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Pre-Event Water Quality Assessment of the Godavari River at Someshwar: Establishing Upstream Baselines for Kumbh Mela Action Planning

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Abstract
Assessing river health before mass religious congregations like the Nashik-Trimbakeshwar Kumbh Mela is vital for establishing baseline environmental conditions and engineering proactive pollution control measures. This investigation evaluates the pre-event physicochemical parameters of the Godavari River along the upstream Someshwar stretch in Nashik. Core parameters, including pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), turbidity, and Total Dissolved Solids (TDS), were analyzed following standard water testing protocols. The findings demonstrate that Someshwar maintains good water quality prior to the event, satisfying CPCB Class B criteria for primary outdoor bathing. High DO concentrations combined with low organic loads emphasize the self-purification and buffering dynamics driven by fresh releases from the Gangapur Reservoir. To safeguard this upstream reference status and prevent degradation across downstream ritual sites, this paper outlines key preventive strategies including scheduled flushing flows, floating trash collection systems, temporary bio-sanitation facilities, phytoremediation techniques, and automated real-time sensor networks.

Keywords: *River Ecosystems, Surface Water Quality, Kumbh Mela Action Plan, Someshwar Reference Point, CPCB Standards, Waste Interception, Environmental Governance.*

1. Introduction

Mass gathering events along riverine corridors place acute, sudden demands on local municipal infrastructure and aquatic ecosystems. The Nashik-Trimbakeshwar Kumbh Mela brings millions of devotees together along the banks of the Godavari River, presenting significant challenges for regional water supply, public sanitation, and ecological preservation. During peak pilgrimage periods, concentrated ritual immersions introduce substantial loads of organic pollutants, suspended solids, inorganic salts, and microbial contaminants into the stream.

To transition from reactive environmental management to preventive governance, establishing reliable baseline profiles across river segments prior to major events is crucial. These baseline metrics serve as a reference for assessing event-driven degradation, determining stream carrying capacities, and formulating targeted mitigation plans.

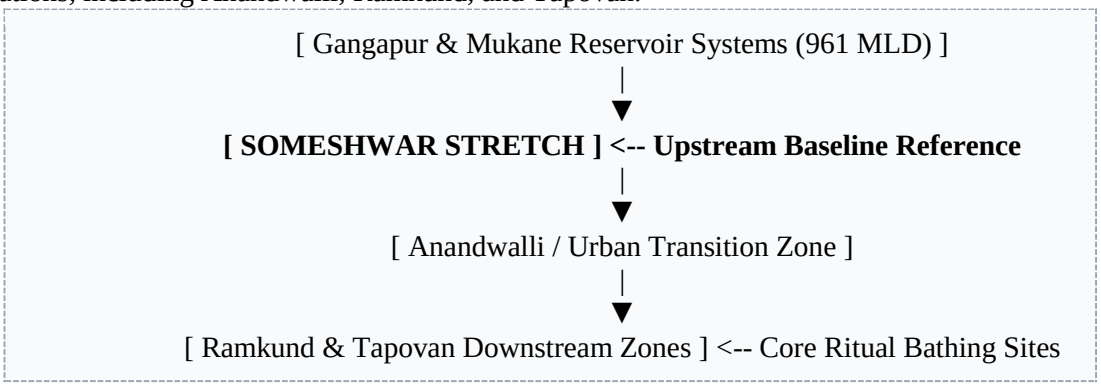
The Someshwar stretch lies upstream of Nashik's core urban center, directly receiving releases from the Gangapur Reservoir before the river passes through heavily populated downstream ghats like Tapovan and Ramkund. Recent assessments indicate that treatment plants operating at Gangapur and Mukane dams supply roughly 961 MLD of water to the region, highlighting the critical role of upstream supply dynamics. Investigating Someshwar during the pre-event phase offers direct insight into the initial chemical purity and oxygenation capacity of the river before it reaches main urban impact zones. This study establishes a pre-event baseline for Someshwar to support regional action planning and water quality management for the Kumbh Mela.

2. Materials And Methods

2.1 Study Area

This evaluation focused on the Someshwar section of the Godavari River in Nashik, Maharashtra (Latitude: ~20.02° N, Longitude: ~73.74° E). The site features rocky bed topography, natural flow turbulence, and suburban vegetative cover. It marks the upstream

entry point for Godavari waters before they pass through downstream urban monitoring stations, including Anandwalli, Ramkund, and Tapovan.



2.2 Sampling and Preservation

Water samples were collected in pre-treated 2-liter polyethylene containers and specialized glass BOD bottles under clear weather conditions prior to the festival. Sub-surface sampling (15–30 cm depth) was conducted across cross-sectional points to obtain representative samples. Temperature and pH were recorded immediately on-site. Samples reserved for BOD, COD, and TDS analysis were stored in insulated containers at 4°C and transferred to the laboratory within 6 hours.

2.3 Analytical Methodologies

Physicochemical characteristics were determined using standardized procedures from the American Public Health Association (APHA, 23rd Edition) and Central Pollution Control Board (CPCB) guidelines:

- **pH:** Measured on-site using a calibrated digital pH meter (APHA 4500-H^+).
- **Dissolved Oxygen (DO):** Analyzed using Winkler's iodometric titration with azide modification (APHA 4500-O C).
- **Biological Oxygen Demand (BOD):** Evaluated via 5-day incubation at 20°C (BOD_5) (APHA 5210 B).
- **Chemical Oxygen Demand (COD):** Determined using closed reflux potassium dichromate digestion and FAS titration (APHA 5220 C).
- **Turbidity:** Measured using a Nephelometric Turbidity Meter and expressed in Nephelometric Turbidity Units (NTU) (APHA 2130 B).
- **Total Dissolved Solids (TDS):** Measured gravimetrically by oven-drying filtered samples at 180°C (APHA 2540 C).

3. Results and Discussion

3.1 Physicochemical Profile

The baseline experimental results for the Someshwar reference point are presented in Table 1 alongside standard CPCB Class B parameters for primary outdoor bathing.

Parameter	Observed Value (Mean ± SD)	CPCB Class B Standard (Outdoor Bathing)	Inferred Quality Status
pH	7.6 ± 0.2	6.5 – 8.5	Stable / Slightly Alkaline
Dissolved Oxygen (DO)	7.2 ± 0.4 mg/L	≥ 5.0 mg/L	High Oxygenation
BOD (5-day at 20°C)	1.8 ± 0.3 mg/L	≤ 3.0 mg/L	Low Organic Load
Chemical Oxygen Demand (COD)	12.4 ± 1.8 mg/L	Baseline Target (≤ 250 mg/L)	Minimal Refractory Matter
Turbidity	4.2 ± 0.8 NTU	Desirable < 5.0 NTU	High Water Clarity
Total Dissolved Solids (TDS)	210 ± 15 mg/L	≤ 500 mg/L	Low Mineralization

Table 1: Pre-Event Physicochemical Parameters at Someshwar vs. CPCB Class B Norms

3.2 Evaluation of Water Quality Parameters

1. pH Stability: The recorded pH of 7.6 ± 0.2 reflects stable, neutral-to-slightly-alkaline conditions, aligning well with broader regional findings across Godavari stretches (pH 7.13–7.42) and conforming to CPCB Class B standards (6.5–8.5). This natural buffering protects aquatic biota and ensures safe conditions for bathers.

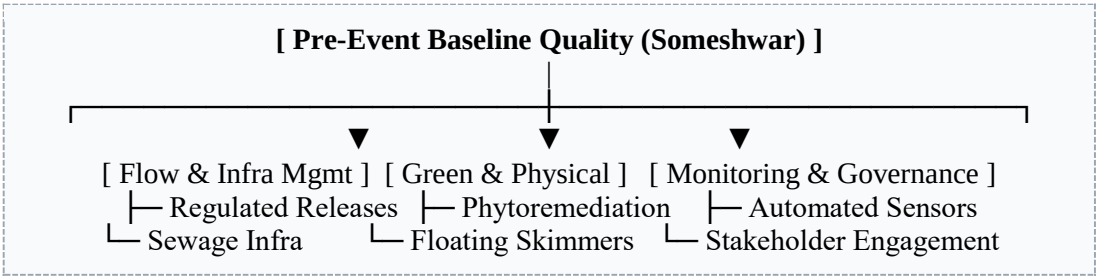
2. Dissolved Oxygen (DO) and Oxygenation: The average DO level of 7.2 mg/L easily exceeds the CPCB minimum standard of 5.0 mg/L. This high dissolved oxygen concentration is maintained by continuous freshwater releases from Gangapur Dam combined with natural aeration over rocky bed sections near Someshwar.

3. Organic Load (BOD and COD): The mean BOD level of 1.8 mg/L remains within the permissible 3.0 mg/L limit, while COD levels averaged 12.4 mg/L. While baseline organic loads at Someshwar remain low, comparative studies across downstream reaches (such as Tapovan) report moderate-to-elevated BOD concentrations (1.8–3.12 mg/L) due to ritual offerings and organic runoff.

4. Turbidity and Total Dissolved Solids (TDS): Low turbidity (4.2 NTU) and moderate TDS levels (210 mg/L) demonstrate high physical clarity. These values align with regional baseline surveys where turbidity generally ranges from 1–23 NTU and TDS stays within 209–360 ppm, well within acceptable safety margins before mass gatherings begin.

4. Kumbh Mela Action Plan: Strategic Recommendations

To preserve baseline water quality at Someshwar and manage downstream pollution during peak gathering days, a multi-tiered management strategy is recommended:



4.1 Water Supply and Infrastructure Planning

- **Controlled Reservoir Releases:** Coordinate releases from the Gangapur and Mukane reservoir systems to maintain sufficient dilution ratios and continuous stream flow during peak bathing periods.
- **Dedicated Sewage Treatment Expansion:** Accelerate infrastructure developments, such as the proposed 274 MLD Vilholi wastewater treatment facility, to prevent raw sewage from entering downstream river stretches.

4.2 Biological and Physical Remediation

- **Phytoremediation Implementation:** Deploy aquatic plant systems specifically Vetiveria zizanioides (vetiver grass) along high-load downstream segments like Tapovan. Phytoremediation provides a cost-effective, sustainable approach to absorb excess nutrients, enhance microbial degradation of organic waste, and reduce elevated BOD levels.
- **Solid-Waste Interception:** Install mechanical trash booms, floating skimmers, and collection barriers near Someshwar and Anandwalli to collect flowers, plastic items, and ritual debris before they pass downstream.

4.3 Real-Time Monitoring and Environmental Governance

- **Continuous Multi-Parameter Sensing:** Deploy automated IoT sensor networks across key monitoring points (Someshwar, Ramkund, Tapovan) to track pH, DO, Turbidity, and BOD indicators continuously.
- **Community Engagement:** Involve local communities, non-governmental organizations, and pilgrims through public awareness initiatives focused on eco-friendly ritual practices and river conservation.

5. Conclusion

Pre-event monitoring at the Someshwar stretch confirms that the Godavari River currently meets CPCB Class B standards for outdoor bathing, characterized by high dissolved oxygen levels, good physical clarity, and low baseline organic loading. Preserving these baseline conditions during major events requires integrated management. Combining infrastructure upgrades, controlled flow releases, physical waste barriers, real-time sensor networks, and natural phytoremediation using vetiver systems can effectively protect river health during peak festival periods.

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