



Adopting Eco-friendly and Socially Responsive Strategies as a tool for designing Mixed-Use Facilities in Port Harcourt

Iragunima, Uchere Promise

Department of

Rivers State University, Nkpolu Oroworukwo, Port Harcourt

Email: Upiragunima@gmail.com

ABSTRACT

This study investigates how mixed-use facility design in Port Harcourt, Nigeria, incorporates environmentally friendly and socially responsible practices. The study emphasizes how crucial sustainable building is to combating environmental deterioration and promoting inclusivity in communities. This paper emphasizes eco-design, social responsiveness, and mixed-use developments as successful approaches to attaining sustainability by reviewing previous research and new theories. The results show that these tactics improve social justice and economic sustainability in addition to lessening their negative effects on the environment. In the end, the study offers a road map for using sustainable design principles in upcoming projects.

Keywords: Eco-friendly, Mixed-Use, Social Responsiveness.

INTRODUCTION

Humans' need for advancement both in knowledge and infrastructure has impacted the earth negatively over the years through depletion of ozone layer, increased entrapment of greenhouse gases in the atmosphere, leading to global warming; resource depletion, environmental degradation caused by mining activities and construction activities; the emissions of volatile and harmful chemicals and gasses into the atmosphere causing air pollution which adversely affects health and wellbeing. (Kaja & Goyal, 2023) In recent years the world over, there has been clamor for a drastic change and earnest shift in paradigm as it relates to energy consumption, waste generation, and ultimately various goals aimed towards preservation of the earth, more conveniently termed sustainability. As contained in the United Nations 2030 agenda and sustainability development goals, there is the dire need to shift from the prevailing patterns of production, energy consumption as before, to an inclusive, long-term sustainability driven development pattern which borders on the concepts of social equity, community inclusiveness, community driven economic goals, energy efficiency and mitigation of environmental degradation. (United Nations, 2018) All the above concepts summed into two distinct:

Eco-friendliness on the part of mitigating environmental degradation and

environmental sustainability and **social responsiveness** on the part of social equity and community inclusive developments.



Figure 1: Sustainability Development Goals

Source: United Nations. (2018)

Both terms highlighted above aim to serve a specific function: achieve sustainability; a word that has been used ambiguously over the years; with little or no actionable impact on the global stage. This research thus seeks to address the two factors towards achieving a sustainable mixed-use development in Port Harcourt, Nigeria. The rapid rate of development in the construction industry across the globe poses a great deal of strain on the environment due to high energy demand for production, construction; hence the clamor for a paradigm shift. In Nigeria however, The concept of sustainability is still at its vague and infancy stages, with little or no regard for such terms in the construction industry and other sectors at large. The waste generated and energy utilization in Nigeria's construction sector is not eco-friendly in the least; making for a really un-sustainable practice; one that needs a drastic paradigm shift. Also, the development of real estate in Nigeria more often than not neglect the constructive inputs of the communities upon which such developments are to be sited; and this creates a gap which is evident in the rampant existence of secondary/informal developments across all real estate developments in the Country. The aim of this paper is to explore the strategies, principles of ecofriendly design and social responsive strategies towards development of more sustainable mixed-use projects in Port Harcourt, Rivers State; as it is imperative to draw up a new road map for future developments if we as a country, is to achieve sustainability development goals.. This was achieved through careful research into past works carried out on the subject of eco-friendly architecture; sustainability development in the built environment; marking out key themes, theories and workable ideas.

Types / Forms of Mixed-Use Developments

The Merriam-Webster Online defines 'Mixed-Use' as: '*used or suitable for several different functions*'. (Merriam-Webster, 2024). Although the term "mixed-use" has changed over time, in 2006 the National Multi Housing Council (NMHC), the International Council of Shopping Centers (ICSC), the National Association of Industrial and Office Properties (NAIOP), and BOMA International (BOMA) formed the four major property associations in the United States gave the definition of mixed-use as agreed upon by the industry:

"A mixed-use development is a real estate project with planned integration of some combination of retail, office, residential, hotel, recreation or other functions. It is pedestrian-oriented and contains elements of a live-work play environment. It maximizes space usage, has amenities and architectural expression, and tends to mitigate traffic and sprawl." (Niemira 2007, p. 54 in Wardner, (2014)).

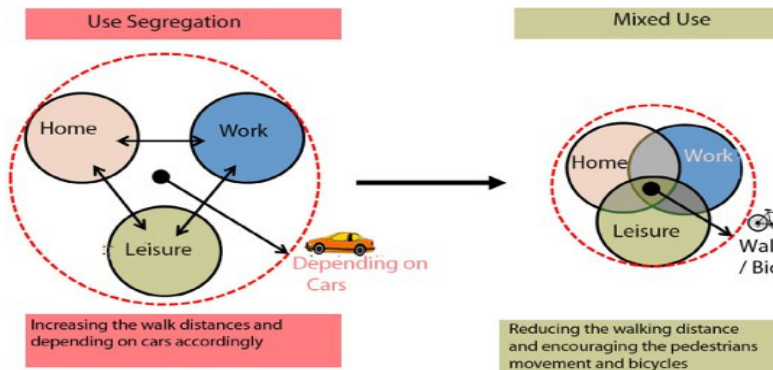


Figure 4: Influence of Mixed-Use on the daily life

Source: http://www.plan4sustainabletravel.org/key_themes/mix_of_uses/. In (Nabil & Eldayem, 2014)

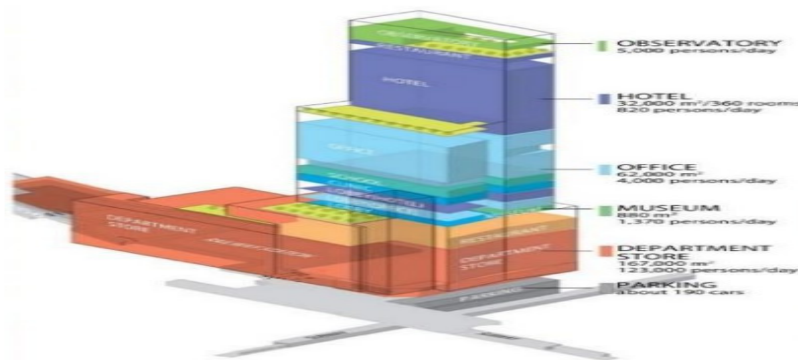


Figure 5: Vertical Mixed-Use Development - «Abeno Harukas» (Osaka, Japan, 300 m, 60 floors, 2014, hotel/office/retail. Source: <http://skyscrapercenter.com/building/abeno-harukas/533>.

Over the years, mixed use developments have taken various forms, all aimed at satisfying various developmental criteria. Below is a list of the various forms of Mixed-use developments.

Vertical Mixed-use Development: this is a type of development in which a single building accommodates multiple uses, distributed along various vertical zones in the building such as a skyscraper that has floors of office spaces, hotel complex, terrace buildings that houses flats and commercial/retail/entertainment on the ground floor level or more commonly, podium level. (Designing Buildings, 2020).

Horizontal Mixed-use Developments: this is a type of development where a range of buildings on the same site each fulfill a specific purpose, such as a community area that has accommodation as well as playing facilities, shops, parking and other amenities. (Designing Buildings, 2020)

Live-work Mixed-use development: this is a type of development in which residents do not need to leave a given area to access all of their living needs, including residential housing, office complexes, shopping, recreation, restaurants, or other amenities. (McGrath, 2024)

Retail-Residential Mixed-Use Developments: This type of development incorporates commercial retail spaces and residential units within a single development.

Transit-Oriented Developments: refers to an approach to urban design that combines effective public transit infrastructure with mixed-use projects. By situating residential, commercial, and recreational areas close to transit hubs like train stations, bus terminals, or metro stops, TOD stresses walkability, connectedness, and sustainability.

Urban Renewal and Revitalization: These initiatives sometimes entail revitalizing abandoned or underutilized spaces, giving run-down neighborhoods a fresh lease on life. Mixed-use urban revitalization projects create lively, welcoming communities by combining a variety of purposes, such as commercial, residential, cultural, and recreational areas. These initiatives serve as catalysts for social and urban renewal by drawing in investments, enhancing infrastructure, and stimulating economic growth. (VARISCO DESIGN BUILD GROUP, 2023)

Destination Mixed-Use Development: The goal of destination mixed-use developments is to create distinctive and engaging spaces that entice

tourists from far and wide. These developments, frequently combine retail, dining, entertainment, leisure, and hospitality. The goal of destination developments like resort-type complexes, lifestyle centers, and themed entertainment districts is to give guests an immersive experience. They act as centers for tourism, entertainment, and cultural events, which strengthens the local economy and increases the area's allure as a travel destination. (VARISCO DESIGN BUILD GROUP, 2023)

Water front Mixed-Use Development: In order to take advantage of picturesque vistas and waterfront amenities, Waterfront mixed-use development projects frequently combine residential, commercial, and recreational areas. By providing recreational possibilities, waterfront dining, and water-based transportation, waterfront developments bring life to metropolitan areas. They design appealing locations that encourage travel and improve locals' quality of life. (VARISCO DESIGN BUILD GROUP, 2023)

Types of Contemporary Mixed-Use Zoning (as manifested in various scenarios in the United States of America) are:

- a. **Neighborhood Commercial**
- b. **Main-Street Residential/Commercial**
- c. **Urban Residential/Commercial**
- d. **Office Convenience**
- e. **Office/Residential**
- f. **Shopping mall conversion:**
- g. **Retail District Retrofit:**
- h. **Live/work:**
- i. **Studio/Light industrial:**
- j. **Hotel/Residence:**
- k. **Parking Structure with ground floor retail.**
- l. **Single family detached home district with standalone shopping center.** (Wikipedia, 2024)

Conceptual Theories of Mixed-Use Developments

Snippets of the works of Geyer Jr. (2024) provides a meta-theoretical classification of various theories and methodologies of mixed-use literature by various scholars into themes highlighted below:

- a. **Post Structuralist theories of Mixed-uses:** Jane Jacobs was the first to contend that a close-grained mix of people, buildings, and land uses characterizes healthy cities, which are the result of an unplanned urban

ordering of space. Organic urban development, according to Jacobs, produces pedestrian-friendly cities with a high population density, a variety of nearby urban activities, a mixed economy, short urban blocks, and buildings with a range of architectural styles and expressions for the various uses and functions. (Geyer Jr. 2024)

b. Aesthetic-Environmental

Principles of Mixed-Use Developments: New models of sustainable development, especially New Urbanism and Smart Growth approaches (Durack, 2001), provide the majority of the impetus for mixed-use development. These approaches propose mixed-use development as a set of aesthetic-environmental design principles to achieve an ideal smart, sustainable urbanism that improves the economy, preserves the environment, upholds community relations, and increases accessibility and mobility (Dierwechter, 2014 in Geyer Jr. 2024).

c. Positivist

Functional-Relational

Conceptions of Mixed-Use Development: Numerous positivist studies on the practical cost-benefit analyses of mixed-use development are also associated with the aesthetic-environmental idea. Determining whether land use integration accomplishes specific social goals and whether mixed-use designs minimize the total environmental and social costs of segregated land uses are the goals of functional-relational measures (Talen, 2013 in Geyer Jr. 2024).

d. Regulatory Conceptions of Planned Mixed-Use Development in Policy:

Case studies of mixed-use policies, especially zoning and smart growth tactics, make up a significant portion of the literature on mixed-use development. The regulatory mechanisms used to develop and manage mixed land uses are assessed in this literature (Nabil & Eldayem, 2015). These case studies encourage mixed-use development to build resilient and inclusive neighborhoods by facilitating public-private sector cooperation through participatory planning procedures.... (Geyer Jr., 2024)

Principles of Mixed-Use Developments

Some of the principles that guide the conception, planning, execution and management of mixed-use developments are as follows:

- e. Compact Development:** Services are planned, oriented and executed with the aim of mitigating travel distances between various provided facilities in such development to reduce land consumption, energy usage, and mitigating air pollution.

- f. **Diversity in Use:** Mixed-use developments integrate various functions, such as residential, commercial, recreational, and cultural spaces, to encourage dynamic interactions.
- g. **Accessibility:** Accessibility for pedestrians, safety and comfort. Mixed use developments have at their core, pedestrian access as well as mobility.
- h. **Connectivity:** Mixed-use developments aim to integrate into existing modes of transportation such as roads, bike lanes, public transit systems, ensuring seamless movement within and beyond the development.
- i. **Human-Scale Development:** Design elements are tailored to human proportions, enhancing comfort and aesthetical appeal.
- j. **Public Spaces and Amenities:** The inclusion of parks, plazas, recreational facilities further enhance social interaction and well-being.
- k. **Cultural and Historical Integration:** Respecting and incorporating local culture and history into the development fosters a sense of place and identity in mixed-use facilities.
- l. **Density Optimization:** High-density design supports walkability, public transport usage, and efficient land use.

Sustainability:

As expressed by UCLA (2024): sustainability is the balance between the **environment**, **equity** and **economy**. They expand it further by stating that:

"Sustainability is the integration of environmental health, social equity and economic vitality in order to create thriving, healthy, diverse and resilient communities for this generation and generations to come." (UCLA, 2024).

According to the US Environmental Protection Agency, sustainability is founded on a basic principle: everything we require for existence and well-being is dependent on our natural environment, either directly or indirectly. To pursue sustainability means creating and maintaining the conditions under which humans and nature can exist in productive harmony to support present and future generations. (EPA, 2024)

Dimensions of Sustainability

For sustainability to be implementable or actualized, is it divided into three major dimensions:

- 1. **Environmental Dimension:** Environmental sustainability refers to long-term resource conservation, pollution reduction, and ecosystem preservation strategies such as renewable energy utilization, sustainable agriculture, and biodiversity protection.
- 2. **Social Dimension:** Social sustainability seeks to build inclusive communities that provide equitable access to basic needs, quality healthcare, and education, while emphasizing the importance of justice, fairness, and equality for all individuals.

3. **Economic Dimension:** Economic sustainability prioritizes long-term planning, equitable wealth distribution, and stable growth by promoting ethical corporate practices, supporting innovation, and investing in sustainable businesses.

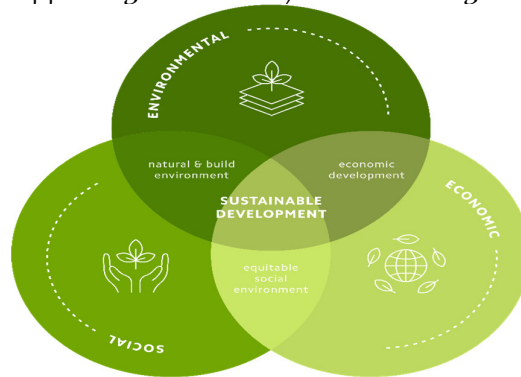


Figure 6: Three Dimensions of Sustainability
Source: Better Future Factory (2024)

The aftermath of the United Nations global conference yielded 17 goals to transform the world into a fully sustainable space; of which seven (7) of those goals are such that can be affected through changes in the processes and methodologies of implementation in the built environment. These eight are:

Affordable Energy and clean energy

- a. **Industry, Innovation and Infrastructure**
- b. **Sustainable cities and communities**
- c. **Responsible consumption and production**
- d. **Climate action**
- e. **Life below water**
- f. **Life on land**



Figure 7: Sustainability development goals Source: Better Future Factory (2024)

Barbier (1987) identified three pillars of sustainability to be the social, biological as well as the resource system; more refined by John Elkington in the early 90s as the '90s the "triple bottom line" – people, the planet and profit. Of recent, there are up to five (5) "P" s: the people, Planet, Prosperity, Peace and Partnership. (Dabija, 2020). Beyond the talks about sustainability in the context of definitions, there are a few principles that can be implemented:

The Precautionary Principle:

Another example is this idea, which encourages decision-makers to adopt precautionary measures in the face of uncertainty. For example, some governments have implemented precautionary measures against Genetically Modified Organisms (GMOs) because of their possible impact on the environment and biodiversity. Despite the potential benefits, there is still scientific doubt about their long-term consequences, thus their usage is limited until more solid scientific data is available.

The Polluter Pays:

According to this idea, people who cause environmental damage must shoulder the expenses of mitigation and rehabilitation. Carbon pricing is an example of the principle; it is a mechanism for reducing greenhouse gas emissions that involves taxing entities for their carbon emissions, typically in the form of a carbon tax. Companies that emit more will pay more, incentivizing them to lower their carbon impact.

Intergenerational Equity Principle:

This principle emphasizes the equitable distribution of resources and opportunities among current and future generations. As a result, governments all over the world set aside natural lands to be preserved, both for their intrinsic value and to recognize the responsibility of leaving a sustainable world for future generations.

Designing for Eco-Friendliness

The process of designing goods, structures, and services to have a less negative influence on the environment is known as eco-friendly design. To guarantee the least amount of damage to the environment, this entails taking into account every stage of the lifespan, from material selection to end-of-life disposal. For the purpose of Discourse, we will be addressing Eco-friendliness as Eco-design. Eco-Design...definition is more inclusive of the concepts of: regenerative design - transitioning from designing 'like' to 'with' 'nature'; designing in systems and for life cycles; designing for zero waste – moving from a take-make-waste model to circular economies; and making better design choices, or ethical design for collective wellbeing which includes links to indigenous knowledge and expertise. (Lockery, et al., 2022) identifies two themes relating to the concept of Eco-

design and four principles emerged. The two key themes are:

- Eco-Design aims to achieve sustainable material outcomes' that benefit the environment, economy, and human well-being. This approach is often results-oriented.
- Eco-Design is based on 'ethical-value approaches', a collection of values, ethics, and ideologies that lead to sustainability-focused behaviors. This approach is often process-focused.

The four principles are highlighted below:

Principle 1: Regenerative Design: transitioning from designing 'like' to 'with' nature: Collaborating with nature to maintain, enhance, and regenerate ecosystems, society, and culture, while ensuring variety in each bioregion and site. To achieve positive results, eco-effectiveness techniques must shift from reducing resource usage and toxicity to actively collaborating with natural systems. Eco-Design involves collaborating with biological systems from the start, rather than applying ecological concepts to current industrial techniques.

Principle 2: Think in Systems and Design for life-cycles - To design holistically, it's important to consider the interconnectedness of all elements at all scales, including cells, organisms, and ecosystems, throughout their life cycles. This involves embracing practices that are complex, diverse, scale in transparent and collaborative approaches. Product, system, and service development should prioritize sustainability, interdisciplinary collaboration, customization, repairability, and emotional attachment to ensure product longevity.

Principle 3: Zero waste – Move from a take-make-waste model to circular economies: The goal is to eliminate waste and toxins during the entire life cycle. Braungart and McDonough's 'cherry-tree' paradigm (Braungart & McDonough 2002) promotes closed-loop total-systems approaches for circular material use, where waste becomes nutrition in the next cycle. (Lockery, et al., 2022)

Principle 4: Making better design choices – Ethical design for collective wellbeing: This involves making ethical design decisions that promote overall well-being and including all stakeholders in creating a prosperous and safe future. Designers and customers must share a similar understanding and ethical integrity when creating for the environment, society, and culture. They should make clear judgments that prioritize the long-term common good. (Lockery, et al., 2022)

Social Responsive Design strategies

Social responsiveness refers to a person's or organization's commitment to contribute to the welfare or environment of their community or society. It also includes the action part of corporate social responsibility, which is a company's ability to respond to social pressure. As in Vavickas & Kontautiene, (2015), the '*action phase*' of social responsibility and a method of managing and responding to societal and stakeholder demands is social responsiveness. Responsiveness requires organizations to take proactive steps to engage with stakeholders (end users, host communities) and the public. Policy concerns (Waddock, 2004). Logsdon (2004) defines corporate social responsiveness as the process of implementing socially responsible actions. Corporate social responsiveness efforts can provide a competitive advantage and promote corporate social responsibility (Friedman et al. 2004 in Vavickas & Kontautiene, (2015)). Waddock (2004) in Vavickas & Kontautiene, (2015) maintained that corporate social responsiveness was drawn from the experience of companies rather than from calls for more responsibility from scholars and activists. Businesses realize and take responsibility not only for the success of their activities, but also for the contribution to the development of a community, region and country. Taking a peek into the corporate sector, corporate social responsiveness refers to methods for achieving social responsibility, including developing and executing measures. Maurer (2007) in Vavickas & Kontautiene, (2015) emphasizes the need of assessing a company's ability to foresee, respond to, and manage difficulties resulting from various stakeholder claims and expectations. Also, Wood (1991) in Vavickas & Kontautiene, (2015) identified three types of corporate social responsibility processes: **environmental management**, **issue management**, and **stakeholder management**.

Table 1: Corporate Social Responsiveness as Organizational Programs

CORPORATE SOCIAL RESPONSIVENESS	
Philanthropic programs	The company presents a formalized philanthropy program made of a clear mission and application procedures to allocate donations and grants
Sponsorships	The company introduces sponsorships as a type of responsibility initiative aimed at providing assistance to work for a good cause during paid working hours.

**Adopting Eco-friendly and Socially Responsive Strategies as a tool for
designing Mixed-Use Facilities in Port Harcourt**

Volunteerism	The company presents programs that allow employees to work for a good cause during paid working hours
Code of Ethics	The company discusses the content and/or implementation of a code of ethics or conduct
Quality Programs	The company describes a formal product/service quality program as a form of responsibility initiative
Health and Safety Programs	The company introduces formal health and safety programs aimed at one or more stakeholder groups as a form of responsibility initiative
Management of	The company discusses activities aimed at diminishing the
Environmental impacts	negative impact of productive activities on the natural environment.

Source: Maignan, Ralston (2002) in Vavickas & Kontautiene, (2015).

In the context of architectural design and the built environment as a whole, the concepts of social responsiveness are expressed in the following ways:

- a. **Participatory Designing:** This involves incorporating community members' feedback into the design process to ensure that their needs, values, and goals are reflected in the final design. This is accomplished via workshops, surveys, and forums. (Lewis & Morelli, 2017)
- b. **Equity in Accessibility:** Design strategies ensure that people of all ages and demographics have equal access to spaces, including those with impairments, the elderly, and marginalized groups. Universal design principles frequently influence such attempts. (Mace, Story, & Mueller, 2016)
- c. **Affordable and Sustainable Housing:** Designing affordable, resource-efficient housing that caters to many economic groups is important to socially responsive architecture. (Aravena & Lacobelli, 2015)
- d. **Climate-Responsive Design:** This involves tailoring all design solutions to reflect the local climate and compliment it wholly. (Olgyay & Seruto, 2016)
- e. **Flexibility and Adaptability:** Spaces designed for multi-functionality in mind to allow for evolving community needs, making them resilient to demographic and economic changes. (Brand, 2017)
- f. **Promoting Inclusivity Through Technology:** with the advent of

technologies and rapid advancement of same, it creates the opportunities for creative testing of design ideas and solutions towards creating interactive and inclusive environments that cater to diverse users. (Salingaros & Mehaffy, 2020). The issues of environmental management are one critical issue that not only companies need to adhere to, but one that will ultimately ensure the sustenance of the planet for future generations. In line with sustainability goals and the desire to be eco-friendly, these two parameters must be highly considered through the conception and proposition of workable solutions to be implementable in the proposed mixed-use development for Port Harcourt, Rivers State.

RESEARCH METHODOLOGY

This research adopted the desk research methodology; data were collected from secondary sources, such as: research articles, publications, textbooks, websites.

DISCUSSION OF FINDINGS

Findings from this research reveal that mixed-use developments incorporating eco-friendly and socially responsive strategies contribute significantly to sustainable urban growth. Key observations include:

- Eco-design principles, such as regenerative design and zero waste models, lead to reduced environmental impact and resource conservation.
 - Socially responsive strategies, such as participatory designing and climate-responsive architecture, enhance community engagement and resilience. Compact urban developments integrating residential, commercial, and cultural functions improve accessibility and economic vitality.
 - Aesthetic-environmental principles, including New Urbanism and Smart Growth, promote harmonious urban landscapes and better living conditions.

Despite these advantages, challenges remain, including regulatory hurdles, lack of awareness, and inadequate incentives for sustainable development in Nigeria. Addressing these issues requires concerted efforts from policymakers, developers, and local communities.

CONCLUSION

The adoption of eco-friendly and socially responsive strategies in the design of mixed-use facilities is imperative for achieving sustainability in Port Harcourt. This research highlights the need for regenerative design, stakeholder involvement, and policy-driven incentives to foster environmentally responsible and socially inclusive developments. Future developments should integrate these strategies to promote resilience, reduce environmental degradation, and improve urban livability. By implementing these principles, Port Harcourt can set a precedent for sustainable urban development in Nigeria and beyond.

1. From the above research, it is no longer a hidden knowledge, the viability of mixed-use developments as it will serve as an attraction which will connect the

citizens and expand various sectors – economic, social, cultural towards creating a more sustainable society. It is also a sign of hope for the people in revitalizing the city and creating a great economic future; as such it is recommended for the Rivers State Government to adopt the Master layout and Architectural drawings and implement same.

2. It is also recommended that students, researchers and persons/organization of interest avail themselves with the information contained in this research and develop on knowledge.

Contribution to Knowledge

This study contributes to the field of sustainable architecture by providing a framework for integrating eco-design and social responsiveness in mixed-use developments. It bridges the gap between theoretical sustainability concepts and practical implementation in Nigeria. The research also emphasizes the role of local culture and climate adaptation in sustainable urban planning, offering insights that can be applied to similar developing regions.

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