



# A Study Of Laundry Waste Water Scenario In Kolhapur City India

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**Abstract:** Laundry wastewater is the byproduct of washing clothes and linens in homes, commercial facilities, hotels, and hospitals. It contains pollutants like detergents, dirt, oils, chemicals, and microorganisms, making it harmful to the environment if discharged untreated. This study focuses on the current scenario of laundry wastewater management in Kolhapur city, examining the practices of commercial, hospital, and hotel laundries. It explores the widespread discharge of untreated wastewater into municipal systems, which contributes to environmental pollution and strains local water resources. Through surveys, case studies, and laboratory analysis of wastewater samples, the study evaluates water quality parameters range such as pH 9-10, COD 900-1200, BOD 80-90, TDS 600-800, and TSS 60-80 which is beyond the limits of MPCB and CPCB. The waste water which is directly disposed in municipal sewer system needs immediate treatment. It also investigates the potential for adopting cost-effective and sustainable Laundry Wastewater Recycling (LWWR) systems tailored to the city's needs, aiming to reduce freshwater consumption, promote environmental conservation, and improve compliance with pollution control regulations.

**Index Terms** – Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Laundry Waste Water Recycling (LWWR)

## I. INTRODUCTION:

Water scarcity is an urgent global challenge that Hazards ecosystems, human health, and economic stability. The growing demand for freshwater, fueled by rapid population growth, urbanization, and industrialization, has placed immense pressure on natural water reserves. Many freshwater sources are not only overexploited but also heavily polluted by industrial discharge, agricultural runoff, and untreated domestic wastewater. This alarming situation underscores the need for immediate and effective solutions to conserve and manage water resources sustainably. One major contributor to this crisis is the laundry industry, which consumes significant amounts of water for its operations. Whether in residential, commercial, hotel, or hospital settings, the laundry sector requires substantial water resources, further straining the already limited supply. Additionally, the untreated wastewater discharged by laundry services adds to environmental degradation, polluting local water bodies and threatening aquatic ecosystems.

In response to these challenges, the concept of recycling laundry wastewater has emerged as a viable and sustainable solution. By treating and reusing wastewater, the industry can reduce its dependence on freshwater sources while minimizing environmental pollution. This approach not only conserves precious water resources but also aligns with global sustainability goals. This research focuses on analyzing the current scenario of laundry wastewater management in Kolhapur city. It aims to assess the extent of

wastewater generation, its disposal methods, and the potential for implementing recycling systems. Through surveys and case studies of various laundry operations in Kolhapur, this study seeks to highlight the pressing need for wastewater treatment and explore innovative methods to ensure efficient reuse. By addressing these issues, the research aims to contribute to sustainable water management practices in Kolhapur's laundry sector, paving the way for a more environmentally responsible future.

## **II. BACKGROUND STUDY:**

The laundry business in Kolhapur has a rich and long-standing history, deeply intertwined with the city's cultural and environmental landscape. Traditionally, the profession was dominated by washermen known as "dobis," who would gather at designated "dobi ghats" to clean large volumes of laundry for both households and businesses. These ghats were strategically located along major natural water bodies such as Rankala Lake, Kalamba Lake, Panchganga Ghat, and Rajaram Bandhara. These locations were not just functional spaces but also served as communal hubs where dobis worked in unison, drawing water from the lakes and rivers to rinse and wash the fabrics. The accessibility to these natural water sources was crucial for the sustenance of the laundry trade. In the past, the dobis performed their duties with minimal machinery, relying heavily on manual labor and the abundant water available from Kolhapur's lakes and rivers.

However, with the advent of urbanization and changing lifestyles, the laundry business in Kolhapur witnessed significant transformations. Over time, people moved away from public ghats, opting for the convenience of private laundry spaces within homes or commercial establishments. The rise of modern amenities like washing machines and easily accessible private water supplies led to this shift. Borewells became a primary water source for many laundry businesses, although in some cases, municipal corporation water was also used. In the current era, most laundry businesses, particularly in urban and semi-urban areas, have moved away from using natural water bodies due to concerns about water conservation, pollution, and regulations. However, some small-scale laundry operators, especially those in rural or less-developed regions, still rely on natural sources for their operations. Despite these changes, the evolution of the laundry business in Kolhapur is a reflection of broader environmental concerns and the need to adapt to changing resource availability and urban development.

## **III. NEED OF THE STUDY:**

The current laundry wastewater scenario in Kolhapur city presents significant environmental challenges due to the lack of proper treatment and disposal systems. Kolhapur, with its growing urban population and commercial activities, generates a considerable amount of wastewater from various laundry services, including hospitals, hotels, and commercial laundries. A majority of these facilities discharge untreated or minimally treated wastewater directly into municipal sewers, contributing to water pollution and threatening the health of nearby water bodies like the Panchganga River, Rankala Lake, Kalamba lake. This wastewater contains harmful chemicals, detergents, and other pollutants, which not only degrade water quality but also disrupt local ecosystems.

In this research paper, a comprehensive survey was conducted across multiple laundry services, including commercial laundry shops, hospital laundries, and hotel laundries. The analysis of the collected data revealed that nearly 90% of these establishments discharge their wastewater directly into the municipal sewer system. This practice highlights the urgent need for effective wastewater treatment solutions to mitigate the environmental impact and safeguard natural water resources.

## **IV. TARGET AUDIENCE:**

The survey for this research targeted local laundry shops, hospital laundries, and hotel laundries. Kolhapur hosts various types of laundries, including hotel, hospital, industrial, commercial, outsourcing laundry services, and residential laundry shops. Among these, hospital, hotel, and commercial laundries were specifically chosen as the focus of this study. The selection was based on the fact that these three types constitute the majority of laundries in the city and cater to the largest number of customers, thereby generating the highest volume of wastewater. These laundries handle significant loads daily, including linens from hospital operations, hotel accommodations, and commercial services. This high level of activity makes them critical contributors to wastewater generation within the laundry industry. By addressing

wastewater management in these areas, the study identifies substantial opportunities to mitigate water pollution and promote sustainability.

Targeting these specific sectors offers considerable potential for implementing effective wastewater recycling and treatment solutions, which could reduce the strain on local water resources. Such efforts would not only benefit the environment by minimizing water pollution but also support the city's broader water conservation and pollution control initiatives.

## V. METHODOLOGY:

To collect data for this research, a questionnaire survey was conducted with 15 laundries. Among these, three laundries representing different categories—hospital, hotel, and commercial laundry shops—were selected for detailed interviews and analysis. Subsequently, wastewater samples from these three laundries were collected and sent to a laboratory for testing. Key parameters such as pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD) were analyzed to assess the quality and environmental impact of the wastewater. This analysis provided insights into the pollution levels and treatment requirements specific to each type of laundry.

### V.1 TABULATION OF QUESTIONNAIRE SURVEY:

TABULATION OF DIFFERENT LAUNDRY SERVICES IN KOLHAPUR								
Sr. No.	Name of Laundry	No. Of Washing Machines	Per Day Washing	Detergents, cleaning Chemicals	Source of water	No. Of Washing Cycles	Water required per day	ETP Plant
1	Sayaji Hotel (for 120 Rooms) (hotel laundry)	a. Washing machine- 3 (90 kg, 50 kg, 30 kg, machines 7 kg -2 no.) b. Dryer - 2	700-1000 kg	Bleaching , caustic soda, private liquid	Bore well	3 to 4	1,30,000	Yes
2	D. Y. Patil hospital, Kadamwadi (Hospital Laundry)	a. Washing machine- 4 (90 kg, 50 kg, 30 kg, 30 kg) b. Dryer - 2	1000-1200 kg	Bleaching , caustic soda, private liquid	a. Deepwell -1 b. Borewell -1	4 to 5	1,50,000	Yes
3	Tonape Laundry ( Laundry Shop)	Washing machine- 2 (10 kg each)	200-300 Depending on orders	Soda, bleaching, ultrafar m, boush liquid, soap liquid, costic soda	a. Borewell -1 b. Municipal	Depends ( If necessary they do hand washing)	1500	No

4	Fab Expert ( Laundry Shop)	Washing machine-4 (20 kg, 10 kg, 6 kg ,6 kg) b. Dryer - 3	1000 kg	Private Company Detergent	Borewell	4	4000	No
5	Gayatri Laundry ( Laundry Shop)	Washing machine (20 kg )	300 kg	Caustic soda, Bleaching , starch	Bore well	6 to 7	1800	No
6	Rajhans Laundry ( Laundry Shop)	Washing machine-2 (7 kg )	200 kg	Caustic soda, Bleaching , starch	Borewell	6	1500	No
7	Tumbledry Dry clean and Laundry ( Laundry Shop)	Washing machine-2 (10 kg each)	500 kg	Private Company Detergent	Municipal	8	2000 - 2500	No
8	Finix Laundry Services (C. Laundry Shop)	Washing machine (23 kg)	100 kg	Eco-Lap company washing powder	a. Municipal b. Borewell	4	600	No
9	Kwik Clean Laundry ( Hospital, Hotel, Laundry shop)	Washing machine-2 (10 kg each)	200 kg	Private Company Detergent	Borewell	8	2000	Proposed
10	Students Home Laundry ( Hotel, C. Laundry shop)	Washing machine-4 (20 kg each)	500 kg	Caustic soda, Super wash Powder, Bleaching , starch	Borewell	4	9000	No
11	Arun Laundry ( Laundry shop)	Washing machine-2 (18 kg each)	200 kg	Bleaching , costic soda, private liquid	Borewell	5	800-1000	No
12	Sanjay Laundry ( C. Laundry shop)	Washing machine-2 (9 kg each)	100 kg	Private Company Detergent, Starch	Borewell	4	200-300	No
13	Swami Vivekanad Laundry ( C. Laundry shop)	Washing machine - 1 (36kg)	120 kg	Private Company Detergent	Borewell	3	200-300	No
14	Express Electrical Dry Cleaners ( C. Laundry	Washing machine-2 (9 kg each)	100 kg	Caustic soda, Bleaching , starch	Borewell	5	200	No

shop)								
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**Table 1 – Tabulation of different laundry services in Kolhapur**

## VI. AN INTERVIEW SURVEY:

As part of this research, an interview-based survey was conducted, focusing on three distinct case studies: a hotel laundry, a hospital laundry, and a commercial laundry shop. A detailed analysis of the operations, wastewater generation, and management practices at these laundries was carried out. Additionally, wastewater samples from each facility were collected and tested in a university laboratory to evaluate critical parameters, including pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). These tests provide valuable insights into the composition of laundry wastewater and play a crucial role in identifying the most effective recycling and treatment methods. The findings revealed contrasting approaches to wastewater management across the three laundries. Both the hotel and hospital laundries have implemented basic wastewater treatment systems. The treated water is primarily reused for secondary purposes, such as landscaping and toilet flushing, reducing their dependence on freshwater resources and contributing to water conservation efforts.

Conversely, the commercial laundry shop lacks any form of wastewater recycling or treatment system. All generated wastewater is discharged untreated, posing environmental risks and missing an opportunity to reduce water wastage. This comparative study underscores the need for improved awareness and adoption of wastewater recycling technologies, particularly in the commercial laundry sector. By integrating suitable treatment systems, even smaller laundries could significantly mitigate their environmental impact while conserving valuable water resources. The testing and analysis of wastewater parameters offer a foundation for recommending targeted, sustainable solutions tailored to the specific needs of each type of laundry facility.

### 1. SAYAJI HOTEL KOLHAPUR:

Sayaji Hotel, the only five-star establishment in Kolhapur, features 120 bedrooms and a banquet hall. Its laundry operations consume approximately 120,000 to 130,000 liters of water daily. The laundry includes hotel room linens such as bed sheets, towels, napkins, and curtains, as well as customer laundry, staff uniforms, and banquet hall-related items. Washing cycles are tailored to the color of the linen, and all laundry tasks are completed within the same day, eliminating the need for pre-washing. The process begins at 9 a.m. and concludes by 5 p.m. Laundry wastewater is collected in a storage tank, and once full, a chemical recycling process is initiated. After treatment, the recycled water undergoes parameter checks to ensure quality before being reused for various purposes

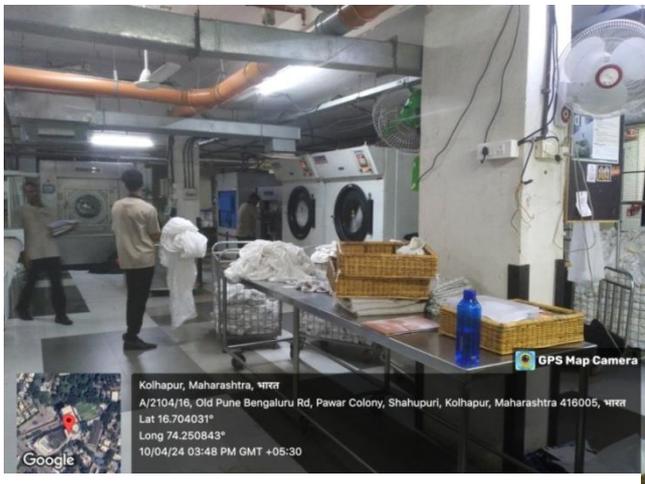


Figure 1- Sayaji Hotel Laundry



Figure 2- Sayaji Hotel Laundry

## 2. D.Y. PATIL HOSPITAL, KADAMWADI KOLHAPUR:

D Y Patil hospital Kadamwadi, a leading 1,000-bed facility in Kolhapur, operates a dedicated laundry service using 140,000–150,000 liters of water daily. The laundry handles hospital linens, including OT linen, which undergoes pre-washing and disinfection before standard washing. Washing cycles are adjusted by linen color, with daily loads completed the next day. The hospital manages laundry wastewater through a dedicated Effluent Treatment Plant (ETP) featuring continuous recycling. The process includes primary cleaning and secondary chemical treatment, ensuring efficient water reuse.



Figure 3- D.Y.Patil Hospital Laundry



Figure 4- D.Y.Patil Hospital Laundry

### 3. TONAPE LAUNDRY, MARKET YARD, KOLHAPUR:

Tonape Laundry and Dry Cleaners, a private shop specializing in residential laundry, handles items like sarees, shirts, pants, curtains, and towels. They use both manual and machine washing, requiring 1,500–1,700 liters of water daily, depending on orders. The washing cycle is adjusted based on linen color, with manual washing involving three cycles. All wastewater is discharged into the municipal sewer system.



Figure 5- Tonape Laundry



Figure 6- Tonape Laundry

#### VI.1 COMPARISON OF INTERVIEW SURVEY:

COMPARISON OF INTERVIEW SURVEY				
Sr. no.	Criteria	Sayaji Hotel, Old Pune–Bangalore road, Kolhapur	D.Y.Patil Hospital , Kadamwadi, Kolhapur	Tonape laundry and dry cleaners, Market Yard, Kolhapur
1	Type of laundry	Hotel	Hospital	Commercial Shop only includes residential laundry
2	Per day washing in kg	700 -1000 kg	1000 – 12000 kg	200 – 300 kg
3	prewashing needed	No	Yes	No
4	Follow Color code	Yes	Yes	Yes
5	Water Required per day	130,000	150,000	1500
6	Source of water	Bore well	Bore well, Deep well	Bore well, Municipal corporation
7	Detergent used for washing	Bleaching powder, Caustic soda, Private company liquid soap	Bleaching powder, Caustic soda, Private company liquid soap	Starch powder, Bleaching Powder, Liquid Soap, Caustic soda
8	Time required for per washing cycle	1 hour ( only for washing)	1 1/2 hour ( only for washing)	1 1/2 hour ( only for washing)
9	ETP Plant	Yes	Yes	No
10	Amount of water	Approximately	Approximately	-

	recovered	120,000	130,000	
11.	Method used	Chemical Coagulation	Sand Filtration and Chemical Coagulation	No method used
12.	Time required for water recycling	1 to 1 ½ hour	1 to 2 hour This ETP plant is continuous type plant.	-
13.	Process of ETP plant	First, all water is collected in a collection tank located adjacent to the ETP plant. Subsequently, chemical treatment begins	Once the water is collected in collection tank, it undergoes a filtration process to remove any large particles. After the filtration process, the water then moves to the chemical treatment stage.	-
14.	Chemicals Used in chemical treatment	Alum Dosing	Polymers and Poly aluminum Chloride	-
15.	Uses of Recycled water	Toilet Flushing, Gardening	Toilet Flushing, Gardening	-
16	Byproducts Obtained	Sludge & Organic Compounds used for gardening as a fertilizers	Sludge & Organic Compounds used for gardening as a fertilizers	-

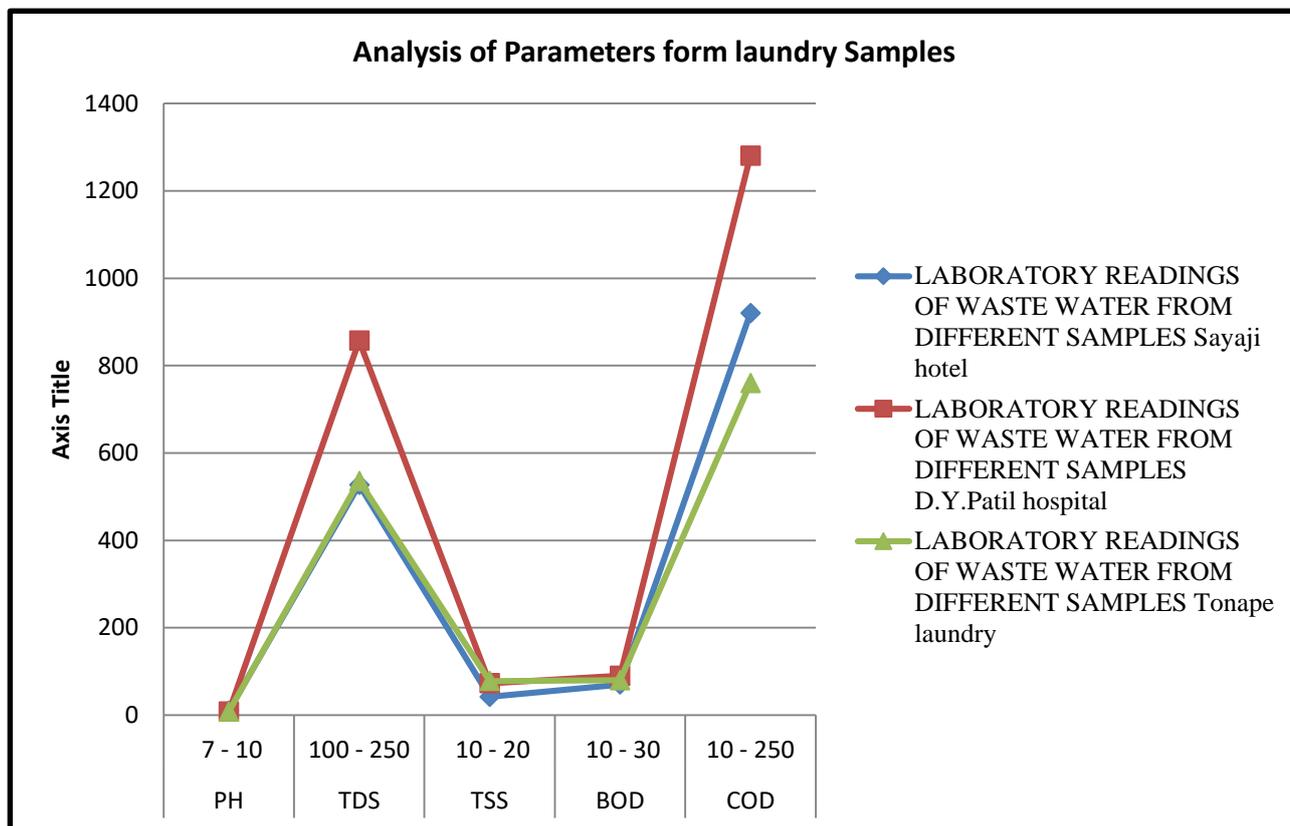
**Table 2 – Comparison of Interview survey**

## VII.LABORATORY REPORT:

Laundry wastewater samples from Sayaji Hotel Kolhapur, D.Y. Patil Hospital Kadamwadi, and Tonape Laundry Shop were submitted for laboratory analysis. The tests focus on critical parameters such as pH, temperature, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). These metrics are essential for assessing wastewater quality and evaluating the effectiveness of existing treatment methods. The findings will offer valuable insights into the environmental impact of laundry operations and guide the development of efficient wastewater management strategies for these establishments.



Figure 7 – Samples Submitted in Laboratory



Graph 1 – Analysis of Parameters from Laundry Samples

Table 3 – Basic Parameters and Laboratory Readings

BASIC PARAMETERS OF WATER REQUIRED FOR WASHING CLOTHS AND LABORATORY READINGS				
PARAMETERS	REQUIRED RANGE OF WATER	LABORATORY READINGS OF WASTE WATER FROM DIFFERENT SAMPLES		
		Sayaji hotel	D.Y.Patil hospital	Tonape laundry
PH	7 - 10	10.5	8	8.36
TDS	100 - 250	527	857	536
TSS	10 - 20	42	73	78
BOD	10 - 30	70	90	80
COD	10 - 250	920	1280	760



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Date: 23/4/2024

**Analysis Report**

**Sample Details:-**

*Sample Collected By Party	
Name	Ms. Dhanashree Pawar
Sample Type	Laundry Water
Sample No.	3
Date of Analysis	10/04/2024
Receipt Date	23/04/2024
Receipt Number	5376
Amount : Rs.	Rs.1365/-

**Results:-**

Sr. No.	Parameter	Unit	Sample			Analysis Method
			Private	Sayaji Hotel	D.Y.Patil Hospital	
1	pH	----	8.36	10.5	8	IS 3025, Part 11
2	TDS	mg/l	536	527	857	IS 3025, Part 15
3	TSS	mg/l	78	42	73	IS 3025, Part 15
4	BOD	mg/l	80	70	90	IS 3025, Part 44
5	COD	mg/l	760	920	1280	IS 3025, Part 15

\*Samples submitted for analysis were collected by party and analyzed by Department of Environmental Science, Shivaji University, Kolhapur.

Analyzed by

*CS Bhosale*  
23/4/24

Mr. Chetan S. Bhosale

Checked by

*P. R. Bhosale*

Dr. (Mrs.) P. R. Bhosale

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*A. S. Jadhav*

Dr. (Mrs.) A. S. Jadhav

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Figure 8- Laboratory Report of Laundry Waste Water

## VIII. CONCLUSION:

Water, essential for life, is becoming scarce due to population growth, industrialization, and pollution. This study highlights the serious challenges of freshwater depletion and pollution of water sources. The laundry industry, which uses large amounts of water, offers a chance to adopt wastewater recycling as a sustainable solution.

As per Table 3, the average readings of laundry wastewater are approximately: pH 9–10, TDS 600–800 mg/L, TSS 60–80 mg/L, BOD 80 mg/L, and COD 900–1000 mg/L, all of which exceed permissible limits. These values indicate the urgent need for recycling laundry wastewater. Additionally, Table 1 from the questionnaire survey reveals that around 90% of laundry businesses in Kolhapur city directly dispose of wastewater into the environment, causing significant harm to both living and non-living systems. According to this study following points needs to be focus.

1. **Environmental Impact:** Laundry wastewater in Kolhapur contains high pollutants, requiring urgent treatment and management.
2. **Diverse Practices:** Larger establishments use Effluent Treatment Plants (ETPs) for water recycling, while smaller laundries lack treatment systems.
3. **Recycling Potential:** Wastewater reuse in hotels and hospitals for landscaping and flushing proves recycling is effective.
4. **Laboratory Insights:** Most laundry wastewater exceeds safe limits, showing current practices are inefficient.
5. **Water Conservation:** Recycling systems can reduce freshwater use and lower laundry costs.
6. **Awareness and Support:** Smaller laundries need better awareness, affordable technology, and incentives for wastewater treatment.
7. **Policy Implications:** Stricter regulations are needed for compliance with wastewater treatment standards.
8. **Sustainability Goals:** Recycling systems can align the laundry industry with environmental sustainability.
9. **Scalable Solutions:** The study offers a framework for improving wastewater management in other urban areas.
10. **Collaborative Effort:** Effective wastewater management requires cooperation between businesses, policymakers, and environmental agencies.

Focusing on Kolhapur's laundry sector, this research shows how recycling laundry wastewater can reduce environmental damage and save costs. Recycling not only conserves water but also helps laundry businesses attract eco-friendly customers by showing environmental responsibility. The study stresses the need for water conservation through innovative solutions like wastewater recycling. Such practices can help the laundry industry thrive while protecting the environment and supporting sustainability goals.

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