month working at a factory manufacturing railway coaches.

"If you keep the water for a while, it turns light yellow. I can drink it as we are used to it. But anyone from the city won't be able to drink it," he says.

'Rise in patients'

Dr. Anurag Sachan, who runs a hospital in Aung village, Fatehpur district, says he gets 15-20 patients a month from the villages with contaminated water, many more compared to other areas.

He says over the last 10 years the number of patients coming to see him with skin and gastro issues has more than doubled.

Manoj Kumar Tiwari, Associate Professor at IIT Kanpur, who is heading a team that the government has roped in to do a comprehensive study to map the affected areas in the three districts, says cleaning up the affected areas is not an easy task.

The study has just started and the first phase of mapping areas is expected to take six months.

He says if contamination is stopped, groundwater in the aquifers can purify itself, but it can take tens to hundreds of years, depending on the nature of the aquifer and level of contamination.

nikhil.m
@thehindu.co.in

Context: Groundwater in parts of Kanpur Nagar, Kanpur Dehat and Fatehpur has been contaminated by **hexavalent chromium [Cr(VI)],** linked to decades of improper disposal of industrial waste. The issue highlights how legacy industrial pollution can persist in soil and aquifers and eventually enter the human body.

1. How Chromium Contaminates Groundwater

- **Industrial source**: Chromium-containing waste from industries such as leather tanning and electroplating is dumped or inadequately treated.
- **Leaching**: Rainwater carries soluble chromium from contaminated waste/soil into the ground → soil contamination → aquifer contamination.
- **Persistence**: Once Cr(VI) reaches groundwater, it can migrate with groundwater flow, making contamination difficult and expensive to reverse.
- **Human exposure**: Communities dependent on contaminated groundwater may ingest or otherwise come into contact with chromium → groundwater becomes a direct exposure pathway.

2. Why Cr(VI) Is a Serious Contaminant

- **Highly toxic**: Cr(VI) is substantially more toxic than the relatively less harmful trivalent chromium [Cr(III)].
- **Carcinogenic**: The International Agency for Research on Cancer (IARC) classifies chromium(VI) compounds as carcinogenic when inhaled.
- **Bio-health concern**: A 2025 government assessment cited in the article found elevated Cr(VI) levels in the blood of 73–96% of sampled people in affected areas.

3. Why Contamination Becomes a Long-Term Crisis

- **Legacy pollution**: Old industrial waste can continue releasing chromium even after the original industrial activity has stopped.
- **Groundwater dependence**: Where alternative safe-water sources are inadequate, people remain exposed.
- **Remediation difficulty**: Unlike surface pollution, contaminated aquifers are invisible, spatially extensive and technically difficult to clean.
- **Governance gap**: Delayed removal of hazardous waste and weak enforcement allow the contamination pathway to continue.

4. Tackling Groundwater Contamination

- **Prevent at source**: Enforce hazardous-waste treatment and disposal standards; apply the Polluter Pays Principle.
- **Contain & remediate**: Identify contamination hotspots, isolate/remove legacy waste and use site-specific groundwater remediation.
- **Protect communities**: Provide reliable safe piped drinking water and health screening in affected areas.
- **Monitor aquifers**: Continuous groundwater-quality monitoring using GIS, sampling networks and periodic health surveillance.

BANGKOK

Over 300,000 Rohingya refugees verified for repatriation: Myanmar

AP

Myanmar's military-backed government said on Saturday that more than 300,000 Rohingya refugees living in camps in Bangladesh are former residents of western Rakhine state and that it will accept their return once security conditions improve. The statement comes as the Rohingya refugee crisis enters its ninth year. AP

19. Consider the following pairs :

Community sometimes mentioned in the news		*In the affairs of*
1. Kurd	:	Bangladesh
2. Madhesi	:	Nepal
3. Rohingya	:	Myanmar

Which of the pairs given above is/are correctly matched?

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

Ukraine attacks Russia's Samara industrial site

Associated Press
KYIV

A large-scale Ukrainian attack struck industrial infrastructure in Russia's southwestern Samara region on Saturday, a Russian official said.

Ivan Noskov, head of the region's capital, Samara, said air defence forces had repelled a "massive" missile attack, with "localised damage" to the city's industrial sites. He also said that medical assistance has been provided to those injured in the attack, but did not give further details.

Ukraine has stepped up its long-range aerial attacks on Russian military industries and energy facilities, aiming to cut Moscow's revenue for the war and make Russians feel the consequences of the invasion, now in its fifth year.

A file photo of Vladimir Putin during a visit to the Progress Centre in Samara region in southwestern Russia. REUTERS

Writing on social media, Ukrainian President Volodymyr Zelenskyy said that Kyiv's forces had carried out a strike against Samara's Progress Centre, which operates under Russian space agency Roscosmos and is involved in producing rocket technology and electronics.

He said that the strike used Ukraine's domestically produced Flamingo missiles to hit the site, which is approximately 900 km from the Ukrainian border. Mr. Zelenskyy also said Russia's Savasleyka air base, some 700 km from the front line, had also been hit.

Russia's Ministry of Defence said that it had shot down 598 Ukrainian drones over 19 Russian regions, as well as the Black and Azov Seas and Crimea.

90. Consider the following pairs :

	Regions sometimes mentioned in news		*Country*
1.	Catalonia	—	Spain
2.	Crimea	—	Hungary
3.	Mindanao	—	Philippines
4.	Oromia	—	Nigeria

Which of the pairs given above are correctly matched ?

(a) 1, 2 and 3

(b) 3 and 4 only

(c) 1 and 3 only

(d) 2 and 4 only


ATLANTIC OCEAN
ARCTIC OCEAN
EUROPE
Samara
RUSSIA
KAZAKHSTAN
MONGOLIA
ASIA
CHINA
PACIFIC OCEAN
JAPAN
0 500 1,000 mi
0 500 1,000 km
© Encyclopædia Britannica, Inc.

Context: The Russia–Ukraine war has increasingly extended beyond the immediate battlefield, with long-range missiles and drones allowing both sides to target strategic infrastructure deep inside enemy territory. The recent Ukrainian strikes bring attention to the geography and strategic importance of Samara and the wider Volga region, as well as Savasleyka in Nizhny Novgorod.

Samara — Russia

Location: Southeastern part of European Russia, on the middle Volga, near the confluence of the Volga and Samara rivers. Samara Oblast also lies relatively close to Kazakhstan.

Geographical importance: Located along the Volga transport corridor, connecting Russia's interior with the Caspian region.

Strategic importance: A major industrial and aerospace centre; the Progress Rocket and Space Centre, under Roscosmos, is based here.