Exploring the Application of Green Design Strategies in Selected Shopping Malls in Southwest Nigeria

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ABSTRACT

Green design is a design strategy that incorporates environmental consciousness into architecture. The research aimed at investigating the application of green design strategies in shopping malls in Southwest, Nigeria in order to understand how these strategies can be applied in the design of shopping malls. The study is limited to selected shopping malls in Southwest Nigeria. The study utilized a qualitative research methodology due to its appropriateness and subsequently incorporated it into the research approach. The purposive sampling technique was used for this study. The shopping malls that were built within the last 10 years are believed to have incorporated green building strategies as a result of the establishment of Green Building Council (GBC). Three shopping malls were randomly selected in Ogun and Lagos state. The study reveals that not all the green design strategies as indicated in the observation guide were considered in the design of the selected shopping malls. The study recommended that green design strategies such as provision of adequate vegetation on the site, and use of renewable energy strategies should be addressed throughout the design and planning stages of the shopping malls.

Keywords: Green Design, Environmentally Friendly Structures, Shopping Mall, Sustainability

1. INTRODUCTION

Haddad, King, Osmond, & Heidari (2012) defined green building as pertaining to building designs that are less damaging to the environment. According to Sinha, Gupta & Kutnar (2013), sustainable construction development has emerged as a result of global sustainability objectives and is based on the principles of green building. However, it is important to note that these two concepts are distinct and cannot be used interchangeably. Yoshida & Sugiura (2010) have outlined specific environmental performance criteria that a building must meet to be considered green, while Howe (2010) has described green building as the efficient use of land and energy, conservation of water and other resources, enhanced air quality both inside and outside of the building, and the utilization of more recycled and renewable materials. According to Islam, Nazifa, Priyanka, Ahmed, & Shahid (2019), sustainability is a balanced approach that prioritizes the environment, economy, and society. Nonetheless, green building is a critical aspect of sustainable development (Huo & Yu, 2017).

The demand for environmentally friendly structures has led to the increasing popularity of green building (GB) as a viable solution in the construction sector (Chan, Darko, Ameyaw, & Owusu-Manu (2016). Green buildings are commonly referred to as environmentally friendly structures as their benefits are experienced throughout the building's life cycle, extending beyond the early stages of construction (Ding, Fan, Tam, Bian, Li, Illankoon, & Moon, 2018). The impact of building development on the natural environment has historically been significant and buildings form a large part of the environment. To mitigate this issue, architectural designers must adopt high-performance building strategies and sustainable principles to develop innovative solutions that can coexist with natural conditions by reducing land pollution, preserving the environment, conserving natural resources, and minimizing energy usage.

The aim of this paper is to investigate the application of green design strategies in shopping malls in Southwest, Nigeria in order to understand how these strategies can be applied in the design of shopping malls. By examining the use of green design strategies in a proposed shopping mall, the study seeks to illustrate how sustainability can be incorporated into the design of shopping malls to make them more eco-friendly and energy-efficient, resulting in lower operational and maintenance costs. The study's scope is limited to shopping malls in Southwest, Nigeria, specifically in the Ogun and Lagos States, because these states are home to the highest concentration of economic activities in the country. The purpose of this study is to generate empirical data that can be utilized by students, professors, researchers, architects, and professionals in the built environment. The data aims to inform the design of shopping malls that are more sustainable and in greater harmony with the natural environment.

2. LITERATURE REVIEW

A shopping mall, also referred to as a shopping centre or shopping plaza, is a modern interpretation of the traditional market (Ahmed & Hassanain, 2020). It consists of various independent retail establishments, services, utilities, and a parking lot that are deliberately designed, built, and overseen as a unified entity by a separate management firm. Furthermore, shopping malls may feature additional facilities such as eateries, banks, cinemas, business centres, gas stations, and other amenities (Animesh, n.d.). Bazaars and markets were the earliest shopping centres, and they are still existing, it gradually evolved into sophisticated arcades, malls, and today's street malls, which operate on a global scale (Ibrahim & McGoldrick, 2017). There are different types of shopping malls, including neighbourhood, community, regional, and super-regional shopping malls.

The pressing issue of our time is the need to live in harmony with nature and protect the environment, natural resources, and ecosystems. In response to this, the goal of green design is to minimize resource consumption during the building's construction, use, and operation, while also reducing the environmental harm caused by component emissions, pollution, and waste (Ragheb, El-Shimy, & Ragheb (2016). The term "green architecture" refers to environmentally friendly architecture that encompasses all categories and includes some universally agreed-upon elements (Tascı, 2015). These elements, which are green design principles provide guidance for architects and designers as they strive to create high-performance structures with minimal environmental impact (Gil-Mastalerczyk, 2016).

In the light of this, Augenbroe, Pearce & Kibert (1998) identified fifteen (15) key strategies aimed at achieving a green and sustainable built environment. These strategies cover a broad spectrum of areas, such as reducing waste, conserving resources, improving indoor environmental quality, adopting energy-efficient technologies, and redesigning the design process. Also, the strategies include measures for conserving energy, introducing incentive programs, and implementing education and training initiatives. Together, these strategies work in unison to drive the progress of green and sustainable practices.

Furthermore, Otegbulu & Rsv (2011) conducted a study that presents eleven (11) different aspects of green building design, which encompass energy and water efficiency, waste reduction, building operation, construction, maintenance, occupant health and productivity, stormwater management, climate, and environmental integration. This aligns with the findings of Nduka & Ogunsanmi (2015), who identified seven (7) elements essential for green building adoption, including indoor air quality, maintenance, and building optimization. These elements cover aspects such as energy efficiency, water efficiency, environmental and resource preservation, recycling, and waste reduction.

Zhang, Platten & Shen (2011) reaffirmed the principles outlined in the previous study, incorporating them similarly in green building practices. They emphasized the importance of enhancing indoor environmental quality, water, and material efficiency, optimizing operations and maintenance, and achieving energy efficiency. However, this list seems to overlook the

optimization of site potential, which is a crucial aspect of green design. It is worth mentioning that the strategies mentioned above align with those put forth by the Sustainable Building Industry Council (SBIC).

Therefore, this study will employ six guiding principles outlined by the Sustainable Building Industry Council (SBIC). These principles encompass optimizing the potential of the site, reducing energy consumption while incorporating renewable energy strategies, conserving, and protecting water resources, utilizing environmentally preferable products and materials, improving indoor environmental quality, and optimizing practices related to operations and maintenance.

2.1. Optimize Site Potential

The process of sustainable construction starts with selecting an appropriate site, as it impacts various environmental factors, security, accessibility, and energy consumption. By addressing site selection, planning, and design early in the project development phase, designers can lay the foundation for sustainable development and steer development towards a green direction. It is also essential to recognize and preserve a site's functional components and how it interacts with the surrounding community (Thomas, 2009). Site potential can be optimized by managing solar and environmental influences, balancing earthwork, and improving functionality and aesthetics. Given the importance of this principle, Wheeler (2013) recommends involving architects and consultants with green expertise in the site design process.

2.2. Minimize Energy Use and Use of Renewable Energy Strategies

With the rise of technology, economic activity and standard of living have increased, leading to a higher demand for energy. Therefore, enhancing energy efficiency in buildings has enormous potential. As noted by Fischer (2010), energy efficiency is one of the most frequently highlighted characteristics of green buildings. Energy-efficient structures use less energy than traditional buildings while still maintaining or improving the occupants' comfort levels (Thomas, 2009). Renewable energy sources are energy sources that do not get depleted and can be continuously replenished by natural processes without causing environmental harm. Some examples of alternative renewable energy sources include solar water heating, solar photovoltaic strategies, wind power, biomass, and geothermal energy.

2.3. Conserve and Protect Water

The objective of green design is to minimize water usage while ensuring water quality is not compromised. The scarcity of water in various parts of the world is a fundamental issue associated with water consumption, and wastewater and sewage treatment require a substantial amount of energy. Additionally, a significant amount of water is utilized for power generation, with losses occurring due to evaporation in hydroelectric plants and cooling towers in thermoelectric plants.

2.4. Use Environmentally Preferable materials

Architects and designers play a significant role in determining the materials used in construction. However, many of them are not well-informed about the long-term consequences of their choices beyond cost and performance. To ensure the sustainability of building construction, selecting appropriate building materials is a very crucial step. As stated by Thomas (2009), designers are advised to give priority to materials with minimal maintenance needs, local manufacturing, extended lifespan, and low embodied energy ratings.

2.5. Enhance Indoor Environmental Quality

Buildings provide shelter for humans, shielding them from the external environment. However, the building materials that protect against external factors can also cause negative effects on human comfort and well-being in the indoor environment. Indoor Environmental Quality (IEQ)

encompasses the physical, chemical, and biological factors that affect the quality of life indoors, including air quality, temperature, humidity, brightness, and sound level. It is crucial to the success of a project, although it is often overlooked in cost-effective building design (Augenbroe, Pearce, & Kibert, 1998; Steinemann, Wargocki, & Rismanchi, 2017).

2.6. Optimize Operations and Maintenance Practices

To ensure that a building remains eco-friendly, it must be regularly maintained and used appropriately. The sustainability of a building during operation and maintenance (O&M) focuses on the behavior of building occupants and includes elements such as health, safety, comfort, and productivity, with a consideration for the ability of future generations to reuse and recycle building components.

Implementing green design strategies has economic, social, and environmental benefits. Green building construction is more cost-effective than traditional construction, reducing resource consumption during construction, operation, and maintenance. The United States Green Building Council (USGBC) studies show that green buildings can reduce operating costs by 8-9%, increase building value by 7.5%, provide a better ROI of 6.6%, and increase occupancy rates and rent ratios. Green buildings also improve the health and well-being of occupants (Chan, 2015). Intelligent operating procedures and energy-efficient systems are necessary in green building design and green buildings preserve the environment and its resources and outlast non-green buildings twice as long. Implementing green building design strategies in the design and construction process will lower carbon emissions, and there will be less demand for demolition and new construction.

3. METHODOLOGY

The study was conducted to investigate the application of green design strategies in shopping malls in Southwest, Nigeria in order to understand how these strategies can be applied in the design of shopping malls. In order to achieve this, the qualitative research approach was deemed appropriate and used for this study. This study is a multiple case study research as data was gathered from selected case studies of shopping malls. This study employed the purposive sampling method, and the malls were chosen based on the year they were commissioned. The aim was to gain a comprehensive understanding of shopping malls that have implemented environmentally friendly design approaches. The Green Building Council (GBC) was founded in South Africa in 2007 and later expanded its influence to other African nations, including Nigeria (Wilkinson, 2016). The GBC is in charge of promoting eco-friendly building designs in the Sub-Saharan African area. It is assumed that the introduction of the GBC a decade ago led to the incorporation of green building techniques in shopping malls constructed during this period. (Izobo-Martins, Oyelami, Agboola & Ejale, 2022).

Table 1: List of Shopping Malls Built in the Last Twelve Years in Southwest, Nigeria

S/N	Building	Location	Year Opened
1.	Ikeja City Mall	Ikeja, Lagos State	2011
2.	Novare Mall	Lekki, Lagos State	2016
3.	Apapa Mall	Apapa, Lagos State	2012
4.	Maryland Mall	Maryland, Lagos State	2016
5.	Festival Mall	Amuwo Odofin, Lagos State	2015
6.	Circle Mall	Osapa, Lekki, Lagos State	2015
7.	Addas Mall	Ikeja, Lagos State	2019
8.	Leisure Mall	Surulere, Lagos State	2011
9.	Lennox Mall	Lekki Phase I, Lagos State	2018
10.	The Palms Shopping Mall	Ota, Ogun State	2016

Source: Kiprop (2019)

Three (3) out of the ten (10) identified shopping malls were randomly selected. The Palms Shopping Centre in Ota, Ogun State, is the first mall. Ikeja City Mall and Maryland Mall are the second and third shopping malls in Lagos State. The researcher selected these malls based on their alignment with the stated objective (James, Fulani & Azoji, 2022). In order to gather field data, a well-structured observation guide was developed based on the principles of green design culled from literature. The selected shopping malls were visited by the researcher, and an observation schedule was used to collect data. The observation guide was divided into six sections which are optimize site potential, minimize energy use and use of renewable energy strategies, conserve and protect water, use of environmentally preferrable materials, enhance indoor environmental quality, and optimize operations and maintenance practices. The selected buildings were closely examined to determine whether the strategies outlined in the observation guide were present or absent. The data was gathered between December 2022 and January 2023. The results were analysed using content analysis and it was presented using a descriptive method and photographs.

4. RESULTS AND DISCUSSION

4.1. The Palms shopping mall, Abeokuta express, Ota, Ogun State

The Persianas Group established The Palms Shopping Mall in Ota in 2016 with the goal of offering an outstanding retail experience and raising the bar for retail not just in Nigeria, but also in the larger West African region. Although the mall was intended to be a convenient one-stop-shop for customers to access a variety of local and international brands in a modern and user-friendly environment, it is currently not well-maintained. Additionally, the mall's location is situated a little bit away from public transportation networks.

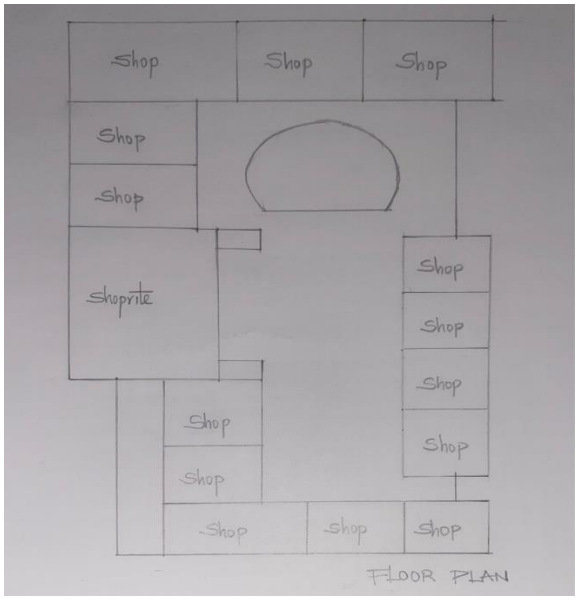

Figure 1: Floor plan of the Palms shopping mall

Figure 2: Exterior view of the Palms shopping mall

Figure 3: Aerial view of the Palms shopping mall showing the building orientation

Figure 4: Exterior view of the Palms shopping mall showing shading devices, carparks, and minimal greens on the site

Figure 5: Shopping spaces properly lit with daylight

2.3.3. Ikeja city mall, Obafemi Awolowo Way, Alausa, Ojodu, Lagos

Located in Alausa, Ikeja, Lagos State, the Ikeja City Mall is a unique establishment as the first of its kind on Lagos Mainland. Although the development of the Ikeja City Mall began in May 2010 and its public launch was originally scheduled for November 2011, technical difficulties caused it to open much later, on December 14, 2011. Designed to serve as a destination for both leisure and business, the mall is a popular meeting spot for friends, family, and entrepreneurs.

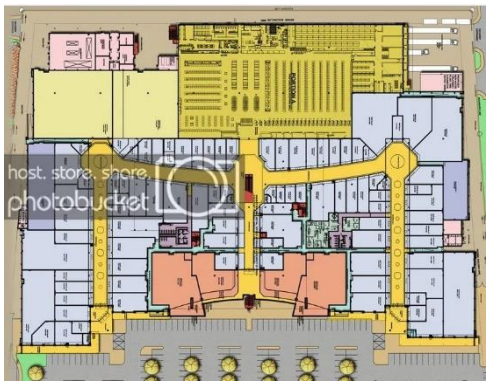

Figure 6: Ground floor plan of Ikeja city mall

Figure 7: Aerial view of Ikeja city mall showing the building orientation

Figure 8: Interior of Ikeja city mall showing the space properly lit with natural light.

Figure 9: Exterior view of Ikeja city mall showing the use of shading devices and light-coloured finishes

4.3. Maryland mall, 360 Ikorodu-Ososun Rd, Anthony 100211, Ikeja, Lagos

The Maryland Mall, which is sometimes nicknamed "The Big Black Box," has become a recognizable landmark in Lagos. Its design was created to serve as a background for the LED screen and any accompanying brand signage, and the building's 60-meter-long screen, which was the longest in West Africa during construction, generates revenue throughout its vertical plane. The anchor tenants: Market square and Genesis cinemas are also the largest retail spaces located at strategic and visible positions in the mall.

4.4. Optimize Site Potential.

4.4.1 *Building orientation*

The Palms shopping mall, as seen in Figure 4 and Ikeja city mall, as seen in Figure 7 have their longer sides oriented along the east-west axis which is best for maximizing natural lighting and ventilation. On the other hand, Maryland mall has its longer side oriented along the north-south axis, as seen in Figure 11.

4.4.2 *Vegetation (trees and shrubs)*

the site of the selected shopping malls does not have adequate vegetation.

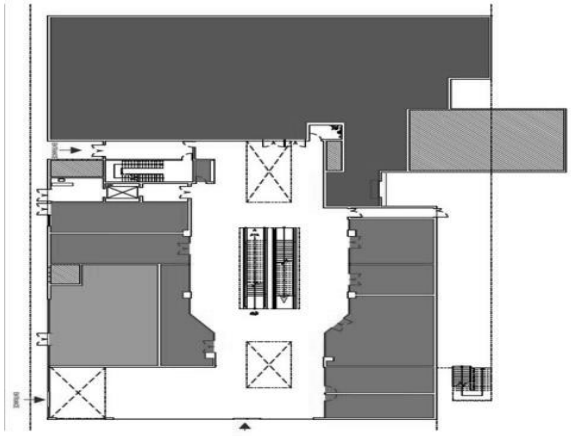

Figure 10: Ground floor plan of Maryland mall

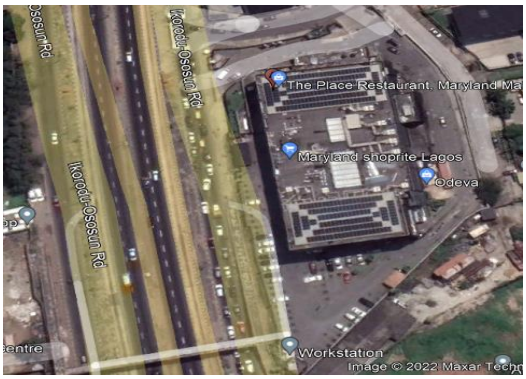

Figure 11: Aerial view of Maryland mall showing the building orientation

Figure 12: Exterior view of Maryland mall showing the building, and the carparks

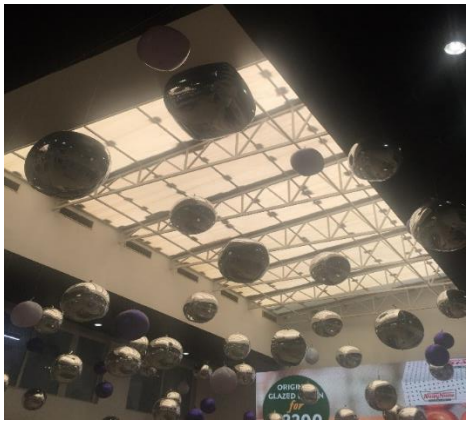

Figure 13: Daylight in the interior from the skylight

Table 2: Application of Green Design Strategies in the Selected Shopping Malls in Southwest, Nigeria

PRINCIPLES	FEATURES	COMMENTS		
		The Palms Shopping Mall	**Ikeja City Mall**	**Maryland Mall**
Optimize Site Potential	Building orientation	The building's longer side is oriented along the east-west axis allowing for adequate daylight and natural ventilation.	The building's longer side is oriented along the east-west axis.	The building's longer side is oriented along the north-south axis. This is not the best orientation to maximize natural lighting and ventilation.
	Vegetation (trees, shrubs)	Inadequate vegetations on the site.	There is a lot of hard surfaces on the site with minimal greens.	Inadequate vegetations on the site.
Minimize Energy Use and Use of Renewable Energy Strategies	Daylighting	Incorporated high-level windows which allowed for adequate natural lighting in the shopping space.	Natural lighting is allowed into the building through an array of skylights on the walkways.	Incorporates skylights in the building design, but this does not provide adequate lighting and ventilation.
	Window shading devices	The horizontal steel façade acts as a shading device which reduces the heat gain.	The windows were recessed and covered with cantilevered concrete slabs to reduce its exposure to direct sunlight.	There are no windows on the exterior, therefore, no shading devices.
	Light coloured finishes	Use of light-coloured finishes on the interior (white) and exterior(light brown and cream) of the building to reflect heat	Use of light-coloured finishes on the interior (white) and exterior (cream) of the building to reflect heat	Black colour finish on the building exterior attracts heat.
	Renewable energy	Not identified	Not identified	Incorporated the use of solar energy
Conserve and Protect Water	Use of low-flow urinals, WCs, and faucet aerators	The use of low-flow sanitary fittings (urinals, WCs, faucet aerators) conserve water in the building.	The use of low-flow sanitary fittings (urinals, WCs, faucet aerators) conserve water in the building.	The use of low-flow sanitary fittings (urinals, WCs, faucet aerators) conserve water in the building.
	Rainwater harvesting	Not identified	Not identified	Not identified
Use of Environmentally Preferrable Materials	Sustainable materials	Durable and recyclable materials such as glass, steel aggregates.	Durable and recyclable materials such as glass, steel aggregates.	Durable and recyclable materials such as glass, steel aggregates.
	Locally produced materials	Use of concrete blocks.	Use of concrete blocks.	Use of concrete blocks.
Enhance Indoor Environmental Quality	Provide natural ventilation	Provides natural ventilation with openable high-level windows.	Minimal provision of natural ventilation within the building.	Minimal provision of natural ventilation within the building.
Optimize Operations and Maintenance Practices	Use of automated monitors and controls	Not identified	Incorporated the use of motion sensing	The building incorporated the use of smart motion sensing

4.5. Minimize Energy Use and Use of Renewable Energy Strategies

4.5.1. *Daylighting*

Figure 5 shows how high-level windows were used to admit daylight in the Palms shopping mall, while skylights were used to admit natural light in Ikeja city mall and Maryland mall.

4.5.2. *Window shading devices*

For the Palms shopping mall, the horizontal steel façade acts as a shading device (Figure 3), while for Ikeja city mall (Figure 9), the windows are recessed and covered with cantilevered concrete slabs to reduce its exposure to direct sunlight, thereby reducing heat gain.

4.5.3. *Light coloured finishes*

All the selected shopping malls made use of light-coloured finishes in the building interior. Only Maryland mall incorporated a black colour finish on the building exterior, hence increasing heat gain.

4.5.4. *Renewable energy*

Out of the three selected shopping malls, the use of renewable energy (solar energy) was observed only in Maryland mall.

4.6. Conserve and Protect Water

4.6.1. *Use of low-flow urinals, WCs, and faucet aerators*

All the selected shopping malls made use of low-flow sanitary fittings such as urinals, water closets, and faucet aerators.

4.6.2. *Rainwater harvesting*

None of the selected shopping malls implemented the use of rainwater harvesting in the design of the malls.

4.7. Use of Environmentally Preferrable Materials

4.7.1. *Sustainable materials*

The materials used in the design of the selected malls are very durable and can be recycled.

4.7.2. *Locally produced materials*

All the selected shopping mall used concrete blocks, and this can be produced on the site.

4.8. Enhance Indoor Environmental Quality

4.8.1. *Provide natural ventilation*

Minimal natural ventilation was provided in the Palms shopping mall and Ikeja city mall but there are no windows visible on the façade of Maryland mall, hence no natural ventilation in the shopping space.

4.9. Optimize Operations and Maintenance Practices

4.9.1 *Use of automated monitors and controls*

The use of motion sensors was observed in Ikeja city mall and Maryland mall, but this was not functional in the Palms shopping mall.

According to the findings from this study, some of the common green design strategies implemented in the design of shopping malls include use of shading devices, presence of natural lighting, light-coloured finishes in the building interior and exterior, use of low-flow sanitary fittings in order to conserve water, and use of environmentally friendly materials. Although, some of the strategies were implemented to a good extent, not all the green design strategies as indicated in the observation guide were considered in the design of the selected shopping malls. Some of the green design strategies to be more considered in the design of shopping malls are the provision of adequate vegetation on the site, use of renewable energy strategies, incorporating rainwater harvesting systems, and provision of natural ventilation.

5. CONCLUSION

The detailed analysis of the collected data for the study as contained in the previous chapters has enabled this study to reach a valid conclusion while addressing the aim of the study, which is to investigate the application of green design strategies in shopping malls in Southwest, Nigeria. Three different shopping malls were studied: the Palms shopping mall located in Ota, Ogun State, Ikeja City Mall, and Maryland Mall in Lagos State. This research provided empirical data to students, lecturers, researchers, architects, and other professionals on the green design strategies adopted by selected shopping malls. As a result of the findings from

this paper, the following recommendations were given: Green design strategies such as provision of adequate vegetation on the site, use of renewable energy strategies, and provision of natural ventilation should be addressed throughout the design and planning stages of the shopping malls. It's a holistic approach that considers long-term benefits for both the project and the planet.

Furthermore, because this research was carried out as a case study, it is advisable to undertake comparable investigations in various regions within Nigeria as well as globally. Similar inquiries could be conducted across various architectural structures, thereby broadening the scope of the study's insights. This approach would aid in creating a foundational reference for gauging the extent of green design strategy integration in diverse building categories, while also facilitating the identification of obstacles that hinder the application of such strategies.

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REFERENCE

Animesh, T. (n.d.). History of Malls. Retrieved from https://www.yourarticlelibrary.com/mall-management/history-of-malls-management/87292

Augenbroe, G., Pearce, A. B. G., & Kibert, C. K. (1998). Sustainable construction in the USA; A perspective to the year 2010. *Sustainable development and the future of construction*, CIB report 225. Retrieved from https://www.researchgate.net/profile/Annie-Pearce/publication/312616703_Sustainable_construction_in_the_USA_Perspectives_to_the_year_2010/links/5ec2feb1a6fdcc90d68256c8/Sustainable-construction-in-the-USA-Perspectives-to-the-year-2010

Ahmed, W., & Hassanain, M. A. (2020). Post-Occupancy Evaluation of a University Shopping Mall Facility. *Architecture, Civil Engineering, Environment*, *13*(2), 5–15. https://doi.org/10.21307/ACEE-2020-013

Chan (2015). The impact of green buildings on cognitive function. *Sustainability at Harvard*. Retrieved from https://green.harvard.edu/tools-resources/research-highlight/impact-green-buildings-cognitive-function

Chan, A. P. C., Darko, A., Ameyaw, E. E., & Owusu-Manu, D. G. (2016). Barriers Affecting the Adoption of Green Building Technologies. *Journal of Management in Engineering*, *33*(3), 04016057. https://doi.org/10.1061/(asce)me.1943-5479.0000507

Ding, Z., Fan, Z., Tam, V. W. Y., Bian, Y., Li, S., Illankoon, I. M. C. S., & Moon, S. (2018). Green building evaluation system implementation. *Building and Environment*, *133*, 32–40. https://doi.org/10.1016/j.buildenv.2018.02.012

Fischer, E. A. (2010). *Issues in Green Building and the Federal Response: An Introduction*.

Gil-Mastalerczyk, J. (2016). Sustainable design in the contemporary architecture of tall buildings. *E3S Web of Conferences*, *10*, 00125. https://doi.org/10.1051/e3sconf/20161000125

Haddad, S., King, S., Osmond, P., & Heidari, S. (2012). Green vs. sustainability performance assessment: a case study of an office building in Putrajaya, Malaysia. *Proceedings - 28th International PLEA Conference on Sustainable Architecture + Urban Design: Opportunities, Limits and Needs - Towards an Environmentally Responsible Architecture, PLEA 2012*. https://digital.library.adelaide.edu.au/dspace/handle/2440/78067

Howe, J. C. (2010). *Overview of Green Buildings*.

Huo, X., & Yu, A. T. W. (2017). Analytical Review of Green Building Development Studies. *Journal of Green Building*, *12*(2), 130–148. https://doi.org/10.3992/1943-4618.12.2.130

Ibrahim, M. F., & McGoldrick, P. J. (2017). Shopping choices with public transport options: An agenda for the 21st century. *Routledge*. https://doi.org/10.4324/9781315243153

Islam, M. R., Nazifa, T. H., Priyanka, H. K., Ahmed, A., & Shahid, S. (2019). Identifying factors and mitigation measures of safety practices for sustainable building construction. *IOP Conference Series: Earth and Environmental Science*, *294*(1), 012041. https://doi.org/10.1088/1755-1315/294/1/012041

Izobo-Martins, O. O., Oyelami, B. J., Agboola, O. O., & Ejale, E. A. (2022). Investigation of Passive Cooling Strategies in Selected Shopping Malls, Southwestern Nigeria. *IOP Conference Series: Earth and Environmental Science*, 1054(1). https://doi.org/10.1088/17551315/1054/1/012024

James, M. E., Fulani, O. A., & Azoji, C. F. (2022). Application of Passive Cooling Principles in Selected Hotel Buildings in Southwest Nigeria. *IOP Conference Series: Earth and Environmental Science*, *1054*(1). https://doi.org/10.1088/1755-1315/1054/1/012032

Kiprop, J. (2019). The Largest Shopping Malls in Nigeria. Retrieved from World Atlas:https://www.worldatlas.com/articles/the-largest-shopping-malls-in-nigeria.html

Nduka, D. O., & Ogunsanmi, O. E. (2015). Stakeholders Perception of Factors Determining the Adoptability of Green Building Practices in Construction Projects in Nigeria. *Journal of Environment and Earth Science*, *5*(2), 188-196.

Otegbulu, A. C., & Rsv, F. (2011). Economics of Green Design and Environmental Sustainability. *Journal of Sustainable Development*, *4*(2). https://doi.org/10.5539/jsd.v4n2p240

Ragheb, A., El-Shimy, H., & Ragheb, G. (2016). Green Architecture: A Concept of Sustainability. *Social and Behavioural Sciences*, *216*, 778–787. https://doi.org/10.1016/j.sbspro.2015.12.075

Sinha, A., Gupta, R., & Kutnar, A. (2013). Sustainable Development and Green Buildings. *Drvna Industrija*, *64*(1), 45–53. https://doi.org/10.5552/drind.2013.1205

Sholanke, A. B., & Agomuo, I. U. (2020). Architectural Features Constituting Hindrances to Achieving Universal Design in Selected Shopping Malls in Lagos State, Nigeria.

Steinemann, A., Wargocki, P., & Rismanchi, B. (2017). Ten questions concerning green buildings and indoor air quality. *Building and Environment*, *112*, 351–358. https://doi.org/10.1016/j.buildenv.2016.11.010

Tasci, B. G. (2015). Sustainability Education by Sustainable School Design. *Social and Behavioural Sciences*, *186*, 868–873. https://doi.org/10.1016/j.sbspro.2015.04.199

Thomas H., R. (2009). *Site Planning and Design Handbook* (2nd ed.).

Wheeler, S. M. (2013). Planning for sustainability: Creating liveable equitable and ecological communities, second edition. *Taylor and Francis*. https://doi.org/10.4324/9780203134559

Wilkinson, B. (2016). South Africa - leading the green building charge into Africa. Retrieved from World Green Building Council: https://www.worldgbc.org/news-media/south-africa-leading- green-building-charge-africa

Yoshida, J., & Sugiura, A. (2010). Which "Greenness" is Valued? *Evidence from Green Condominiums in Tokyo*.

Zhang, X., Platten, A., & Shen, L. (2011). Green property development practice in China: Costs and barriers. *Building and Environment*, *46*(11), 2153–2160. https://doi.org/10.1016/j.buildenv.2011.04.031