

DEMAND SIDE WATER AUDIT:



KEY TO WATER CONSERVATION

PART-3

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Introduction

Water links the environment, economy, and quality of life. In the ongoing battle against water scarcity and environmental degradation, the attention on water consumption by the built-up sector has raised several questions. Buildings, the cornerstones of modern life, harbour both immense potential for conservation and significant challenges in managing water resources effectively. Within this context, demand-side water audits emerge as indispensable tools, offering a nuanced perspective on consumption patterns and opportunities for sustainable practices. Unlike traditional water audits that focus solely on overall consumption, demand-side audits delve deeper, scrutinizing the myriad ways in which water is utilized within the built environment. From the humble tap to the complex machinery of industrial processes, every droplet is accounted for, every opportunity for conservation identified.

While the previous issue discussed about the types of demand side water audits, the present article delves deeper into the methodology employed in conducting a demand side water audit in respect of buildings. First, let us understand why do we need more of demand side audits in the present world.

Efficient buildings can significantly improve water efficiency. The actual savings depend largely on when the building was constructed or when any conservation/efficiency improvement efforts were made with the oldest buildings offering the greatest potential savings. Adopting Performance standard IS 17650 (Part 1&2) developed by BIS in 2021 for water efficient Sanitary ware and Sanitary fittings would reduce water consumption by 8 trillion litres, and avoid 51 TWh of energy consumption if all taps and showerheads are replaced with compliant models (median lifetime is 2 years for showerheads up to 10 years for taps).



Why we need more demand side audit?

To quantify water consumption and identify leakages: By meticulously measuring consumption patterns, these audits can pinpoint inefficiencies and detect leakages that may otherwise go unnoticed, thus conserving precious water resources and reducing operational costs.

To assess infrastructure integrity within the facility: Demand-side audits help evaluate the condition of water distribution systems, plumbing fixtures, and other infrastructure components within buildings.

To comply with local and national regulations and promote water conservation: With the help of an audit, organizations can comply by the local and national regulations and efficient water use practices.

To formulate targeted strategies for sustainable water utilization: Demand-side audits enable stakeholders to identify opportunities for efficiency gains, prioritize interventions, and allocate resources effectively. Whether it's retrofitting fixtures, optimizing processes, or implementing behavioral changes, these strategies can yield significant water savings and environmental benefits.

To set benchmarks and enhance system efficiency: Based on the audit results, sector specific benchmarks can be set to optimize and enhance the efficiency of the system. It is one of the recommendations of National Workshop for Water Audit and Water Conservation, 2004 organized by Central Ground Water Board.

How do organizations get benefitted?

- Help organizations increase water efficiency within facilities by implementing a water efficiency program.
- Help identify immediate- and long-term opportunities for water efficiency improvements in the facilities.
- Help companies and institutions in furnishing details like surface water, Ground water, Desalinated water, power consumed in pumping and total volume of water consumption (in kilolitres). Water intensity per rupee of turnover required as per the new Business Responsibility and Sustainability Report (BRSR) introduced by SEBI in 2021.
- Help commercial entities extracting ground water submit online annual water audit report including an audit of water use.

There is increased regulatory pressure in the nation to manage water efficiently, including the following significant developments:

- **Bharat Tap An Initiative**¹- MoHUA (Ministry of Housing and Urban Affairs) launched "Bharat Tap - An Initiative" on 12th May 2022 during PlumbexIndia exhibition to popularize the use of water efficient plumbing Sanitary ware and Sanitary fittings as per IS 17650 Part 1 and Part 2 in collaboration with Indian Plumbing Association. This ensures efficient plumbing fixtures such as sanitary ware like water closets, flushing cisterns, urinals, etc., and sanitary fittings like showers, mixers, taps/faucets as being used. This will lead to minimum 40% saving of water at source.

- **Green Credit Programme 2023**²: Ministry of Environment, Forest and Climate Change notified the Green Credit Rules, 2023 to leverage a competitive market-based approach for green credit for



incentivizing environmental actions of various stakeholders. The rules include water management as one of the major program activities. Thus, stakeholders will earn green credit through sustainable actions like water conservation, water harvesting and water use efficiency including treatment and reuse of wastewater.

- **Atal Mission for Rejuvenation and Urban Transformation - AMRUT 2.0** was launched in 2021 to achieve circular economy of water through development of City Water Balance Plan (CWBP) for each city focusing on recycle/reuse of treated sewage, rejuvenation of water bodies, rooftop rainwater harvesting measures, water-efficient plumbing fixtures and water conservation³.
- **Sustainability of Business including ESG compliances relating to water and wastewater:** Vide Gazette notification no. SEBI/LAD-NRO/GN/2021/22 dated May 05, 2021, SEBI has introduced new reporting requirements on ESG parameters called the Business Responsibility and Sustainability Report (BRSR). The BRSR seeks disclosures from listed entities on their performance against the nine principles of the 'National

1. PIB, 2022
2. MOEF Notification, 2023
3. PIB, 2022



Guidelines on Responsible Business Conduct' (NGBRCs) and reporting under each principle is divided into essential and leadership indicators. The essential indicators are required to be reported on a mandatory basis while the reporting of leadership indicators is on a voluntary basis. The BRSR is intended towards having quantitative and standardized disclosures on ESG parameters to enable comparability across companies, sectors and time. Such disclosures will be helpful for investors to make better investment decisions. The BRSR shall also enable companies to engage more meaningfully with their stakeholders, by encouraging them to look beyond financials and towards social and environmental impacts.

As per the **Business Responsibility & Sustainability Reporting Format, Annexure I, Principle 6**, Details like surface water, Ground water, Desalinated water, Power consumed in pumping and Total volume of water consumption (in kilolitres) Water intensity per rupee of turnover (Water consumed / turnover), Water intensity (optional) – the relevant metric may be selected by the entity. These details are to be furnished on year-on-year basis for which Water Audit is required. This manual will help in devising methodology of conducting a successful water audit.

- **A National Workshop for Water Audit and Water Conservation** was organized in 2004 jointly by Central Water Commission (CWC) and Central Ground Water Board (CGWB). It pointed out water audit to be an effective tool for water audit and measurement of relative performance and recommended that a Benchmarking system of various suitable parameters for all sectors of water use may be



developed and introduced for optimizing and enhancing the efficiency of the system. Water audit of built-up spaces will help in setting benchmarks for each sector of built environment like residential, commercial, institutional facilities etc . This manual has also focused on use of sectoral benchmarks for certification water sustainability in buildings.

- A steering committee led by NITI Aayog (A policy think tank) published a report on '**Water Neutrality for Indian Industry**' to bring out a standard definition and approach for water neutrality/positivity based on defining key principles on which water neutrality should be based. It is envisaged that the standardized definition, approach, and principles put forth, will benefit the industry immensely. It will also help in extending and evolving this approach to other sectors/areas of the economy



such as for towns and cities for a secured water future. A clear methodology has been defined to assess water neutrality and water positivity required across sectors to ensure sustainable use of water. Based on assessment, incentives are also proposed like rebates on use of appliances with water efficient models, supplying free retrofit kits for households and businesses to avoid wastage. By integrating water audits into the methodology proposed by the committee, stakeholders can gain valuable insights into their water usage patterns, enabling them to make informed decisions and take proactive measures to conserve water resources effectively. By conducting comprehensive water audits, we can gather essential data to assess the current state of water usage, identify areas of inefficiency, and develop targeted strategies for improvement which will serve as the foundation for setting benchmarks and monitoring progress towards water neutrality goals.

4. CWC and CGWB 2017



Though, there is a huge of demand side water audits; there is no document available in India to guide water audit of built-up areas as represented in the following table. Organizations like CPHEEO (Central Public Health & Environmental Engineering Organisation), CWC (Central Water Commission), BIS (Bureau of Indian standards) and MoEFCC (Ministry of Environment, Forest and Climate Change) have issued rules and

regulation around water supply, water quality monitoring, wastewater discharge standards and water conservation but do not focus on providing a defined methodology for auditing water at the demand side. In light of this, the Water Audit Council an initiative of Indian Plumbing Association has drafted a Water Auditor's Guide to elaborate on the process of water auditing typically for the built-up area.

Guidelines and Manuals	Key points
Guidelines and benchmarks for green large area development	Focuses on the preservation of surface water and water quality, protecting and enhancing on-site water resources, reusing and recycling wastewater, and sustainable storm-water management for large-area development
EIA	Tool for imposing restrictions and prohibitions on new projects or activities, or the expansion or modernization of existing projects or activities based on their potential environmental impacts on water and other natural resources
Advisory on Conservation and Restoration of Water Bodies in Urban Areas by CPHEEO 2013	Reflects the environmental and social impact of lake restoration and also suggests steps in Lake Conservation, additional support by the Government of India for water conservation is discussed.
BIS Standards	Sets acceptable limits and the permissible limits for water Assessing the quality of water resources, and checking the effectiveness of water treatment and supply by the concerned authorities
CPHEEO Manual on Water Supply & Treatment 1994	Summarizes legal and policy matters related to water supply, quality monitoring, and management
General Guidelines for Water Audit & Water Conservation by CWC 2017	Discusses action plans for water conservation and describes steps for water audit of supply facilities
NRW reduction tool kit by JnNURM 2012	Provides the idea of auditing water supply and calculating losses at various stages from the water treatment plant to the consumer's premise level
Conservation and management of lakes by MoEFCC	Describes legal and regulatory framework and technologies involved in lake restoration Catchment-based initiatives along with policy initiatives for the protection of lakes is discussed
Manual On Water Supply and Treatment Systems (Drink From Tap)	Ensure efficient, sustainable, and accessible water supply for our growing urban communities Capacity Building, Asset Management, and Public Private Partnership are crucial for the successful management of a Drink from Tap Water Supply System.



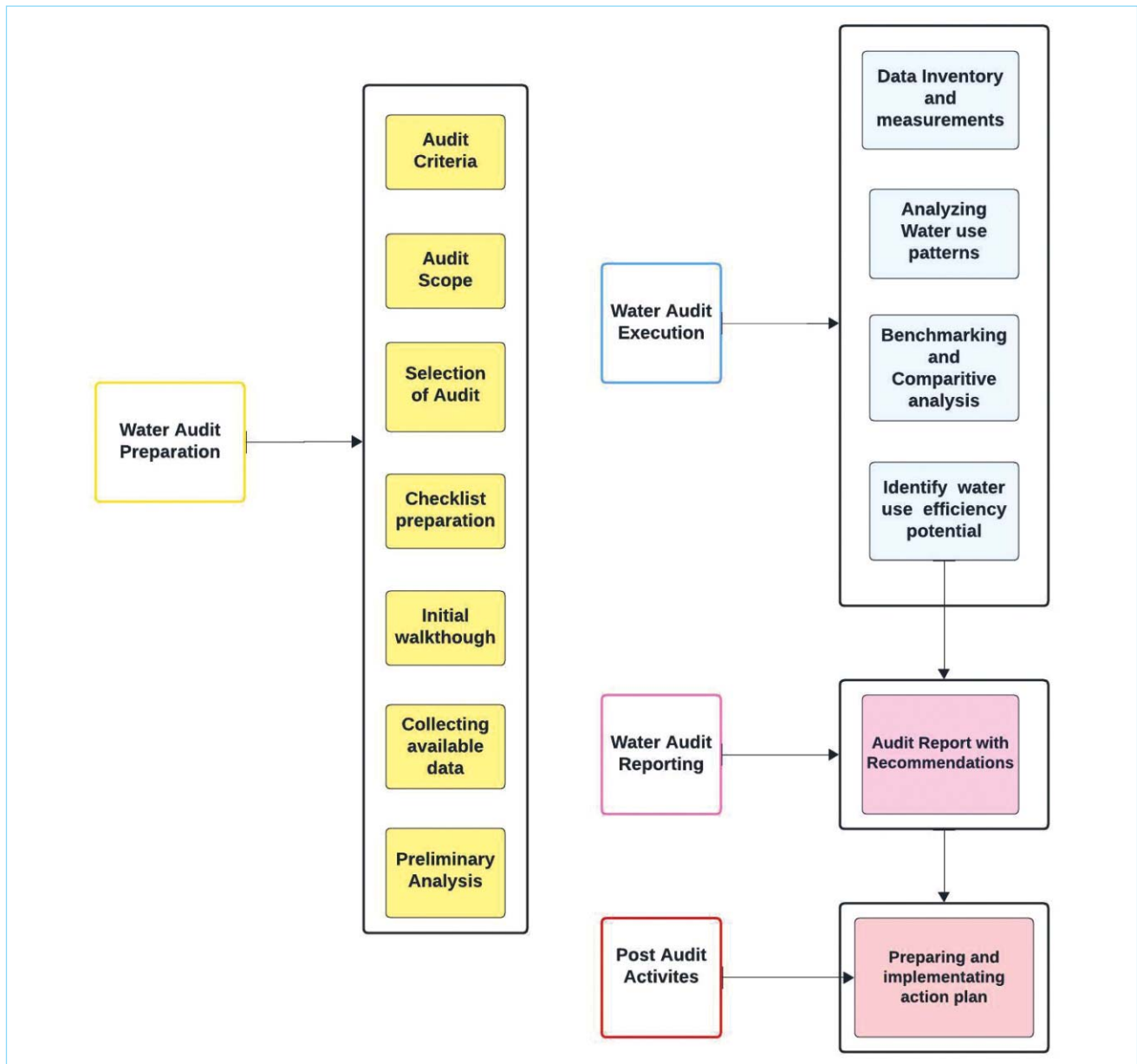
Methodology of Demand-Side Water Audit

Water Audit of a building can typically be carried out as per ISO 46001:2019 methodology. Periodicity of water audit and its report may be determined in advance at the commencement of commissioning the project by the project authority and the auditing party and appropriate provision of fund may be made for its implementation. Ideally, an audit is recommended bi-annually. Conducting a demand-side water audit is a systematic process that involves several key steps to assess water usage within a building or facility comprehensively:

- Water audit Preparation (Pre-survey information and data collection, Site survey)

- Water Audit Execution (Analysis of the data collected)
- Water Audit Reporting (Documentation of results obtained)
- Post Audit Activities (Formulation of water-saving solutions and implementation)

The process of carrying out a water audit is defined but the data inventory details can be customized and tailored according to the type of facility audited, the scale of building and the detail in which audit is to be carried out. Data inventory is the most important section and may require the longest time among the four phases. Let us understand each steps in detail.





1. Water Audit Preparation

- a) **Audit criteria:** Define the criteria that will guide the water audit process. This may include objectives such as reducing water consumption, improving efficiency, identifying leaks, or ensuring compliance with regulations.

Determine the indicators that will be used to measure the success of the audit. Examples include reduction in water consumption, reduction in water bill and energy bill, water use efficiency etc.

- b) **Audit Scope:** Define the boundaries and extent of the audit, including the facilities, systems, and processes that will be included.

Consider factors such as geographic location, size of the facility, types of water use (e.g., industrial, commercial, residential), and availability of resources.

- c) **Selection of Audit Team:** Identify the individuals or team members who will be responsible for conducting the water audit. This may include internal staff with expertise in water management, as well as external consultants or specialists if needed.

- d) **Checklist Preparation:** Develop a checklist or audit tool to guide the audit process and ensure consistency in data collection and analysis. The checklist should cover various aspects of water usage, including water fixtures, equipment, processes, and management practices. Customize the checklist based on the specific objectives and scope of the audit, as well as any relevant regulations or industry standards.

- e) **Initial Walkthrough:** Conduct an initial walkthrough of the facility or area to be audited to familiarize the audit team with the layout, water systems, and key water use points.

- On-site discussion with facility manager and personnel
- Basic information that is required is:
 - The contact person
 - The basic building characteristics
 - Gather all the plans from the contractor and the maintenance personnel
- Utility bills provide useful data on water supply and consumption (water purchased and tariffs paid). Bills going back number of years (at least 3) will enable long-term trends in water usage

- Regular readings from water meters and any sub-meters present
- Identify potential areas of concern, such as visible leaks, outdated equipment, or inefficient practices. Take note of any opportunities for improvement or areas where data collection may be needed during the audit.

- f) **Collecting Available Data:** After initial information is collected about the building, a walk-through survey must be conducted to collect primary data. It will provide much additional information which cannot be obtained from the plans. The assessment of the condition of the building (e.g., the efficiency of water fittings, leakages from fittings, etc.), and interviews with building managers, engineers, caretakers, and others can provide useful anecdotal evidence and a better understanding of the operation of the building. Other points to be noted are:

- Plans/elevations/slope/design of the building (water recycling line, storm water collection line)
- Information on the building's purpose, hours of work and operation
- Past trends in water consumption, current sources, supply amount, source metering, distribution, storage, wastewater generation

- g) **Preliminary Analysis:** Conduct a preliminary analysis of the available data to identify trends, patterns, and potential areas of concern.

Use the preliminary analysis to inform the development of the audit plan and prioritize areas for further investigation during the audit execution stage.

2. Water Audit Execution:

The form and extent of the analysis depends on the depth of the audit, nature of the building and the needs of the client. Collection of Data Inventory and measurements should include the following points:

- i. Quantification of baseline water map
- ii. Monitoring and measurements using pressure and flow meters and various other devices
- iii. Quantification of inefficiencies and leaks
- iv. Modelling the water balance i.e. balance between water supply, consumption and losses
- v. Identifying areas of water losses and inefficiency
- vi. Estimating possible energy savings due to improved water infrastructure



3. Water Audit Reporting

Observations of water audit (water leaks, identification of water saving solutions and implementation plan) must be communicated with the organization in the form of water audit report. The audit report presented to the client must outline:

- a) Identification of locations/areas of an organization's current water use
- b) Identification of water recycling potential in the organization's processes and measurement of quantity and quality of water before and after for those processes that have been identified as having water recycling/recovery potential
- c) Identification of water savings measures
- d) Cost-effectiveness of the methods recommended
- e) Investment required in improving water usage in the facility
- f) Action plan to implement the identified measures including identified savings, program priority and implementation timelines.
- g) List of best options to earn green water credits and water neutrality within the premises
- h) Recommendations for various remedial action/installations, fittings for reduction in water consumption and improvement in water distribution efficiency.
- i) Suggestions on ETP/STP Plant
- j) Suggestions on rainwater harvesting systems and water recycling system

4. Post-Audit Activities

The primary objectives of post audit activities is to

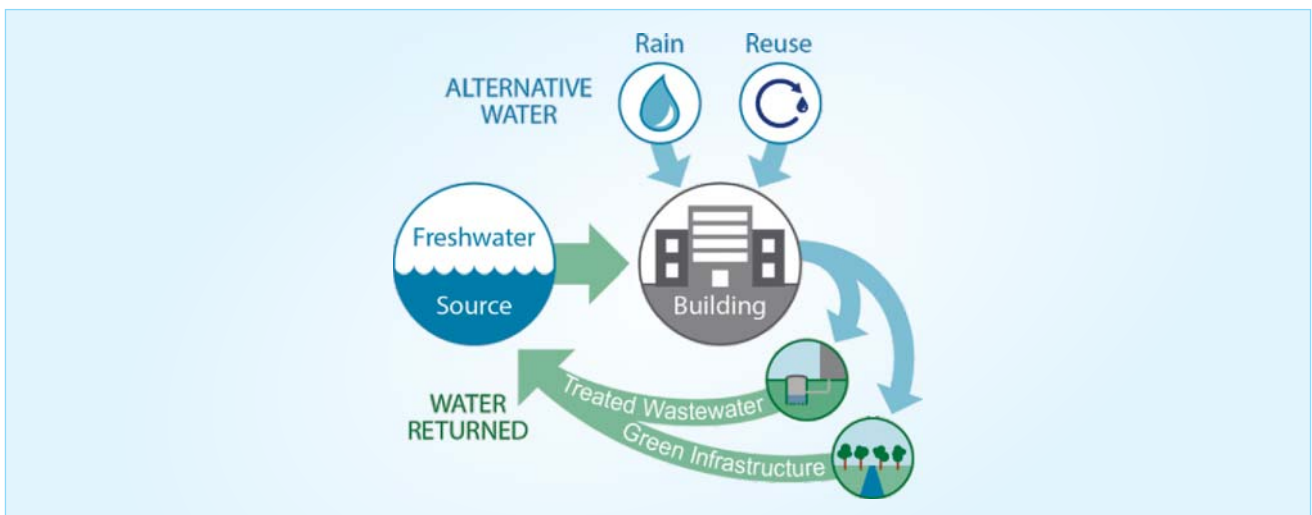
prepare a water conservation action plan highlighting water savings solution and a cost-benefit analysis. The analysis of the data collected should result in the identification of water consumption and water losses. Losses can be reduced by implementation of no-cost solutions (changes to water infrastructure, recycling of water, low-tech solution such as rain water harvesting system) to highly engineered and costly measures (installation of dual piping systems for drinking water and treated water). After suitable means of water use reduction are identified, the estimated savings should be calculated and their cost effectiveness should be assessed.

Finally, a water conservation action plan must be formed with two kinds of measures:

1. Water conservation within the premises (achieving net-zero)
2. Water conservation within the same geological aquifer (achieve water neutrality)

Net zero measures: This includes simple and innovative measures focusing on reducing water usage, harnessing alternative sources of water such as reuse of treated wastewater and rainwater and designing green infrastructure. These can easily be included in new buildings, and retrofitted to old ones, for establishing net zero water buildings.

Water Neutral measures: Water Neutrality can be defined as "Total freshwater consumption should either be less than or equal to all the quantifiable (and verifiable) water savings both in plant's watershed as well as critical watersheds from where supply chains are derived. Priority must be given to neutralizing impacts in same watersheds or aquifers where high criticality exists and impact occurs. Any new developments in





built areas must ensure total water use in the region after development must be equal to or less than total water availability in the region. The 7R approach can be adopted to move towards water neutrality.



Conclusion

As we look towards the future, demand-side water audits will play an increasingly pivotal role in shaping our built environment. They will guide us towards a future where every drop is valued, every action is purposeful, and every building stands as a beacon of sustainable water management. The stewardship of our limited water resources isn't solely the government's responsibility; it falls upon each of us as individuals as well. As citizens of India, we must embrace this responsibility and contribute our part towards the vision of a developed India by 2047, as outlined in the Viksit Bharat initiative. By re-evaluating our water consumption habits and adopting necessary behavioural changes, we not only align with the objectives of demand-side water audits but also advance the overarching goals of the Life Mission initiated by the Government of India.

Organizations must pay attention to their water consumption and water footprint and work towards reducing it. Together, through collective action and conscientious choices, we can realize a future where water is cherished, communities flourish, and our nation strides confidently towards a sustainable and prosperous tomorrow.



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