Water audit report

In collaboration with the DBT Star College Scheme

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INTRODUCTION

Water is a vital natural resource essential for human survival, ecological balance, and socio-economic development. Rapid urbanisation, population growth, and increasing institutional activities have led to a significant rise in water demand, often resulting in over-extraction and deterioration of water quality. Educational institutions, being high-use public spaces, play an important role in water consumption and wastewater generation. Therefore, systematic assessment and responsible management of water resources within such institutions are necessary.

A water audit is a scientific and systematic process used to assess water consumption, identify sources of water use and loss, evaluate water quality, and suggest measures for efficient utilisation and conservation. It helps institutions understand how water is used, where it is wasted, and how sustainability can be improved through informed decision-making.

WHAT IS A WATER AUDIT

A water audit is a comprehensive evaluation of water inflow, usage, storage, and outflow within a defined system such as a household, institution, or locality. It involves both quantitative assessment (amount of water consumed) and qualitative assessment (quality of water). The objectives of a water audit include:

- Estimating total water consumption
- Assessing water quality parameters
- Identifying inefficient water use and losses
- Promoting water conservation and sustainable practices

Water audits are commonly conducted at multiple levels, including institutional, domestic, and community or area levels, to obtain a holistic understanding of water usage patterns.

METHODOLOGY ADOPTED IN THE WATER AUDIT

A three-level water audit was conducted in Vile Parle (Mumbai) to assess both water consumption and water quality. The study integrates field observations, survey-based data, and experimental analysis using a water testing kit.

The three levels included:

1. Institution-level water audit (Sathaye College)
2. Individual / household-level survey using Google Forms
3. Area (pin code) -level water quality analysis using physico-chemical parameters and BOD estimation
    Pincode level sample were taken from:
    1. Koledongri area
    2. Nariman Road
    3. Tejpal Road
    4. Hanuman Road
    5. Shraddhanand Road

LEVEL 1: INSTITUTION-LEVEL WATER AUDIT (SATHAYE COLLEGE)

The institutional water audit was conducted to estimate the daily water consumption pattern of Sathaye College, a non-residential educational institution. Since direct water meter readings were not accessible, the audit was carried out using standard institutional water-use norms and Google Maps-based campus area measurements.

The total campus area measured using Google Maps was 5,114.37 m², with a perimeter distance of 294.91 m. Water consumption was estimated based on activities such as drinking, sanitation, personal cleaning, cooking, floor cleaning, and gardening. These estimates provide an approximate but realistic assessment of institutional water use. This level helps in understanding how water is distributed across various activities within the campus and highlights areas where conservation measures can be implemented.

LEVEL 2: INDIVIDUAL / HOUSEHOLD-LEVEL WATER AUDIT (SURVEY-BASED STUDY)

The second level of the water audit focused on individual and household water usage patterns. A structured Google Form survey was designed and circulated among residents of the Vile Parle area. Responses were collected from over 100 participants, providing representative data on domestic water use. The survey included questions related to:

- Source of water supply
- Daily water consumption habits
- Water storage practices
- Awareness about water conservation
- Perceived water quality

The collected data were analysed to understand public awareness, consumption behaviour, and common water-use practices at the household level. This level complements the institutional audit by incorporating community participation and perception.

LEVEL 3: AREA / PINCODE-LEVEL WATER QUALITY ANALYSIS (VILE PARLE)

The third level involved experimental water quality analysis of samples collected from different locations within the Vile Parle area, including Koledongri, Nariman Road, Tejpal Road, Hanuman Road, Shraddhanand Road, and Sathaye College. Water samples were analysed using a water testing kit to determine the following parameters:

- Colour and odour
- pH
- Total Dissolved Solids (TDS)
- Electrical Conductivity (EC)
- Temperature
- Nutrient content (Nitrogen, Potassium, Phosphorus)

In addition, Biochemical Oxygen Demand (BOD) was calculated using the standard formula:

$$BOD = Day\ 1\ DO - Day\ 5\ DO$$

BOD analysis indicates the organic pollution load present in water. This parameter is crucial for assessing water quality and its suitability for domestic and environmental use.

SIGNIFICANCE OF THE WATER AUDIT

By integrating institutional assessment, public participation, and scientific water analysis, this three-level water audit offers a comprehensive evaluation of water usage and quality in the Vile Parle region. The study emphasises the importance of water conservation, awareness, and sustainable management practices at all levels of society.

Level	Scope	Method Used
Level 1	Institution (Sathaye College)	Area estimation & standard water-use norms
Level 2	Individual / Household	Google Form survey (100+ participants)
Level 3	Area / Pincode (Vile Parle)	Water testing kit & BOD analysis

RESULTS AND INTERPRETATION

- Water Quality Analysis (Physico-Chemical Parameters)

table no.	water sample	colour	odour	Nitrogen (red) kg/acr	potassium (blue) kg/acr	K - Phosphorous (yellow) kg/acr	pH (green)
1	koledongri	colourless	odourless	10	15	150	4.5
2	nariman raod	colourless	odourless	10	25	150	4.5
3	tejpal road	colourless	odourless	10	25	0	6
4	Hanuman Road	colourless	odourless	20	45 or ≥45	0	4.5
5	shraddhanand road	colourless	odourless	10	25	150 or ≥ 150	4.5
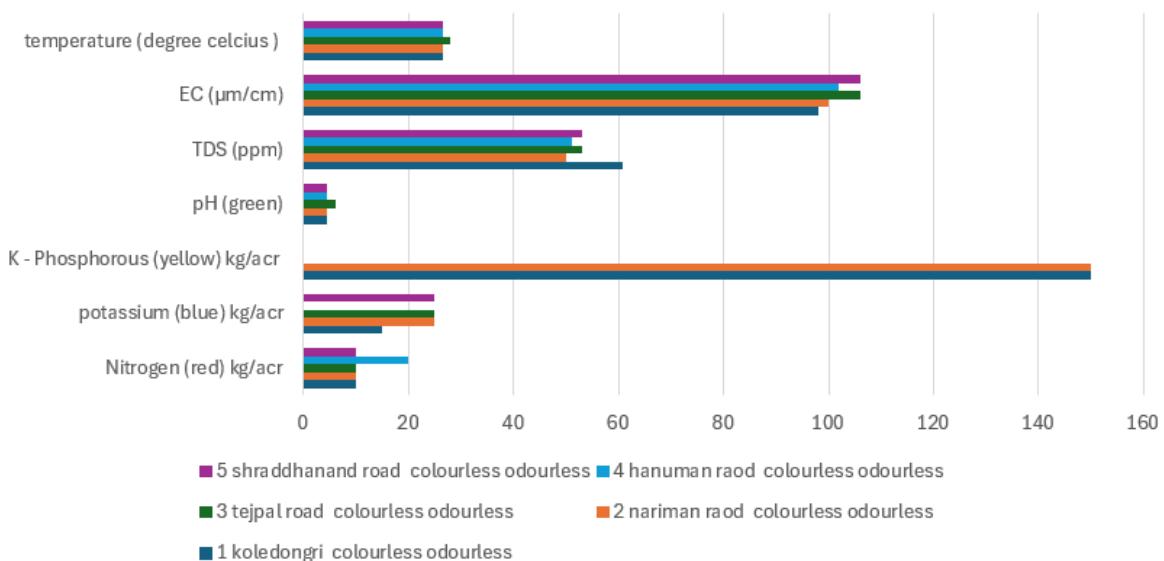
TDS (ppm)	EC (µm/cm)	temperature (degree Celsius)
60.72	98	26.6
50	100	26.6
53	106	27.9
51	102	26.5
53	106	26.5

Water samples collected from different locations in the Vile Parle area were analysed using a standard water testing kit. The parameters studied included colour, odour, pH, Total Dissolved Solids (TDS), Electrical Conductivity (EC), temperature, and nutrient content (Nitrogen, Potassium, and Phosphorus).

Results

- All water samples were colourless and odourless, indicating the absence of visible contamination.

- The pH values ranged from 4.5 to 6, indicating slightly acidic conditions in most samples.

- TDS values ranged between 50–60.72 ppm, which are well within permissible limits for drinking water.

- Electrical Conductivity (EC) values ranged from 98 to 106 µS/cm, suggesting low dissolved ionic content.

- The temperature of samples ranged from 26.5°C to 27.9°C, consistent with ambient environmental conditions.

- Nutrient analysis showed low to moderate Nitrogen and Potassium levels, while Phosphorus was absent in some samples and elevated in others.

Interpretation

The physico-chemical analysis indicates that the water quality in the study area is generally good with respect to physical parameters such as colour, odour, TDS, and EC. However, the slightly acidic pH values observed in most samples may be attributed to urban runoff, atmospheric pollution, or ageing pipeline infrastructure. Although the TDS and EC values are within acceptable limits, continued monitoring is necessary to prevent the gradual deterioration of water quality.

II. Biochemical Oxygen Demand (BOD) Analysis

BOD was calculated using the standard formula:

$$BOD = Day\ 1\ DO - Day\ 5\ DO$$

Water Sample Location	Day 1 (mg/L)	Day 5 (mg/L)	BOD (mg/L)
Shraddhanand Road	13.5	9.5	**4.0**
Koledongri	9.6	8.6	**1.0**
Hanuman Road	8.3	11.5	**−3.2**
Sathaye College	11.0	8.3	**2.7**
Tejpal Road	11.2	8.5	**2.7**
Nariman Road	10.0	11.0	**−1.0**

Interpretation

- Positive BOD values (1–4 mg/L) indicate the presence of biodegradable organic matter.

- Shraddhanand Road showed the highest BOD value (4 mg/L), suggesting moderate organic pollution.

- Koledongri and Sathaye College samples showed low BOD, indicating comparatively cleaner water.

- Negative BOD values (Hanuman Road and Nariman Road) may be due to experimental error, aeration during incubation, or instrumental limitations of the testing kit, and should be interpreted cautiously.

Overall, the BOD values suggest that the water quality in the study area ranges from good to moderately polluted, with no evidence of severe organic contamination.

III. Analysis of Survey-Based Household Water Audit

A Google Form–based survey was conducted with **108 participants** to assess household water usage and awareness.

Key Observations

- Over 95% respondents reported using municipal water supply as their primary source.

- A majority of participants bathe once or twice daily, with bucket bathing being more common than showers, indicating moderate water use.

- More than 50% respondents flush toilets 7–10 times per day, with single-flush systems being predominant.

- Most households use washing machines, with laundry typically done 2–3 times per week.

- Water reuse practices such as using RO wastewater for plants or laundry water for mopping were reported by only one-third of participants.

- Awareness regarding water conservation was present, but consistent implementation was limited.

Interpretation

The survey highlights that although residents are **aware of water conservation**, actual practices such as reuse, low-flow fixtures, and reduced wastage are **not uniformly adopted**. Domestic water consumption patterns indicate scope for improvement through behavioural change and awareness programs.

INTERACTION WITH INSTITUTIONAL MANAGEMENT STAFF

As part of the institutional water audit, a personal interaction and informal interview were conducted on Tuesday, 23 December, with two staff members responsible for water supply and maintenance activities within the institute. The purpose of this interaction was to obtain firsthand information regarding the source of water, supply duration, storage facilities, sanitation infrastructure, maintenance practices, and water conservation measures followed on campus.

During the interaction, the staff members provided details about the primary source of water supply, which is mainly municipal water supplemented by groundwater, and the daily supply duration, which ranges between 2 and 4 hours. Information regarding water storage tanks, their capacity, and usage patterns was also shared. The staff confirmed that water is stored in overhead and semi-underground tanks and is distributed across the campus for Various purposes.

The interview also revealed that routine maintenance of plumbing systems is carried out to address leakages and blockages, although advanced water-saving fixtures such as dual-flush systems and aerator taps are not uniformly installed across the campus. The staff members highlighted that toilets are cleaned twice daily, ensuring hygiene and sanitation standards are maintained. However, wastewater generated within the institute is not treated on-site and is directly discharged into the municipal drainage system.

In addition, the staff informed us about the presence of a rainwater harvesting system, which is primarily used for storage and gardening purposes, especially during the monsoon season. Regular cleaning of catchment areas is conducted before the monsoon, although systematic groundwater-level monitoring is not practised.

CONCLUSION

The present water audit was conducted at three levels: institutional, household, and area (pincode) level to obtain a comprehensive understanding of water consumption patterns and water quality in the Vile Parle region of Mumbai. The institutional water audit of Sathaye College indicated that a major proportion of water is utilised for sanitation, toilet flushing, and personal hygiene activities, which constitute the highest demand among all water-use categories. This highlights the critical need for improving water-use efficiency, particularly in sanitation infrastructure and daily operational practices.

The water quality assessment carried out at the area level showed that the collected water samples were colourless and odourless, with Total Dissolved Solids and Electrical Conductivity values within acceptable limits. However, the slightly acidic pH values observed in several samples and the presence of moderate Biochemical Oxygen Demand (BOD) levels at certain locations indicate the influence of urban activities and emphasise the necessity for regular monitoring and timely preventive measures to maintain water quality.

The household-level water audit, conducted through a structured survey, revealed that while a considerable level of awareness regarding water conservation exists among residents, the actual adoption of conservation and reuse practices remains limited and inconsistent. High dependency on municipal water supply, frequent water usage for bathing and flushing, and limited greywater reuse were observed, suggesting significant scope for behavioural change and improved water management at the domestic level.

Overall, the water audit clearly demonstrates that effective water management is a shared responsibility involving institutional administration, individual users, and the surrounding community. Sustainable water use can be achieved only through systematic assessment, informed planning, regular monitoring, and active participation of stakeholders. The findings of this water audit underline the importance of adopting water-efficient practices and strengthening conservation efforts to ensure long-term water sustainability in urban regions.

RECOMMENDATIONS

Based on the findings of the water audit, a set of practical and sustainable recommendations is proposed to improve water management at the institutional, household, and community levels.

At the institutional level, significant water savings can be achieved by improving sanitation infrastructure and daily operational practices. The installation of dual-flush systems and aerator-fitted taps can substantially reduce water consumption in toilets and wash areas, which were identified as the major water-consuming activities. Regular inspection and maintenance of plumbing systems are essential to prevent leakages and unnoticed losses. In addition, the existing rainwater harvesting system should be expanded and utilised more effectively, particularly for non-potable uses such as gardening and floor cleaning. Periodic water quality testing within the campus is also recommended to ensure the safety of drinking water and to detect any deterioration in water quality at an early stage.

At the household level, water conservation can be strengthened through changes in daily habits and increased adoption of efficient practices. Encouraging bucket bathing instead of shower bathing can significantly reduce domestic water consumption. The reuse of greywater, such as water from washing clothes or RO units, for gardening and floor cleaning should be actively promoted. Households should be encouraged to adopt water-efficient appliances, including low-water-use washing machines and dual-

flush toilets. Awareness campaigns focusing on reducing unnecessary flushing, avoiding continuous tap flow, and responsible water use can help translate awareness into consistent action.

At the community or area level, coordinated efforts are required to maintain water quality and ensure a sustainable supply. Regular monitoring and maintenance of municipal water pipelines can help prevent contamination caused by leakages or cross-connections with sewage lines. Periodic BOD and physico-chemical water quality testing at the ward level is recommended to track changes in water quality and identify potential sources of pollution. Furthermore, community-based awareness programs on water conservation, rainwater harvesting, and pollution prevention can foster collective responsibility and long-term sustainable water management.

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