

Urban Planning: Case Study Lagos State Water Corporation (LSWC)

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Abstract. Urban water utilities play a critical role in ensuring sustainable water supply in rapidly growing megacities, particularly in developing countries where demand, infrastructure pressure, and resource constraints are acute. As the primary public agency responsible for potable water supply in Lagos State, the Lagos State Water Corporation (LSWC) occupies a strategic position in advancing sustainable water conservation and management practices. This study examines the key sustainable water conservation and management strategies adopted by LSWC to enhance operational efficiency and long-term water supply sustainability. A purposive sampling technique was employed to select respondents drawn from LSWC's management and operational structure. A total of ten (10) staff members were sampled for the study. Data were collected using closed-ended questionnaires and analyzed using descriptive statistics, including frequency, percentage, and mean item score (MIS), to rank respondents' perceptions of the adopted strategies. Findings reveal that operational management practices with direct implications for water conservation ranked highest. These include effective metering system implementation (MIS 4.9), routine equipment inspection (MIS 4.9), efficient management of maintenance staff (MIS 4.9), and the development of the Lagos Water Supply Master Plan (MIS 4.9). Infrastructure rehabilitation (MIS 4.8) and the adoption of sustainable operational practices (MIS 4.8) were also highly ranked, while public awareness campaigns (MIS 4.6) played a complementary role. Conversely, the preparation of facility-specific manuals and the use of appropriate tools and methods ranked lowest (MIS 4.3). The study concludes that LSWC's water conservation efforts are largely driven by structured management systems, metering efficiency, infrastructure maintenance, and strategic planning.

Keywords: Sustainable Water Management, Lagos State Water Corporation, Water Conservation Strategies, Metering System, Public Awareness.

1. Introduction

Lagos State, a densely populated metropolitan area, faces immense water supply and management challenges. The Lagos State Water Corporation (LSWC) is the primary institution responsible for ensuring sustainable water distribution. With increasing demand and climate variability, LSWC has adopted innovative strategies to enhance water conservation within urban planning frameworks.

Water Conservation Strategies in Lagos State by LSWC has implemented stringent policies aimed at reducing water wastage and promoting conservation. The Lagos Water Sector Law provides a regulatory framework for efficient water use, including penalties for excessive consumption and incentives for conservation.

Sustainable water management is crucial for ensuring the availability of freshwater resources for present and future generations. With increasing population growth, climate change, and urbanization, water scarcity has become a pressing global issue. Effective water management strategies are essential to balance the demand and supply while preserving the quality of water ecosystems (Gleick, 2018). One of the primary challenges in sustainable water management is water scarcity. According to the United Nations, nearly two-thirds of the world's population

experiences water stress at least one month a year (UN Water, 2021). This scarcity is exacerbated by climate change, which alters precipitation patterns and increases the frequency of droughts and floods (IPCC, 2019).

1.1 Study Location

The Lagos State Water Corporation (LSWC) is the principal water supply agency in Lagos State, Nigeria. It has a long history dating back to 1910, when the first formal water supply system in Lagos was established by the colonial government. The system initially relied on the Iju Waterworks, which was constructed to provide potable water to the growing population of Lagos. Over the years, Lagos' rapid urbanization and population growth necessitated the expansion of the water supply infrastructure. In 1979, the Lagos State Government formally restructured the water supply system under the Lagos State Water Management Board, which was later renamed the Lagos State Water Corporation (LSWC). This transformation aimed to enhance water production, distribution, and management across the state.

The corporation has since developed several additional waterworks, including Adiyin Waterworks, Ishasi Waterworks, and Akute Water Scheme, among others. These facilities, along with numerous mini-waterworks, help to increase water supply capacity in response to the increasing demand in Lagos.

Today, LSWC is responsible for providing potable water to millions of residents across Lagos State. The corporation has implemented various initiatives, including metering systems, public awareness campaigns, and infrastructural rehabilitation projects to improve service delivery. However, challenges such as aging infrastructure, water wastage, illegal connections, and funding constraints continue to hinder optimal performance.

To address these issues, LSWC has adopted Public-Private Partnerships (PPP), sustainable water conservation strategies, and capacity-building initiatives to enhance water supply efficiency and sustainability in Lagos. The corporation remains committed to achieving its vision of ensuring safe, reliable, and affordable water supply for all residents of Lagos State. (See Lagos State Map)

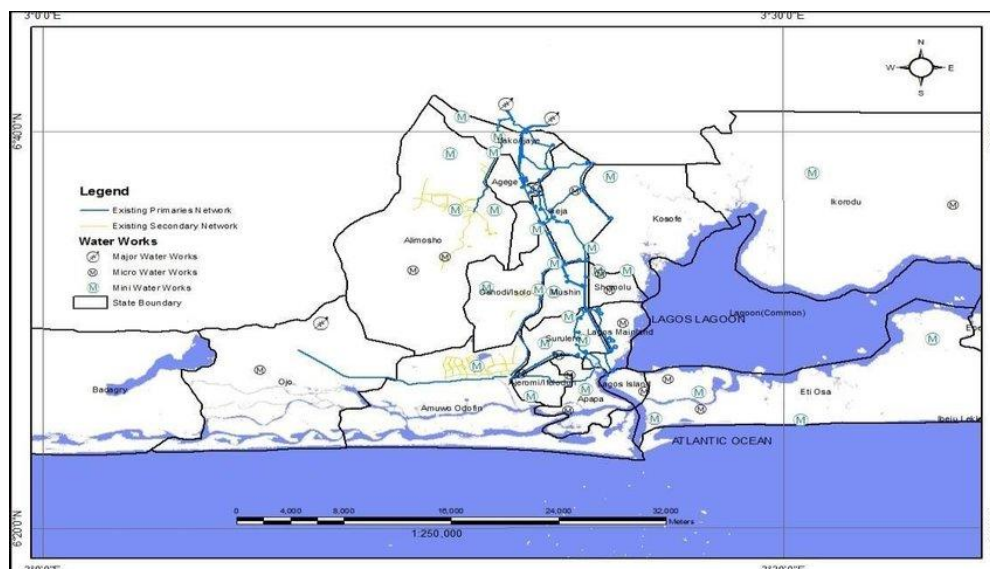


Figure 1: Location map showing the Lagos State Water corporation Location

Source: Google Maps. (2025). Locational map of Lagos State Water Corporation [Map].

Google. <https://maps.google.com.ng>

2.0. Literature Review

Water conservation is widely recognized as a fundamental component of sustainable urban water management, particularly amid increasing urbanization, population growth, and climate change impacts. Urban water systems face significant pressure due to greater demand and aging infrastructure, necessitating strategies that improve efficiency, reduce losses, and ensure long term supply reliability (Sunny, 2024). Such strategies are integral to sustainable urban planning because they help balance resource availability with socio economic development goals.

A substantial body of research stresses the importance of managing water demand and reducing distribution losses as key conservation strategies. Enhancements in leakage detection and repair, along with demand management policies such as pricing reforms and public awareness campaigns, have been shown to create synergies that improve overall system efficiency and resilience (Jacque, 2025). Studies in European contexts demonstrate how integrated policies targeting both infrastructure loss and consumer behavior can significantly enhance water efficiency (Jacque, 2025; Sunny, 2024).

Rainwater harvesting, greywater reuse, and green infrastructure are recognized as complementary strategies in sustainable urban water management. These practices not only reduce reliance on centralized supply systems but also support ecological functions such as stormwater mitigation and groundwater recharge. For example, Olley et al. (2025) highlight the potential of water reuse and recycling in urban water management, emphasizing their role in addressing water scarcity while improving the sustainability of urban systems. Similarly, rainwater harvesting has been quantified as a viable tool for reducing urban water stress while engaging local communities in resource stewardship (Gamallo Chaine, 2025).

The institutional and socio economic dimensions of water conservation are increasingly emphasized in the literature. Public awareness and acceptance are critical for the success of conservation programs. Kabanda and Babirye (2025) found that awareness campaigns significantly influence household water consumption behaviours and contribute to improved reliability of urban water supplies, reinforcing the linkage between conservation education and sustainable development goals (SDGs). This finding aligns with research advocating for community involvement and stakeholder engagement to embed conservation practices within broader urban planning frameworks.

From a planning perspective, sustainable urban water management requires not just technical interventions but integrated strategies that align with spatial planning, policy frameworks, and governance mechanisms. Hurlimann (2018) proposes a holistic framework that situates water conservation within broader urban adaptation and planning processes, calling for cross sector collaboration and integrated policy actions. This aligns with contemporary sustainable urbanism paradigms that view water systems as integral to city resilience and environmental health.

However, challenges persist. Implementation barriers include limited financial resources, institutional capacity constraints, and regulatory frameworks that lag behind innovative practices. Studies in developing country contexts underscore that the adoption of advanced conservation measures often depends on enabling policies and investments in technology and infrastructure (Sunny, 2024). Furthermore, equitable access and variability in public acceptance highlight the need for context specific strategies that consider local socio economic conditions.

Another major challenge is water pollution. Industrial discharge, agricultural runoff, and improper waste disposal contribute to water contamination, affecting both human health and

aquatic ecosystems (WHO, 2020). Poor infrastructure and inefficient water distribution systems lead to significant water losses. In many cities, aging pipelines result in leakage rates exceeding 30% of total supply (Gleick, 2018).

To address these challenges, integrated water resource management (IWRM) is widely advocated. IWRM promotes coordinated development and management of water resources across sectors, ensuring equitable distribution and sustainability (GWP, 2020). Additionally, the adoption of water-efficient technologies, such as drip irrigation in agriculture and smart meters in urban areas, can significantly reduce water wastage (FAO, 2019).

Water recycling and reuse play a vital role in sustainable management. Many cities have implemented wastewater treatment plants to reclaim water for irrigation and industrial use, reducing dependence on freshwater sources (EPA, 2021). Furthermore, nature-based solutions, such as wetland restoration and rainwater harvesting, help enhance water retention and purification (WWF, 2020).

Community involvement and policy reforms are also crucial. Governments and stakeholders must work together to implement policies that promote sustainable water use and conservation. Public awareness campaigns and education programs can encourage responsible water consumption at the individual and community levels (UNESCO, 2018). A review of relevant literature reveals that urban water conservation strategies often include policy interventions, smart water management technologies, and community engagement. Studies highlight the importance of integrated water resource management (IWRM) and the role of public-private partnerships in enhancing water sustainability. The Lagos State context presents unique challenges, making it essential to evaluate localized strategies.

Despite these efforts, challenges such as inadequate infrastructure, high population growth, and climate change impact water sustainability in Lagos. However, emerging technologies and policy refinements present opportunities for improving urban water management.

The adoption of smart metering systems has improved monitoring and reduced water wastage. LSWC has integrated Geographic Information Systems (GIS) to track leakages and manage water distribution networks more effectively while Urban buildings and industries are encouraged to install rainwater harvesting systems to supplement municipal water supplies. Recycled water is increasingly used for non-potable purposes such as irrigation and industrial cooling.

Educational campaigns and community-based initiatives have been launched to promote water conservation awareness. LSWC collaborates with schools and local organizations to instill water-saving habits among residents. Strategic partnerships with private entities have facilitated investments in water infrastructure and efficiency projects. These partnerships enhance resource mobilization and introduce innovative water conservation technologies.

Innovative water conservation strategies are critical for sustainable urban planning in Lagos State. The case of LSWC demonstrates that integrated approaches, incorporating technology, policy, and community participation, are essential in addressing water scarcity. Sustainable water management requires a comprehensive approach that addresses scarcity, pollution, and inefficiency. Through integrated management, technological advancements, water recycling, and policy reforms, it is possible to ensure water security for future generations. Continued research and investment in sustainable practices are essential to overcoming the challenges of water management in an increasingly water-stressed world.

Despite ongoing efforts by the Lagos State Water Corporation, urban water sustainability in Lagos continues to be undermined by ageing and inadequate infrastructure, rapid population growth, rising operational inefficiencies, and the increasing impacts of climate variability on water sources. While emerging technologies and policy reforms offer potential pathways for improving urban water management, there remains limited empirical evidence on how existing institutional conservation strategies are prioritized, implemented, and perceived within public water utilities. This knowledge gap constrains evidence-based decision-making and weakens the effectiveness of reforms aimed at achieving sustainable urban water supply. Consequently, this study addresses this gap by systematically evaluating the key water conservation and management strategies adopted by LSWC, providing empirical insights into their relative effectiveness and institutional emphasis. In summary, the literature demonstrates that water conservation strategies ranging from demand management and leakage control to rainwater harvesting and public engagement are essential for sustainable urban planning. These strategies contribute to improved water efficiency, resilience to environmental stressors, and progress toward global sustainability targets. The integration of such practices into urban planning processes remains a critical area for research and policy action.

3.0. Methods

A purposive sampling technique was adopted for this study in order to obtain informed and policy-relevant data from key decision-makers of the Lagos State Water Corporation (LSWC), who are directly involved in water management and urban water planning. The target population comprised members of the top management and senior operational staff of the Corporation. Specifically, ten (10) respondents were selected, including the Executive Manager, senior management personnel, technical and operations staff, as well as administrative and support staff. Data were collected through the administration of ten (10) structured, closed-ended questionnaires between [insert month/year], as this method enabled uniform responses and facilitated quantitative analysis. The choice of closed-ended questions was informed by the need to objectively measure respondents' perceptions of water conservation strategies and their alignment with sustainable urban planning goals. The data obtained were analysed using descriptive statistical tools, including frequency distributions, percentages, and Mean Item Score (MIS), which was employed to rank respondents' opinions according to their level of importance. The information collected focused on existing water conservation strategies implemented by LSWC, the effectiveness of these strategies, and their contribution to sustainable urban planning in Lagos State.

4.0 Results and Discussion

4.1. Demographic Profile of Respondents

Table 1: Background Information of the Respondents

Qualifications	Frequency	Percentage (%)
ND	0	0
NCE	0	0
HND/B.Sc	7	70
MSC and above	3	30
Total	100	100.0

Professional Qualification	Frequency	Percentage (%)
COREN	1	10
FMP	4	40
PMP	3	30
CIPM/MNSE	2	20
Total	10	100.0

Duration	Frequency	Percentage (%)
0 – 5 years	2	20
6 – 10 years	5	50
10 years and above	3	30
Total	10	100.0

Table 1 below shows the summary of the background information of the sampled respondents which indicates that 70% of the respondents have at least a B.Sc degree or a Higher National Diploma (HND) while 30% had postgraduate degrees higher than a B.Sc/HND. This indicates that the management team of Lagos State water corporation (LSWC) can be said to be very knowledgeable as they have all passed through the four walls of a higher institution within or outside the shores of this country. The team comprises of top management and professionals in various fields in the project management, facilities management and health safety security and environment, this indicates that the team is vast in knowledge in their various fields which connotes that together, they are capable to provide the necessary services required to run the estate and also provide the relevant data required for achieving the aim of this research. The years of experience shows that 80% of the sampled respondents had above 6 years of experience in their fields.

Table 2: Outcome Of key sustainable water conservation strategies employed by LSWC

Responsibility Areas	SA	A	SD	D	U	MIS	Rank
Public Awareness Campaigns	5 (60%)	4 (40%)				4.6	3 rd
Metering System Implementation	9 (90%)	1 (10%)				4.9	2 nd
Infrastructure Rehabilitation	8 (80%)	2 (20%)				4.8	5 th
Development of Lagos water Supply master plan	6 (60%)	4 (40%)				4.6	2 nd
Creation, maintenance and use of facility-specific manuals to assist with the processes	3 (30%)	7 (70%)				4.3	7 th
Methods, equipment and tools	3 (30%)	7 (70%)				4.3	6 th

Management of maintenance staff	9 (90%)	1 (10%)	4.9	2 nd
Project management	5 (50%)	5 (50%)	4.5	5 th
Consideration and implementation of sustainable practices	8 (80%)	2 20%	4.8	5 th
Conducting risk management	7 (70%)	3 (30%)	4.7	7 th
Safety, security and cleaning	1 (10%)	-	5.0	1 st
Equipment inspections	9 (90%)	1 (10%)	4.9	2 nd

The study attempts to determine the key sustainable water conservation strategies employed by LSWC measured with a 5-Likert Scale and ranked using their mean item score as shown in table 2 above. The opinions of the respondents showed that activities such as Safety, security and cleaning (5.0 (1st), Metering System Implementation (4.9 (2nd), management of maintenance staff (4.9 (2nd), equipment inspection (4.9 (2nd), Development of Lagos water Supply master plan (4.9) 2nd, Public Awareness Campaigns (4.6)3rd, Infrastructure Rehabilitation (4.8 (5th), consideration and implementation of sustainable practices (4.8 (5th) ranked 1st to 5th respectively were the most selected. While activities areas such as Creation, maintenance and use of facility-specific manuals to assist with the processes (4.3 7th) and methods, equipment and tools (4.3 (6th) were the least selected as they ranked the 6th and 7th in no particular order.

The outcome of the analysis as shown in Table 2 above solely means that the key sustainable water conservation strategies employed by LSWC revolved around the general public awareness, metering system implementation, periodic equipment inspection, safety and cleaning as well as steady evaluation of best practices of sustainable water conservation strategies. The required resources and staff of the operations is also of utmost importance as they are the persons that implements the necessary activities needed to ensure the smooth running of the developed strategies effectively.

Table 3: What are the technological innovations in water management and Conservation

Technological Innovations	SA (%)	(n, A (%))	(n, SD (%))	(n, D (%))	(n, U (%))	(n, MIS Rank
Smart water Meters & IoT sensors	5 (50%)	2 (20%)	3 (30%)	-	-	4.2 1 st
Desalination Technology	2 (20%)	7 (70%)	-	1 (10%)	-	4.0 1 st
AI & Big Data Analytic for water management	7 (70%)	3 (30%)	-	-	-	4.7 2 nd

Technological Innovations	SA (%)	(n, A %)	(n, SD %)	(n, D %)	(n, U %)	(n, MIS Rank
Water Recycling	-	2 (20%)	4 (40%)	3 (30%)	1 (10%)	2.7 3 rd
Atmospheric Water Harvesting	7 (70%)	3 (30%)	-	-	-	4.7 1 st
Drip Irrigation & Precision Agriculture	4 (40%)	6 (60%)	-	-	-	4.4 3 rd
Leak Detection & Pipeline Monitoring System	4 (40%)	6 (60%)	-	-	-	4.4 3 rd

The overall sustainable technological innovations in water management and Conservation as shown in Table 5 above, the major impacts experienced on various aspects of sustainable technological innovations in water management and Conservation operations according to the responses of the respondents were Smart water meters & IoT sensors (3.8 (1st), Desalination Technology (3.7 (2nd), AI & Big Data Analytics for water Management (3.5) 2nd and Water Recycling (3.5 (3rd) while the aspect with the least impacts were Drip Irrigation and Precision Agriculture and Leak detection and Pipeline monitoring System.

This can be further explained that the impact of technological innovations in water management and Conservation has been most felt in smart water meters and IoT sensors, this can be said to be true as the introduction of the use of digital spreadsheets has ensured that proper monitoring of water management and consumption.

Table 4: What are the efforts of public-private partnerships in water sustainability

Technological Innovations	SA (%)	(n, A %)	(n, SD %)	(n, D %)	(n, U %)	(n, MIS Rank
Investment in water structure	5 (50%)	2 (20%)	3 (30%)	-	-	4.2 1 st
Automated water Dispensing supply scheme	2 (20%)	7 (70%)	-	1 (10%)	-	4.0 1 st
Clean water Provision in by Private Companies	7 (70%)	3 (30%)	-	-	-	4.7 2 nd
Public Awareness & Education Campaigns in Lagos State	-	2 (20%)	4 (40%)	3 (30%)	1 (10%)	2.7 3 rd
Policy & Regulatory Support	7 (70%)	3 (30%)	-	-	-	4.7 1 st
Financing & Subsidies for water conservation project	4 (40%)	6 (60%)	-	-	-	4.4 3 rd
World bank sustainable power and irrigation Project	4 (40%)	6 (60%)	-	-	-	4.4 3 rd

The greatest effort of public-private partnerships in water sustainability is shown in the table above. It shows that the major efforts and beneficiaries include Investment in water structure (4.8 (1st), Automated water Dispensing supply scheme (4.7 (2nd) and Clean water Provision by Private companies (4.7 (2nd), Public Awareness & Education Campaigns in Lagos State (4.5) 2nd ,Policy & Regulatory Support (4.7) 1st , Financing & Subsidies for water conservation project (4.4) 3rd , World bank sustainable power and irrigation Project(4.4) 3rd as they ranked 1st to 3rd .

These examples illustrate how public private partnership in Nigeria are leveraging combined resources, efforts and expertise to promote sustainable water management and conservation as their social responsibility to the society.

Table 5: Assessing how public/community engagement strategies in water conservation helps in management and conservation of water.

Benefits	SA (%)	(n, A %)	(n, SD %)	(n, D %)	(n, U %)	(n, MIS Rank
Cost savings	7 (70%)	3 (30%)	-	-	-	4.8 1 st
Increased efficiency	8 (80%)	2 (20%)	-	-	-	4.7 2 nd
Improved asset longevity	7 (70%)	3 (30%)	-	-	-	4.0 5 th
Enhanced safety	6 (60%)	4 (40%)	-	-	-	4.4 4 th
Better environmental sustainability	4 (40%)	6 (60%)	-	-	-	4.6 3 rd

The overall impact of the public engagement strategies in water conservation helps in management and conservation of water as shown in Table 5 above, the major impacts according to the responses of the respondents were cost savings (4.8 (1st), safety and Increased efficiency (4.7 (2nd) , improved asset longevity (4.0 (5th), Enhanced Safety (4.4 (4th) and better environmental sustainability (4.6 (3rd).

This can be further explained that the impact of the public/community engagement strategies in water conservation helps in management and conservation of water

4.0. Conclusion

Innovative water conservation strategies are critical for sustainable urban planning in Lagos State. The case of LSWC demonstrates that integrated approaches, incorporating technology, policy, and community participation, are essential in addressing water scarcity. There should be Strengthening water conservation policies through stricter enforcement and incentives and Expanding smart water management technologies to improve efficiency.

Conclusively, the Government should ensure large-scale adoption of rainwater harvesting systems and enhancing community engagement through educational programs and public awareness campaigns

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