



Assessment of Water Quality of the Pavana River in Pimpri–Chinchwad, Pune

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Abstract

The present study evaluates the water quality status and pollution levels of selected locations along the Pavana River in the Pimpri–Chinchwad area of Pune district through the analysis of key physicochemical parameters. Water samples were collected from three distinct sampling sites along the river course to assess spatial variations in water quality and the influence of anthropogenic activities. Parameters such as colour, odour, temperature, pH, and dissolved oxygen (DO) were analysed using standard methods. The results indicated that the river water was polluted, as evidenced by noticeable changes in colour and odour and low dissolved oxygen levels. Water temperature ranged from 26–27 °C, pH values varied between 7.3 and 7.6, and dissolved oxygen concentrations were recorded between 2.6 and 3.0 mg/L, reflecting organic pollution and reduced ecological health of the river. The study highlights the deteriorating water quality of the Pavana River and emphasizes the need for continuous monitoring and effective pollution control measures to protect and restore the river ecosystem.

Keywords: Pavana River; River ecosystem; Water quality parameter; Water pollution; Urban river

Introduction

Water is a fundamental resource for daily human activities and sustains life on Earth. Approximately 71% of the Earth's surface is covered by water, distributed across oceans, rivers, lakes, glaciers, and groundwater. Water plays a vital role in numerous biological, chemical, and physical processes, including metabolism, nutrient transport, temperature regulation, and ecosystem functioning. Adequate availability of clean water is therefore indispensable for human survival, public health, and environmental sustainability. (Mishra, R.K., 2023; Singh, V. 2024; Alimovna, Z.S., 2025) The water problem is a phenomenon, and is not restricted to any one nation (Jamdade, A.B. and Gawande, S.M., 2017; Ansari, A., et. al.2019). Now-a-days, there are many issues being evolved due to contaminated water.

The Pavana River is an important component of Pune's regional ecosystem, and its effective conservation and management are essential for sustaining environmental quality and supporting local socio-economic activities. The river contributes to multiple ecosystem services, including water supply, habitat provision, nutrient cycling, and support for biodiversity. In recent years, however, the Pavana River has experienced increasing pollution, primarily due to the discharge of untreated or partially treated domestic sewage through various drainage channels. This continuous influx of wastewater has led to the deterioration of water quality, adversely affecting aquatic organisms and overall ecosystem health. Systematic assessment of river water quality is therefore a critical step toward understanding pollution levels, identifying sources of contamination, and developing appropriate management strategies to protect and restore this valuable freshwater resource (Fadtare, V.V. and Mane, T.T., 2007; Kalbage, Kalbage, B.T. and Chandanshive, N.E., 2021; Mane, A. V. et. al. 2013).

According to the Environmental Status Report of the Pimpri–Chinchwad Municipal Corporation (PCMC), the Pavana River is among the most polluted rivers in the Pimpri–Chinchwad industrial region. The report indicates a substantial decline in dissolved oxygen levels over time, reflecting severe degradation of water quality. This deterioration has been associated with repeated incidents of large-scale fish mortality, with several episodes of mass fish deaths reported in recent years (Mahajan, B. et. al. 2021).

Physico-chemical parameters are key indicators for evaluating water quality, as they provide essential information about the physical and chemical characteristics of water. These parameters help in understanding the complex

interactions between climatic factors and biological processes occurring within aquatic ecosystems (Chandanshive, N. E. 2021; Mane, A. V. et.al. 2013). The present investigation evaluated the water quality of the Pawana River in Pune city to determine its suitability for irrigation purposes. The extent of pollution was assessed by analysing selected physico-chemical parameters, including colour, odour, temperature, pH, and dissolved oxygen (DO).

Materials and Method

Study Area

The Pawana River originates in the Western Ghats near Lonavala, Maharashtra, at an elevation of about 1,100 m above mean sea level. It flows predominantly in an east-southeast direction, passing through the Pimpri-Chinchwad municipal region and the northwestern parts of Pune city. Within the urban stretch, the river flows through rapidly developing localities such as Ravet, Chinchwad, Pimpri, and Wakad. The Pawana River eventually merges with the Mula River near the Aundh-Ravet confluence, forming an important component of the Mula-Mutha river system.

For the present study, water samples were collected twice a month from January 2025 to June 2025 at three selected urban sampling locations along the Pawana River: Sangavi ($18^{\circ}34'36''\text{N } 73^{\circ}49'16''\text{E}$) (Station I), Dapodi ($18^{\circ}35'05''\text{N } 73^{\circ}49'41''\text{E}$) (Station II), and Chinchwad ($18^{\circ}37'34''\text{N } 73^{\circ}46'40''\text{E}$) (Station III).

Physico-chemical Analysis

The collected water samples were analysed to assess the pollution status of the river using selected physico-chemical parameters, including colour, odour, temperature, pH, and dissolved oxygen (DO). Temperature and pH were measured in situ using a multiparameter probe (Eutech PCS Tester 35). Dissolved oxygen was determined in the laboratory using Winkler's iodometric method. The generated data were subsequently subjected to statistical analysis.

Result and Discussion

The physico-chemical parameters of the Pawana River water at three sampling sites (S₁, S₂, and S₃) are presented in Table 1. The results reveal spatial variations in water quality across the studied river stretch, reflecting the influence of surrounding urban and anthropogenic activities.

Colour and Odour

Water samples collected from all three sites exhibited a grey-black coloration accompanied by an unpleasant organic odour. The consistency of these characteristics across sites suggests the widespread presence of organic matter, suspended solids, and untreated or partially treated wastewater inputs. Such sensory indicators point toward deterioration of water quality and significant anthropogenic pressure on the river system.

Temperature

The mean water temperature ranged from 26.43 ± 0.79 °C at S₂ to 27.17 ± 0.41 °C at S₃. The relatively narrow temperature range indicates similar environmental conditions across the sampling locations. Slightly higher temperatures at S₃ may be associated with reduced riparian vegetation cover and increased exposure to urban heat, which can influence biochemical reactions and oxygen solubility in river water.

pH

The pH values at all sampling sites were slightly alkaline, varying between 7.47 ± 0.15 and 7.70 ± 0.12 . These values fall within acceptable limits for surface water; however, the alkaline tendency may reflect the influence of urban runoff, domestic effluents, and materials derived from construction and industrial activities.

Dissolved Oxygen (DO)

Dissolved oxygen concentrations were low at all sampling sites, with mean values ranging from 2.68 ± 1.99 mg/L to 3.03 ± 1.58 mg/L (Fig.1). The reduced DO levels indicate high organic loading and increased microbial oxygen consumption due to the decomposition of organic matter. Although Site S₂ showed marginally higher DO levels, all recorded values remain below the desirable threshold required to support healthy aquatic life.

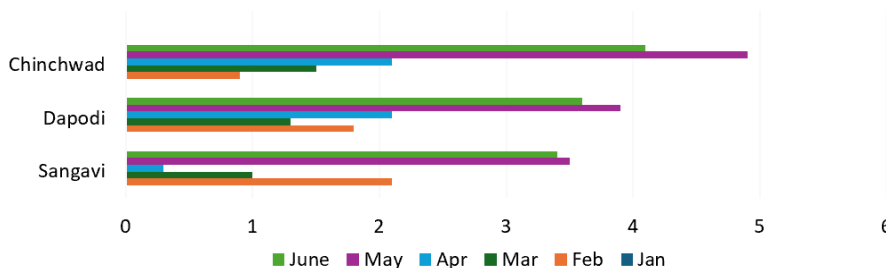


Fig. 1. Dissolved Oxygen Levels at Selected Sampling Sites of the Pawana River

Table 1: The Physico-chemical parameters of sampling sites of Pawana River

Pawana River Sampling sites	Physiochemical Parameters (Mean±SD)				
	Colour	Odour	Temp(°C)	pH	OD (mg/L)
S ₁	Grey black	Unpleasant organic odour	26.5±0.55	7.467±0.15	2.68±1.99
S ₂	Grey black	Unpleasant organic odour	26.43±0.79	7.5±0.23	3.03±1.58
S ₃	Grey black	Unpleasant organic odour	27.167±0.41	7.7±0.12	2.88±1.60

Temp-Temperature, OD-Dissolved oxygen, SD- Standard deviation

Kalbage, B.T. and Chandanshive, N.E., (2021) examined the physico-chemical quality of Pavana River water over a two-year period (August 2016–July 2018) and showed clear effects of seasonal changes and human activities on the river system. Water temperature varied with climate and flow conditions and directly influenced dissolved oxygen levels. Changes in TDS were mainly linked to evaporation, reduced dilution during summer, and continuous inputs from domestic and industrial sources. Lower dissolved oxygen along with higher BOD and COD values indicated the presence of organic and chemical pollution, largely from sewage and industrial effluents. Alkalinity levels suggested that the river has a reasonable buffering capacity, although higher values may affect its suitability for domestic use. Increased chloride concentrations during low-flow periods pointed to urban and industrial contamination, especially near the Pimpri–Chinchwad region. The presence of sulphates and phosphates reflected inputs from agricultural runoff, detergents, and industrial waste, with elevated phosphate levels increasing the risk of eutrophication. Calcium and magnesium levels, responsible for water hardness, were influenced by both natural geological processes and human activities. Overall, the findings suggest that the Pavana River is under growing pressure from urbanization and industrialization, highlighting the need for regular monitoring and improved management to protect this important water resource.

The study by Nerlekar et al. (2025) reported notable differences in water quality between urban and suburban/rural regions during 2017–2018, largely driven by variations in land use and human activity. Urban sampling locations recorded inferior water quality, evidenced by elevated BOD, pH fluctuations, reduced dissolved oxygen, and higher chlorine concentrations, primarily due to industrial effluents, urban runoff, and sewage discharge. In comparison, suburban and rural areas exhibited relatively better water quality, although diffuse pollution from agricultural runoff remained evident. The findings underline the significant impact of urbanization and land-use patterns on water quality and stress the importance of implementing focused pollution-control measures and sustainable land-management practices to safeguard water resources.

Conclusion

The present study demonstrates that the Pawana River water quality at the selected sampling sites is significantly influenced by urbanization and associated anthropogenic activities. Uniform grey-black coloration and persistent organic odour across all sites indicate widespread organic pollution and continuous input of untreated or partially treated wastewater. Although temperature and pH values remained within acceptable ranges, their observed patterns suggest the influence of urban runoff and reduced riparian cover. Dissolved oxygen levels were consistently low at all sampling locations, indicating elevated organic loading and unfavourable conditions for aquatic life. The reduced oxygen availability reflects active microbial degradation of organic matter and highlights ecological stress within the river system. Overall, the findings confirm a deterioration in the water quality of the Pawana River in the studied stretch, emphasizing the need for regular monitoring, improved wastewater management, and effective pollution control measures to restore and protect the river ecosystem.

References

- Alimovna ZS (2025) Water Resources and Their Role for Life Activity. Ta'lim, Tarbiya Va Innovatsiyalar Jurnalı 2(1):146–155.
- Fadtare VV and Mane TT (2007) Studies on water pollution of Mula, Mutha and Pawana rivers in summer season in the Pune city region. Nature Environment and Pollution Technology 6(3):499.
- Jamdade AB and Gawande SM (2017) Analysis of water quality parameters: a review. International Journal of Engineering Research 6(3):145–148.
- Kalbage BT and Chandanshive NE (2021) A Studies On Physico-Chemical Parameters to Assess Water Quality of Pavana River in Pune, Maharashtra.

Mahajan B, Shastri S and Londhe S (2021) Impact Assessment of Waste Water Streams on Water Quality of River Pavana in Pimpri Chinchwad City Area. In: 2021 International Conference on Computing, Communication and Green Engineering (CCGE), pp. 1–6. IEEE.

Mane AV, Pardeshi RG, Gore VR, Walave RL, Manjrekar SS and Sutar GN (2013) Water quality and sediment analysis at selected locations of Pavana river of Pune district, Maharashtra.

Mishra RK (2023) Fresh water availability and its global challenge. British Journal of Multidisciplinary and Advanced Studies 4(3):1–78.

Nerlekar T, Mulay BN, Gajghate P, Mane CP, Thorat SS and Chipade AM (2024) A Comparative Assessment of Water Quality in the Pavana River: Urban vs. Suburban Locations in Pune, India. Journal of Mines, Metals & Fuels 72(12).

Singh V (2024) Water Resources. In: Textbook of Environment and Ecology, pp. 107–122. Springer Nature Singapore.

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Ethics approval

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