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A Noble Study on Quality Assessment and Treatment of Godavari River Water in Trimbakeshwar area of Nashik District. Maharashtra

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ABSTRACT: The project of a noble study on quality assessment and treatment of Godavari river water in Trimbakeshwar area of Nashik district Maharashtra aims to restore and clean the sacred Kushavart Kund, which is the origin of the holy Godavari River. Over the years, the Kund has become polluted due to waste from religious activities, sewage, and lack of proper maintenance. The Kushavart Kund in Trimbakeshwar, Nashik, marks the sacred origin of the Godavari River and serves as a primary site for mass ritual bathing and religious activities. However, increasing anthropogenic pressure, influx of floral waste (nirmalya), and seepage of domestic sewage have significantly deteriorated its water quality, posing environmental and health risks. This study presents a comprehensive assessment of the physicochemical and biological parameters of the Kund water, including pH, Turbidity, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Total Coliform counts. Experimental results indicate that several parameters exceed the permissible limits set by the Central Pollution Control Board (CPCB) for 'Class A' water bodies. The research evaluates the efficacy of various treatment interventions, ranging from localized filtration units to eco-friendly bioremediation techniques, aimed at restoring the water's purity while respecting the site's heritage. The study further proposes a sustainable management framework involving periodic aeration, waste diversion protocols, and real-time monitoring. The findings provide a technical roadmap for the rejuvenation of the Kushavart Kund, ensuring the ecological integrity of the Godavari River at its source.

I. INTRODUCTION

The Godavari River, India's second-largest river system, originates at the sacred Brahmagiri Hills in Trimbakeshwar, Nashik. The Kushavart Kund serves as the primary collection point and the spiritual epicenter where the river first manifests for public use. Despite its immense religious significance, the Kund faces severe ecological degradation due to constant anthropogenic pressure and stagnant hydrological conditions. Mass ritual bathing, the immersion of Nirmalya (floral offerings), and the ingress of domestic sewage have significantly altered the water's chemical and biological integrity. Preliminary studies indicate critical levels of Biochemical Oxygen Demand (BOD) and a depletion of Dissolved Oxygen (DO), rendering the water unfit for its intended 'Class A' status. While larger river reaches receive significant administrative attention, the source-point contamination at Trimbakeshwar remains a neglected research gap. This study addresses this crisis by conducting a rigorous quality assessment of the Kund water through various physicochemical and microbial parameters. Furthermore, the research evaluates a sustainable treatment framework, integrating modern filtration with eco-restoration techniques to rejuvenate this sacred source. By restoring the purity of Kushavart Kund, this project aims to ensure the long-term ecological health of the Godavari River at its very inception.

Kushavart Kund, located in Trimbakeshwar near Nashik, Maharashtra, is a sacred water tank believed to be the origin of the holy Godavari River, also called the Dakshin Ganga. According to Hindu mythology, Lord Vishnu created the Kund using a blade of kusha grass to bring the river Ganga to earth for the purification of Sage Gautama's ashram after a divine curse. Over the centuries, Kushavart Kund has become an important center for ritual bathing and ancestral rites, symbolizing spiritual cleansing and redemption. The structure was renovated by the Peshwas during the Maratha period and continues to be maintained as a revered pilgrimage site.



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Figure: Current Water quality of kushavarth kund

Even today, it holds immense religious, cultural, and historical importance, attracting thousands of devotees, especially during the Kumbh Mela at Trimbakeshwar. Kushavart Kund holds immense religious importance as the source of the sacred Godavari River, which is worshipped as the Dakshin Ganga. It is a major site for ritual bathing, pind daan (ancestral rites), and holy ceremonies, believed to cleanse one's sins and grant spiritual liberation. The Kund is also central to the Trimbakeshwar pilgrimage and plays a key role during the Kumbh Mela, one of the largest religious gatherings in the world. Culturally, it reflects India's ancient traditions of water worship, spirituality, and architectural heritage, symbolizing the deep connection between faith and nature.

This synopsis report aims to develop a comprehensive framework for the rejuvenation of Kushavarat Kund through systematic water quality monitoring, treatment strategy design, and sustainable management practices. The proposed framework not only seeks to restore the kund's ecological balance but also to ensure long-term sustainability, community participation, and preservation of its cultural heritage.

II. LITERATURE REVIEW

The assessment and treatment of water quality in sacred and urban water bodies has been a growing field of research due to the increasing levels of pollution and ecological degradation in recent decades. Water bodies, particularly those associated with religious and cultural practices, often face unique challenges arising from ritual activities, urban encroachment, and unregulated waste discharge. Understanding existing research on lake and river restoration, pollution control, and eco-friendly treatment methods is crucial to designing effective and sustainable frameworks for rejuvenation. The following review presents major studies and findings relevant to the Kushavart Kund and Godavari River restoration, categorized under water quality assessment, natural treatment methods, and community-based resource management.

Tourbier and Piovar (1984), in Managing Urban Runoff: discussed urban runoff management as a critical component of protecting natural water bodies from pollution. Their study emphasized the use of vegetative buffers, infiltration basins, and retention ponds to reduce the entry of sediments, nutrients, and organic pollutants into surface waters. They highlighted that uncontrolled stormwater runoff in urban areas significantly degrades water quality. The authors advocated decentralized drainage systems rather than relying solely on conventional sewer networks. Their approach is particularly relevant for towns with mixed land use and high human activity. The study demonstrated that simple land-based interventions can significantly reduce non-point source pollution. These strategies help in minimizing pollutant loads entering lakes, ponds, and sacred tanks. In pilgrimage towns, runoff often carries domestic waste and ritual residues. Hence, the findings are applicable to the Trimbakeshwar region. Their work laid an early foundation for sustainable urban water management practices..

Ostrom (1990), presented a comprehensive framework for managing common pool resources through community participation and institutional arrangements. She argued that local users are capable of sustainably managing shared



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resources when empowered with rule-making authority. The study emphasized the importance of monitoring, accountability, and graduated sanctions. Ostrom challenged the traditional belief that common resources inevitably face degradation. Her research demonstrated that cooperation and collective action can prevent resource depletion. The framework highlighted trust, transparency, and local leadership as key success factors. These principles are especially relevant for culturally significant water bodies. Temple tanks and sacred ponds function as shared community resources. Applying this approach can improve compliance and stewardship. Thus, Ostrom's work provides a strong governance foundation for water body restoration projects.

Pretty (2003), examined the role of social capital in the collective management of environmental resources. He defined social capital as networks, trust, shared norms, and cooperation among community members. The study showed that communities with strong social capital achieve better environmental outcomes. Pretty emphasized that technical interventions alone are insufficient without community involvement. Participation enhances ownership and long-term maintenance of restoration projects. The study highlighted the importance of dialogue, learning, and inclusive decision-making. Religious and cultural institutions strengthen collective environmental responsibility. In pilgrimage centers, shared beliefs can support conservation efforts. Community cooperation reduces misuse and pollution of water bodies. Therefore, social capital is essential for sustaining water quality improvements.

No.	Paper Title	Author Name	Key Points	Remark
1	An assessment of water quality index of Godavari river water in Nashik city, Maharashtra	Ashali C. Kharake, Vaishali S. Raut	Used WQI method; analyzed pH, DO, BOD, F-coliform; found pollution due to sewage, tourism & urban activities; WQI ranged 35–133 indicating poor to moderate quality	Highly relevant for WQI methodology and Nashik stretch
2	Water quality assessment of Godavari river water at Nashik	Resham Bhalla et al.	Studied physico-chemical parameters (TDS, DO, COD, heavy metals); seasonal variation observed; pollution from domestic & agricultural waste makes water unfit for drinking	Useful for parameter selection and seasonal analysis
3	Water Quality Assessment of the Godavari River	Ajay D. Chavan, M.P. Sharma, R. Bhargava	Found ~82% pollution from domestic sources; study stretch includes Trimbakeshwar to downstream; highlights impact of urbanization	Important for source identification of pollution
4	Knowledge-Guided Dynamic Systems Modeling: A Case Study on Modeling River Water Quality	Namyong Park et al.	Combines data-driven and knowledge-based models for water quality prediction; improves accuracy of river system modeling	Useful for advanced modeling techniques
5	Multifractal Description of Streamflow and Sediment Data from Indian River Basins	Adarsh Sankaran et al.	Godavari basin shows high complexity in sediment–flow relation; useful for understanding hydrological variability	Helpful for hydrological analysis aspect

Studies on the Godavari River in the Nashik–Trimbakeshwar region show that water quality is significantly affected by sewage discharge, religious activities, and urban runoff, often resulting in poor Water Quality Index (WQI) values. Most research focuses on physico-chemical parameters like pH, DO, BOD, COD, and coliform, using methods such as WQI and statistical analysis to assess pollution levels and seasonal variations. However, there is a research gap in site-specific assessment and treatment strategies for the Kushavart Kund, highlighting the need for localized water treatment solutions.

III. METHODOLOGY

Study Area Selection and Sampling- The study focuses on the Godavari River at Kushavart Kund, which is considered a significant origin point of the river. Sampling locations are carefully selected at the kund and nearby upstream and downstream stretches. The selection is based on factors such as religious activities, population influence, and possible wastewater discharge. Grab sampling technique is adopted to collect representative water samples. All samples are collected in clean, sterilized bottles to avoid contamination.



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Sample Preservation and Initial Analysis- After collection, the samples are preserved at low temperature (around 4°C) to maintain their original characteristics. Initial water quality analysis is carried out to determine baseline conditions. Physical parameters like temperature, turbidity, and TDS are measured along with chemical parameters such as pH, DO, BOD, COD, hardness, and nitrates. Biological parameters like total and fecal coliform are also analyzed. All tests are conducted as per standards of the American Public Health Association and Bureau of Indian Standards.

Sr No	Effluent Parameters	Current Inlet	Desired Outlet
1	pH	6–8	6–8
2	O&G ppm	< 10	0
3	COD, ppm	< 50	< 50
4	BOD, ppm	< 20	< 3
5	TDS, ppm	AA	AA
6	Turbidity, NTU	< 50	< 2
8	TKN ppm	< 10	< 5
9	NH ₄ -N ppm	< 50	< 1
10	Total Coliform CFU/100 ml	< 10000	< 2.2
11	Odour	Pungent Noticeable	No Odour
12	DO, ppm	4 to 5	5.5 to 6.5



Table. Inlet parameter of collected sample

Fig. Sample collected on site

Experimental Setup Using Water Activator Technology- An experimental setup is developed using Water Activator Technology, which works on principles such as magnetic field or vortex motion. The collected water samples are passed through the activator device under controlled laboratory conditions. Important factors such as flow rate, contact time, and temperature are maintained constant. The setup is designed to ensure uniform treatment of all samples. In some cases, pre-treatment like filtration or aeration is also incorporated to enhance performance.

Post-Treatment Analysis and Efficiency Evaluation- After treatment, the water samples are again tested for the same physical, chemical, and biological parameters. The results are compared with initial values to determine the effectiveness of the treatment process. Percentage removal efficiency is calculated for key pollutants like BOD, COD, turbidity, and microbial load. The Water Quality Index (WQI) is also computed to evaluate overall improvement in water quality. This helps in classifying water into different quality categories.

Data Interpretation- The collected data are analyzed using statistical methods such as mean, standard deviation, and correlation analysis. Graphs and charts are prepared to clearly present variations in water quality before and after treatment. The performance of Water Activator Technology is evaluated in terms of efficiency, cost, and feasibility. Based on the findings, conclusions are drawn regarding its suitability for river water treatment. Recommendations are also provided for practical implementation and integration with conventional treatment methods.

IV. CONCLUSION AND FUTURE WORK

The present study on the Godavari River at Kushavart Kund reveals that the water quality is significantly influenced by religious activities, sewage discharge, and surface runoff. The analysis of physico-chemical and biological parameters indicates that the water is not suitable for direct consumption without treatment, as several parameters exceed permissible limits. The application of Water Activator Technology (WAT) showed noticeable improvement in certain parameters such as turbidity, dissolved oxygen, and partial reduction in BOD and COD. However, it was observed that WAT alone is not sufficient for complete purification, especially for microbial contaminants. The Water Quality Index (WQI) values improved after treatment, indicating a positive impact of the technology. Overall, the study concludes that Water Activator Technology can be considered as a supportive or pre-treatment method, but it should be combined with conventional treatment processes for effective and safe water purification. The study also highlights the urgent need for proper wastewater management and pollution control measures in the study area.



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Future research can focus on conducting long-term and seasonal studies to better understand variations in water quality of the Godavari River. More detailed investigations can be carried out specifically at Kushavart Kund to evaluate pollution sources and their intensity throughout the year.

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