



PAPER TITLE IN ENGLISH MIXED-USE DEVELOPMENT IN PORT HARCOURT.

SUB-TITLE: SUSTAINABLE ECOLOGICAL ARCHITECTURE

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Abstract English

The significance of a healthy built environment cannot be overstated; regardless of the magnitude of the development, user safety should not be jeopardized. Architecture is a crucial field that is impacted by the increased loss of ecological biodiversity, so a practical strategy should be implemented to address the problems faced by the building industry, including pollution, environmental degradation brought on by the ongoing eradication of plant and tree life, and incessant rain and harsh weather conditions brought on by climate change without proper and effective landscaping plans to mitigate the issues. This study aims to demonstrate how to achieve ecologically sustainable architecture through eco-friendly design of mixed-use development in Port Harcourt Rivers State, Nigeria. This study employed case studies to conduct a SWOT analysis on similar structures. Questionnaires were used to collect information from residents and business operators to determine if the proposed development could meet their needs. It was discovered that buildings designed with an eco-friendly design approach were healthier, and the mixed-use development can meet housing demands in the area while also improving walkability. The research took into account sustainable ecological architecture, area revitalization, efficient mix integration, and environmental sustainability. It was recommended that an eco-friendly design approach be used, and that the government create legislation to preserve sustainable ecological architecture, while no construction permits that do not protect the environment should be granted for developments.

Ecological, Sustainable, Mixed-use development, Architecture, Eco-friendly, Design

1. INTRODUCTION

The study's three main focal points are the sustainable ecological architecture component, eco-friendly design approach, and mixed-use development. this paper explains these project components and how they can support the conservation of ecosystem diversity in built environments. the development's contribution to the research area's revitalization and the improvement of walkability, intensity of use, and micro-mobility within the study area is acknowledged in the study. the term ecological architecture has started to appear frequently in project descriptions as yet another indicator of how environmentally responsible the design is.

BACKGROUND TO THE STUDY

Sustainable design aims to reduce the negative environmental effects of buildings by improving efficiency and moderation in the use of resources, including materials, energy, development space, and the wider ecosystem. When designing the built environment, sustainable architecture takes a deliberate approach to energy and ecological conservation (Ken Beattie, 2013). The goal of sustainability, or ecological design, is to make sure that how we utilize the resources that are currently accessible does not have long-term negative impacts on our collective well-being or make it difficult to get resources for alternative uses. Until now, building technology and its changes have dominated discussions of the word "sustainable" in design. Beyond the realm of "green design," creativity, and knowledge, some academics are beginning to situate architecture within a much larger cultural framework of the interplay between humans and the environment. Adopting this paradigm enables the exploration of a long history of cultural discussions on human interactions with the natural world and the environment from the perspective of many historical and geographical contexts.

STATEMENT OF THE PROBLEM

The rate of climate change, bad air quality, and species extinction have accelerated to an alarming degree. This is a result of the increased loss of biodiversity, and little or nothing has been done in this area to slow or stop the rate at which these issues are spreading. Being an oil-rich and prosperous city, Port Harcourt's population has tended to grow through time as a result of urbanization. A comprehensive and long-term plan for controlling population growth and the attendant burden on municipal services, including housing, infrastructure, education, and health, must be in place for Rivers State to manage the expanding population, particularly in the city's capital, Port Harcourt. In the past, human communities have been built using a variety of uses, each with a different scope and purpose for specific projects. Government zoning laws were used during industrialization to separate distinct uses, such as production from residential areas, but the advantages of mixed-use zoning have once again become appealing. Therefore, for any city to operate well, all of its components must be put, sited, situated, located, and organized functionally to ensure proper harnessing.

STATEMENT OF ARCHITECTURAL PROBLEM

Architecture is a crucial field that is impacted by the increased loss of ecological biodiversity, so a practical strategy should be implemented to address the problems faced by the building industry, including pollution, environmental degradation brought on by the ongoing eradication of plant and tree life, and incessant rain and harsh weather conditions brought on by climate change without proper and effective landscaping plans to mitigate the issues.

AIM AND OBJECTIVES

This study aims to demonstrate how to achieve ecologically sustainable architecture through eco-friendly design of mixed-use development in Port Harcourt, Rivers State, Nigeria.

The following are the objectives this research is set to achieve:

1. To design stronger neighbourhoods with the ability to walk to amenities, places of employment, and other locations around the neighbourhood.
2. To examine eco-friendly design principles
3. Rejuvenation of the area's landscape through thoughtfully chosen and well-executed services and outdoor areas
4. To enhance the use of eco-friendly design approaches in mixed-use building development

PROJECT SCOPE

The project's scope includes a community in the Obio/Akpor local government area of Rivers State, Nigeria, after taking into account residents' livelihoods, the rate of migration into the area has increased and there is a housing shortage, necessitating the construction of a facility to efficiently house people and relieve

pressure on the local infrastructure. restoring the shoreline to reassert for the Rivers people the nostalgia that a healthy water body signifies. This project will only affect a small section of the road during this initial phase. Diverse waterfront developments serve a variety of purposes.

PROJECT LIMITATIONS

One of the project's limitations is the lack of residents' knowledge of the site's characteristics, including its topographical and geographical elements. Obtaining precise data from the immigration office regarding the population of the region where the site is located over the last five years is another limitation. One restriction was the region's rising cult activity. The Ogbum-nu-Abali slum area revitalization into an urban mixed-use development, appealing to tourists, and to be developed not only for residential purposes but also for recreational, hospitality, and commercial activities, to help revitalize the socio-cultural value attached to waters and thus enhance the economy of the state and the Nation at large, constitutes the sole focus of this project; since its primary goal is to attend to the city's and the host community's urgent requirements.

PROJECT SIGNIFICANCE

It is impossible to overstate the importance of the project given that it will aid in the following areas:

1. Build affluent houses
2. Reduced cost of transportation fees
3. Enhanced micro-mobility
4. Encourage a wholesome environment.
5. Improve the site's functional integration of various uses.
6. boosts the state's economy by creating jobs at this facility that will benefit society on many levels.
7. Strengthening the cultural ties that people have to the water.
8. Provide housing and healthier water bodies for aquatic animals and the locals.

DEFINITION OF TERMS

Biodiversity: The variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural environment are all included in what is known as biodiversity.

An Ecosystem: An ecosystem is a region where a bubble of life is created by plants, animals, and other organisms interacting with the weather, environment, and other factors.

Ecology: Ecology is the study of living things and how they relate to their surroundings. An ecologist researches the interactions between organisms and their environments.

An Eco-friendly: not damaging the environment or making efforts to protect it

Sustainability: This is taking care of the present while without compromising the capacity of the next generation to take care of themselves.

Revitalization: to infuse new energy or vitality to revitalize or revive.

Mixed-use development: A development that combines two or more residential, commercial, cultural, institutional, and/or industrial purposes must be pedestrian-friendly.

Waterfront: This is a piece of land, land that has buildings on it, or a portion of a town that is adjacent to or fronts on water.

Biomaterial: A biomaterial is a substance that has been created specifically to interact with biological systems for therapeutic or diagnostic purposes in medicine.

Geothermal: A biomaterial is a substance that has been developed to work with biological systems in a therapeutic or diagnostic manner for medical purposes.

LEED: The most popular green building rating system in the world is LEED (Leadership in Energy and Environmental Design). LEED offers a foundation for healthful, highly effective, and cost-effective green buildings and is available for almost all building types.

1.1. LITERATURE REVIEW

MIXED-USE DEVELOPMENT

Because of mixed-use construction, a structure can accommodate a variety of applications or services. It is made up of commercial, residential, cultural, institutional, and manufacturing features that are all intertwined. It acts as the main centre of activity for people. Because many people like to concentrate in one spot, it enables individuals from various walks of life to communicate with one another, while also boosting space security. It also makes a location more economically feasible. This type of design development is particularly successful since it caters to a relatively narrow range of human expectations. The presence of these various functions will encourage local economic growth and preservation. According to JD Esanjian (2022), the multiplicity of uses allows for a uniform and compacted distribution of multifunction among the city's inhabitants. A mixed-use facility has been designed and built inside the boundaries of a city, municipality, and/or state to blend residential and non-residential functions. These real estate initiatives can range from a single structure to an entire neighborhood, and they are frequently designed to respond to a specific environment.

MIXED-USE AS IN INTEGRATED APPROACH

a mix of vertically or horizontally oriented commercial (such as office, retail, and entertainment) and non-commercial (such as residential) uses, as specified in a mixed application handbook. According to the Mixed-Use Development handbook, a mixed-use development supports integration, density, and compatibility of land uses and offers three or more significant revenue-producing applications (Levitt, 2005). The city core is often where these kinds of construction projects are located. Residents will be able to continue living close to their places of employment and leisure.

ECOLOGICAL SUSTAINABLE ARCHITECTURE

Ecological diversity can be directly linked to evolutionary and selective pressures that constrain the diversity outcome of ecosystems within different niches all over the world. Evolutionary pressures cause tundra, rainforests, coral reefs, and deciduous forests to form. Even seemingly minor evolutionary interactions can have a significant impact on the diversity of ecosystems around the world. One of the best-studied examples is the honey bee's interaction with angiosperms on all continents except Antarctica. A study on the health and nutrition of honey bee colonies conducted by Brodschneider and Crailsheim (2010) showed that human activity does contribute to the decline in the fitness of the bee colony. Alternative pollination techniques would be required for many plants that feed humans on a large scale if these pollinators went extinct or were on the verge of going extinct. Not only will costs rise, but there will also be a decline in colony fitness, which will result in a reduction in genetic diversity, which research has shown is directly related to the honey bee colonies' long-term survival. Over 50 plants, many of which are important staples for feeding the world, rely on bee pollination, according to a study.

According to a different study, a lack of plant diversity will result in a decline in the fitness of the bee population, and a low level of bee colony fitness will affect the fitness of plant ecosystem diversity. Bee pollination can increase the genetic diversity of flora growth and create a distinct ecosystem that is highly diverse and can provide a habitat and niche for many other organisms to thrive by allowing bee pollination and working to reduce anthropogenically harmful footprints. There is no escaping the fact that pollinators have an impact on ecosystem diversity due to the evolutionary pressures placed on bees by their distribution across six of the seven continents. The pollen that bees collect from nearby plants is harvested and used as a wintertime energy source, but this activity also has a more significant impact by facilitating the transfer of genes between organisms. Potentially, the new evolutionary pressures, which are largely anthropogenically induced, could lead to a widespread ecosystem collapse. An investigation into how human activity affects the nearby ocean habitats was carried out in the North Atlantic. No habitat or trophic

level was found to be adversely impacted by human interaction, and as a result, a large portion of the diversity of life was being stunted.

HISTORY OF ECOLOGICAL SUSTAINABLE ARCHITECTURE

The current enthusiasm for sustainable architecture originated in the energy crisis of the 1970s when architects became cynical about building enclosed glass-and-steel boxes that required massive heating and cooling systems. However, it wasn't until the 1990s that "green architecture" started to manifest as a fundamental architectural consideration. Leadership in Energy and Environmental Design (LEED) standards — which are still the golden criteria for building green were formed in 1994. Worldwide construction output will grow when the construction industry produces an astonishing USD 15.5 trillion in total revenue. The architectural design community is increasingly aware of the responsibilities and opportunities resulting from this growth. It's now clear that the ever-evolving sustainability and "back to nature" movements must move on from green-washing and tokenism and adopt a holistic approach to encompass all stages of architecture.

ECOLOGICAL DIVERSITY

The diversity of ecosystems, natural communities, and habitats is referred to as ecosystem diversity. It essentially refers to the range of interactions between species and their surroundings. The species present in both ecosystems, as well as the temperature and rainfall, distinguish the forests of Maine from the forests of Colorado. These two ecosystems, which on the surface appear to be identical, actually differ greatly and are each unique. The topic of ecosystem diversity is the diversity of ecosystems within a given geographic area and how that diversity affects both the environment and human life in general.

ECO-FRIENDLY DESIGN APPROACH

According to Ogunde et al. (2018) to offer services like lighting, water, and climate control for necessary shelter, financial gain, and human comfort, the building sector contributes significantly to environmental deterioration. Buildings have several systems connected to them, including heating, cooling, ventilation, and daylighting systems. Mechanical and electrical systems that are employed to power and increase these systems' necessary operations are examples of conventional technologies' negative contributions. Along with the release of these gases, solid and liquid waste also pollutes the environment during the course of their lifetimes. Nature will be greatly impacted by this. Water and solid waste may be caused by subpar construction techniques or materials. The industry must directly assume responsibility for the maintenance and preservation of its environment due to the rate of environmental degradation. Climate change warns of risks to humanity's survival due to changes in the climatic environment, where global warming is no longer an issue that will just affect us in the future but demands immediate awareness and a worldwide reaction. The Energy star ratings and the Green Building Council are two examples of international reactions (Ogunde et al., 2018).

ECO-FRIENDLY DESIGN

Designing physical items, the built environment, and services by the principles of ecological sustainability is known as eco-friendly design (also known as environmentally conscious design, eco-design, environmentally sustainable design, etc.). Eco-friendly design aims to improve the health and comfort of building occupants. Building performance is improved through sustainable design, which aims to minimize harmful effects on the environment, the health, and the well-being of building occupants. Design that is environmentally friendly or sustainable makes a purposeful effort to lessen how much of an influence people have on the environment. Utilizing natural, non-toxic, and recycled materials and finishes that enhance air quality and lessen habitat loss can be one way to do this.

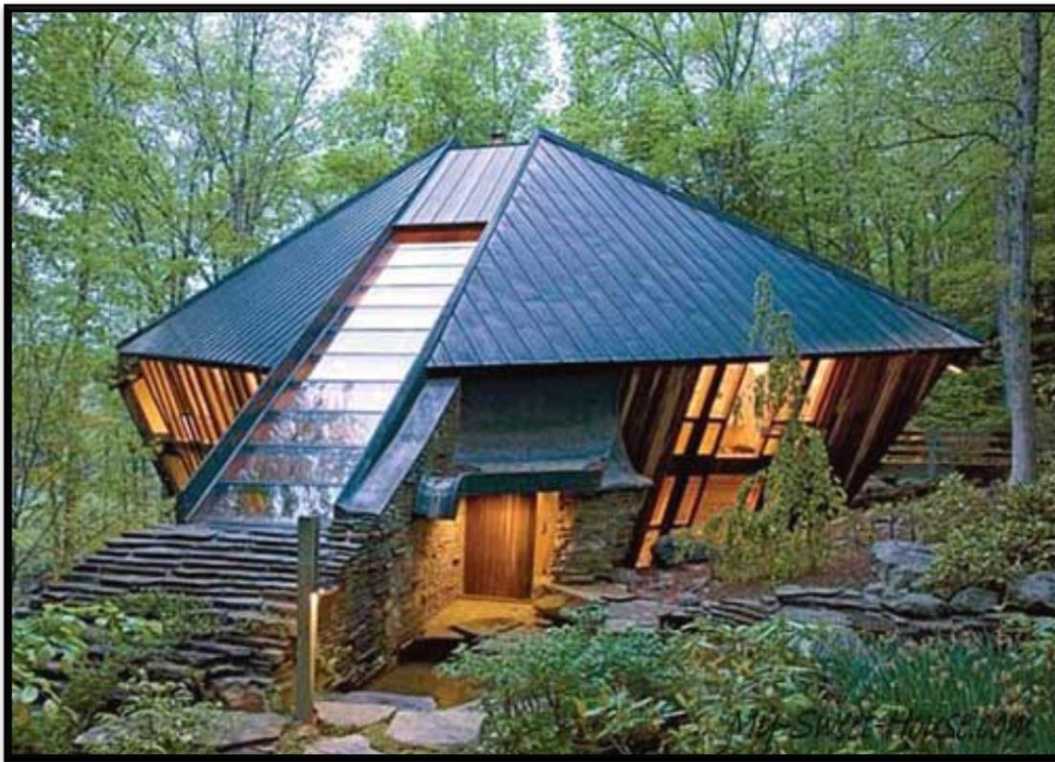


figure 1.0: Eco-design in an unusual natural site

source: Bruce (2007)

ENVIRONMENTALLY FRIENDLY ENERGY EFFICIENT BUILDING

In many poor nations throughout the world, green buildings provide a significant contribution that cannot be ignored. Sustainable construction is said to have benefited a country's economy. Contrary to popular assumption, these structures may not be more expensive than comparable structures and nevertheless benefit people, businesses, communities, governments, and entire countries economically. to spend less money while consuming less energy. In the x-ray of the technologies that can be used, the use of renewable energy sources and the construction of ecologically friendly, energy-efficient homes are mentioned.

ECO-SUSTAINBLE BUILDING

Sustainability may be defined as the ability of a civilization, ecosystem, or other interacting systems to continue operating without depleting essential resources or negatively impacting the environment. Sustainable development satisfies current demands without jeopardizing the ability of future generations to satiate their own needs, according to the Commission on Environment (1987), Sustainable development has been based on the idea of residing within an ecosystem's carrying capacity (S. V Deodhar, 2005). Sustainable development has also been described as construction that doesn't harm the environment and helps a city maintain its social and economic system in the context of architecture and urban planning. Sustainable construction is therefore both financially and ecologically advantageous as well as socially acceptable. However, according to Ellingham & Fawcett, (2013), a building is sustainable during its lifetime if it continues to contribute favourably to physical capital, its activities contribute to human well-being, and it does not significantly deplete natural capital (Ellingham & Fawcett, 2013). Considering the aforementioned primary goals throughout design and construction makes a building sustainable;

- a. Social development, or taking into account everyone's needs.

- b. effective environmental protection
- c. using natural resources

However, the majority of modern architects and engineers find it simpler to create buildings without taking into account the natural world; as a result, many fossil fuels are used to make the majority of the structures in our cities habitable. An architect who is conscious of the environment would create various structures. His idea was to develop a structure that makes sense in terms of aesthetics, economy, society, and the environment. Sustainable design aims to replace human control over the environment with a more positive connection with it (Ramos & Mendes Da Silva, 2004). Additionally, structures, as they are created and utilized in modern cities, represent the unchecked consumption of energy and natural resources (such as Stone/Aggregate, Sharp Sand, and Wood), which has a detrimental effect on the environment. The mining holes strewn over the northern region of Ebonyi State in Nigeria are an excellent illustration. By using eco-friendly building materials and applying acceptable retrofit options to existing structures, buildings may be designed and built with sustainability ideas in mind, which might greatly increase energy usage efficiency in the building industry.

CONCEPT OF ECOLOGIC AND GREEN DESIGN

Studies on traditional Nigerian architecture have shown that the environment was taken into careful account when constructing homes, structures, and other living units. Since there may have been fewer energy supplies accessible at the time, man was forced to discover how to effectively utilize natural resources and ecological materials. In the construction sector, ecological and green design and building materials contribute to the current and future enhancement of living quality (Shu-Yang, Freedman, & Cote, 2004).

Ramos & Mendes Da Silva (2004) summarized the principle of ecologic design by stating that any form of design that minimizes environmentally destructive impacts by emulating and integrating with the natural ecosystem can be referred to as eco-design or eco-friendly design/building. Therefore, the eco-friendly design aims to provide a framework for an environmentally appropriate system of design and management by cooperating with both anthropogenic and ecological values, at relevant spatial and temporal scales (Guner Aktas, 2013). According to Shu-Yang et al. (2004), the concept of eco-friendly or eco-design involves several key aspects of architectural decisions

RESEARCH METHODOLOGY

- a) This research study will analyse and assess the significance of integrating mixed-use developments in the state owing to expanding population, family income, density, and so on. The research evaluated mixed-use development and attempted to:
- b) Determine the causes that led to the emergence of these advancements.
- c) Determine the elements that influence where individuals work, live, play, and study.
- d) Create an environmentally sustainable mixed-use development that will have a net beneficial impact on its people and the urban environment.

GEOGRAPHICAL AREA OF STUDY

The study area was chosen in Ogbum-nu-Abali, Port Harcourt city due to the following reasons:

- Port Harcourt is the capital city in Rivers State with a population of the city proper estimated at 3,325,000 people
- Due to the search for a better standard of living, migration to the city is on the rise.
- Port Harcourt is an administrative and economic place.
- Ogbum-nu-Abali is in an Urban prowl

- The site study area is in a degrading state

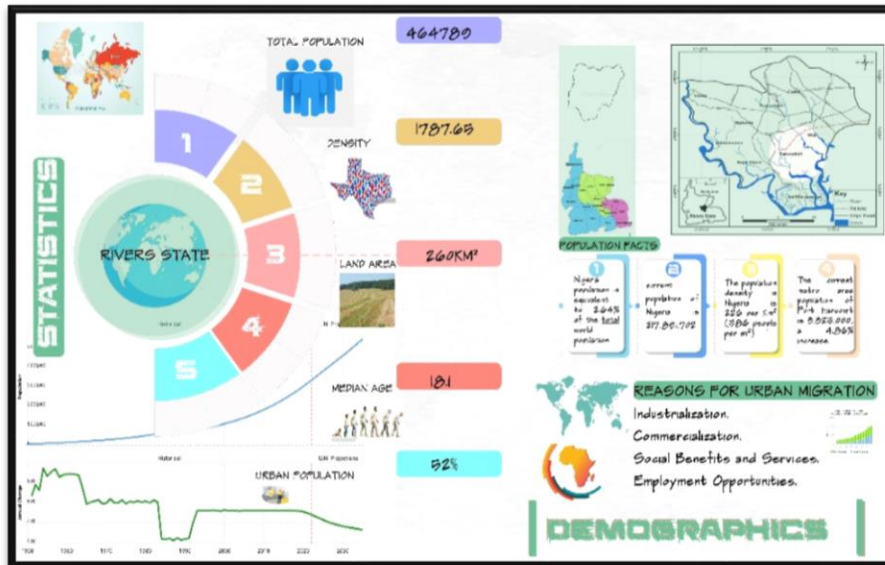


plate 1.0: Demographic details of Port Harcourt City Area

source: authors fieldwork

DATA SOURCES

In the study, data was gathered from both primary and secondary sources. In descriptive analyses of the collected data. Because of the variety of mixed-use developments, several protections have been put in place to guarantee that accurate information is gathered. As a result, several sampling strategies were employed to acquire data. Specific sampling procedures were used to choose the various mixed-use projects. This was achieved through interviews with inhabitants of mixed-use developments, analysis of movement patterns in single-use suburban developments, observation of automobile traffic movements, and critical analysis of the data acquired.

SURVEY

To collect data, a survey was conducted throughout the geographical region. Specific sites were chosen because of their unique role within the urban environment. The survey was carried out in the following areas:

- a) Residential areas
- b) Commercial areas
- c) Recreational areas
- d) Office areas
- e) Entertainment areas

PRIMARY DATA COLLECTION

CASE STUDIES

Case studies have shown to be quite beneficial in defining and establishing procedures (Cropper, 1986). According to Rule (1986), a case study is a research approach that may be likened to an experiment, a history, or a simulation. He explains that this does not imply the adoption of any certain type of evidence or information-gathering approach. It will be determined by quantitative and qualitative data, fortifying procedures, verbal descriptions, and observations, either individually or collectively. It was also suggested that having an analytical structure and guiding hypothesis through a literature review will avoid the case study from becoming too open-ended intellectually. Studies on planned mixed-use were also undertaken using the internet and periodicals. These were chosen to show the researcher how some of the urban design concepts uncovered in the previous chapter's Literature study were implemented.

CRITERIA FOR CHOOSING CASE STUDIES

According to the Department of Architecture at Rivers State University, the normal number of case studies should be five (5) to offer the researcher a comprehensive understanding/in-depth knowledge of how the solution to the Architectural challenge will be executed. They must be selected using the following criteria:

1. Similarities to the research (shared functions and nature of spaces, facilities).
2. The study's uniqueness or importance
3. Geographic position.

QUESTIONNAIRES

Questionnaires are one of the four primary forms of information collecting used in qualitative research, along with focus groups, surveys, and observation. They will ask unstructured, open-ended questions with a restricted range to elicit participants' ideas and opinions (Creswell, 2003). During this study, key informant interviews, particularly with state authorities, as well as casual interviews with researchers and people to give supplemental data, were done.

The key informant interview area unit's goals are as follows:

1. To obtain first-hand information on the rationales, issues, and techniques of authorities in city district development that may be unavailable in publications;
2. To understand Ogbum-nu-executive Abali's structure
3. to elicit insiders' perspectives on city area development; and
4. As a means of collecting government documentation from interviewers.

It was not specified how many key informant interviews should be undertaken, nor was a form particularly supplied to the World Health Organization. The interview went on until there was no more spare data and replies became repetitious.

SECONDARY DATA COLLECTION

LITERATURE REVIEWS AND CASE STUDIES

A thorough evaluation of books, journals, and other documented research relevant to the topic was conducted. Government legislation, institutional norms, and professional design standards on mixed-use constructions were also utilized. A significant percentage of the material was obtained electronically and properly cited. Similar mixed-use developments in foreign nations connected to this research were also evaluated and chosen as case studies for this work.

1.1.1. FINDINGS AND DISCUSSION

FINDINGS AND ANALYSIS

The first section of this chapter presents the findings of case studies on mixed-use projects. As a result, the evaluation of these mixed-use complexes is increasingly focused on suitable design standards and circumstances. The data acquired from the case studies are included in the subsequent phases of the study. The study's goal is to identify common design issues in mixed-use developments, discover solutions to these issues, and improve these solutions to meet the design criteria. Finally, key inferences for the study were drawn from the evaluated literature.

CASE STUDY 1: GREEN-LIT MIXED-USE



Figure 1.1: aerial view of Hackney Wick mixed-use London

Source: Forbes Massie

Project Title – Mixed-Use Development

Project Location – Hackney, Wick London

Project Site Area – 28800sqm

Project Architects – BUJ Architects and Ash Sakula Archite

PROJECT INFORMATION

Wickside will be a £120 million "permeable, mixed-use neighbourhood" with 475 dwellings and 300 jobs for the neighbouring community. The neighbourhood, designed by BUJ Architects and Ash Sakula Architects, just got approval from the LLDC planning committee.

CONCEPT

The concept, which has been in the works for over nine years, employs "urban blocks built around typical London streets" to create a complex, diversified townscape with a range of functions. The neighbourhood is located in Hackney Wick, London, and is contained in a 28,800-square-meter-old garbage transfer station. Wickside, which integrates the context's existing buildings and cultural assets, intends to develop the current creative community via "retention and regeneration," and is one of the area's major development sites.

RECREATION

The linear park that runs along Wickside's southern edge offers an attractive threshold between the buildings and the canal, pulling people in and being one of the numerous sites where organic community interactions might develop. "Carefully stitched into the urban fabric," the concept also gives great pedestrian and cycling access to the neighbouring Hackney Wick Station, while the green rooftops create a unique spot for playing, relaxing, and gardening.

The idea has gained much acclaim for its quality and liveability. Piers Gough, a planning committee member, described it as "the greatest we've ever seen," praising it as quirky, amusing, and brilliantly managed. The architect's attention to the existing feeling of location contributes to its success. While introducing fresh ideas to strengthen Wickside's developing creative community, the LLDC's main purpose is to "create a dynamic new heart for east London, generating opportunities for local people, and promoting innovation and growth in London."

SWOT ANALYSIS

STRENGTH

1. Excellent access to a Hackney Wick station
2. Integration of content in existing buildings with cultural heritage
3. Unique green rooftops and unique space for playing and pausing on planting

WEAKNESS

1. The linear park at the South end of the facility is segregated from other parts of the building
2. There is no defined car park for the facility
3. Building services are handled by the local authority based on the fact that the facility has different streets making up one urban neighbourhood

OPPORTUNITY

1. Job creation for surrounding communities
2. Community interaction fostered by the presence of linear park
3. Regeneration of waste transfer site

THREAT

1. Industrial effluents from industrial workers will be harmful to members of the community
2. The safety of habitants is not guaranteed since it's an open neighbourhood

DEDUCTIONS

1. Neighbourhood parks in the form of urban beaches
2. Green terrace
3. Rooftops
4. Access to the community station via a light rail system
5. Inclusion of an art gallery to foster community interaction

CASE STUDY 2: KINGSWAY TOWER

Project Title – Kingsway Tower

Project Location – Ikoyi Lagos

Project Site Area – 27832sqm

Project Architects – Stefan Antoni, Olmesdahl Truenn Architects (SAOTA)

Project Year – 2019

PROJECT INFORMATION

Kingsway Tower is a notable mixed-use skyscraper in Ikoyi, Lagos, Nigeria, located on a prominent corner of Alfred Rewane Route, an arterial road that bisects the city, heading north to the airport and south to Victoria Island. Kingsway Tower is a 15-story building designed by South African architect SAOTA. It features a basement, a two-story retail podium, a parking podium, and 12 stories of office space. The design of Kingsway Tower not only introduces new architectural concepts to Lagos, Nigeria's economic centre and one of the world's fastest-growing cities, but it is also uncompromisingly world-class in its quality and execution, emphasizing the importance of this expanding market in a worldwide context.

Located in Ikoyi, a prestigious residential neighbourhood, Alfred Rewane Road and its surrounds have been rezoned to create a mixed-use corridor, resulting in a boom in office and hotel developments. Much of the development in Lagos, however, has a fairly anonymous character, generally following a standard commercial model with concrete slab and curtain wall facades. “We wanted to design a building that made direct references to the fact that it was in Lagos, with a façade that responded to the local climatic conditions,” says SAOTA Director Greg Truen, lead architect on the project.

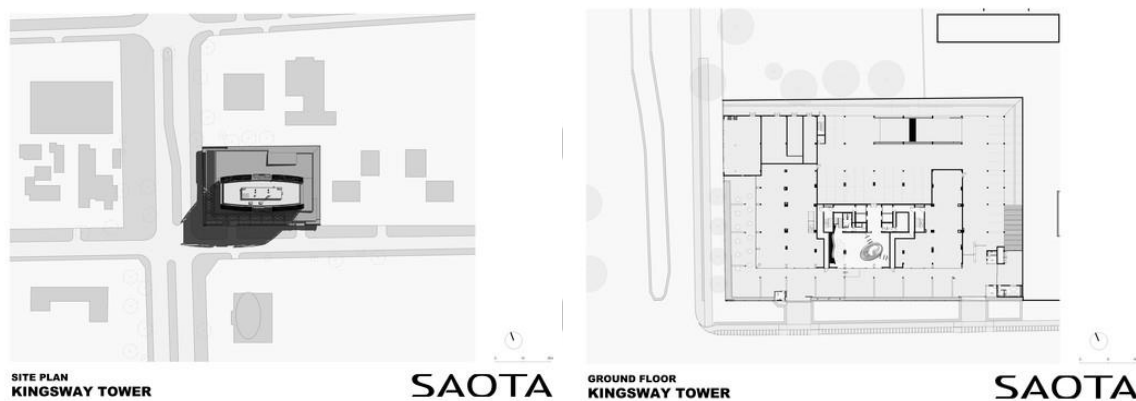


figure 4. 1: site plan and ground floor plan

Source: Adam Letch

The distinctively swollen, billowing form of the tower subtly references the square sails of the traditional boats on Lagos Lagoon while conveying the effect of the gentle breeze that characterizes the climatic conditions of the city. The tower rises above a wavy canopy with a “woven” pattern on its underside, reminiscent of fabric caught in the breeze. The canopy sweeps around a two-level retail podium, providing shelter at street level and lifting invitingly towards the entrance at the most prominent corner.



figure : perspective view of Kingsway tower

Source: Adam Letch

SWOT ANALYSIS

STRENGTH

1. The use of multi-story parking to conserve space
2. Appropriate integration of uses and spaces in the facility

WEAKNESS

1. There is no adequate land on site
2. There is no landscaping feature on site

OPPORTUNITY

1. The use of natural means of lighting creates an opportunity to reduce the energy costs of artificial means
2. the construction of the facility created employment opportunities for the members of the immediate community

THREAT

1. The site area has no neighbourhood feel and this is a threat to the performance of workers
2. The security of the site is not very effective and it is a threat to the inhabitants of the facility

DEDUCTIONS

1. Use of natural lighting for the facility
2. The use of sustainable practices and efficient landscape features on site

GEOGRAPHICAL LOCATION AND HISTORICAL BACKGROUND

The planned project site is Ogbum-nu-Abali, which is located in the southern area of Port Harcourt City, the capital of Rivers State. The site is located between latitudes $4^{\circ}47'43.66''\text{N}$ and longitude $7^{\circ}0'59.62''\text{E}$. It is bordered on the north by the Nkpogu neighbourhood, on the east by Amadi west by the Orogbum community and south by the eastern bypass and Port Harcourt Aggrey road.

4.4.7 LOCATION AND AREA OF SITE

The site is located in the Ogbum-nu-Abali community and covers an area of 133,327 square meters or 13.3Ha



Plate 1.2: proposed site location

CLIMATIC DATA AND ANALYSIS OF PORT HARCOURT

The climate of a region affects the project purpose, building orientation, structural components to be employed, and the durability of materials used, hence it is critical in every architectural project.

Research and analysis of the Port Harcourt climate were conducted to give the necessary knowledge and solutions for the project's success. In addition to microclimate, there are promising opportunities for using sustainable design principles.

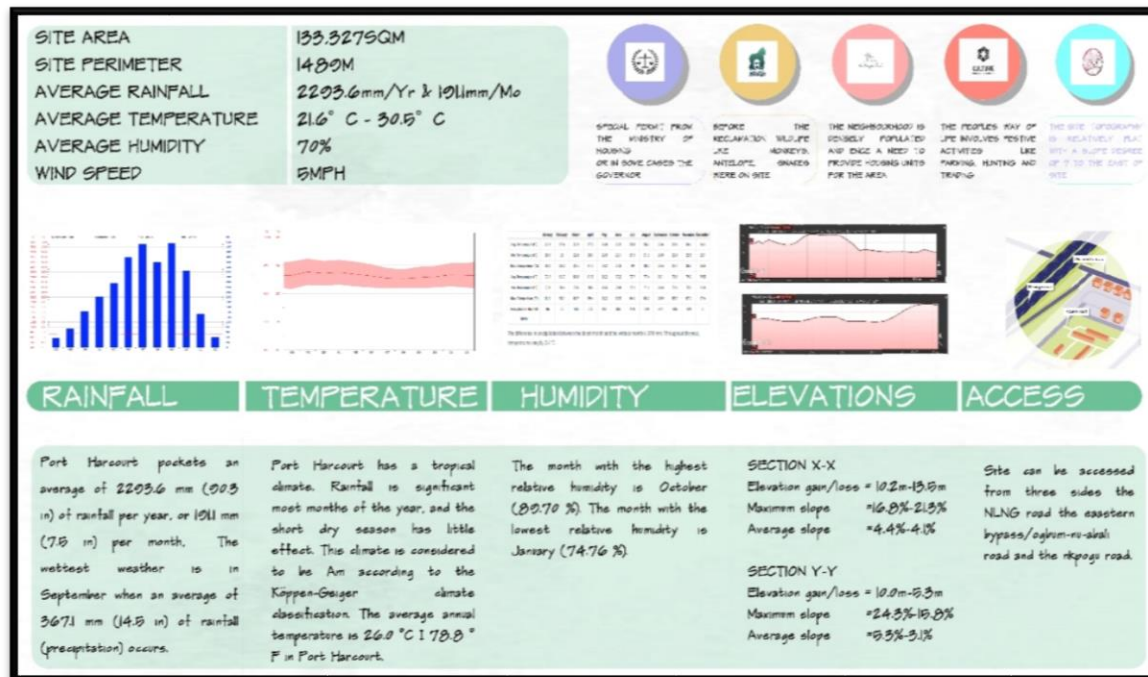


Plate 1.3: site analysis and climatic conditions

DESIGN CONSIDERATIONS

Certain challenges have been highlighted as crucial in mixed-use project planning. As noted in Neufert's Architects' expertise and Time Saver Criteria, some of these were considered tight general principles backed up by advice based on comprehensive investigations and reviews. Others provide several possibilities, allowing the designer to select the best one for the specific setting or condition. New design aspects, on the other hand, are affecting how style practitioners think about gift concerns, which has the potential to have a long-term impact.

Function: The mixed-use complex should create a sense of belonging, a home, and a safer urban environment for its people.

Interaction: Its growth should result in the establishment of a social meeting space, as well as the enhancement of social links and diversity.

Satisfaction: The mixed-use development should provide optimal housing and social satisfaction. As a result, the following factors should be addressed while planning and developing a mixed-use development.

LOCATION, RESULTS:

- a. Ascertain if the facility is located a reasonable distance from adjacent developed regions.
- b. Check to see if public transit and its routes are conveniently accessible to the mixed-use property.
- c. Ensure that the mixed-use development's business, retail, social, and residential amenities are easily accessible.

CHARACTERISTICS OF THE NEIGHBOURHOOD, OUTCOMES:

- a. Ascertain that the development respects and fosters users' diversity.
- b. Take advantage of the undeveloped and natural environment.

- c. Promoting innovative and well-designed solutions to raise standards of living while also increasing the area's security and economic viability.
- d. Ensure that the development integrates with the character of the site or location.

CAR PARKING, OUTCOMES:

- a. Ensure that users have enough parking and bicycle storage at all times on the property.
- b. To ensure that parking spots and access points are in convenient and safe places that do not detract from the streetscape's character.
- c. To make vehicular traffic in the parking lot as efficient as feasible.
- d. To guarantee that the parking and access spaces are practical and simple to operate.

RESIDENCE AMENITIES:

- a. Designing practical and acceptable living areas and accompanying facilities to provide people with a fair level of living.
- b. Assuring a realistic, stable, and successful development design while also addressing consumers' life demands.
- c. Improves the service and amenities while encouraging user participation.
- d. To create shared communal places that meet people's leisure demands.

LANDSCAPING, OUTCOMES:

- a. Existing vegetation, particularly canopy trees and street trees, should be exhibited to sustain and improve the garden city ambience.
- b. Employing landscaping is an important approach for softening the look of hard surfaces like driveways and other paved areas.
- c. Ensure low-maintenance, practical landscaping that complements open space areas and preserves the neighbourhood's landscape identity while meeting the demands of users.
- d. Trees with canopy and branching crowns should be included.
- e. Assist in the planning of appropriate losses to ensure the survival of big canopy trees.

DEVELOPMENT OF DESIGN

Mobility is a recurring element that customers value to encourage the presence of mixed-use development throughout the research and evaluation of the various case studies in this work. The movement of labour from low-wage to high-wage jobs, the daily transit of employees from their homes to workplaces, the transfer of supplies to work sites, and the distribution of finished goods to markets are all examples of mobility. Cities collapse, businesses dwindle, and cultures wither in the absence of human activity. Mobility has become increasingly important to the sustainability of human activity, fuelling productivity development and propelling the global dispersion of interconnected activities. The mixed-use complex is intended to help people enjoy nature. Ambience, elegance, completeness, landscape, character, and the community's nature all contribute to individuals embracing and controlling their immediate surroundings. This has an impact on the individual's general health and well-being. A need to sustain the health of the ecosystem while moving about interconnected spaces and carrying out various activities is still vital to the development of mixed-use development, imbuing a concept that doesn't only aid the workability of diversity but also incorporates the sustainability of ecological architecture in the built environment hence a metaphor that imbibes nature is instrumental in passing across a message of good health, sustainability and integrated and complemented mixed-use development

1.1.1.1 OBSERVATIONS

CONCLUSION

The effort undertaken to design a mixed-use development to improve sustainable ecological architecture while rejuvenating the city of Port Harcourt is significant because it can assist the government in having a framework to utilize as a foundation for initiating these types of developments in the city. Because it incorporates mixed-use services such as workplaces, residential, retail, and supporting facilities, its design will promote a sustainable community, continuous connectedness, and an ecologically friendly setting. Finally, this thesis on mixed-use projects highlights the need of being more eclectic, and ad-hoc, and provide people with more options, diversity, and flexibility. It is the sort of architecture that is based on the stability of location while yet being able to evolve and renew itself in the face of an uncertain future. Through the application of eco-friendly design principles in the process of designing such developments in Port Harcourt, the planned mixed-use developments would accelerate urban rejuvenation and boost sustainable practices.

CONTRIBUTION TO KNOWLEDGE

This research has uncovered essential information from which mixed-use initiatives might be launched, with the ultimate goal of improving the state's economic status. As such, it adds to the body of knowledge on mixed-use development design that currently exists. It has also prepared new aspects of thinking for knowledge discovery and subsequent research promotion by implying the possibility of providing facilities for city development through eco-friendly design techniques to promote ecologically sustainable architecture.

RECOMMENDATIONS

We live in an ever-changing, dynamic world. Today's cities are increasingly in need of strategically planned structures and areas that can serve several tasks. Residents in mixed-use projects benefit from frequent contact and long-term ties with others. As a result, mixed-use construction must adapt, providing greater flexibility and efficiency while assisting inhabitants in their pursuit of a richer, better, and healthier future. The goal of this design is to create a city where people can work, play, shop, and live in areas that are smarter, more useful, and people-oriented. The mixed-use development should be planned to be ecologically clean, family-friendly, pleasant, and secure. It should have ample public space for entertainment events and casual gatherings. Some related suggestions have been developed based on the findings of this research and the creation of the Mixed-use design. The following are the recommendations:

1. Encourage future developments that orient building activity in the Ogbum-nu-Abali community
2. Evaluate and prioritize existing future infrastructure improvements, such as landscaping.
3. Support the use of an eco-friendly design approach.
4. Encourage the government to create legislation to preserve sustainable ecological architecture.
5. Ensure that no construction permits be granted for developments that do not protect the environment

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