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GOA'S DIRTY SECRET:

Iconic beaches, lakes & rivers fail pollution test

It's time to pay the environmental cost of Goa's tourism boom. The State pollution board's annual report reveals alarming contamination levels across beaches, rivers and lakes as sewage treatment failures jeopardise public health and economic future. KARSTEN MIRANDA finds out more

The pristine beaches and waterways that have made Goa synonymous with a tropical paradise are facing an unprecedented environmental crisis. The Goa State Pollution Control Board's (GSPCB) annual report for 2024-25 has revealed extensive contamination across the state's coastal and inland waters, painting a disturbing picture of a tourism destination grappling with the consequences of inadequate waste management infrastructure.

Beaches and rivers declared unsafe

The pollution board's comprehensive study, spanning water samples collected from March 2024 to March 2025, has categorized Goa's most popular tourist destinations as 'SW II' – meaning they fail to meet Central Pollution Control Board (CPCB) guidelines for recreational water use. The affected areas read like a tourism brochure gone wrong: Miramar, Calangute, Morjim, Vagator, Arambol, Baga, Bambolim in North Goa, and Mobor, Baina, Galijbag, Colva, Velsao, Bogmalo, Betalbatim, Benaulim, Varca, Agonda, Palolem and Rajbhag in South Goa.

The contamination extends beyond beaches to major rivers that form the backbone of Goa's ecosystem. The Mandovi, Zuari, Tiracol, Sinquerim, Mapusa, and Sal rivers, along with the Cumbharjua canal, have been deemed highly polluted and unfit for commercial fishing – a devastating blow to local fishing communities who depend on these waters for their livelihoods.

Water quality tests have revealed faecal coliform levels ranging from 500 to 1,100 MPN (most probable number) per 100 milliliters of water – dramatically exceeding the CPCB's safety threshold of 100 MPN per 100ml for recreational waters. Biochemical Oxygen Demand (BOD) levels have been recorded between 1.9 to 2.9 milligrams per liter, surpassing the permissible limit of 1 mg/L for Goa's beaches. While Dissolved Oxygen levels remain within acceptable ranges of 6-8 mg/L, the presence of disease-causing pathogens renders these waters unsafe for human contact.

Sewage treatment: The missing link

The root cause of this environmental catastrophe lies in Goa's inadequate sewage treatment infrastructure. GSPCB officials have identified the disposal of untreated or partially treated raw sewage as the primary culprit behind the alarming pollution levels, compounded by plastic waste accumulation and unchecked urban development.

The state operates 13 sewage treatment plants managed by both government and private entities, but their effectiveness remains questionable. An online monitoring system designed to record BOD and Chemical Oxygen Demand levels is mandatory for all treatment facilities, yet compliance remains patchy. According to GSPCB sources, only two or three plants have installed the required monitoring systems, with others citing delays in tendering processes.

The hospitality sector, which forms the economic backbone of Goa's tourism industry, has come under intense scrutiny. While large hotels are expected to operate their own sewage treatment plants, board audits have revealed significant deficiencies across major properties. Seasonal beach shacks, operating in close proximity to sea and rivers, present an additional challenge, with many unable to afford the capital costs associated with proper waste management systems.

The GSPCB has proposed mini sewage treatment plants costing between Rs 6-7 lakh as a viable solution for smaller establishments, suggesting implementation through build-own-operate models where operators would be charged based on sewage volume treated.

Evidence points to systemic failure

Research conducted by the National Institute of Oceanography (NIO) has provided scientific backing to the pollution crisis. A study led by Principal Scientist Dr. Mahua Saha, published in reputed international journals, identified sewage from Panaji's treatment plant as a major contributor to Mandovi river contamination. The capital's sewage, despite treatment, is discharged directly into the river through pipelines and nullahs.

The St. Inez Creek, originating from Taleigao's Nagalli Hills and flowing into the Mandovi near the Entertainment Society of Goa, serves as another significant pollution source. The Corporation of the City of Panaji has acknowledged direct discharge of wastewater and sewage into the creek by establishments along its eastern banks. Recent incidents, including video evidence of night soil tankers discharging sewage directly into the creek at Camrabhat, highlight the ongoing violations.

Adding to environmental concerns, a joint study by the Indian Institute of Technology Kharagpur and NIO discovered mercury traces in the Mandovi river and edible oysters harvested from it. While mercury levels in oysters remained within permissible limits, the presence of this neurotoxin raises serious questions about long-term ecosystem health.

The GSPCB has moved to address concerns about offshore casino contributions to river pollution. Each casino vessel is equipped with sealed sewage collection tanks, with disposal overseen by both pollution board officials and Captain of Ports representatives. Collected sewage is transported by barge to shore and then by tankers to the St. Inez sewage treatment plant.

In recent months, the board has directed offshore casinos to implement online monitoring systems for continuous water quality assessment around their vessels.

Lakes face worst classification

The contamination crisis extends to Goa's inland water bodies, with 39 lakes classified as Class E – the worst possible rating under national water quality standards. These lakes, traditionally popular for summer recreation, are now deemed unfit for outdoor bathing and suitable only for irrigation, industrial cooling, and controlled discharge.

The affected lakes span both North and South Goa, including Mayem, Carambolim, Curca, and dozens of others. The classification stems primarily from stagnant water conditions that promote bacterial growth and organic matter accumulation. Only Harvalem waterfall and Anjunem lake have achieved Class C status, meeting basic water quality parameters.

Compounding the issue, the GSPCB's latest annual report has revealed a disturbing layer of contamination — heavy metals. Conducted under the National Water Quality Monitoring Programme, the study analyzed lake water samples for arsenic, cadmium, copper, lead, chromium, nickel, zinc, iron, manganese, and mercury. Several lakes showed elevated levels of these toxic elements, posing significant environmental and public health risks.

Among the worst-affected was Gawali Maula Lake in Tiswadi, which emerged as a major pollution hotspot. In October, chromium levels in the lake spiked to 1.3 mg/l, far exceeding safe thresholds. April testing recorded iron concentrations as high as 3.78 mg/l, while nickel and manganese contamination were also present at 0.53 mg/l and 0.34 mg/l respectively.

The current crisis represents a culmination of years of environmental degradation. Both GSPCB and CPCB reports have consistently highlighted high faecal coliform presence in Goan waters since 2023, indicating systemic contamination from human and animal waste sources.

However, Sanjeev Joglekar, Acting Member Secretary of GSPCB, emphasizes the importance of examining long-term trends rather than isolated incidents. The board is preparing a comprehensive State Environment Report analyzing environmental indicators over the past seven years since 2018. Preliminary data suggest some areas may have experienced pollution decline compared to previous years, though current levels remain dangerously high.

Public health and economic implications

The pollution crisis poses severe public health risks, with contaminated waters harboring pathogens that cause gastrointestinal infections, skin conditions, and other waterborne diseases. The presence of disease-causing bacteria makes these waters unsuitable for the very activities that drive Goa's tourism economy – swimming, water sports, and fishing.

Beyond immediate health concerns, the contamination threatens Goa's reputation as a clean, desirable tourist destination. The state's 105-kilometer coastline, dotted with starred hotels, guest houses, and beach shacks, faces an existential challenge as environmental degradation undermines the natural assets that attract millions of visitors annually.

Air quality provides contrasting picture

While water contamination dominates environmental concerns, Goa's air quality presents a more positive scenario. The GSPCB monitors 18 ambient air quality monitoring locations under the National Air Quality Monitoring Programme, with an additional station at the fire brigade facility at Mormugao Port Trust.

Air quality across the state has been classified as good to satisfactory for most of the year from April 2024 to March 2025. However, industrial estates including Cuncolim, Tuem, Bicholim, Vasco, Baina, and Kundaim show satisfactory to moderate levels due to anthropogenic activities such as vehicular movements, construction activities, and road excavation work.

The monitoring covers key pollutants including particulate matter (PM10 and PM2.5), sulfur dioxide, and nitrous oxide across all stations.

Groundwater remains safe haven

Despite widespread surface water contamination, Goa's groundwater presents a reassuring contrast. The Central Ground Water Board's annual groundwater quality report for 2024 confirms that the state's groundwater remains among the safest for human consumption in the country across multiple parameters.

Testing of groundwater samples shows 100% compliance with safety standards for critical contaminants including fluoride, nitrate, and other harmful substances. This finding provides some relief for communities dependent on well water and bore wells for domestic consumption, though industrial estate locations show some parameter violations.

The GSPCB monitors groundwater sources within major industrial estates on a half-yearly basis, with eight bore well locations included in the comprehensive monitoring network. While some bore wells show non-compliance with Dissolved Oxygen and BOD parameters, the overall groundwater quality remains significantly better than surface water bodies.

The scope of Goa's water quality crisis becomes evident through the GSPCB's extensive monitoring network covering 115 locations across the state. This comprehensive surveillance system includes rivers, wells, canals, lakes, reservoirs, creeks, nallahs, and sewage treatment plant inlets and outlets.

The monitoring network is strategically distributed with 54 stations in North Goa and 61 in South Goa, ensuring representative coverage of the state's diverse water bodies. A total of 1,263 samples were collected and analyzed during 2024-25, with 107 locations monitored monthly and eight bore well locations in industrial estates monitored bi-annually following CPCB protocols.

Specific pollution hotspots identified

Beyond the general contamination patterns, specific pollution hotspots have emerged from the monitoring data. St. Inez creek in North Goa and Bethora nallah in South Goa are classified under Class B category, indicating severe non-compliance with CPCB standards for critical parameters including Dissolved Oxygen, BOD, faecal coliform, and faecal streptococci.

These waterways serve as direct conduits for urban waste into major river systems, with St. Inez creek carrying contamination from Panaji's urban core directly into the Mandovi river. The creek's three-kilometer journey from Taleigao's Nagalli Hills to its confluence with the Mandovi represents a concentrated pollution pathway that affects one of Goa's most important waterways.

Tourism infrastructure under scrutiny

The tourism industry's role in the contamination crisis extends beyond large hotels to encompass the entire ecosystem of accommodation and recreational facilities. Homestays and residential properties used for tourism purposes have been specifically targeted by GSPCB directives requiring sewage treatment facility installation.

The seasonal nature of many tourism operations, particularly beach shacks that operate for limited periods annually, creates unique challenges for waste management infrastructure investment. The proposed mini-STP solution addresses this economic reality while maintaining environmental protection standards.

Water sports operators, fishing charter services, and other marine tourism activities face direct impact from the contamination, as their operations depend on clean coastal waters. The 'SW II' classification of coastal waters effectively renders many tourism activities unsafe, creating a feedback loop where environmental degradation undermines the economic activities that drive development.

Enforcement challenges

Despite regulatory frameworks and monitoring protocols, enforcement remains a persistent challenge. GSPCB officials acknowledge that while they have fulfilled their mandate of identifying violations and issuing directives, accountability and compliance enforcement require strengthening.

The gap between regulation and implementation is particularly evident in the sewage treatment sector, where monitoring system installation delays and non-compliance with online reporting requirements highlight systemic weaknesses in environmental governance.

The High Court has intervened in waste management issues, directing GSPCB to work with state government and Goa Sewerage Infrastructure Development Corporation to devise practical mechanisms for waste management in beach shacks and other tourism-related establishments.

KEY FINDINGS

INFRASTRUCTURE DEFICITS:

- 13 sewage treatment plants with patchy compliance
- Only 2–3 plants have required monitoring systems
- Mini STP solution proposed at Rs 6–7 lakh cost
- Direct sewage discharge through St. Inez Creek

SCIENTIFIC EVIDENCE:

- NIO studies confirm sewage contamination sources
- Mercury traces found in Mandovi River and edible oysters
- Research published in international journals
- Seven-year trend analysis underway
- Joint IIT-Kharagpur and NIO mercury study findings

ENVIRONMENTAL CONTRASTS:

- Groundwater remains among safest in India (100% compliance on key parameters)
- Air quality good to satisfactory most of year
- Industrial areas show moderate air pollution levels
- Harvalem waterfall and Anjunem lake achieve Class C compliance

St Inez creek sewage water