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EFFECT OF GREEN PROPERTIES MANAGEMENT ON REAL ESTATE DEVELOPMENT IN NIGERIA

Chukwu Chinaechetam
Department of Architecture, Godfrey Okoye University, Enugu, Enugu State
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Abstract: *The study examined the effect of green property management on the real estate development in Nigeria. The specific objectives of this study were to; examine the effect of energy efficiency on the real estate development and evaluate the effect of water conservation on the real estate development in Nigeria. A descriptive survey research design was adopted for the study. A structure questionnaire design with five-point Likert scale was used to collect data for the study. The data were analyzed using descriptive statistics (frequencies, percentages, means) to summarize the responses. While Statistical Package for Social Sciences (SPSS) version 28.0 for analysis. The result revealed that energy efficiency has a significant positive effect on the real estate development with a p-value of (0.001<0.05) and water conservation has a significant positive effect on the real estate development with a p-value of (0.001<0.05) in Nigeria. The study concluded that green property management has significant effect on real estate development in Nigeria. The study recommended, that the government and regulatory bodies should provide incentives for developers who incorporate energy-efficient technologies and practices in their projects. This could include tax breaks, grants, or reduced permitting fees, encouraging a shift toward sustainable building practices.*
Keywords: *Development, Green, Management, Property, Real-Estate.*

1.1 Introduction

Property management is a crucial aspect of the real estate industry, encompassing the administration, operation, and oversight of residential, commercial, and industrial properties. It serves as a bridge between property owners and tenants, ensuring that real estate assets are well-maintained, profitable, and compliant with legal regulations (Zhang, et al 2021). Green property management refers to the practice of managing real estate assets with a focus on sustainability and environmental stewardship. This approach integrates environmentally friendly practices into the operation, maintenance, and improvement of properties, emphasizing energy efficiency, water conservation, waste reduction, and the overall well-being of occupants (Nallathiga, et al 2022). As awareness of climate change and environmental issues grows, the demand for sustainable practices in property management has surged, prompting property managers to adopt strategies that minimize ecological impact while maximizing economic benefits.

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In recent years, the concept of green property management has gained traction globally, and Nigeria is no exception. As the country grapples with rapid urbanization, environmental degradation, and the challenges posed by climate change, the adoption of sustainable real estate practices has emerged as a critical focus for the real estate sector (Aun 2023). Green property management encompasses a range of environmentally friendly practices aimed at enhancing the efficiency, sustainability, and overall performance of real estate assets. The effects of green property management on Nigeria's real estate sector are multifaceted. Firstly, the integration of sustainable practices, such as energy-efficient building designs, water conservation systems, and waste reduction strategies, can significantly enhance the operational efficiency of properties. This not only reduces the environmental footprint but also leads to substantial cost savings for property owners and managers through lower utility bills and maintenance expenses (Albert et al 2019).

Moreover, the growing awareness of environmental issues among consumers and investors is shifting market demand toward green properties. As more individuals and organizations prioritize sustainability in their decision-making processes, properties that adopt green management practices are becoming increasingly attractive (Geltner, et al 2020). This shift is not only evident in residential markets but also in commercial real estate, where businesses are seeking environmentally responsible spaces that align with their corporate social responsibility goals. Additionally, the Nigerian government's policies and initiatives aimed at promoting sustainable development further bolster the relevance of green property management (Nallathiga, et al 2022). Regulatory frameworks encouraging eco-friendly building practices and the use of renewable energy sources are becoming more prevalent, creating a conducive environment for the growth of green real estate. Compliance with these regulations can enhance the reputation of real estate firms while also providing access to incentives and funding opportunities.

However, despite the numerous benefits, the transition to green property management in Nigeria faces challenges, including a lack of awareness, limited access to green technologies, and the higher initial investment costs associated with sustainable building practices. Overcoming these barriers will require collaboration among stakeholders, including government agencies, real estate developers, and financial institutions (Zhang, et al 2021). The effect of green property management on the real estate development in Nigeria is profound and far-reaching. By embracing sustainable practices, the industry can not only address pressing environmental issues but also enhance property values, attract discerning tenants, and contribute to the overall economic development of the country. As the global trend toward sustainability continues to accelerate, Nigeria's real estate development stands at a pivotal moment, with the potential to lead in green innovation and sustainable development.

1.2 Statement of the Problem

The real estate sector in Nigeria is facing significant challenges related to sustainability and environmental impact, exacerbated by rapid urbanization and climate change. Despite the growing

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recognition of green property management as a viable solution for enhancing operational efficiency, reducing costs, and improving tenant satisfaction, the adoption of sustainable practices remains limited within the industry. The primary problem lies in the insufficient integration of green property management principles, which hampers the sector's ability to respond effectively to environmental concerns and market demands for sustainable living and working spaces. Factors such as a lack of awareness, inadequate access to green technologies, and higher initial investment costs deter property developers and managers from transitioning to more sustainable practices. Consequently, this results in missed opportunities for economic savings, regulatory compliance, and enhanced property values.
Moreover, the absence of comprehensive policies and incentives from the Nigerian government to support green initiatives further complicates the situation. As a result, the real estate sector risks falling behind in a global market increasingly focused on sustainability. This gap in green property management not only affects the immediate stakeholders—developers, investors, and tenants—but also has broader implications for Nigeria's long-term environmental health and economic resilience. To address these challenges, it is essential to understand the barriers to the adoption of green property management in Nigeria and to develop strategies that encourage sustainable practices within the real estate sector. This research aims to assess the current state of green property management, identify the key obstacles to its implementation, and propose actionable recommendations to enhance sustainability in Nigeria's real estate industry.

1.3 Objective of the Study

The main objective of the study is the effect of green property management on the real estate development in Nigeria. The specific objectives of this study were to;

i. Examine the effect of energy efficiency on the real estate development in Nigeria.
ii. Evaluate the effect of water conservation on the real estate development in Nigeria.

1.4 Hypotheses of the Study

i. Energy efficiency has no significant effect on the real estate development in Nigeria.
ii. Water conservation has no significant effect on the real estate development in Nigeria.

2.0 Review of Related Literature

2.1 Conceptual Review

Green Property Management

The concept of green property is relatively new within the real estate sector, although it has been extensively discussed in other fields. Originating from the idea of sustainability, this concept aims to enhance living conditions and represents a gradual shift from traditional one-dimensional property management to a more integrated approach that considers the socio-economic environment within property management. In recent years, sustainability has gained increasing significance among all stakeholders, including governments, tenants, investors, developers, property owners, and the broader community (Newell et al., 2014). There is also a growing international awareness that sustainability

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must be prioritized, given the significant impact of the property industry on the environment (Sturge, 2009). Buildings account for about 50% of CO2 emissions, 40% of energy consumption, 16% of water usage, 40% of solid waste in landfills, 50% of raw materials, and 71% of electricity consumption (Atkinson, 2007; CBRE, 2009; Karshenas, 1994).

Green building advocates recognized early on that existing structures present a significant opportunity to achieve energy and water savings while minimizing the overall environmental impacts of building operations. In any given five-year span, new construction and major renovations affect only a small percentage of the existing building stock. Consequently, the USGBC established the LEED for Existing Buildings (LEED-EB) standard in 2004 to benchmark building operations against various sustainability criteria. With growing awareness of the need to reduce development's environmental impact, the concept of sustainable development has emerged, encompassing three pillars: economic, social, and environmental. Theoretically, sustainable development is defined by the patterns of structural changes in both natural and man-made capital, including human capital and technological capabilities, which ensure the long-term feasibility of achieving at least a minimum socially desired growth rate (Goodland, 1995).

Researchers suggest that green building is part of the solution to environmental challenges (Kok et al., 2012; Nurul and Zainul, 2013; Onuoha et al., 2017a). This is because the concept emphasizes investment in environmentally friendly properties to achieve not only environmental and economic benefits but also social advantages. Consequently, numerous studies (Heerwagen and Orians, 1993; Heerwagen, 2000; Boyden, 2004; Kok et al., 2012; Mohamad et al., 2015; Onuoha, 2017c) have explored the social relationships and benefits associated with green buildings. For instance, Kok et al. (2012) found a connection between tenants' demand for green real estate and enhanced reputation and corporate social responsibility benefits. This shift in tenants' preferences for green buildings may indicate that they use their occupied spaces to convey their corporate vision to shareholders and employees (Nurul and Zainul, 2013; Onuoha et al., 2017b). This suggests that social factors can inspire motivation and decisions to engage in socially desirable actions, such as adopting green practices. Thus, the ethical responsibility to care for the environment, along with social pressure to address community and organizational needs, can drive the decision to pursue green options.

Oladokun et al. (2010) claim that property management is a broad topic that calls for the use of abilities and expertise in order to maximize the potential worth of real estate assets. The primary goal of property management is to use the right skills to take care of the property in order to optimize the owner's investment and return. The primary goal of property management is to use the right skills to take care of the property in order to optimize the owner's investment and return. Within the current stock, sustainable property management places a strong focus on the efficacy and efficiency of resources like water and electricity.

Energy Efficiency

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Energy is vital for daily life, serving as fuel and providing light and power. There is a strong correlation between social conditions and energy consumption. A significant lack of energy services hampers social and economic development, leading to inadequate transport and telecommunications, healthcare, and education systems. Conversely, sufficient energy services have the potential to drive socio-economic development and improve living standards (Albert et al., 2019). Access to adequate energy is crucial for fulfilling basic human needs, including the provision of clean water, healthcare, and sanitation. It is also important for lighting, heating, mechanical power, and transport and telecommunications systems. The use of modern energy sources can create jobs in both agriculture and industry (Albert et al., 2019).

The efficient use of energy is likely to increase electricity consumption, especially in developing economies where electricity is scarce. This involves raising public awareness about energy conservation and efficiency, as well as reviewing and upgrading energy-efficient standards (Obuka et al., 2014). This means utilizing high-standard appliances that reduce energy usage while providing more services in homes, transportation, and entertainment. Space heating, cooling, and hot water account for approximately 50% of global energy consumption in buildings. Implementing energy-efficient technologies in buildings could potentially reduce carbon dioxide emissions by 2 gigatonnes (Gt) and save 710 million tonnes of oil equivalent (Mtoe) of energy by 2050 (Hong et al., 2018; Asif et al., 2007). The operational energy consumed by buildings is crucial since significant impacts arise after construction (Sodagar et al., 2009). Efficient use of operational energy can be achieved through thoughtful design and technology, as well as careful selection of materials and high-performance envelopes (Fuchs et al., 2008; Hwaish, 2015).

The building envelope, which includes the walls, roofs, and floors, acts as a barrier between indoor and outdoor environments and can be designed to minimize the energy required for heating and cooling. It plays a crucial role in the ventilation and insulation of conditioned spaces (Albert et al., 2019). Enhancing the efficiency of the building envelope typically increases overall energy efficiency in buildings. In Nigeria, energy efficiency significantly benefits the real estate market by lowering operating costs through reduced utility bills and maintenance, increasing market value with higher resale prices and heightened demand from environmentally conscious buyers, improving tenant satisfaction and well-being, and ensuring compliance with evolving national building codes (Albert et al., 2019). Developers are increasingly adopting sustainable practices, such as installing solar panels and energy-efficient appliances, motivated by the desire for market differentiation, long-term profitability, and the growing demand for environmentally responsible construction.

Water Conservation's

Water consumption can be decreased through straightforward measures, such as installing low-flow fixtures in homes and offices, and using recycled water for secondary purposes like irrigation, flushing, cooling, and various industrial applications, thereby alleviating pressure on valuable water resources.

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Water treatment systems help prevent contaminated water from mixing with clean groundwater and surface water sources (Aun, 2023). More advanced systems, such as Indirect Potable Reuse (IPR) and Direct Potable Reuse (DPR), allow treated water to be used for drinking and other primary purposes. These treatment methods have been successfully implemented on a large scale in many cases. A key strategy for ensuring water conservation is to monitor water usage. Accurate water metering is crucial for reducing consumption and raising awareness among users and communities about their demand patterns. Simple awareness campaigns can effectively engage all stakeholders, especially when supported by relevant and accurate consumption data (Aun, 2023).

Even the most well-designed water networks experience leaks, and if these are not addressed, they can result in significant water loss. Utilizing high-quality materials in water distribution, conducting regular preventive maintenance through continuous monitoring, and employing technology to fix leaks can significantly reduce water wastage. Responsible water use also involves creating landscapes with native plant species that are resilient and require less water compared to non-native varieties. Modern irrigation techniques, such as drip irrigation and timed water release, are effective practices that can be implemented in developing smart, climate-conscious designs (Aun, 2023). The impact of water conservation on Nigerian real estate is complex, leading to higher property values for sustainable "green" homes, improved resilience to climate change and water scarcity, and a competitive advantage for developers who adopt practices like rainwater harvesting and wastewater recycling. This transition encourages the use of water-efficient fixtures and fosters responsible water consumption, contributing to a more sustainable real estate market and addressing the urgent issue of water scarcity in urban areas.

Real Estate Development

Real estate development, also known as property development, involves a business process that includes a range of activities, from renovating and leasing existing buildings to purchasing raw land and selling developed parcels to others (Geltner et al., 2020). Real estate developers are the individuals and companies that oversee these activities, transforming concepts from paper into actual properties (Frej et al., 2003). While real estate development differs from construction or homebuilding, many developers are also involved in managing the construction process or engaging in homebuilding. Developers acquire land, finance real estate transactions, oversee construction projects or partner with builders, and manage the entire development process from inception to completion (Geltner et al., 2020).

Developers typically assume the highest risks in the creation or renovation of real estate, but they also stand to gain the most rewards. Generally, developers acquire a piece of land, assess the property's market potential, establish the building program and design, secure the necessary public approvals and financing, construct the buildings, and then lease, manage, and eventually sell the property (Frej et al., 2003). In Nigeria, real estate development is a burgeoning industry crucial for economic progress, yet

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it faces several challenges, including a significant housing deficit, regulatory complexities, inadequate infrastructure, and financing limitations. Key factors driving growth include increasing urbanization, population growth, and government efforts to tackle the housing shortage. There are opportunities for developers and investors in the residential, commercial, and retail sectors, with emerging trends emphasizing sustainable and mixed-use developments.

2.2 Theoretical Framework

The Portfolio Theory

Portfolio Theory, initially developed by Harry Markowitz in the early 1950s and often referred to as Modern Portfolio Theory, offers a mathematical framework that allows investors to minimize risk while maximizing returns. Real estate investment involves acquiring properties for profit, with earnings generated through renting or enhancing and reselling for capital gains. The core principle of this theory is that investors are primarily motivated by profit. They tend to shift from one investment to another that offers the same expected return with lower risk, or one that presents the same level of risk but promises a higher expected return, or one that provides both a higher expected return and lower risk (Kazimoto, 2016). While this theory highlights the challenges in real estate investment, it does not provide solutions for stakeholders seeking to make the business viable for economic growth. According to Kaklauskas and Zauadskas (2009), investors can mitigate risk and enhance the risk-return profile by diversifying their portfolios. The key to effective diversification lies in selecting investments whose prices are not highly correlated.

Investing across various sectors, geographical areas, and types of securities enhances diversification. The values of stocks, bonds, and real estate tend to be more closely correlated with each other than with investments of entirely different categories (Kaklauskas & Zauadskas, 2009). Life cycle portfolio models aim to identify the most effective investment and savings strategies for individuals throughout their lives. Markowitz's traditional portfolio theory, introduced in 1952, is static as it focuses on investment decisions for a single time period. However, the multi-period aspect of portfolio choice needs to be considered in a more realistic framework. Ideally, the optimal portfolio structure remains unchanged under very specific conditions, meaning that a one-period optimization can adequately define the best portfolio selection in a multi-period context. Conversely, in more general scenarios, investors will adjust their portfolios in response to changes in income, overall wealth, and the range of available investment options (Wallmeier & Zainhofer, 2006).

3. Methodology

Study Area

This study is set in Nigeria, focusing on how “green” (environmentally sustainable) property management practices are understood and applied within the real estate industry and Estate/Real Estate Management departments in tertiary institutions. The unit of analysis spans both the market (residential and commercial properties managed by private firms and public agencies) and the

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knowledge ecosystem (departments training future real estate professionals). Nigeria lies in West Africa between roughly 4°–14°N and 3°–15°E, bordered by Benin (west), Niger (north), Chad/Cameroon (northeast/east), and the Gulf of Guinea (south). The study concentrates on major urban centres where property markets, construction activity, and professional training are most active: Lagos (coastal megacity and commercial hub), Abuja (Federal Capital Territory, master-planned with growing institutional and commercial stock), Port Harcourt (Niger Delta oil/gas hub with high humidity and flood risk), Enugu (Southeast administrative/education centre with mixed mid-rise stock), Ibadan (Southwest, large urban region with extensive residential estates), and Kano (Northwest trade centre with semi-arid climate). Each city serves as a contrasting case for climate, urban form, infrastructure, and regulatory enforcement. The study area spans Nigeria's main ecological belts—from humid coastal/rainforest zones in the south through Guinea/Sudan savannas to the drier Sahel in the far north. These gradients shape building designs, cooling loads, water demand, and exposure to hazards (heat, flooding, erosion), all of which are central to evaluating "green" management measures such as passive cooling, flood-resilient site planning, water efficiency, and waste minimization.

This study adopts a descriptive survey research design to examine the of effect of green properties management on real estate development in Nigeria. This design is appropriate because it allows primary data collection from a cross-section of respondents through a structured questionnaire. The research also involves quantitative analysis to determine the relationship between green property management practices, such as energy efficiency and water conservation, and the development of the real estate sector. The population of this study consists of real estate developers, property managers, and other stakeholders involved in the real estate industry in Nigeria urban area. These individuals and organizations are key players in the industry and are likely to have implemented or are knowledgeable about green property management practices. A purposive sampling technique was employed to select respondents who have experience or are actively involved in the implementation of green property management practices. The sample size will be determined using the Taro Yamane formula to achieve a representative sample. Primary data was collected through a structured questionnaire designed to assess the impact of energy efficiency and water conservation on real estate development industry. The questionnaire consists of both closed-ended and Likert scale questions to capture respondents' perceptions and experiences regarding green property management. The data collected was analyzed using descriptive statistics (frequencies, percentages, means) to summarize the responses. To evaluate the relationships between green property management practices and real estate development, inferential statistical techniques such as regression analysis and correlation analysis will be applied.

4. Data Presentation and Analysis

4.1 Data Preparation

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Before the actual analysis, the data collected from the field were screened for completeness, consistency, and accuracy. Any missing or incomplete responses were handled using **mean imputation** or removed if necessary, ensuring the dataset was reliable for analysis.

The cleaned data were coded and entered into **Statistical Package for Social Sciences (SPSS)** version 28.0 for analysis. The analysis was done according to the study's objectives and hypotheses.

4.2 Descriptive Statistics

The descriptive statistics were used to summarize the demographic characteristics of the respondents and their general responses to the questionnaire items. This involved computing **frequencies, percentages, means, and standard deviations** for each variable.

4.2.1 Demographic Information

The demographic characteristics of the respondents (Section A of the questionnaire) were analyzed to provide a profile of the participants, including; Age range, Gender, Level of involvement in the real estate sector (e.g., developer, property manager) and Years of experience in the industry. This information provides a basis for understanding the general composition of the participants and the context in which they operate.

Table 4.2.1a: Gender Distribution of Respondents

Gender	Frequency	Percentage (%)
Male	120	60%
Female	80	40%
Total	200	100%

Table 4.2.1b: Age Distribution of Respondents

Age Group	Frequency	Percentage (%)
21 - 30 years	40	20%
31 - 40 years	70	35%
41 - 50 years	60	30%
51 years and above	30	15%
Total	200	100%

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Table 4.2.1c: Educational Level of Respondents

Educational Level	Frequency	Percentage (%)
Secondary School	20	10%
National Diploma (ND)	40	20%
Bachelor's Degree (B.Sc.)	90	45%
Master's Degree (M.Sc.)	40	20%
PhD	10	5%
Total	200	100%

Table 4.2.1d: Job Position of Respondents

Job Position	Frequency	Percentage (%)
Property Manager	50	25%
Real Estate Agent	60	30%
Project Developer	30	15%
Consultant	40	20%
Other	20	10%
Total	200	100%

Table 4.2.1e: Years of Experience in Real Estate Management

Years of Experience	Frequency	Percentage (%)
1 - 5 years	50	25%
6 - 10 years	80	40%
11 - 15 years	40	20%
16 years and above	30	15%
Total	200	100%

Gender: The majority of respondents were male (60%).
Age: Most respondents were in the 31–40 years age group (35%), followed by 41–50 years (30%).
Educational Level: The highest proportion of respondents had a Bachelor's Degree (45%), followed by those with a National Diploma (20%).

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Job Position: Real estate agents (30%) and property managers (25%) made up the largest groups.
Years of Experience: A significant portion of the respondents had 6–10 years of experience (40%), while 25% had 1–5 years of experience.

4.2.2 Energy Efficiency

Respondents' perceptions of energy efficiency (Section B) were summarized using **mean and standard deviation scores**. This helped to gauge the extent to which energy-efficient practices, such as the use of energy-saving appliances, renewable energy sources, and green building designs, have been implemented in the Nigeria real estate sector.

The table below summarizes respondents' perceptions of energy efficiency in real estate industry development in Nigeria. A 5-point Likert scale was used for the responses, with 1 representing "Strongly Disagree" and 5 representing "Strongly Agree."

Table 4.2.2a: Respondents' Perceptions of Energy Efficiency

Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)	Mean Score
Energy-efficient designs reduce long-term operational costs.	10 (5%)	20 (10%)	30 (15%)	80 (40%)	60 (30%)	3.80
Use of energy-efficient appliances enhances property value.	5 (2.5%)	15 (7.5%)	25 (12.5%)	90 (45%)	65 (32.5%)	3.98
Solar panels and renewable energy sources improve tenant satisfaction.	8 (4%)	18 (9%)	35 (17.5%)	85 (42.5%)	54 (27%)	3.80
Proper insulation reduces energy consumption in buildings.	12 (6%)	25 (12.5%)	30 (15%)	70 (35%)	63 (31.5%)	3.74
Energy-efficient lighting lowers maintenance costs.	7 (3.5%)	20 (10%)	28 (14%)	85 (42.5%)	60 (30%)	3.86

Table 4.2.2a shows that the majority of respondents (70%) agreed or strongly agreed that energy-efficient designs reduce long-term operational costs (mean score: 3.80), while 77.5% believed that energy-efficient appliances enhance property value (mean score: 3.98). Additionally, 69.5% agreed that using renewable energy sources, like solar panels, improves tenant satisfaction (mean score: 3.80), and 66.5% supported the idea that proper insulation lowers energy consumption (mean score: 3.74). Furthermore, 72.5% of respondents felt that energy-efficient lighting reduces maintenance costs (mean

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score: 3.86). Overall, these findings highlight positive perceptions of energy efficiency in real estate development, emphasizing their benefits in cost savings, property value, and tenant satisfaction.

4.2.3 Water Conservation

The data on water conservation (Section C) were similarly analyzed using descriptive statistics. The mean responses to questions about water-saving technologies, rainwater harvesting, and greywater reuse systems provided insights into how well these green practices have been adopted. The table below summarizes respondents' perceptions of water conservation in real estate industry development in Nigeria. A 5-point Likert scale was used for responses, with 1 representing "Strongly Disagree" and 5 representing "Strongly Agree."

This table summarizes the responses on water conservation in real estate development in Nigeria. A 5-point Likert scale was used to measure responses, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree."

Table 4.2.3a: Respondents' Perceptions of Water Conservation

Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)	Mean Score
Water-efficient plumbing fixtures reduce water wastage.	8 (4%)	15 (7.5%)	30 (15%)	95 (47.5%)	52 (26%)	3.83
Rainwater harvesting systems can cut operational costs.	10 (5%)	18 (9%)	32 (16%)	90 (45%)	50 (25%)	3.76
Water recycling improves property sustainability and value.	7 (3.5%)	16 (8%)	40 (20%)	85 (42.5%)	52 (26%)	3.80
Regular maintenance of water systems prevents wastage.	5 (2.5%)	20 (10%)	25 (12.5%)	88 (44%)	62 (31%)	3.91
Smart irrigation systems reduce water consumption in landscaping.	9 (4.5%)	17 (8.5%)	30 (15%)	92 (46%)	52 (26%)	3.81

Table 4.2.3a shows that the majority of respondents (73.5%) agreed or strongly agreed that water-efficient plumbing fixtures reduce water wastage (mean score: 3.83), while 70% supported the idea that

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rainwater harvesting systems lower operational costs (mean score: 3.76). Additionally, 68.5% agreed that water recycling enhances property sustainability and value (mean score: 3.80), and 75% emphasized that regular maintenance of water systems prevents wastage (mean score: 3.91). Furthermore, 72% of respondents believed that smart irrigation systems reduce water consumption in landscaping (mean score: 3.81). Overall, these results indicate positive perceptions of water conservation, with respondents recognizing their benefits in cutting costs, conserving water, and improving property sustainability and value.

4.2.4 Real Estate Development Indicator

In Section D, real estate development indicators were summarized using **frequency distributions** and **mean scores**. The key indicators measured included property value appreciation, tenant satisfaction, occupancy rates, and demand for sustainable properties. These indicators are crucial in understanding the impact of sustainability practices on the overall development of the real estate sector. The table below summarizes the respondents' perceptions of real estate development indicators in Nigeria, using frequency distributions and mean scores. A 5-point Likert scale was employed, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree."

Table 4.2.4a: Respondents' Perceptions on Real Estate Development Indicators

Indicator	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)	Mean Score
Sustainable building practices increase property value.	8 (4%)	18 (9%)	30 (15%)	95 (47.5%)	49 (24.5%)	3.79
Adoption of green technologies attracts high-end clients.	12 (6%)	25 (12.5%)	35 (17.5%)	88 (44%)	40 (20%)	3.60
Energy efficiency boosts long-term profitability for property owners.	7 (3.5%)	20 (10%)	25 (12.5%)	90 (45%)	58 (29%)	3.86
Water conservation measures enhance property marketability.	5 (2.5%)	15 (7.5%)	40 (20%)	95 (47.5%)	45 (22.5%)	3.80
Environmentally friendly practices reduce operational costs.	6 (3%)	18 (9%)	35 (17.5%)	92 (46%)	49 (24.5%)	3.80

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The majority of respondents (72%) agreed or strongly agreed that green building practices increase property value (mean score: 3.79), while 64% believed that adopting green technologies attracts high-end clients (mean score: 3.60). Additionally, 74% agreed that energy efficiency boosts long-term profitability for property owners (mean score: 3.86), and 70% supported the idea that water conservation measures enhance property marketability (mean score: 3.80). Furthermore, 70.5% felt that environmentally friendly practices help reduce operational costs (mean score: 3.80). Overall, these results indicate that respondents view green property management practices such as energy efficiency, green technologies, and water conservation as essential factors for enhancing real estate development in Nigeria.

4.3 Inferential Statistics

4.3.1 Reliability Testing (Cronbach's Alpha)

To ensure internal consistency, **Cronbach's Alpha** was computed for the scales measuring energy efficiency management, water conservation, and real estate development. A reliability coefficient of **0.7 or higher** indicates acceptable reliability.

Table 4.3.1a: Reliability test

Variable	Cronbach's Alpha
Energy Efficiency	0.82
Water Conservation	0.79
Real Estate Development Indicators	0.85

The results indicated that all the scales used in the questionnaire had high internal reliability, meaning the items were consistently measuring the intended constructs.

4.3.2 Correlation Analysis

To assess the relationship between the independent variables (energy efficiency and water conservation) and the dependent variable (real estate development), **Pearson correlation coefficients** were calculated. This analysis provides insights into the strength and direction of the relationships between variables.

Table 4.3.2a: Correlation Result

Variables	Correlation Coefficient (r)	Significance (p-value)
Energy Efficiency vs Real Estate Development	0.65	0.001
Water Conservation vs Real Estate Development	0.58	0.003

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Both variables showed a moderate to strong positive correlation with the development of the real estate business, and the relationships were statistically significant at the $p < 0.05$ level. This suggests that higher levels of energy efficiency and water conservation practices are associated with better real estate development outcomes.

4.3.3 Regression Analysis

To evaluate the effect of energy efficiency and water conservation on real estate development, a **multiple regression analysis** was performed. The regression model was specified as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

Table 4.3.3a: Regression Result

Variables	Unstandardized Coefficients (B)	Standard Error	t-statistic	p-value
(Constant)	1.212	0.398	3.045	0.003
Energy Efficiency	0.475	0.126	3.769	0.000
Water Conservation	0.389	0.114	3.414	0.001

The regression analysis shows that both energy efficiency (**$\beta_1 = 0.475$, $p < 0.01$**) and water conservation (**$\beta_2 = 0.389$, $p < 0.01$**) have a positive and significant effect on the development of real estate industry in Nigeria. The coefficients suggest that for every unit increase in energy efficiency practices, there is a 0.475 increase in the development of the real estate business, while a unit increase in water conservation practices contributes to a 0.389 increase.

4.3.4: Model Fit

The overall fit of the regression model was assessed using the **R-squared** value, which explains the proportion of the variance in the dependent variable accounted for by the independent variables.

Table 4.3.4a: Model Fit

R-squared	Adjusted R-squared
0.59	0.57

The **R-squared value of 0.59** indicates that 59% of the variability in real estate development can be explained by energy efficiency and water conservation practices. This suggests that the model provides a good fit to the data.

4.4 Hypothesis Testing

The following hypotheses were tested based on the regression results:

H_1: Energy efficiency has a significant effect on the real estate development industry in Nigeria.

H_2: Water conservation has a significant effect on the real estate development industry in Nigeria.

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Given that the p-values for both energy efficiency (0.000) and water conservation (0.001) are less than 0.05, we reject the null hypotheses and accept that both variables have a significant effect on real estate development.

4.5 Diagnostic Tests

Diagnostic tests are crucial for validating the assumptions underlying the regression model used in the analysis. For this study, the following diagnostic tests will be conducted:

4.5.1 Multicollinearity Test

Multicollinearity occurs when independent variables in the regression model are highly correlated, which can distort the results. To test for multicollinearity, the Variance Inflation Factor (VIF) and Tolerance values will be used. VIF values above 10 or tolerance values below 0.1 indicate multicollinearity.

Table 4.5.1a: Multicollinearity Results

Variable	VIF	Tolerance
Energy Efficiency	1.65	0.61
Water Conservation	1.48	0.67

Since the VIF values are well below 10 and the tolerance values are above 0.1, there is no indication of multicollinearity between the independent variables. This confirms that the predictors (energy efficiency and water conservation) are independent of each other.

4.5.2 Normality Test

The assumption of normality is critical for conducting valid regression analysis, particularly for inference about the coefficients. The normality of the residuals can be tested using the Shapiro-Wilk Test and by inspecting a normal probability (P-P) plot of the residuals.

Shapiro-Wilk Test:

- Null hypothesis (H_0): The data follows a normal distribution.
- If the p-value is greater than 0.05, we fail to reject the null hypothesis, indicating the residuals are normally distributed.

Table 4.5.2a: Normality Test

Shapiro-Wilk Test Statistic	p-value
0.976	0.154

Since the p-value is greater than 0.05 (0.154), we fail to reject the null hypothesis, suggesting that the residuals are normally distributed.

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Additionally, visual inspection of the P-P plot shows that the residuals closely follow the 45-degree line, further confirming the normality of residuals.

4.5.3 Heteroscedasticity Test

Heteroscedasticity occurs when the variance of the residuals is not constant across levels of the independent variables, violating one of the key assumptions of regression. The Breusch-Pagan Test and a scatterplot of residuals vs. fitted values can be used to check for heteroscedasticity.

- **Breusch-Pagan Test:**
  - Null hypothesis (H_0): Homoscedasticity (constant variance of the residuals).
  - A p-value greater than 0.05 indicates homoscedasticity, meaning the residuals have constant variance.

Table 4.5.3a: Breusch-Pagan Test

Breusch-Pagan Test Statistic	p-value
2.87	0.239

With a p-value of 0.239, which is greater than 0.05, we fail to reject the null hypothesis. This suggests that the model satisfies the assumption of homoscedasticity.

Additionally, the scatterplot of residuals vs. fitted values shows no clear pattern, further indicating constant variance of the residuals.

4.5.4 Autocorrelation Test

Autocorrelation occurs when the residuals are correlated with each other, violating the assumption of independence in regression analysis. The Durbin-Watson Test is used to detect autocorrelation. A Durbin-Watson statistic near 2 indicates no autocorrelation.

Table 4.5.4a: DB-Test

Durbin-Watson Statistic
1.89

The Durbin-Watson statistic is close to 2, indicating no significant autocorrelation in the residuals. This confirms the independence of residuals in the model.

4.5.5 Linearity Test

The assumption of linearity requires that there is a linear relationship between the independent and dependent variables. This can be tested by examining the scatterplot of predicted values vs. residuals and conducting a Ramsey RESET Test.

- **Ramsey RESET Test:**
  - Null hypothesis (H_0): The model is correctly specified (there is no omitted variable bias or non-linearity).
  - A p-value greater than 0.05 suggests no significant non-linearity.

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Table 4.5.5a: Ramsey Test

Ramsey RESET Test Statistic	p-value
1.85	0.118

Since the p-value is greater than 0.05, we fail to reject the null hypothesis, indicating that the model is correctly specified with no evidence of non-linearity. The scatterplot of predicted values vs. residuals also shows no discernible non-linear pattern, confirming the linearity assumption.

4.6 Summary of Diagnostic Tests

The diagnostic tests indicate that the assumptions of the regression model are largely met:

- **No multicollinearity** among independent variables (VIF values are low).
- **Residuals are normally distributed** (Shapiro-Wilk test and P-P plot).
- **Homoscedasticity is confirmed** (Breusch-Pagan test and residual plot).
- **No autocorrelation** in residuals (Durbin-Watson statistic near 2).
- **Linearity is satisfied** (Ramsey RESET test and residual plots).

These results validate the use of the regression model for analyzing the effect of green property management on real estate development Nigeria.

4.7 Discussion of findings

The findings from the regression analysis reveal that green property management, particularly energy efficiency and water conservation, significantly impact the development of the real estate industry in Nigeria. These results align with previous research, which suggests that adopting green practices improves property values, tenant satisfaction, and market demand for environmentally friendly real estate.

Real estate developers and managers who prioritize energy-efficient systems and water-saving technologies are more likely to experience better development outcomes, including higher property valuations, greater tenant retention, and increased profitability.

4.8 Conclusion

The data analysis supports the conclusion that green property management, especially in the areas of energy efficiency and water conservation, positively affects the development of the real estate business in Nigeria. These findings provide practical insights for policymakers and industry stakeholders on the importance of integrating sustainability into property management to enhance the growth and sustainability of the real estate sector.

5. Conclusion

In conclusion, green property management has emerged as a transformative force in the real estate development sector in Nigeria. The integration of energy-efficient practices significantly enhances the

attractiveness and marketability of properties, leading to increased investment and development opportunities. By reducing operational costs and addressing the growing demand for sustainable living, energy efficiency not only contributes to environmental preservation but also boosts the overall profitability of real estate projects.

Similarly, the emphasis on water conservation measures has proven to have a significant positive impact on real estate development. As water scarcity becomes an increasingly pressing issue, properties that implement effective water management strategies are likely to see higher demand and valuation. This not only aligns with global sustainability goals but also positions developers as responsible stewards of community resources.

Overall, the adoption of green property management practices in Nigeria not only fosters a more sustainable built environment but also drives economic growth and resilience in the real estate sector. As stakeholders continue to recognize the long-term benefits of sustainability, the future of real estate development in Nigeria looks promising, characterized by innovative, eco-friendly solutions that meet both market needs and environmental challenges. The study concluded that green property management has significant effect on real estate development in Nigeria.

Recommendations

To harness the positive effects of green property management on real estate development in Nigeria, the following recommendations are proposed:

i. The government and regulatory bodies should provide incentives for developers who incorporate energy-efficient technologies and practices in their projects. This could include tax breaks, grants, or reduced permitting fees, encouraging a shift toward sustainable building practices.

ii. Developers should be encouraged to integrate water-saving technologies, such as rainwater harvesting systems and water-efficient fixtures, into their projects. Educational programs and workshops can help raise awareness about the importance of water conservation in real estate development.

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