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Examining the Sustainable Development of Shopping Malls: A Case Study Approach

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Abstract

Shopping malls are commercial buildings that inject life into the socio-economic activities of people within a geographical location. Historically, shopping malls were mainly created to fulfill the immediate economic and commercial needs of users, and not much was done to cater to the needs of the rising numbers of users found in most communities. However, to develop sustainable malls where users can seamlessly purchase commodities and perform other related activities in view of protecting the environment and climate, this study, therefore, examines four selected existing shopping malls using the case study research method. The case studies, comprised of two shopping malls in and outside Nigeria (constituting local and foreign case studies, respectively), were selected based on convenience sampling and analysed to ascertain the extent sustainable building features and systems were incorporated in their development. Hence, the study outcome revealed that energy-efficient systems, water and waste management systems, climate-responsive systems, carbon-mitigating systems, environmental protection strategies, and sustainable architecture are desirable in the development of shopping malls owing to urbanization and climate change.

Keywords: Building systems, Commerce, Shopping malls, Sustainability.

1.0: Introduction

Sustainable development covers a range of different aspects (Han, Sahito, Nguyen, Hwang & Asif, 2019). It is considered as the integration of environmental, social, and economic development, often referred to as the triple bottom line (Lorek & Spangenberg, 2014). In this context the sustainable development of shopping malls represents an architectural design strategy that prioritizes the relationship between buildings and their local ecosystems as well as the global environment (Han et al, 2019). Sustainable shopping malls aim to minimize negative environmental effects by enhancing efficiency and promoting moderation in the use of materials, energy, development space, and accessibility (Aktas, 2012). A shopping mall design can significantly incorporate ecological and socio-economic needs in the process of business development (Han et al, 2019). Thus, malls act as a link between individuals, technology, and commerce, with design improving the systematic integration of economic, social, and environmental criteria in the context of innovative and more sustainable production, marketing, distribution, and usage patterns (Aktas,2012). Historically, individuals have

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gathered in designated spaces to interact, share information, and conduct trade (Hameli, 2017). Consequently, shopping malls have existed in different forms for more than a thousand years, evolving from ancient market squares, bazaars, and seaport commercial areas (Hameli, 2017).

The contemporary shopping mall, ranging from small suburban strip centers to expensive million-square-foot super regional malls, started to take shape in the 1920s (ICSC, 2021). Currently, shopping malls are not constructed for just one functional role (Kusumowidagdoa et al, 2015). They serve as a contemporary, indoor equivalent of the traditional marketplace (Ali, 2015; kumar & Thakur, 2014). These extensive retail developments, often situated in the suburban areas beyond the city center, combines a variety of retail shops under a unified architectural design. In the 21st century, the architecture, Engineering, and Construction (AEC) industry is adopting sustainable methods sand systems in the development of shopping malls. These multifunctional, integrated spaces are evolving to serve not only as shopping destinations but also as hubs for socio-cultural activities, entertainment, recreation, sports, or relaxation (Hameli, 2017). They are characterized by their impressive architecture, thoughtful interior design, diverse functions, modern sustainable solutions, and strategic marketing approach that capture consumer attention (Hameli, 2017). Furthermore, many offer specialized services and supporting facilities, such as housing estates, hotels, offices, medical and consulting services, and even universities, churches, theaters, or art galleries (Heffner & Twardzik, 2015).

However, despite their utility, shopping malls in most cases contribute to negative environmental impact, such as emission of Green-House Gases (GHG), and high energy consumption. This study is therefore, initiated to highlight eco-friendly systems and measures required for the sustainable development of shopping malls. It aims to propose practical solution to prolong the lifespan of these facilities and enhance their micro and macro environmental performance. Hence this study adopts a qualitative case study methodology, examining four strategically selected shopping malls. These malls were revered fit for inclusion due to their satisfaction in the assessment for accessibility, popularity, and varying approach to sustainability, enabling a comparative analysis of design, environmental impact, and operational strategies. The case study approach specifically examined the integration of sustainable features in selected shopping malls, comprising two local malls in

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Nigeria and two international malls. The selection was guided by accessibility, presence of identifiable sustainable features, and representativeness of modern mall infrastructure across diverse climatic zones. The analysis focused on identifying the extent of sustainable system integration, including passive ventilation, energy-efficient lighting, water reuse technologies, and material selection into each mall design and operation. The findings revealed notable differences between the international and local malls. Specifically, the foreign malls (located in the United Kingdom and the United States) demonstrated advanced sustainability features, such as formal waste management systems and digital building controls. In contrast, the local malls employed adaptive strategies like open-air circulation and climate-responsive shading, although with limited implementation of renewable energy and waste segregation systems. These differences highlight 7565746[8] regional disparities in sustainable development practices, influenced by economic, environmental, and regulatory factors. The findings from these case studies are expected to offer the benefits for public and private developers, investors, architects, and stakeholders seeking to create socially, economically, and environmental objectives.

2.0: Literature review

A variety of researchers have explored the systems and components that contribute to the sustainability of shopping malls. Other researchers have analyzed the motives that encourage consumers to utilize and patronize shopping malls (Hameli, 2017). Shopping malls have a vital role in the lives of consumers, and in sustaining the ecosystem. Owing to the scale and plethora of activities that characterize shopping malls, most malls utilizes large amount of energy and water to function optimally. This leads to the production of large volume of waste, pollution and GHG gases which invariably impact on the environment and climate. Alternatively, Tiwari and Abraham (2010) revealed that malls serve as venues for socializing and recreation beyond just shopping, with customers holding high expectations of these establishments. Consequently, to satisfy these expectations, it is crucial to include architectural design elements that support sustainability in the design of malls. Amit and Kameshvari (2012) indicated that organized retail stores are preferred by consumers because they offer a diverse range of products, allow for shopping in one location, provide more brand

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choices, and feature better parking facilities. Additionally, Koksal and Aydin (2015) pointed out that shopping malls provide a wide selection of products in a single location, are safe, and enable shoppers to enjoy a comfortable shopping experience unaffected by weather conditions, whether it's hot or cold.

More so, functional shopping malls include consistent environments, quality customer service, ample circulation spaces, adequate parking spaces, options for entertainment, gathering places for youth, and other social amenities (Kilic & Tuncel, 2010). The convenience associated with shopping mall is a key factor for consumers, as it relates to location ease, the ability to accomplish shopping in one trip, sustainable working hours, and minimized waiting times. All these elements greatly influence consumers' choices when it comes to shopping malls (Fatima & Rasheed, 2012). The reasons why consumers go to shopping malls can be classified into two factors: utilitarian reason and hedonic reason (Hameli, 2017). Utilitarian consumer behavior is characterized by being purposeful, focused on tasks, efficient, and logical. This type of consumption typically pertains to specific purchases, with visits driven more by necessity than leisure (Hameli, 2017). In contrast, the hedonic aspects of shopping highlight its entertainment and emotional significance, where the act of purchasing is laden with captivating shopping experience (Farrag et al, 2010). Modern consumers are no longer content with just obtaining a product and receiving the expected physiological satisfaction. They desire a shopping experience that is enjoyable and aim for a life free from complications (Hameli, 2017). The effectiveness of retail stores today depends significantly on their ability to comprehend and meet consumers' expectations (Koksal & Emirza, 2011). Cakmak (2012) points out that when developing shopping malls, key factors include being near the city centre, having a clean and tidy environment, ensuring easy access, prioritizing safety, offering quality products, providing sufficient circulation space, and facilitating easy navigation, alongside the presence of cafes and restaurants as components of sustainable and smart systems. Consumers want to access shopping centres easily and feel comfortable within them (Hameli, 2017). The primary aim of shopping malls is to draw individuals into large, spacious, and comfortable environment that feels detached from the outside world, allowing them to enjoy their shopping experience. Nazari and Hesari (2012) suggests

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that the design of a shopping mall can influence consumer behavior, impacting the frequency of purchases and potentially leading to impulsive buying as well as altering shopping times. Shopping in a mall can improve life satisfaction across four essential areas: Consumer life, social life, leisure life, and community life (Hameli, K., 2017). A shopping mall can enhance the well-being of consumers by providing a diverse selection of flexible and adaptable stores that stock essential goods and services. Furthermore, they can improve leisure well-being by including open, green, and blue spaces for shoppers to enjoy. Shopping malls also play a role in boosting community well-being by offering a space for local residents to gather, interact, and limiting negative environmental effects. Improving well-being in consumer, social, and community dimensions is crucial for enhancing overall life satisfaction (El-Hedhli et al, 2023).

Teik et al. (2015) suggest that there is a significant positive relationship between the ambiance of interior spaces, music, and employee engagement with consumer behavior. Malls that provide an appealing atmosphere encourage shoppers to linger, take their time while shopping, and engage in leisure, social, and community events. In contrast, malls with unattractive atmospherics are more likely to push shoppers away (El-Hedhli, 2015). The literature reveals that various studies have stressed the impact of shopping mall design on customers, indoor environmental quality, energy consumption, and the micro and macro climate. This study focuses on exploring sustainable building systems and services in four conveniently selected existing shopping malls in view of recommending measures for sustainable development of malls.

3.0: Methodology

To deepen the exploration introduced in this study, a qualitative case study research design was adopted. This approach allows for an in-depth, contextual analysis of sustainable practices across selected shopping malls, providing insights into their architectural, environmental, and operational dimensions. As outlined in the introduction, this study employed a purposive sampling approach to select four existing shopping malls. The selection criteria were guided by several key factors. Firstly, physical accessibility was crucial, ensuring ease of access for data collection and observation. Additionally, the availability of documentation was essential, allowing for a comprehensive review of sustainability-related features and practices.

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Most importantly, the malls were selected based on the observable implementation of sustainability features. These features included energy-efficient lighting systems, such as those certified by LEED and BREEAM, green spaces and landscaping that incorporate connectivity, and climate-responsive building design. The latter was evident in features such as building orientation tailored to local climate conditions and HVAC systems designed to fit local climate requirements. Furthermore, the selected malls also incorporated natural ventilation strategies, including large atriums and wide corridors that facilitate airflow. These criteria collectively ensured that the selected shopping malls demonstrated a range of sustainability approaches and strategies.

The malls also meet the basic functional and architectural requirements of modern shopping centers, including mixed-use capacity, high visitor footfall, and integration of retail and non-retail services. Importantly, the selected malls are located in distinct geographical and climatic zones, enabling a comparative analysis of how environmental factors influence sustainable design strategies. The selected case studies include:

Case Study 1: Darlington Borough City Centre – England

Case Study 2: St. Lucia City Centre – United States of America

Case Study 3: Aladinma Mall, Owerri – Nigeria

Case Study 4: Palms Shopping Mall, Lagos – Nigeria

These case studies were chosen to reflect a range of regional responses to sustainability challenges, encompassing temperate, tropical, and subtropical climates. While the selection is not statistically representative, the cases were chosen to provide analytically rich insights into varying approaches to sustainable design and operations across both developed and developing economies. As such, the findings are not intended to be universally generalizable, but rather to inform context-specific understanding and guide practice-oriented recommendations.

The analysis focuses on identifying and evaluating sustainable features integrated into the planning, design, construction, and operational systems of each mall. The data was collected through site observations, secondary data reviews, and architectural assessments, with an emphasis on eco-friendly practices, energy use, materials, spatial design, and the malls' accessibility and integration of green technologies.

In summation, the outcome of this study aim to give insight to developers, architects, engineers,

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and other built environment professionals in integrating sustainable building systems in the planning and development of future-shopping malls.

3.1: Research design

The case study research is designed to extract design information from extant literature, and the selected case studies. Hence, a narrative approach was utilized to analyze the data from the selected case studies geared towards drawing out sustainable design attributes in mall designs. The study outcomes are case study deductions that will shape the future of shopping mall designs which is pertinent owing to the impact of climatic change on shopping mall across the world.

3.2 Case study 1: Darlington Borough City Centre - England

This shopping mall is located in St. Augustine's Way, Darlington, Borough, England, and built in 2004 by Cobalt Design Group. It is designed to house a Retail area of 30,029 sq.m, and 785 parking spaces with a No. of 4 floors. The Centre comprises a 35,403 sq.m extension to the Queen Street shopping center, built on the site of the existing Commercial Street surface car parks. The expansion offers an additional 22,029 sq.m of retail and 5,994 sq.m of leisure space across three floors, anchored by an 8,000 sq.m department store trading over two levels and a Winter Garden at the north eastern most part of the site. The Winter Garden offers an indoor recreation and amenity area open to the public that includes a café / coffee shop and will be accessed at ground floor level. There is a mezzanine level above ground floor, which mainly comprises an access balcony to leisure units and additional food and drink units.

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Figures 1 (a & b): Pictorial views of Darlington Borough City Shopping Mall, England

3.3: Case study 2: St. Lucia City Centre - United States of America

This mall was built on 2002, and designed by Sean Compton Architects. The mall is designed to house a retail space of 18,000 sq.m, a Leisure space of 4000 sq.m with 350 Parking spaces as well as has 3 floors. The design is centered on a fully integrated architectural strategy, in which the key design elements also function as cooling devices for the building and help to define its large mass. On the outside, vertical brise soleil was employed as solar control devices, to articulate the facade, and break up the long horizontal mass of the building. Internally, free-form 'pods' penetrate the roof and floors, creating vertical shafts forming atria/lightwells and circulation spaces and providing passive ventilation and daylight to the two floors of seamlessly designed organic shopping spaces, boutiques and salons.

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Figure 2: Site Layout of St. Lucia City Centre, USA

3.4 Case study 3: Aladinma Mall, Owerri - Nigeria

This shopping mall was built from 2010 to 2011 by Bauhaus Construction Company on two floors. The center features a shopping mall built on the site of the existing residential areas. The shopping center includes an indoor recreation and amenity spaces open for public use and will be accessed at ground floor level. Above ground floor, which mainly includes an access hall that connects to leisure units and additional food and drink units. On the first floor level, there are additional retail units accessed with department store. leisure units, including a cinema, and associated food and drink uses provided. Additionally, there are spaces for associated plant, servicing, management.

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Figures 3 (a & b): The exterior and interior views of the Mall Aladinma, Owerri

3.5: Case study 4: Palms Shopping Mall, Lagos - Nigeria

Situated on a 40,000-square-metre (10-acre) plot in Lekki Peninsula, Lagos, Nigeria, The Palms Shopping Mall offers 20,000 square meters (5 acres) of lettable retail area. It was built on a land reclaimed from swamp by the government, and the construction was commissioned by the Oba of Lagos along with President Obasanjo. The mall commenced operations in early 2006 and includes 69 retail outlets along a state-of-the-art six-screen cinema. There is parking available for around 1,000 cars. As the largest and pioneering shopping mall in Nigeria, The Palms is owned by Persians Properties Limited. This company is a partnership between Actis Capital, a leading private equity firm from the UK specializing in emerging markets, and Nigerian property developer Tayo Amusan.

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Figure 4: The exterior view of the Palms Shopping Mall, Lagos (Nigeria)

Occupying a 44,000m^2 plot area, the Palms is mainly a one-story facility with off-road parking available for about 720 vehicles. It stands out as the first and largest mall of its kind in Nigeria, matching the quality of shopping malls globally.

4.0: Results and Discussions

The result of this study is based on deductions from literatures and the four case studies selected are shown below;

4.1 Deductions from literature

From the literature it can be deduced that the most functional patterns (forms) of malls are the dumbbell, strip and high-rise malls and cluster types but cluster patterns are best for community malls. It could however be noted that modern trends in shopping center patterns tend to combine these three patterns in order to achieve functional and sustainable designs. However, deductions with respect to the current trends include the inclusion of multiple land use and regulations as opposed to the early design of such centers. These tenant mix may include leisure, residential and office spaces. Modern shopping malls also houses the erection of ancillary facilities such as basement storage and parking spaces to reduce environmental pollution. Lastly, the emergence of new forms of retailing, including internet shopping and retail warehouse parks that supports the concept and principles of sustainability have brought

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about the death of most malls and as such any design that is to function well in today's world should take care of these issues.

Deductions from Case study 1 (Darlington Borough City Centre, England)

1. Planning description

The main entrance highlighted by a tensile feature canopy over the entrance to provide a frontispiece to the development. The elevation to the west entrance towards King Street takes on a more solid form, characterized by a brick and render palette. The cinema and associated leisure and restaurant use on the third floor of the shopping center are set back considerably from the edge of the main part of the shopping center extension.

2. Structure

The structure is of reinforced and pre-stressed concrete members which are framed to form the skeleton of the structure. Glazing and light metal cladding are then used as outer covering for the building. The roof structure is predominantly of steel trussed construction. Tensile fabric being as the covering over the main mall.

3. Key materials

Pre-stressed concrete, Steel, Glass, Light metal cladding, tensile fabric

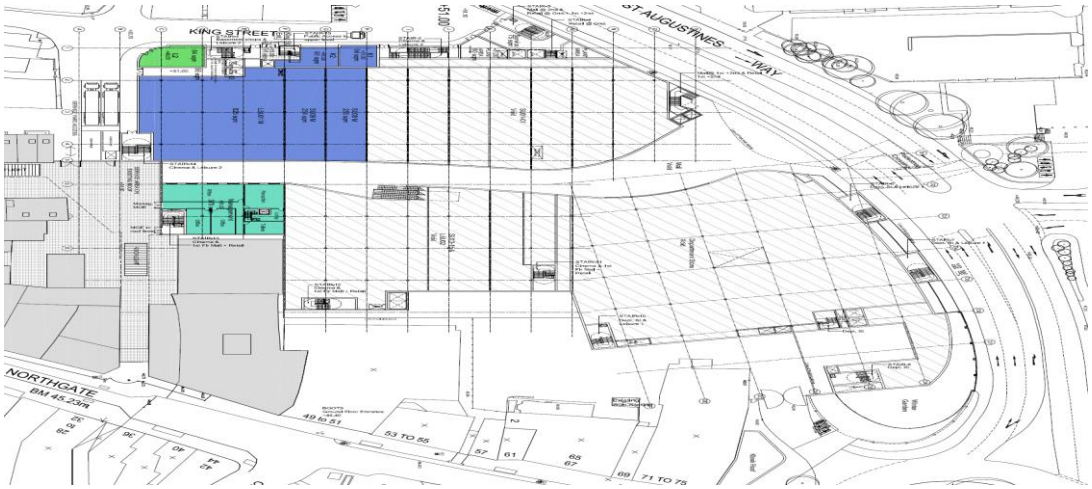


Figure 5: Site layout of Darlington Borough City Centre, England

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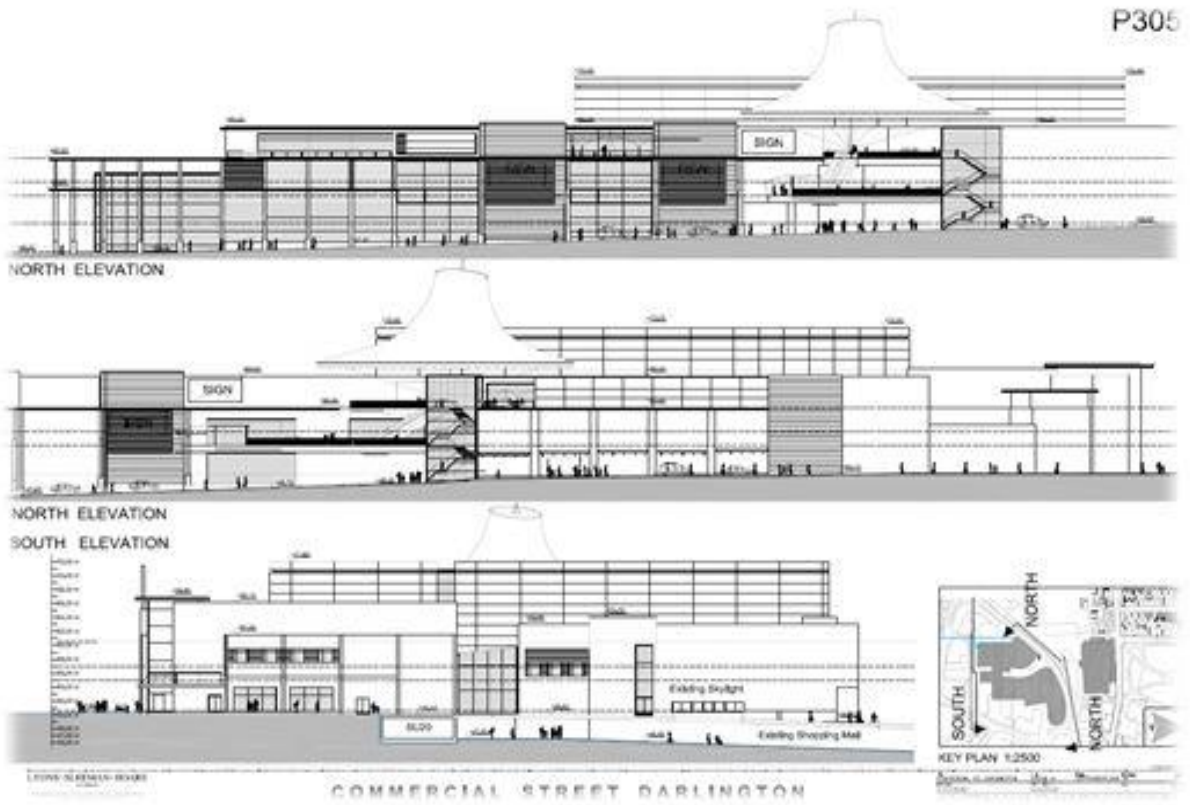


Figure 6: Parallel views of Darlington Borough City Centre, England

Findings from Case study 1

This project is characterized with large fenestrations which adds ambience to the façade and largely supports natural ventilation within the interior spaces. The interior space gives spacious and sufficiently linked circulation areas for an astonishing shopping experience. This case study ushers in a well-planned and designed interior planning achieved by the use of both vegetative and landscape elements within the indoor space of the building. The good headroom, ensures enough clearance for technical service. The mall also boosts of an extensive use of natural means of lighting, and reduces the energy costs of adopting artificial lighting. It also showcases an extensive use of glazing on the exterior of the building, and flexibility is achieved by the use of large open plan spaces as opposed to smaller subdivided spaces animated by easy access into the mall.

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Finally, some of the design elements used in this project reduces healthy shopping experience.

Deductions from Case study 2 (St. Lucia City Centre, United States of America)

1. Planning description

This mall kept the existing cantilevered canopy, which will be renovated and reclad, along with several glass display boxes at ground floor. The facade along Bridge Street will be enhanced by the addition of vertical freeform brises soleil in place of the existing hollow block screen. Constructed from perforated aluminum, these elements will add depth to the building while providing shade and filtered light into the interior.



Figure 7: Interior & exterior views of St. Lucia City Centre, USA

2. Key Materials

Pre-stressed concrete, Steel, Glass, Light metal cladding, tensile fabric.

3. Structure

The elevation along William Peter Boulevard is also given vertical focus with the installation of two-story high 'display strips' for advertising retail/event and large-scale graphics. These 'strips' are covered by perforated aluminum screens, which serves as a modern interpretation of the jalousie shutters of traditional Caribbean architecture.

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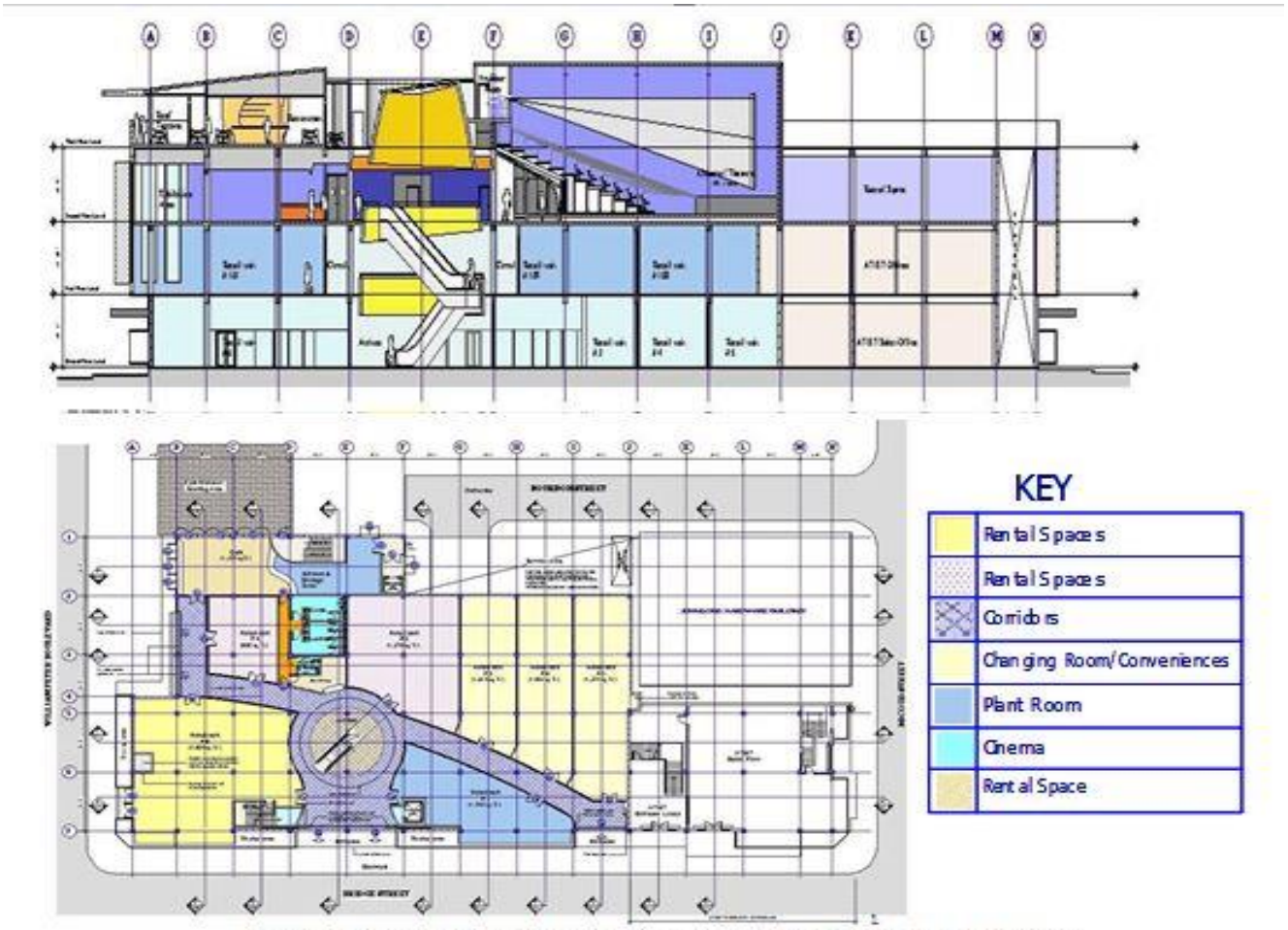


Figure 8: Section J-J & Plan layout of St. Lucia City Centre, USA

Findings from Case study 2

The mall portrays the basic block (strip block) of a mall based on the principles of modern architecture. It is well located to grant easy access for users. The architectural character of the mall is not captivating and not well finished to showcase the commercial nature of malls. The interior of the shopping mall portrays free flowing functional design, relying on uninterruptible power supply to illuminate, ventilate (air condition) the spaces and power its facilities. The choice of roof system for the mall predisposes it to intense weather effects. The shopping center largely depends on active systems to service its facilities, thus, increasing energy dependency.

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Deductions from Case study 3 (Aladinma Mall, Owerri)

1. Planning description

The main entrance to the center features a concrete work over the entrance to provide a frontispiece to the development. The elevation presents a more solid appearance, with a predominantly glazing on various sides. On the ground and first floors of the shopping center, the cinema and related leisure and dining areas are set back notably from the main part of the shopping center extension. Once inside, the escalators will provide access between floors.

2. Structure

The structure is of reinforced and pre-stressed concrete members which are framed to form the skeleton of the structure. Glazing and light metal cladding are then used as covering for the building. The roof structure is predominantly of steel trussed construction.

3. Key materials

Reinforced concrete, Bricks, and Glass

Findings from Case study 3

The building composition maintains a basic regular form (strip) for malls but does not give room for maximum circulation. The mall relied more on roof-light to illuminate it, thus, depends on not more than 50% natural ventilation. The façade of the mall looks rigid, devoid of large fenestrations that could add some ambience to it. Some modern features that makes up all-inclusive design and smart such as use of sensor operated doors and other considerations for those with special needs are deficient in the mall. Hence, water usage is high and no form of re-use is evidenced as well as waste from the mall is properly disposed and treated to reduce environmental pollution.

Deductions from Case study 4 (Palms Shopping Mall, Lagos)

1. Planning description

The mall offers a diverse range of high-quality stores, including merchandise, fashion, services, health, food, sports, IT, and interior decoration. With the ability to accommodate around 62 shops and cinemas, the shopping centre features some of South Africa's biggest retailers, such as Shoprite, a large grocery store known for its fresh food and household goods, and Game, a discount retail chain under Massmart that offers everything from household electronics to jewelry and beauty products. The mall also features Nu Metro, which includes a six-screen cinema and a multimedia store offering books,

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magazines, DVDs, and music. There's also Montaigne Place, which operates the Clarins franchise in Nigeria, Twice as Nice, a shop for shirts and accessories, a Konica photo shop, a digital studio, and Wrangler, a casual wear outlet.

2. Structure

The structure is of reinforced and pre-stressed concrete members which are framed to form the skeleton of the structure. Glazing and light metal cladding are then used as covering for the building. The roof structure is predominantly of steel trussed construction.

3. Key materials

Pre-stressed concrete, steel, and glass

Findings from Case study 4

This shopping mall is characterized by extensive use of natural means of lighting which helps in reducing the energy costs of powering artificial lighting. More so, the mall's flexibility is seen in the use of large open plan spaces as opposed to smaller subdivided spaces with easy accessibility from the street. It is also marked with adequate parking spaces.

4.2: Summary of findings

Studying some selected shopping malls and some literature on shopping malls provided useful data which inspired the design of shopping malls. Some of these key features desirable in malls include; adequate ambience, and ventilation within the indoor spaces, as well as sizeable circulation spaces for seamless movement within and outside the mall. To promote sustainability in the development of shopping malls climatic and environmental conditions should be to be taken into consideration. The types and forms of shopping malls with special emphasis on sustaining the ecosystem and promoting eco-diversity should be studied and applied.

5.0: Conclusion

The design and planning of shopping malls should prioritize the integration of sustainable building materials, methods, components, and systems that minimize energy and water consumption, promote waste recycling, and enhance both indoor and outdoor environmental quality. By incorporating such sustainable features, shopping malls can not only reduce their environmental footprint but also increase their market value and attractiveness to users.

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This study provides valuable insights and design parameters for stakeholders in the built environment, informing the development of sustainable shopping malls that balance user needs with environmental responsibility.

6.0: Recommendations

To promote sustainability in the development of shopping malls, they following systems and measures should be adopted and incorporated thereof;

Lighting

With the advancement of new technology and the ongoing evolution of décor, lighting will become more sophisticated and regarded as a critical component in retail developments, not merely a checklist feature. This study suggests using down-lighting instead of track, and the interior lighting should amplify the atmosphere of shopping while the exterior lighting contributes to how safe shoppers feel about visiting a store or shopping mall. Lighting inside shopping malls can sometimes affect a shopper's purchasing decisions. Additionally, exterior lighting features, such as poles and lamp covers, frequently contribute to a decorative theme at shopping malls.

i. Escape Lighting: Malls need to have emergency lighting in every circulation are and in all protected and unprotected zones. For the lamps selection, the suggested products include HID lamps (with metal halide as the main choice), fluorescent lamps (the widely used T8 model), PAR halogen lamps, compact fluorescent sources, and a few incandescent lamps for added accent.

ii. Natural lighting: Natural lighting in the shopping mall could come from wall or roof openings, e.g. windows, deadlights, and most importantly, sky lighting, which will allow light straight down the central atrium of the building.

Ventilation

A spacious atrium in shopping malls should include an air handling system. Jet diffusers create downward airflow from higher levels, while drum diffusers are employed for substantial air flow. Return air is collected from the upper levels, and food areas are served by dedicating units. The smells from food should be restricted to the area where they are used. A central chilled water system, along with a heating boiler, should be put in place for the

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shopping mall. Moreover, the central plant room should be properly insulated and isolated from the shopping environment.

Different departments have their own specific requirements, so it is important to select equipment that meets these needs. Specialized refrigeration units are necessary for areas that need processes beyond just comfort air conditioning, and their condensing units should be situated outside. Local controls are essential for independent shops and stores. Each space requires its own individual system, designed to turn off when the shops are not in use, it's important to balance the amount of glazing to optimize daylight levels and prevent unnecessary solar gain, making air conditioning vital. Consequently, the glass area in the mall ceilings should not exceed 30%. Additionally, Carbon dioxide sensors should be provided to keep track of the number of occupants in the store, and send a signal to the dampers to regulate airflow. The frame and drum of the diffuser are constructed from aluminum and have brush strips that provide a low-friction air seal between them.

Safety

The following safety measures and strategies should be observed in the design of sustainable shopping mall designs.

- It is recommended to steer clear of features that do not cater to shoppers, such as arcade games and lottery ticket booths. Such establishments tend to encourage loitering and create disorder in the mall, thereby increasing the potential for criminal activity.
- Family-oriented stores should be more prevalent than youth-focused ones, like music shops, trendy clothing stores, and cinemas. Malls that prioritize being family and child-friendly are more likely to draw in a calmer crowd, such as families, or at least create a balance with the presence of teenagers.
- Place stores that appeal to young people close to the entrances and food courts. This setup can gather teenagers in one section of the mall, while shops targeting older customers can be situated on the opposite side.
- It is essential to eliminate narrow and dead-end hallways. Such passages are

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prime targets for theft and are not closely monitored.

- It is important for every store to be visible from a central pedestrian area, with all entrances situated there.
- Decrease the number of entrances to make it easier to monitor who comes in and out of the mall.
- Well-lit and distinctly marked parking lots are important for reducing customer fear and limiting opportunities for would-be criminals.

Water and Waste Management

Bins, baling / compacting machineries and others for disposing and recycling different kinds of waste should be provided. For energy efficiency evaluation in mall designs, metering should be adopted. More so, controlled / leak free flush toilets, ECO cubes in urinals, and other water-saving systems to reduce the need for flushing should be utilized. Proper implementation of various modern technologies for conserving water, such as shower regulators, faucet aerators, toilet tank fill cycle diverters, outdoor irrigation controls, rain sensors, soil moisture, and water flow management devices, is essential.

Fire protection

Fire compartments within a closed shopping centre ought to be placed thoughtfully and equipped with an automatic fire suppression system.

- Escape routes / Emergency exit: From all areas of the mall, there should be a minimum of two pathways leading to an open safe zone beyond the premises without passing through any space that is solely occupied. However, this rule does not apply to a kiosk with a maximum size of 25m^2, in which either the general public are not permitted or the kiosk's depth from the mall is not greater than 5m. Every shop with a frontage to the mall should have an alternative escape route that bypasses the mall. In situations where there is an upper story in a shop, an escape stair may connect to the mall if there is another escape route from that upper level that does not pass through the mall. This is crucial for situations like fire outbreaks or emergencies. Importantly, emergency staircase should be provided

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to ensure quick evacuation of occupants from the building.

- Fire Warning Systems: For the safety and security of a shopping mall, an automatic fire detection and alarm system should be properly designed and installed.
- Fire protection: The design should integrate features to prevent fire outbreaks, which may consist of automatic fire detection system, fire alarms, sprinklers, and fire extinguishers positioned at key locations. Additionally, steel components that are vulnerable to fire damage must be coated with fire retardants to protect them from destruction in an event of fire outbreak.

Circulation space

There has to be enough room for circulation, as a public building of such, is to be visited by hundreds at a time by different people going about the interior for different purposes.

Special needs

The design should be made accessible to all users regardless of their disability. This may include measures such as the inclusion of ramps and lifts for the disabled. People with other special needs such as the blind, deaf, and dumb should considered for an all-inclusive design.

Security

The structure should also be well secured from burglary or anything that could damage cause harm or cause harm to life and property. Apart from physical security, other forms of digital security should be adopted to resist robbery attempts, block hackers from disrupting, altering, damaging or stealing vital information resources from any of the intelligent systems of the mall.

Orientation

The design of shopping malls should be oriented in a way that maximizes the benefits from the of natural ventilation and lighting, this would help reduce energy costs in running such commercial building. Other local factors should be considered in orientating the building such as topography, existing / adjoining land features,

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accessibility etc. to obtain optimal functionality of the building.

Parking and Traffic Organization / Control

Adequate and convenient parking is a fundamental necessity for any commercial facility, regardless of size or location. In projects located in central business districts where land costs are very high, parking typically has to be multi-decked and should preferably connect directly to different levels of the center. For better land utilization, parking can be developed above the retail spaces on decks as roof parking, or it can be located below the retail areas in the form of basement parking or partial basement sections. Separation of various traffic routes is also a major concern in the design of both the site and the main structure. Traffic routes which have to be separated include; Pedestrian from vehicular traffic, Service from customer traffic, and Public transportation from customer traffic.

Architectural Character

The character of the structure should create a unique integration of architecture and landscape at an urban scale. It should not just be a landmark, but also an urban organism which attracts not only the region but becomes a place for excursions. The design should demonstrate an appreciation of street spaces, through the creation of a well-defined visual street enclosure helping to generate a vibrant and animated space. The continuity of shop front activity, spatial connectedness and intimacy is a key component to establishing such vibrancy.

Mechanical conveyors (Vertical and Horizontal circulation systems)

To convey users vertically and horizontally in shopping malls is essential to enable them access different ends of the mall in search of their desired commodities. To realize mechanical conveyors such as escalators, elevators (lifts), and travellators should be strategically located to promote free circulation devoid of conflict in functions. For escalators, the speed should be reduced to 0.45m/s-0.6m/s because of users' difficulty of step on and off and because faster travel apparently produces little and increases in the capacity of escalators. The slope of between 30 degrees – 35 degrees is common and is accepted. Required conditions should be adhered to under fire regulations when installations are in large buildings. These could be similar to requirements in building

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generally, for example sealing of the escalator area with automatically operated doors in the event of fire. On the other hand, buildings served by escalators are compact metalized for the purpose of fire confinement. In that case the escalators can be fixed with steel roller shutter to attain the highest level of safety.

The level of illumination of at least 100luxs to the steps of the elevator should be considered. Escalators are recommended because they move large number of passengers for which a large number of lift occupying more floor space would have been employed. The capacity is very high and the waiting time involved in lift services is eliminated or very nearly so. In case of a break down access is still serves as a strain case. More so, circumstances where an escalator and lift are used complimentarily can be allowed to meet some functional needs, particularly, when lifts are needed to move a crop of personnel (service providers) in between floors for technical and related operations. Lastly, care is however taken to prevent damage to passengers from trapping at the landings and to prevent fire from discarded burning cigarettes. Metal treads and combs with minimum clearance reduce these risks to acceptable limits, hence, should be provided. In essence, shopping mall design should be flexible to adapt to new features that will promote the wellbeing of customers and contribute in sustaining the ecosystem. Hence, mall design should not be limited to these program elements and sustainable measures.

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