ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

Water Recycling Practices and Corporate Real Estate Management in Southwestern Nigeria: An Evaluation of Organisational Profiles and Processes

Abegunde Adebare[1]; Akintunde Adesoji Moronkeji[2]; Igho Fayomi[3]

[1,2,3]Department of Estate Management, Lead City University, Ibadan, Nigeria

Publication Date: 2025/09/18

Abstract: This study evaluates water recycling practices and corporate real estate management in Southwestern Nigeria, focusing on organizational profiles and processes to address water scarcity and promote sustainability. Adopting a descriptive quantitative research design, data were collected via structured questionnaires from 15 corporate real estate organizations, achieving a 100% response rate. Findings reveal a private-sector-driven sector, with 86.7% privately owned SMEs employing fewer than 70 staff, concentrated in Ogun, Oyo, and Lagos. Respondents, predominantly male and middle-aged with advanced qualifications, oversee industrial recycling of domestic wastewater. Processes rely on chemical treatments (73.3–80%), with formal strategies and frequent maintenance, but high costs (60–86.7%) and private funding limit scalability. Efficiency perceptions are moderately positive (mean 3.47), though cost-effectiveness for expansion is a concern. The study concludes that while water recycling is viable, economic barriers hinder advanced technology adoption. Recommendations include policy incentives like subsidies, inclusive hiring for gender and age diversity, and cost-effective strategies for SMEs. Future research should explore national comparisons and longitudinal policy impacts to enhance integrated water management, contributing to sustainable development in Nigeria's corporate real estate sector and addressing regional water challenges.

Keywords: *Water Recycling, Corporate Real Estate, Southwestern Nigeria, Organizational Profiles, Sustainability.*

How to Cite: Abegunde Adebare; Akintunde Adesoji Moronkeji; Igho Fayomi (2025) Water Recycling Practices and Corporate Real Estate Management in Southwestern Nigeria: An Evaluation of Organisational Profiles and Processes. *International Journal of Innovative Science and Research Technology,* 10 (9), 769-779. https://doi.org/10.38124/ijisrt/25sep692

I. INTRODUCTION

Water is a finite and indispensable resource, critical to human survival, socio-economic development, and environmental sustainability. Rapid global population growth, industrialization, and urban expansion have intensified water demand, placing unprecedented pressure on freshwater supplies and necessitating sustainable management practices (Mekonnen & Hoekstra, 2016). Water recycling has emerged as a practical solution to address these challenges by reducing freshwater abstraction, mitigating wastewater disposal risks, and promoting resource efficiency (Silva, 2023). Unlike traditional water supply strategies focused primarily on extraction, water recycling emphasizes conservation and reuse, aligning with global sustainability agendas, particularly the United Nations Sustainable Development Goal 6, which seeks to ensure the availability and sustainable management of water and sanitation for all.

In Nigeria, managing water resources presents significant challenges. Despite abundant freshwater reserves, inadequate infrastructure, weak institutional frameworks, and rising pollution levels have constrained effective water management (Isukuru et al., 2024). Sub-Saharan Africa faces similar issues, with wastewater generation outpacing treatment capacity, leading to severe environmental and health consequences (Onu et al., 2023). These challenges underscore the urgent need for wastewater recycling systems as a cornerstone of sustainable water management. Corporate organizations, particularly in the real estate sector, are uniquely positioned to advance this agenda due to their substantial water consumption and wastewater production. By adopting water recycling facilities, these organizations can reduce their environmental footprint, enhance operational efficiency, and achieve long-term cost savings (Agada & Guobadia, 2024).

Southwestern Nigeria, encompassing Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti states, provides a critical context for studying water recycling practices within corporate real estate. As Nigeria's economic hub, the region hosts significant industrial, commercial, and real estate activities

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

that exert considerable pressure on water resources. Lagos, in particular, with its dense population and status as Nigeria's commercial centre, exemplifies the dual challenge of escalating water demand and wastewater generation (Ngene et al., 2021). Corporate estates, industrial parks, and commercial facilities in this region consume vast amounts of water for construction, cooling, landscaping, and sanitation, necessitating robust water recycling practices. However, adoption remains inconsistent, and management approaches vary significantly across organizations.

A key factor in improving water recycling practices is understanding the profiles of corporate organizations that adopt such systems. Organizational characteristics such as size, sector, ownership structure, and environmental orientation, significantly influence decisions to invest in water recycling technologies (Neelofar et al., 2023). For instance, multinational real estate companies or manufacturing firms with international exposure may demonstrate greater commitment to sustainability due to external compliance requirements, while local firms may face constraints from limited resources or weak regulatory enforcement (Odey, 2023). Examining these organizational profiles provides valuable insights into the drivers and barriers of water recycling adoption within Southwestern Nigeria's corporate real estate sector.

Equally critical is the analysis of water recycling processes employed by these organizations. Recycling technologies range from primary treatment for simple reuse, such as irrigation, to advanced tertiary treatment for industrial or commercial applications (Englande et al., 2015). In Southwestern Nigeria, however, these processes often encounter operational and managerial challenges, including inconsistent electricity supply, lack of skilled personnel, and high operational costs (Adeoti et al., 2023). While some organizations employ modern treatment technologies, others rely on rudimentary or poorly maintained systems, limiting the efficiency and sustainability of their recycling efforts (Singh et al., 2023). Understanding these variations in recycling processes is essential for identifying best practices and developing replicable frameworks for the sector.

Corporate real estate organizations operate at the intersection of urban infrastructure and environmental sustainability, with their decisions impacting internal operations, surrounding communities, and ecosystems. Although scholarly attention on wastewater management in Nigeria has grown, the focus has primarily been on residential or municipal systems, with limited exploration of corporate entities (Amaefule et al., 2023). This research gap is significant, as corporate organizations, due to their scale of operations, exert a disproportionate influence on water demand and wastewater generation. Investigating their practices offers critical insights into the structural and institutional factors enabling or hindering sustainable water recycling.

Moreover, effective water recycling in corporate real estate is not solely a technical challenge but also a governance and organizational issue. Weak enforcement of environmental laws and inconsistent regulatory monitoring in Nigeria have led to poor compliance with water recycling standards (Oruonye & Ahmed, 2020). Consequently, some organizations adopt water recycling facilities symbolically, without sustained investment in maintenance or process optimization (Joseph et al., 2019). Analysing organizational profiles and processes reveals whether adoption is driven by genuine sustainability commitments, regulatory compliance, or reputational considerations.

By situating water recycling within the broader framework of corporate real estate management, this study provides fresh insights into the interplay between organizational profiles, recycling practices, and sustainable water management outcomes. It contributes to academic discourse and practical policy design by highlighting best practices and identifying gaps requiring intervention. The findings aim to inform policymakers, environmental regulators, and industry stakeholders seeking to strengthen sustainable water management frameworks in Nigeria. For corporate organizations, the study offers evidence-based guidance on optimizing water recycling processes to enhance operational efficiency, ensure regulatory compliance, and uphold environmental responsibility.

In summary, water recycling is not merely a technical solution but a strategic organizational practice with implications for sustainability, competitiveness, and community well-being. This study evaluates water recycling practices and corporate real estate management in Southwestern Nigeria, focusing on the profiles of organizations involved and the processes they employ. By exploring how organizational characteristics shape the adoption and implementation of recycling systems and identifying variations in recycling processes that influence sustainability outcomes, the study contributes to a holistic understanding of how corporate real estate organizations can optimize water recycling for improved operational efficiency, regulatory compliance, and environmental responsibility.

II. LITERATURE REVIEW

Building on the introduction's focus on water scarcity, pollution, and the critical role of corporate real estate organizations in advancing sustainable water management in Southwestern Nigeria, this chapter synthesizes existing research to provide a robust foundation for the study. It explores theoretical frameworks, conceptual models, empirical evidence, and research gaps to understand how organizational profiles and recycling processes influence sustainability outcomes in the region's corporate real estate sector.

- *Water Recycling and Corporate Real Estate Management*

The theoretical underpinnings of water recycling in corporate real estate management are rooted in sustainability theories that emphasize resource efficiency and environmental stewardship. The Triple Bottom Line (TBL) framework, used by Mishra & Pandey, (2025), argues that organizations must balance economic viability, social responsibility, and environmental protection for long-term

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

success. In the context of water recycling, TBL encourages corporate real estate firms to treat wastewater as a recoverable resource, reducing operational costs and ecological impacts. For Southwestern Nigeria, where water resources face intense pressure, TBL supports integrating recycling into facility management, aligning with corporate social responsibility (CSR) goals. Organizational profiles prioritizing sustainability-oriented leadership and investment in recycling infrastructure are critical for effective implementation.

The Resource-Based View (RBV) theory complements TBL by positing that firms gain competitive advantages through unique resources, such as advanced water recycling technologies (Barney, 1991). RBV positions recycling systems, like membrane bioreactors, as strategic assets that enhance resilience against water shortages. In Southwestern Nigeria, firms with technological expertise and financial capacity are better positioned to adopt efficient recycling processes, though many local organizations lag due to resource constraints. Institutional Theory further explains how external pressures, such as regulations and industry norms, shape organizational behaviours toward sustainable practices (DiMaggio & Powell, 1983). In Nigeria, weak regulatory enforcement often leads to symbolic adoption of recycling, where firms mimic industry leaders without substantive process integration.

These theories collectively frame how organizational profiles—encompassing size, ownership structure, and expertise—shape recycling adoption. For instance, multinational real estate firms may leverage RBV for cost savings through water reuse, while institutional isomorphism results in uneven implementation among local firms. This theoretical synthesis highlights sustainability as a strategic priority, though its empirical application in Nigeria's corporate real estate sector remains underexplored, aligning with the introduction's call for region-specific research.

- *Conceptual Frameworks for Sustainable Water Management*

Conceptual frameworks for sustainable water management in corporate real estate emphasize integrated and circular approaches to recycling, building on the focus of resource efficiency. The Integrated Water Resources Management (IWRM) framework advocates for coordinated water resource management to maximize economic and social benefits without compromising sustainability (Global Water Partnership, 2000). In corporate contexts, IWRM links organizational profiles, such as operational scale, to process efficiency, promoting wastewater treatment for industrial reuse. For Southwestern Nigeria, where urban growth strains water resources, IWRM supports frameworks that integrate stakeholder engagement, technology selection, and monitoring.

The Circular Economy (CE) model refines IWRM by viewing water recycling as a closed-loop system, where waste from one process becomes input for another, minimizing extraction and disposal (Ellen MacArthur Foundation, 2013). In corporate real estate, CE encourages innovations like greywater systems for irrigation or cooling. In Nigeria, where untreated effluents contribute to pollution, CE offers a pathway for corporate estates to reduce environmental impacts.

The Water-Energy-Food (WEF) Nexus framework further connects water recycling to energy and food security, emphasizing interdependencies to avoid trade-offs (Hoff, 2011). In real estate, this translates to low-energy recycling processes, such as biological treatments, that conserve resources. Hybrid frameworks combining IWRM and CE enable predictive modelling for recycling efficiency incorporating variables like technology adoption. These frameworks provide conceptual clarity, but their application in Nigeria's corporate sector is limited by small-scale operations and scalability challenges, reinforcing the focus on addressing regional gaps.

- *Empirical Studies on Water Recycling Practices in Nigeria*

Empirical research on water recycling in Nigeria's corporate sector highlights adoption patterns, challenges, and outcomes, particularly in urban centres like Southwestern Nigeria. Studies indicate that corporate real estate firms increasingly adopt recycling to address water scarcity, focusing on chemical and biological treatments for industrial reuse (Bakare-Abidola et al., 2025). A survey of Lagos-based firms found that high recycle less than wastewater due to high costs, reflecting profiles dominated by small and medium enterprises (SMEs) with limited infrastructure (Adelegan, 2004). In Ogun State, public-private partnerships have improved processes, achieving up to increasing reuse efficiency through membrane filtration, though adoption remains inconsistent (Abdul Hamid, 2019).

Recent advancements include pilot projects using smart technologies, such as IoT-monitored systems in corporate estates, reducing water losses (Lopez-Vargas et al., 2020). Data from Osun State, adaptable to corporate settings, show a huge preference for wastewater reuse driven by cost savings (Ogunbode et al., 2023). However, reliance on conventional methods poses environmental risks, as seen in pollution hotspots in Oyo State (Ayoola et al., 2025). Comparative studies, such as Singapore's NEWater initiative, suggest Nigerian firms could scale processes through policy incentives, but longitudinal data on organizational profile evolution are scarce.

Quantitative models, such as regression analyses, link organizational profiles to process outcomes, with equations like Recycling Adoption (Ochoche & Ajumobi, 2023). These findings affirm recycling's potential but highlight barriers like cost and infrastructure, aligning with the introduction's emphasis on addressing implementation challenges in corporate real estate.

- *Identified Gaps and Research Implications*

Despite progress, the literature reveals gaps in understanding water recycling in Nigeria's corporate real estate sector. Studies often fail to integrate organizational profiles with recycling processes, overlooking how ownership structures influence technology choices (Banso et

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

al., 2023). Theoretical frameworks like IWRM are rarely tested empirically in corporate contexts, creating a conceptual-empirical disconnect. Additionally, current approaches underexplore emerging technologies, such as AI-optimized recycling, and neglect gender and generational dynamics in organizational profiles.

This study addresses these gaps by evaluating organizational profiles and recycling processes in Southwestern Nigeria, providing targeted insights into private-sector maturity and efficiency. The findings will inform policy recommendations for incentives and technological advancements, supporting sustainable water management. By building on the introduction's focus on corporate contributions, this research bridges theoretical, conceptual, and empirical gaps, offering a pathway for enhanced sustainability in Nigeria's corporate real estate sector.

III. METHODOLOGY

This study adopts a descriptive quantitative research design to evaluate the organizational profiles and water recycling processes of corporate real estate organizations in Southwestern Nigeria with focus on sustainable water management in the region's corporate sector. This design is appropriate as it enables systematic documentation of organizational characteristics and operational processes, providing measurable data for summarization and comparison without manipulating variables (Asenahabi, 2019). By capturing existing realities of water recycling practices, the descriptive approach aligns with the study's aim to explore how organizational profiles and processes contribute to sustainability outcomes.

The target population includes corporate real estate organizations engaged in large-scale wastewater recycling for industrial or facility use in Southwestern Nigeria. These entities, involving facility managers, engineers, and environmental officers, are pivotal in implementing recycling initiatives, as noted in prior research (Raimi et al., 2019). Targeting these professionals ensures access to detailed insights into organizational practices and processes, connecting directly to the literature review's emphasis on corporate contributions to addressing water scarcity and pollution. Their roles in overseeing recycling systems and reporting strategies make them ideal respondents, supporting the study's objectives of evaluating profiles and processes.

A preliminary survey identified key corporate organizations with significant water recycling initiatives in Southwestern Nigeria, including multinational firms, beverage companies, real estate service providers, and environmental solution firms. Table 1 below presents the sampling frame, detailing these organizations and their recycling initiatives.

Table 1 Sampling Frame of Corporate Organisations Involved in Water Recycling in Southwestern Nigeria.

S/N	Organisation	Water Recycling Initiative / Facility
1	British American Tobacco Nigeria (BATN)	Operates a wastewater treatment plant with a capacity of 30,000 m³, recycling all effluent wastewater for internal reuse.
2	Guinness Nigeria Plc	Implements the *"Water of Life"* initiative with over 22 water projects, including wastewater recycling facilities to promote water efficiency in production.
3	Coca-Cola System (Nigeria Bottling Company & Coca-Cola Nigeria)	Member of the Food and Beverage Recycling Alliance (FBRA); recycles process water and engages in PET plastic waste recovery exceeding 13,000 metric tonnes annually.
4	CWAY Group	Promotes sustainable water management through in-house water recycling, reduction, and reuse systems in production plants.
5	Sewatech Nigeria Ltd.	Designs, constructs, and supplies sewage and water treatment plants, with recycling systems tailored for industrial clients.
6	Devtek Water Solutions	Provides modular water treatment and recycling facilities for both household and commercial applications.
7	RP Facilities Limited	Offers corporate facility management services, including reverse osmosis and wastewater recycling systems for real estate clients.
8	Chanja Datti Recycling Ltd.	Transforms industrial and domestic waste, including wastewater by-products, into reusable resources to support environmental sustainability.
9	Jospong Group (Nigeria Operations)	Partners with Lagos State agencies to establish waste-to-resource and water recycling facilities for urban use.
10	Water Initiatives Nigeria (WIN)	Engages in water conservation and wastewater reuse projects, focusing on providing safe and sustainable water systems.
11	African Water Facility (AWF)	Supports infrastructure projects in Nigeria, including wastewater management and recycling for sanitation improvement.
12	Resilient Water Accelerator (RWA)	Collaborates with Lagos State agencies to promote innovative water reuse and recycling programmes for urban resilience.
13	Lafarge Africa Plc	Operates sachet-water recycling initiatives and reuses treated wastewater in cement production processes.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

14	Dow Chemical Company (Nigeria Operations)	Works with local partners to recycle plastic water sachets into industrial packaging and supports wastewater reuse technologies.
15	Blue Seal Energy Group	Produces advanced water treatment chemicals and provides solutions that enhance corporate water recycling systems.

Source: Author's Field Survey, 2025

A purposive sampling technique was employed to include only organizations actively engaged in water recycling, aligning with Creswell's (2009) argument that purposive sampling targets populations with specific characteristics relevant to research objectives. This ensures data relevance, addressing identified gap in private-sector dynamics. Given the limited number of such organizations, a total enumeration approach was used, including all relevant entities to minimize bias and ensure comprehensive data (Ibrahim, 2018), supporting the study's aim to provide a complete picture of recycling practices.

Data collection utilized a structured questionnaire to gather quantitative data on organizational profiles and recycling processes, divided into sections on organizational characteristics (e.g., ownership structure, scale, staffing) and recycling processes (e.g., technologies, capacity, efficiency). Structured questionnaires generate standardized data suitable for statistical analysis, facilitating comparisons (Ghanad, 2023). This instrument aligns with the descriptive design and focus on linking profiles to process outcomes.

Data analysis employs descriptive statistical methods, including frequencies, percentages, and cross-tabulations, to present profiles and processes, highlighting similarities and differences (Almquist, & Brännström, 2019). This approach connects to the conceptual frameworks and empirical models, quantifying variables like technology adoption to inform policy and industry practices, addressing the introduction's call for evidence-based guidance.

IV. RESULTS AND FINDINGS

This chapter presents and analyses data collected from corporate real estate organizations engaged in water recycling services in Southwestern Nigeria, aligning with the study's objectives to examine organizational profiles and investigate water recycling processes. Data were collected through structured questionnaires distributed to representatives of corporate real estate organizations in Southwestern Nigeria. 15 questionnaires were administered, with all retrieved, achieving a 100% response rate. This high retrieval rate ensures comprehensive representation from the small, accessible population, supporting reliable insights into organizational profiles and water recycling processes (Fincham, 2008). The perfect response rate reflects strong stakeholder engagement, likely driven by the pressing water scarcity and regulatory pressures highlighted in the introduction and literature review.

The socio-professional characteristics of respondents provide insight into the profiles of corporate real estate organizations, as these individuals shape water recycling practices. The demographic distribution reveals a predominantly male (80%), middle-aged (36–55 years, 100%), and highly educated workforce, with roles as facility managers (46.7%), environmental officers (33.3%), or engineers/technical staff (20%). All respondents have over 4 years of experience and are affiliated with private organizations. This profile, shown in Table 2, indicates a mature, specialized workforce driving water recycling, reflecting the sector's demand for expertise in Southwestern Nigeria (Becker, 1994).

Table 2 Demographic Information of Respondents

Variables	Parameters	N	Percentage
Gender of Respondent	Male	12	80
	Female	3	20
	Total	15	100
Age	18-25	0	0
	26-35	0	0
	36-45	9	60
	46-55	6	40
	56 and above	0	0
	Total	15	100
Highest Educational Qualification	Secondary School Certificate	0	0
	Diploma/Technical Certification	2	13.3
	BSc	7	46.7
	MSc	4	26.7
	PhD	2	13.3
	Total	15	100
Current Job Title	Facility Manager	7	46.7
	Environmental Officer	5	33.3
	Engineer/Technical Staff	3	20
	Regulatory Official	0	0

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

	Total	15	100
Years of Experience with the Organization	<1	0	0
	1-3	0	0
	4-6	4	26.7
	7-10 Years	9	60
	More than 10 years	2	13.3
	Total	15	100
Type of Organization	Government Agency	0	0
	Private Company	15	100
	Non-governmental Organization	0	0
	Research/Academic Institution	0	0
	Total	15	100

Source: Author's Field Survey, 2025

The structural and operational characteristics of the organizations further define their profiles. As detailed in Table 3, most are privately owned (86.7%), small-scale (under 70 employees, 100%), and locally or regionally focused (100%), operating primarily in Ogun (60%), Oyo (26.7%), and Lagos (13.3%). With over 6 years of experience in water recycling, they focus on industrial use (86.7%) and domestic wastewater (80%), highlighting a private-sector-driven, localized approach to sustainable practices (Abukari & Saluja, 2025; Grimsey & Lewis, 2004; Juntunen & Martiskainen, 2021; Kaiser et al., 2025; Silva, 2023).

Table 3 Demographic Profile of the Organizations

Variables	**Parameters**	**N**	**Percentage**
Ownership Type of Organization	Privately Owned	13	86.7
	Government Owned	0	0
	Public-private Partnership	2	13.3
	Total	15	100
Number of Employees	<50	9	60
	51-60	5	33.3
	61-70	1	6.7
	>70	0	0
	Total	15	100
Operational Scale of Organization	Local	10	66.7
	Regional	5	33.3
	National	0	0
	International	0	0
	Total	15	100
Organization Current Location	Lagos	2	13.3
	Ogun	9	60
	Oyo	4	26.7
	Osun	0	0
	Ondo	0	0
	Ekiti	0	0
	Total	15	100
Length of Experience in Water Recycling	<2	0	0
	2-5	0	0
	6-10	11	73.3
	More than 10 years	4	26.7
	Total	15	100
Purpose of Water Recycling	Industrial Use	13	86.7
	Agricultural Use	0	0
	Municipal Use	0	0
	Environmental Use	2	13.3
	Total	15	100
Type of Wastewater Recycle	Industrial Wastewater	3	20
	Domestic Wastewater	12	80
	Agricultural Wastewater	0	0
	All of the above	0	0
	Total	15	100

Source: Author's Field Survey, 2025

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

Water recycling processes were assessed through technological choices, management strategies, and operational challenges. Table 4 indicates chemical treatment dominates (80%), with formal management strategies in most organizations (86.7%), but high maintenance costs (60%) and funding issues (40%) persist, underscoring cost-driven processes (Beckett & Terziovski, 2025; Zak et al., 2025).

Table 4 Technology and Operations of Water Recycling in Organizations

Question	Response Options	N	Percentage
Which water treatment technology does your facility use?	Membrane filtration (e.g., reverse osmosis)	0	0
	Biological treatment (e.g., activated sludge, bioreactors)	3	20
	Chemical treatment (e.g., coagulation, chlorination)	12	80
	Constructed wetlands (natural treatment)	0	0
	Total	15	100
Does your organization have a formal management strategy for water recycling?	Yes	13	86.7
	No	2	13.3
	Not sure	0	0
	Total	15	100
What are the major challenges your facility faces in water recycling?	Lack of funding	6	40
	Limited technical expertise	0	0
	Government regulations and compliance issues	0	0
	Public perception and acceptance	0	0
	High maintenance costs	9	60
	Total	15	100

Source: Author's Field Survey, 2025

Efficiency perceptions, seen in Table 5, indicate moderate favourability (overall mean 3.47), with strong agreement on technology upgrades (mean 4.47, RII 0.89) but concerns over cost-effectiveness for scaling (mean 2.47, RII 0.49), highlighting financial constraints (Song et al., 2025).

Table 5 Efficiency of Water Treatment Technology

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Total Weighted Opinion	Mean	RII
Our water treatment technology effectively removes contaminants.	3	2	1	4	5	51	3.40	0.68
Our technology is cost-effective for large-scale recycling.	6	3	0	5	1	37	2.47	0.49
We regularly upgrade our technology to meet industry standards.	0	0	0	8	7	67	4.47	0.89
The operational cost of maintaining our treatment system is sustainable.	0	5	0	7	3	53	3.53	0.71

Source: Author's Field Survey, 2025

Detailed water recycling processes, presented in Table 6, reveal coagulation and flocculation as primary water recycling processes (73.3%), with frequent upgrades (every 1–3 years, 100%) and daily/weekly maintenance (80%). High costs dominate challenges (maintenance 86.7%, operational 73.3%), funding is private (100%), and recycled water serves industrial processes (100%) with recycling rates of 30–90% (Sengupta & Majumder, 2024; Qadir et al., 2020).

Table 6 Water Recycling Process of Corporate Real Estate Organisations

Question	Response Options	N	Percentage
Water Treatment Process	Reverse Osmosis	1	6.7
	Activated Sludge Process	3	20
	Coagulation and Flocculation	11	73.3

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

	Ozone Disinfection	0	0
	Total	15	100
Frequency of Upgrade of water treatment technology	Every Year	9	60
	Every 2-3 Years	6	40
	Every 4-5 Years	0	0
	More than 5 years	0	0
	No upgrades have been made	0	0
	Total	15	100
Routine Maintenance of Recycling Equipment	Daily	8	53.3
	Weekly	4	26.7
	Monthly	3	20
	Quarterly	0	0
	Annually	0	0
	Total	15	100
Maintenance Challenges Faced by facility	High cost of maintenance	13	86.7
	Lack of skilled personnel for equipment	0	0
	Difficulty in assessing spare parts	2	13.3
	Frequent breakdowns due to aging	0	0
	Total	15	100
Percentage of Water Recycled at Facility	Less than 30%	0	0
	30-50%	7	46.7
	51-70%	3	20
	71-90%	5	33.3
	More than 90%	0	0
	Total	15	100
Main use of Recycled Water in the Facility	Industrial Use/processes	15	100
	Agricultural irrigation	0	0
	Public Sanitation	0	0
	Drinking water supply	0	0
	Environmental Conservation	0	0
	Total	15	100
Decision-making responsibility of Water Recycling Operations	Executive Management	8	53.3
	Facility Managers	3	20
	Engineers/Technical Staff	4	26.7
	Government Regulatory Agencies	0	0
	Total	15	100
Water Recycling Funding	Government Grant/Subsidies	0	0
	Private investment/Corporate Funds	15	100
	Public-private partnerships	0	0
	Revenue from recycled water sales	0	0
	Total	15	100
Biggest Financial Challenge Affecting water recycling facility	High operational cost	11	73.3
	Limited Government Support	0	0
	Lack of private sector investment	0	0
	Unstable revenue from recycled water sale	4	26.7
	Total	15	100

Source: Author's Field Survey, 2025

V. DISCUSSION OF FINDINGS

The findings provide a comprehensive evaluation of water recycling practices in Southwestern Nigeria's corporate real estate sector, aligning with the objectives to examine organizational profiles and processes. The perfect questionnaire retrieval rate from 15 organizations underscores strong stakeholder engagement, likely driven by water scarcity and regulatory pressures. The respondent demographic reveals a male-dominated (80%), middle-aged (36–55 years), and highly educated workforce, with roles as facility managers, environmental officers, or engineers, all with over 4 years of experience in private firms. This suggests a mature, technically proficient workforce, essential for managing complex recycling systems, though the gender imbalance reflects systemic barriers in technical sectors (Powell et al., 2009). The absence of younger professionals may limit fresh perspectives, while advanced education

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

(86.7% with BSc or higher) supports innovation emphasis on expertise-driven sustainability (Mohamed et al., 2021).

Organizationally, the predominance of privately owned (86.7%), small-scale (under 70 employees), and locally/regionally focused firms operating in Ogun, Oyo, and Lagos highlights SMEs' role in driving environmental innovations amid infrastructural challenges (Abukari & Saluja, 2025; Grimsey & Lewis, 2004). The focus on industrial use (86.7%) and domestic wastewater (80%) reflects practical adaptations to local conditions, though limited environmental use (13.3%) suggests policy and health barriers (Juntunen & Martiskainen, 2021).

Water recycling processes rely heavily on chemical treatments (80%), with formal management strategies (86.7%) but face high maintenance (60%) and funding challenges (40%). This preference for chemical methods reflects cost-effectiveness for SMEs but raises sustainability concerns due to chemical residues, echoing critique of conventional methods. The lack of advanced technologies like membrane filtration suggests capital constraints, while formal strategies indicate institutional commitment (Beckett & Terziovski, 2025). Efficiency perceptions show moderate favourability (mean 3.47), with strong support for upgrades (mean 4.47) but concerns over scaling costs (mean 2.47), aligning with the literature's economic barriers (Song et al., 2025).

Detailed water recycling processes confirm coagulation and flocculation as dominant (73.3%), with frequent upgrades (every 1–3 years) and routine maintenance (80% daily/weekly), demonstrating operational commitment (Sengupta & Majumder, 2024). However, high maintenance (86.7%) and operational costs (73.3%) dominate challenges, with private funding (100%) amplifying financial pressures. Recycling rates of 30–90% and exclusive industrial use reflect health and regulatory constraints (Qadir et al., 2020). The decision-making by executives and technical staff suggests strategic integration.

These findings portray corporate real estate organizations as private, SME-led entities with experienced personnel and conventional, industrially focused recycling practices. Financial barriers hinder technological diversification and scaling, potentially undermining sustainability. The results validate the private sector's role but highlight needs for policy incentives, gender-inclusive hiring, and youth engagement (Grimsey & Lewis, 2004; Powell et al., 2009). Implications include adopting cost-effective innovations and partnerships to enhance efficiency, addressing the introduction's call for sustainable water management.

VI. CONCLUSIONS AND RECOMMENDATIONS

This study evaluated water recycling practices in corporate real estate management in Southwestern Nigeria, focusing on organizational profiles and processes. The results highlight the sector's role in sustainable water management amid regional scarcity and pollution challenges, as discussed.

Organizational profiles reveal a private-sector-driven landscape, with 86.7% of firms privately owned and 13.3% in public-private partnerships, primarily small to medium-sized enterprises (SMEs) employing fewer than 70 staff. Operating locally or regionally in Ogun (60%), Oyo (26.7%), and Lagos (13.3%), these firms are led by experienced, predominantly male (80%), middle-aged professionals with advanced qualifications, focusing on industrial recycling of domestic wastewater. This expertise-driven profile underscores maturity but highlights gender and generational imbalances and limited government involvement, reflecting privatization trends.

Water recycling processes predominantly use chemical treatments like coagulation and flocculation (73.3–80%), with formal strategies (86.7%), frequent upgrades, and routine maintenance, achieving 30–90% recycling rates for industrial use. However, high maintenance (60–86.7%) and operational costs (73.3%), reliant on private funding, limit scalability, echoing financial barriers in the literature. Efficiency perceptions (mean 3.47) praise upgrades but critique cost-effectiveness.

The study concludes that water recycling is viable but constrained by economic challenges, necessitating policy interventions like subsidies to promote advanced technologies, such as membrane filtration, and inclusive hiring to enhance diversity and innovation. SMEs can optimize processes through cost-effective strategies. Future research should explore national comparisons or longitudinal impacts of policy changes to advance integrated water management, addressing Nigeria's water challenges and supporting the sustainability goals outlined in earlier chapters.

REFERENCES

[1]. Abdul Hamid, R. Y. A. R. (2019). An Integrated Approach for Sustainability in the Application of Industrialised Building System (IBS). *International Journal of GEOMATE, 17*(61). https://doi.org/10.21660/2019.61.4810

[2]. Abukari, Y., & Saluja, R. (2025). Economic Impact of Digitalization on SME Internationalization. *Interdisciplinary Journal of the African Alliance for Research Advocacy and Innovation*. https://doi.org/10.64261/ijaarai.v1n2.010

[3]. Adelagan, J. A. (2004). *The History of Environmental Policy of Water Sources in Nigeria (1960-2004) The Way Forward. - References - Scientific Research Publishing*. Scirp.org. https://www.scirp.org/reference/referencespapers?referenceid=1371684

[4]. Adeoti, S., Kandasamy, J., & Vigneswaran, S. (2023). Water infrastructure sustainability in Nigeria: a systematic review of challenges and sustainable solutions. *Water Policy, 25*(11), 1094–1111. https://doi.org/10.2166/wp.2023.173

[5]. Agada, D. I., & Guobadia, J. O. (2024). Sustainable Water Management Practices for Green Building Development in Nigeria. *International Journal of*

Research Publication and Reviews, *5*(9), 3455–3464. https://www.researchgate.net/publication/384897433_Sustainable_Water_Management_Practices_for_Green_Building_Development_in_Nigeria

[6]. Almquist, Y. B., Kvart, S., & Brännström, L. (2019). *A practical guide to quantitative methods with SPSS*. Research Reports in Public Health Sciences, Stockholm University, no:2019:2.

[7]. Amaefule, E. O., Amarachi, A. S., Abuka, C. O., Nwaogazie, F. O., Nwabuko, C. N., & Divine, C. C. (2023). Water and Wastewater Treatment in Nigeria: Advancements, Challenges, Climate Change and Socioeconomic Impacts. *Traektoriâ Nauki*, *9*(8), 2010–2031. https://doi.org/10.22178/pos.95-4

[8]. Asenahabi, B. M. (2019). Basics of Research Design: A Guide to selecting appropriate research design. *International Journal of Contemporary Applied Researches*, *6*(5), 76–89. https://www.researchgate.net/publication/342354309_Basics_of_Research_Design_A_Guide_to_selecting_appropriate_research_design/citations

[9]. Ayoola, O. J., Afeonkhai, E., & Raifu Olatunji Anibaba. (2025). *Assessment of Underground Water Quality of Gosa Landfill Site of the Federal Capital Territory, Abuja Nigeria*. 4168–4178. https://doi.org/10.38124/ijisrt/25apr2205

[10]. Bakare-Abidola, T., Elabor, I., Onwuchekwa, N., Onwuchekwa, C., Oladeji, J., Olawale, A. O., & Adeiza, A. A. (2025). Environmental Impact Assessment of Abattoir Wastewater. *Path of Science*, *11*(6), 5001–5001. https://doi.org/10.22178/pos.119-16

[11]. Banso, A. A., Olurin, J. O., Okem, E. S., & Ogunjobi, O. A. (2023). Integrated Water Resource Management in South West Nigeria: A Comprehensive Review of Strategies and Outcomes. *International Journal of Applied Research in Social Sciences*, *5*(8), 330–351. https://doi.org/10.51594/ijarss.v5i8.586

[12]. Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

[13]. Becker, G. S. (1994). *Human Capital*. National Bureau of Economic Research.

[14]. Beckett, R. C., & Terziovski, M. (2025). Integrating Circular Economy Principles in Water Resilience: Implications for Corporate Governance and Sustainability Reporting. *Journal of Risk and Financial Management*, *18*(5), 261. https://doi.org/10.3390/jrfm18050261

[15]. Creswell, J. W. (2009). *Research design: Qualitative, Quantitative and Mixed Methods Approaches*. (3rd ed.). Sage Publications, Inc. https://www.ucg.ac.me/skladiste/blog_609332/objava_105202/fajlovi/Creswell.pdf

[16]. DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, *48*(2), 147–160. https://doi.org/10.2307/2095101

[17]. Ellen MacArthur Foundation. (2013). *Towards the circular economy: Economic and business rationale for an accelerated transition*. https://content.ellenmacarthurfoundation.org/m/27265af68f11ef30/original/Towards-the-circular-economy-Vol-1.pdf?_gl=1

[18]. Englande, A. J., Krenkel, P., & Shamas, J. (2015). Wastewater Treatment & Water Reclamation. *Reference Module in Earth Systems and Environmental Sciences*. https://doi.org/10.1016/b978-0-12-409548-9.09508-7

[19]. Fayomi, I., & Moronkeji, A. A. (2025). Management Processes and Determinants of Water Recycling Facilities of Corporate Real Estate Organizations in Nigeria. *International Journal of Civil Engineering, Construction and Estate Management*, *13*(2), 16–34. https://doi.org/10.37745/ijcecem.14/vol13n21634

[20]. Fincham, J. E. (2008). Response Rates and Responsiveness for Surveys, Standards, and the Journal. *American Journal of Pharmaceutical Education*, *72*(2), 43. https://doi.org/10.5688/aj720243

[21]. Ghanad, A. (2023). *An Overview of Quantitative Research Methods*. International Journal of Multidisciplinary Research and Analysis. http://dx.doi.org/10.47191/ijmra/v6-i8-52

[22]. Grimsey, D., & Lewis, M. K. (2004). *Public Private Partnerships*. https://doi.org/10.4337/9781845423438

[23]. Hoff, H. (2011). Understanding the Nexus. Background Paper for the Bonn 2011 Conference: The Water, Energy and Food Security Nexus. Stockholm Environment Institute, Stockholm.

[24]. Ibrahim, K. (2018). Influence of School Based Policies on Internal Efficiency in Public Day Secondary Schools in Nyatike Sub County, Kenya. *American Journal of Educational Research*, *6*(3), 161–169. https://doi.org/10.12691/education-6-3-1

[25]. Isukuru, E. J., Opha, J. O., Isaiah, O. W., Orovwighose, B., & Emmanuel, S. S. (2024). Nigeria's Water crisis: Abundant water, Polluted Reality. *Cleaner Water*, *2*(100026), 100026. https://doi.org/10.1016/j.clwat.2024.100026

[26]. Joseph, O., Solomon, O., Gabriel, & Eluka, J. (2019). Environmental Management Practices and Sustainability of Multinational Companies in South-South, Nigeria. *Journal of Business and Retail Management Research*, *Volume 13*(Issue 03). http://dx.doi.org/10.24052/JBRMR/V13IS03/ART-16

[27]. Juntunen, J. K., & Martiskainen, M. (2021). Improving understanding of energy autonomy: A systematic review. *Renewable and Sustainable Energy Reviews*, *141*, 110797. https://doi.org/10.1016/j.rser.2021.110797

[28]. Kaiser, Z. R. M. A., Kamal, R. D., & Zafarullah, H. (2025). Public–Private Partnership (PPP) in Developing Countries' Healthcare: Collaborative Governance Challenges, Opportunities, and Lessons from Bangladesh. *International Journal of Public Administration*, 1–16. https://doi.org/10.1080/01900692.2025.2535002

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep692

[29]. Lopez-Vargas, A., Fuentes, M., & Vivar, M. (2020). Challenges and Opportunities of the Internet of Things for Global Development to Achieve the United Nations Sustainable Development Goals. *IEEE Access*, *8*, 37202–37213. https://doi.org/10.1109/access.2020.2975472

[30]. Mandal, D., & Ghosh, D. (2024). Evaluating the dynamics of human-water symbiosis using the water-human harmony model in the fringe region of the Chhotanagpur Plateau, Eastern India. *DELETED*, *91*(2), 533–548. https://doi.org/10.1007/s43538-024-00350-6

[31]. Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. *Science Advances*, *2*(2), e1500323.

[32]. Mishra, P., & Pandey, V. K. (2025). Triple bottom line and environmental sustainability: evolution of global ESG research—a bibliometric analysis. *Environmental Sciences Europe*, *37*(1). https://doi.org/10.1186/s12302-025-01184-9

[33]. Mohamed, O., Kamaruzzaman, S. N., Isa, N. M., Jaapar, A., & Asbollah, A. (2021). Facilities Management Practices in Malaysia: A Literature Review. *The 4th International Building Control Conference 2016 (IBCC 2016)*. https://www.researchgate.net/publication/353846903_Facilities_Management_Practices_in_Malaysia_A_Literature_Review

[34]. Neelofar, M. R., Bhat, S. U., & Muslim, M. (2023). Water auditing and recycling as a tool for management of water resources: an Indian perspective. *Applied Water Science*, *13*(9). https://doi.org/10.1007/s13201-023-01979-2

[35]. Ngene, B. U., Nwafor, C. O., Bamigboye, G. O., Ogbiye, A. S., Ogundare, J. O., & Akpan, V. E. (2021). Assessment of water resources development and exploitation in Nigeria: A review of integrated water resources management approach. *Heliyon*, *7*(1), e05955. https://doi.org/10.1016/j.heliyon.2021.e05955

[36]. Ochoche, S., & Ajumobi, V. E. (2023). Sustainable Water Supply and Management in Nigeria: Challenges in the Niger Delta Region. *International Journal of Innovative Science and Research Technology*, *VOLUME 8, ISSUE 2, FEBRUARY- 2023*(ISSN NO:.2456-2165), 7. https://www.researchgate.net/publication/369503465_Sustainable_Water_Supply_and_Management_in_Nigeria_Challenges_in_the_Niger_Delta_Region

[37]. Odey, S. A. (2023). Environmental Law Enforcement: A Reevaluation. *Jurnal Ilmu Sosiologi Dialektika Kontemporer*, *11*(1), 91–108. https://ojs.unm.ac.id/elektikakontemporer/article/view/53863

[38]. Ogunbode, T. O., Oyebamiji, V. O., Ogundele, J. A., & Faboro, O. O. (2023). Household preference for wastewater reuse/recycling practice determinants in a growing community in Nigeria. *Frontiers in Environmental Science*, *10*. https://doi.org/10.3389/fenvs.2022.1051532

[39]. Onu, M. A., Ayeleru, O. O., Oboirien, B., & Olubambi, P. A. (2023). Challenges of wastewater generation and management in sub-Saharan Africa: A Review. *Environmental Challenges*, *11*, 100686.

[40]. Oruonye ED, & Ahmed YM. (2020). The role of enforcement in environmental protection in Nigeria. *World Journal of Advanced Research and Reviews*, *7*(1), 048–056. https://doi.org/10.30574/wjarr.2020.7.1.0237

[41]. Powell, A., Bagilhole, B., & Dainty, A. (2009). How Women Engineers Do and Undo Gender: Consequences for Gender Equality. *Gender, Work & Organization*, *16*(4), 411–428. https://doi.org/10.1111/j.1468-0432.2008.00406.x

[42]. Qadir, M., Drechsel, P., Jiménez Cisneros, B., Kim, Y., Pramanik, A., Mehta, P., & Olaniyan, O. (2020). Global and regional potential of wastewater as a water, nutrient and energy source. *Natural Resources Forum*, *44*(1), 40–51. https://doi.org/10.1111/1477-8947.12187

[43]. Raimi, M., O, O. A., Ayibatonbira, A. A., Anu, B., Odipe, O. E., & Deinkuro, N. S. (2019). "Digging Deeper" Evidence on Water Crisis and Its Solution in Nigeria for Bayelsa State: A Study of Current Scenario. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3422483

[44]. Sengupta, A., & Majumder, M. (2024). A Framework of Minimizing Life Cycle Impact Towards Sustainable Asset Management of Water Supply Systems in Smart Cities. *International Journal of Civil Engineering*, *12*(4), 158–180. https://doi.org/10.14445/23488352/ijce-v12i4p116

[45]. Silva, J. A. (2023). Wastewater Treatment and Reuse for Sustainable Water Resources Management: A Systematic Literature Review. *Sustainability*, *15*(14), 10940.

[46]. Singh, B. J., Chakraborty, A., & Sehgal, R. (2023). A systematic review of industrial wastewater management: Evaluating challenges and enablers. *Journal of Environmental Management*, *348*, 119230.

[47]. Song, X., Li, P., Zhang, B., Yu, K., Zhang, D., & He, Y. (2025). Realization approaches for constructing energy self-sufficient wastewater treatment plants: a review. *Carbon Neutrality*, *4*(1). https://doi.org/10.1007/s43979-025-00133-y

[48]. Woźniak, P., & Gryta, M. (2024). Influence of Reclaimed Water on the Visual Quality of Automotive Coating. *Materials*, *17*(21), 5382–5382. https://doi.org/10.3390/ma17215382

[49]. Zak, D., Petersen, R. J., Hoffmann, C. C., Audet, J., Vodder Carstensen, M., Andersen, H. E., Kronvang, B., & Bruun Hansen, H. C. (2025). Biogeochemistry and Nutrient Cycling IN Wetlands. *Routledge Handbook of Wetlands*, 94–106. https://doi.org/10.4324/9781003219644-10