



IMPACT OF DECREASING WATER QUALITY ON TOURISM IN PUNE: A CASE STUDY OF URBAN AND PERIPHERAL WATER BODIES

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Abstract:

The present research investigates the deteriorating water quality in Pune and its influence on tourism activities across both urban and peripheral zones. Using a year-long dataset from five representative locations — Mulshi Dam, Balewadi, Military Engineer Services (MES), Vishrantwadi, and Sangamwadi — the study analyzes parameters such as temperature, pH, electrical conductivity (EC), biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), and hardness. The findings indicate a significant decline in water quality, particularly in urban catchments like Sangamwadi and Balewadi, due to industrial discharge, untreated sewage, and urban runoff. While water-based tourism such as dam recreation and riverfront leisure has declined, cultural, historical, and event-based tourism in Pune has grown concurrently, reflecting a structural shift in the city's tourism economy. The study emphasizes the need for sustainable water management practices and environmental restoration to maintain ecological integrity and revive eco-tourism potential in Pune.

Keywords: Water quality, tourism, Pune, BOD, COD, dissolved oxygen, urban pollution, sustainability.

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Introduction:

Water quality is one of the fundamental determinants of environmental health and an essential factor influencing tourism attractiveness, especially in urban and semi-urban contexts. Pune, one of India's rapidly urbanizing metropolitan centers, has experienced tremendous population growth, industrial expansion, and infrastructural development in recent decades. However, this growth has come at the cost of environmental degradation — particularly in its river systems, lakes, and dam reservoirs that once served as major natural attractions.

Tourism in Pune historically flourished around its clean rivers, scenic ghats, and nearby water-based destinations such as Mulshi, Panshet, and Khadakwasla dams. Today, however, deteriorating water quality has significantly reduced the recreational value of these water bodies. Concurrently, cultural, educational, and IT-driven tourism activities have increased, shifting the nature of tourism from natural to urban-based experiences. This paper aims to analyze how decreasing water quality affects tourism in Pune while examining how other sectors of tourism continue to grow despite environmental decline.



Study Area Overview:

Pune district lies in the western part of Maharashtra, positioned between $18^{\circ}25' - 19^{\circ}37' \text{ N}$ latitudes and $73^{\circ}10' - 75^{\circ}10' \text{ E}$ longitudes. The city is located along the confluence of the Mula and Mutha rivers and surrounded by the Sahyadri ranges. The area enjoys a tropical wet-and-dry climate, with hot summers, a humid monsoon season, and mild winters.

For this study, five representative sites were selected:

- **Mulshi Dam:** A peripheral site representing relatively unpolluted, upstream water with tourism activities such as boating and resorts.
- **Balewadi:** A semi-urban site influenced by residential expansion and runoff from urban settlements.
- **Military Engineer Services (MES):** A mixed-use area reflecting intermediate pollution levels from institutional and domestic sources.
- **Vishrantwadi:** A dense residential and commercial area where sewage inflow affects water quality.
- **Sangamwadi:** A central urban site located near the confluence of rivers, heavily affected by domestic wastewater and industrial effluents.

This combination of sites provides a comprehensive picture of water quality transition from rural and peripheral zones to urban cores.

Materials and Methods:

The study used secondary data extracted from monthly water quality measurements (January–December) at the five selected sites. Parameters analyzed include temperature, pH, electrical conductivity (EC), biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), and hardness. Each parameter serves as an indicator of specific environmental conditions:

- **BOD and COD** reflect organic pollution from sewage and industrial waste.
- **DO** represents the oxygen availability necessary for aquatic life, inversely related to organic pollution.
- **EC and Hardness** are indicators of dissolved ions, reflecting mineralization and salinity levels.
- **pH** indicates the acidity or alkalinity of water, affecting aquatic ecosystems and water usability.

Data interpretation emphasized relative differences between locations and seasons (pre-monsoon, monsoon, post-monsoon). The analysis was qualitative and interpretative, correlating physicochemical conditions with observed tourism trends in Pune.

Results and Discussion:

The results reveal substantial spatial and temporal variation in water quality across Pune.

1. Seasonal Variations

At **Mulshi Dam**, water quality remained relatively stable and within permissible limits throughout the year. BOD values were low (15–25 mg/L), COD ranged between 52–71 mg/L, and DO averaged 6.6 mg/L — indicating healthy aquatic conditions. Monsoon months (June–August) saw a temporary rise in BOD due to surface runoff, but remained within acceptable ecological thresholds. These clean-water conditions support tourism activities such as boating, lakeside resorts, and weekend getaways.



In contrast, **Balewadi** and **Sangamwadi** exhibited high BOD (over 100–250 mg/L) and COD (400–700 mg/L) with near-zero DO, reflecting severe organic pollution. These figures point to heavy contamination from untreated domestic and industrial waste. The high EC readings at these sites indicate increased dissolved solids, contributing to unpleasant odor, discoloration, and algal growth. Such conditions have rendered riverfront recreation unsuitable for tourism and even for local leisure use.

2. Spatial Contrast and Urbanization Effect

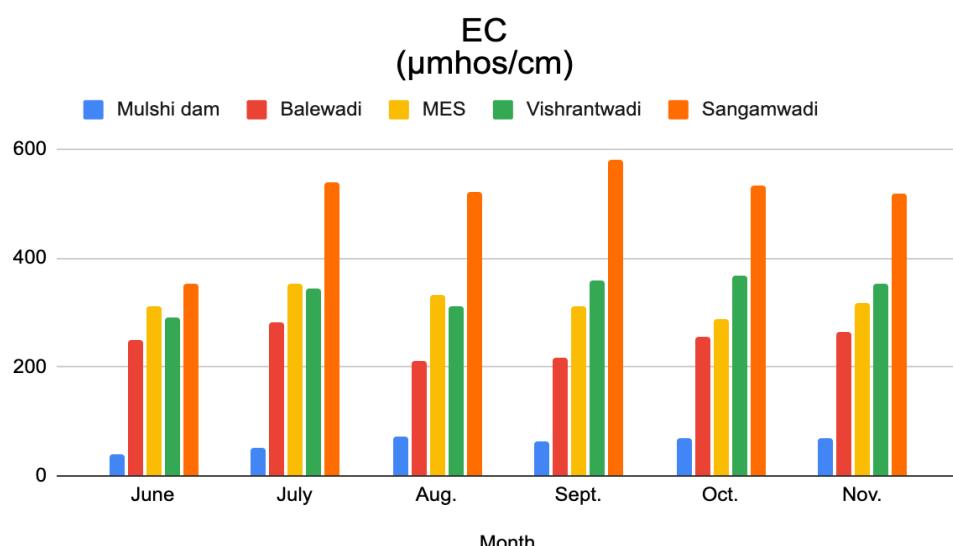
Moving downstream from Mulshi to Sangamwadi shows a clear degradation gradient. The upper catchment (Mulshi) retains its natural appeal and continues to attract eco-tourists and short-stay visitors. However, as water flows toward the city, effluent inflows and encroachments along riverbanks degrade water quality drastically. Urbanization in Balewadi and Vishrantwadi, coupled with poor wastewater management, has converted once clean river stretches into polluted drains.

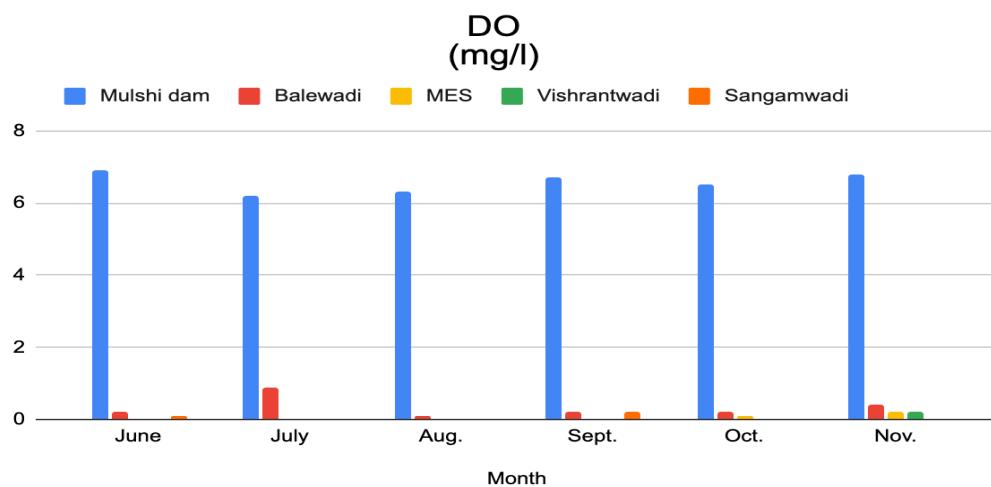
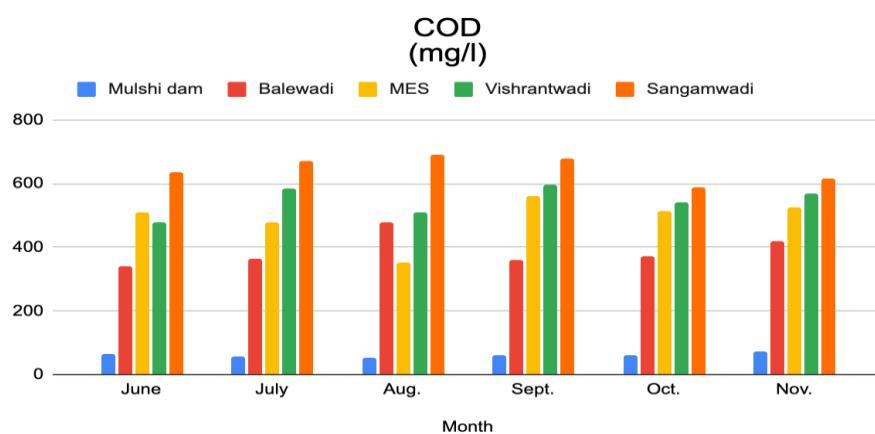
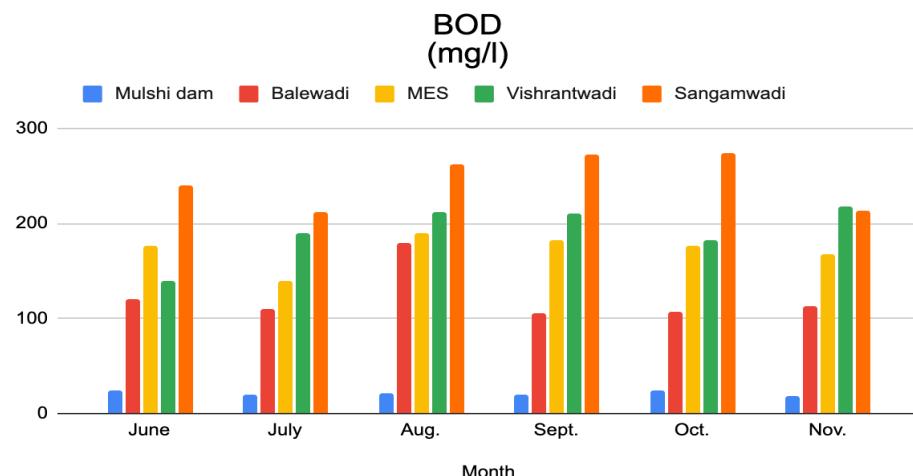
These degraded water bodies no longer support boating, riverfront picnics, or fishing — activities that were once popular among residents and tourists alike. Moreover, poor water aesthetics deter visitors, affecting local businesses dependent on water-based recreation.

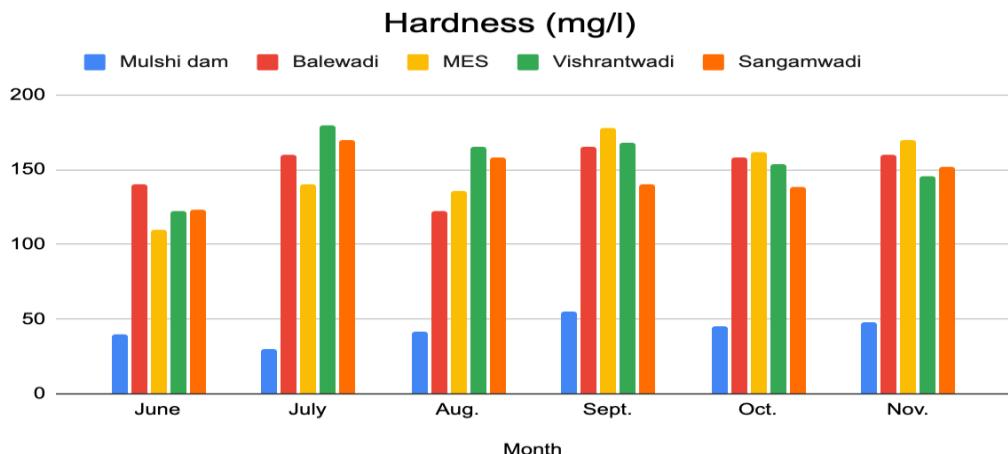
3. Shift in Tourism Patterns

Interestingly, while water-based tourism has declined, Pune's **urban tourism** has grown significantly. The rise of cultural festivals, heritage circuits (such as Shaniwarwada and Aga Khan Palace), IT conferences, and event-based tourism has partially compensated for the loss of natural attractions. This shift indicates that Pune's tourism economy is resilient but environmentally imbalanced. While overall tourism numbers have not drastically declined, the nature of tourist motivation has shifted from "nature-based" to "culture-based."

Concentration of physicochemical parameters in the water of the Mula River 2023

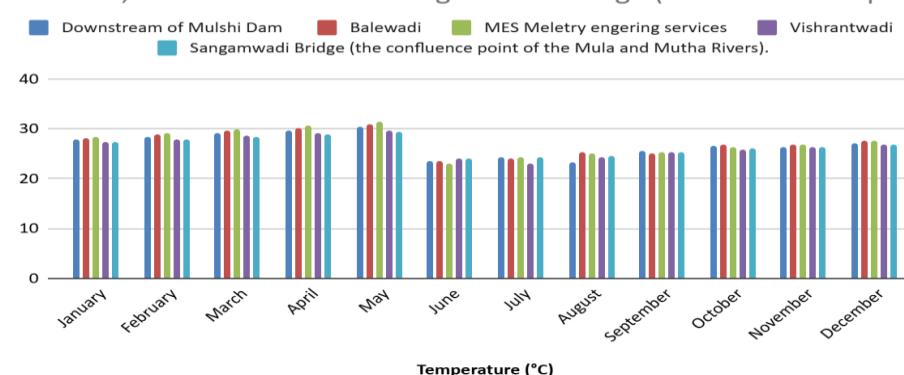




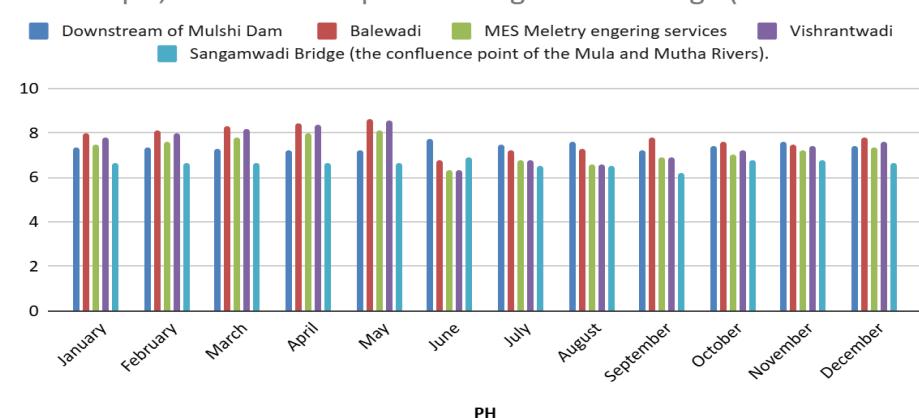


Concentration of physicochemical parameters in the water of the Mula River 2024

Downstream of Mulshi Dam , Balewadi , MES Meletry engering services , Vishrantwadi and Sangamwadi Bridge (the confluence point of the Mula and Mutha Rivers).

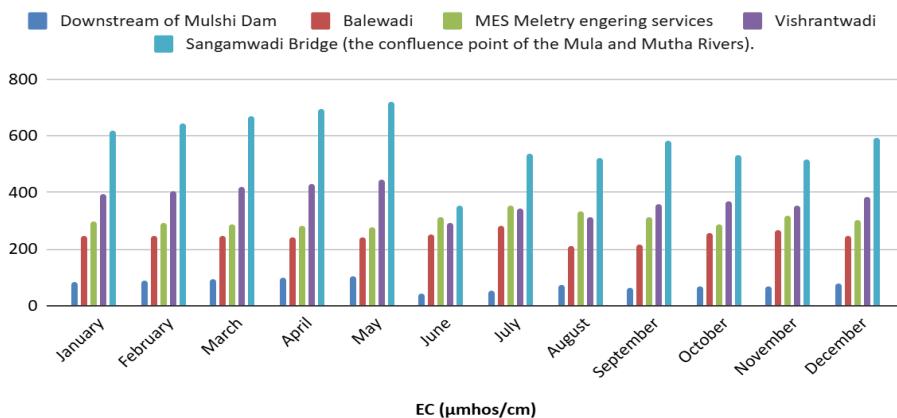


Downstream of Mulshi Dam pH, Balewadi pH, MES Meletry engering services pH, Vishrantwadi pH and Sangamwadi Bridge (the confluence point of the Mula and Mutha Rivers).

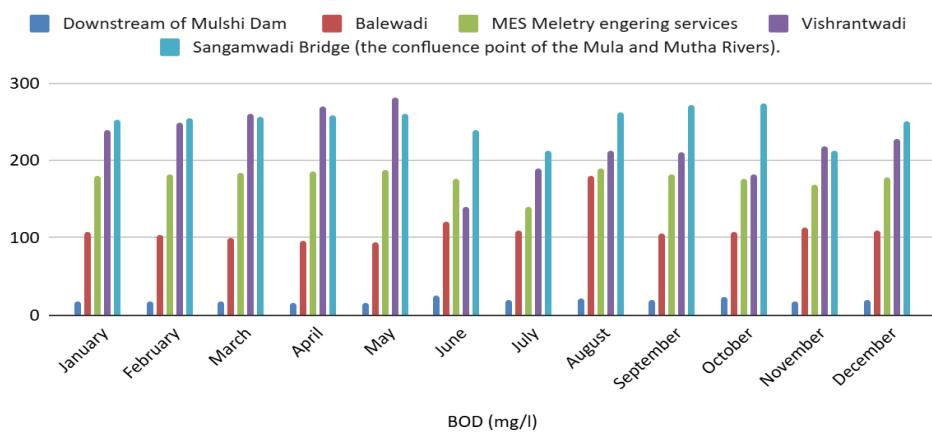




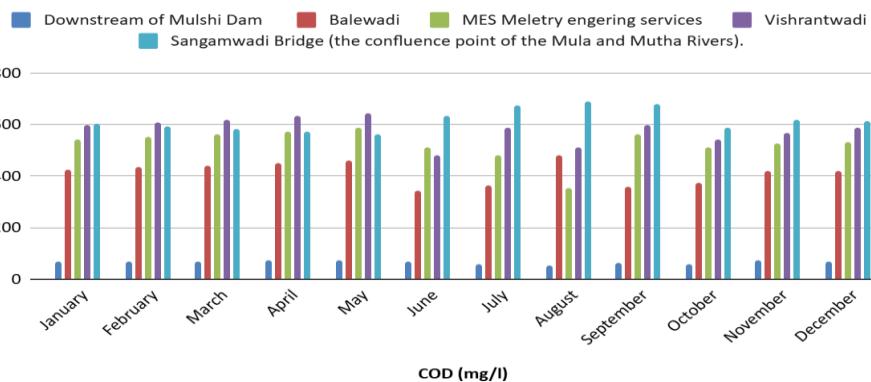
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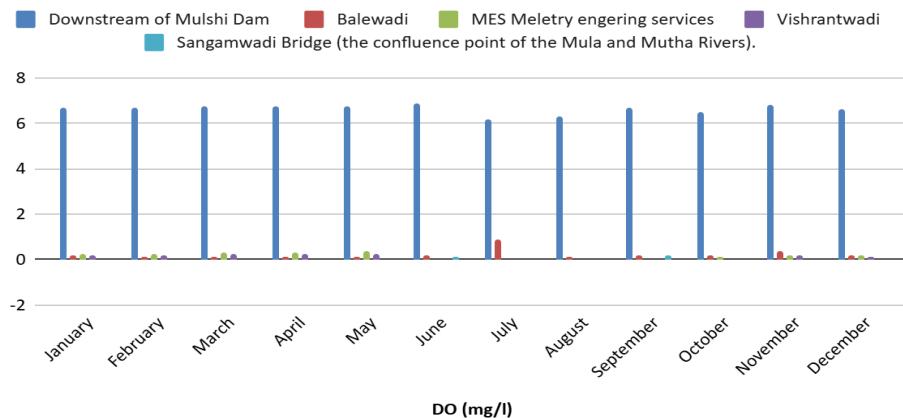


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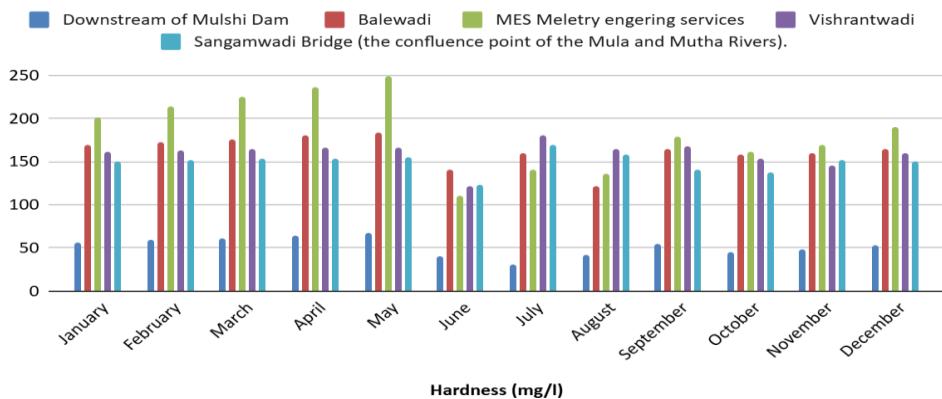




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Interpretation of Results:

The decline in water quality has direct and indirect implications for tourism. Directly, poor water conditions reduce the aesthetic and recreational appeal of lakes and rivers, discouraging both domestic and foreign tourists. Indirectly, it signals weak environmental governance, affecting the city's image as a sustainable destination.

The upstream-downstream contrast exemplifies how urbanization, inadequate wastewater infrastructure, and uncontrolled dumping affect ecosystem health. The high BOD and COD values in Sangamwadi and Balewadi confirm severe organic contamination, while near-zero DO levels suggest oxygen depletion detrimental to aquatic life.

Tourism stakeholders—resort owners, local guides, and recreational operators—have faced reduced activity in peripheral lakes. Yet, new tourism sectors have emerged, including cultural heritage tourism, medical and educational tourism, and IT-related business travel. This duality shows that Pune's tourism is diversifying but not necessarily sustainable.



A sustainable solution lies in **integrated water resource management** — incorporating sewage treatment, riverfront restoration, and eco-tourism development. Projects like the “Mula-Mutha River Rejuvenation” have potential, but success depends on long-term monitoring and community participation.

Conclusion:

The study concludes that water quality deterioration in Pune is both an environmental and socio-economic concern. While the peripheral zones, such as Mulshi, retain acceptable quality and continue supporting eco-tourism, urban stretches like Sangamwadi and Balewadi exhibit extreme pollution levels, eliminating water-based tourism opportunities. The decline in water quality has transformed tourism patterns, pushing the city toward cultural and event-based tourism rather than natural recreation.

The findings call for urgent policy measures, including strict wastewater regulation, regular water quality monitoring, and public awareness campaigns. Sustainable tourism in Pune can only thrive when ecological restoration goes hand in hand with tourism planning. Reviving clean water bodies will not only enhance biodiversity but also restore Pune’s identity as a scenic, livable, and touristic destination.

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