International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Mixed Used Development in Port Harcourt: Sustainability of Tall Development

Lucky-Badom, Lucky Tomduune and Prof. Napoleon Imaah
Department of Architecture, Faculty of Environmental Science, Rivers State University

Submitted: 25-05-2022 Revised: 01-06-2022 Accepted: 05-06-2022

ABSTRACT
The problem associated with this study is the rapid urban development and increasing land use dynamics in Port Harcourt metropolis which is characterized continuous rapid urban growth or development into the surrounding landscape, swallowing even more villages, coastlines, and previously unspoiled landscape, transforming such landscape into an ever increasing urban conglomerate. However, this decentralization is unregulated and not realized with proper architectural designs over the years and an integral modern city and regional planning but with patchwork of partial plans which cause negative effects on urban environment, forests, fertile agricultural land, and cultural values. Today, cities in Nigeria suffer from little or no investments actions in proper urban developments and the continuous duplications of single use buildings. With rapid urbanization, there is increasing pressure on land particularly in the Port Harcourt metropolitan area. The population of the study comprised residents and employees of ministry of environment, housing from federal, state and local governments. Data were collected through questionnaire administered to the residents and interview conducted by the researcher. Descriptive statistics were used as data analysis methods. The city is expanding in all directions resulting in large scale urban sprawl and changes in urban land use. An important problem in the urban fringe is the problem of land use. The pattern of land use in the area is dynamic and changes from rural land use to urban land use over short periods of time and distance. The reason for the choice of this topic is to promote and motivate adequate urban community revitalization though the use of mixed-use spaces to curtail excessive land use thus creating a sustainable tall development in Port Harcourt. To first ascertain the claims of rapid development dynamics in Port Harcourt metropolis, the study adopted the method of Geographic Information Systems (GIS) approach followed by the integration design approach to actualize the course of curtailing excessive land use thereby achieving urban revitalization through the integration of a range of land uses (mixed-use tall development) in the heart of the city. A thorough literature review on the concept of mixed-use development, importance of mixeduse development, the social, economic, and environmental role of mixed-use development in Port Harcourt, urban revitalization, and issues of residential development dynamics in Port Harcourt metropolis among others. The study concludes that optimal design of mixed-use tall developments to revitalize the city of Port Harcourt would help the government to have a framework as a basis for starting these kinds of development in the city. Mixed-use tall developments will boast a sustainable community, continuous connectivity, and an environmentally friendly atmosphere since it integrates mixed-use functions such as offices, residential, retail and supporting facilities. The study then recommended the need to invigorate planning machinery and activity in Port Harcourt metropolis to incorporate and integrate new planning paradigm such as mixed-use development into planning of the city while introducing measures to manage smart growth because today's cities need smartly designed buildings and spaces that can perform many functions.

Keywords: Mixed Used Development, Port Harcourt, Sustainability, Tall Development

I. INTRODUCTION

To comprehend the intricacy of designing mixed used development it is important to understand the reasons for its transformed emergence and success in cities all over the world today. Also, it is important to note and understand that there are characteristics of successful mixed used developments from stake holders and the users' point of view. There are so many difficulties encountered in Port Harcourt due to the rapid urban growth in the city. Some of the threatening

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

challenges include inadequate housing and basic amenities (electricity, water, and waste disposed), people living in substandard environments, insufficient social amenities, poverty experienced by residents and the environment it-self. The most persistent problem in Port Harcourt is the lack of adequate infrastructure. There are other problems which include poor transportation network, low productivity and high rates of unemployment and underemployment.

A mixed-use development is critical to achieving urban revitalization through the integration of a range of land uses in the heart of the city. It has been seen that development with a combination of different uses brings vitality to the city, adds life and safety to the streets and opens opportunities which can be accessed easily by many residents, visitors, and workers. Mixed use developments can raise social cohesion, increase land space, highlight cultural values, and generate a considerable number of environmental welfares (Rowley, 1988). The whole idea is that inhabitants should be able to live their normal lives without leaving the artificial environment created for them.

The urban fabric of Port Harcourt metropolis has undergone dramatic changes in the last few decades. From colonial city clearly delineated in its historic boundaries, Port Harcourt has continued to grow into the surrounding landscape, swallowing even more villages, coastlines, and previously unspoiled landscape, transforming into an ever-increasing urban conglomerate. After 1980s, multi-centre development of cities and its catalytic impact on reshaping of the economic landscape in metropolitan areas has drawn much attention (Hackworth, 2005). During the last quarter of the twentieth century, Port Harcourt has experienced tremendous structural transformation due to population and economic growth and development of its transportation and communication systems and the impact of globalization (Obinna, Owei & Okwakpam, 2010).

Like many cities in Nigeria, Port Harcourt has recorded rapid growth in population and spatial growth. From an estimated population of 500 in 1915 it grew to 30,200 in 1944. By 1963, its population was 179,563 and by 1973 it has reached 231, 532 persons. The Port Harcourt municipality's population was given as 440,399 by the 1991 national census (Okoye, 1975, Ogionwo, 1979, Alagoa & Derefaka, 2001). The 2006 national census shows this population is more than a million (Obinna, Owei & Mark, 2010). In terms of its physical size, the city grew from 15.54 sq. km in 1914, to a metropolis covering an area of 360 sq. kilometres in the 1980s. Urban development is denser on the corridors determined by geographic thresholds and major transportation connections in Port Harcourt because of population increase and economic growth spreading to the periphery as in the other metropolitan cities. However, this decentralization is not realized with an integral and regional planning but with patchwork of partial plans. This causes negative effects on urban environment, forests, fertile agricultural land, and cultural values are threatened. This kind of sprawling process creates a settlement pattern that increases the costs of infrastructure. Indeed residential development dynamics of Port Harcourt has been very rapid (Wizor, 2012).

Spatial growth has occurred in both a south easterly direction and a northerly direction. To the south, growth was through marshland colonization in squatter settlements locally called waterfronts. In the last few years settlements of these waterfronts have been demolished by the Rivers State Government. Growth has also occurred in north westerly and north easterly direction through the entrapment of indigenous enclaves of semi-rural and rural communities within the built up area of the city. The Port Harcourt urban fringe currently stretches to Iriebe, Eleme, Elelewon Rukpoku, Woji, Choba, Rumokwurusi and Onne, Wizor, 2012).

The spatial pattern of such changes is clearly noticed on the urban fringes or city peripheral areas, than in the city centre. This has made the fringe area of the city to be the most dynamic landscape (Kirk, 2003). In the modern age of urban expansion, 'fringe' is of much significance. The term 'fringe' suggests a border line case between the rural and the urban and it lies on the periphery of urban areas, surrounding it and distinguishing it from the truly rural countryside. The fringe of an urban complex forms a pattern depending upon the physiographic and transportation facilities of the area. Around major urban centres the physical expansion of built-up areas beyond their municipal boundaries has been very conspicuous. As one moves out of a major city along the roads, one observes new residential colonies and a considerable amount of vacant land with partially developed residential land use. An important problem in the urban fringe area is the problem of land use. The pattern of land use in the area is dynamic and changes from rural land use to

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

urban land use over short periods of time and distance. The primary design issue related to such mixeduse development initiative includes the need to effectively balance the requirements of residential uses such as the need for privacy, comfort, and security with the needs of commercial uses for access, visibility, parking, and perhaps extended hours of operation.

II. LITERATURE REVIEW

History of Mixed-Use-Development

From the origin of man when he started in caves till the time when he started to making divers use of enclosed spaces for his living spaces, marketplaces as well as places for entertainment has always existed. Most of them grew as mixed-use environments. The workplaces are usually close to living places for proximity and ease of access. People usually walk to and from work and their living spaces are sometimes accompanied using livestock to convey their goods to be sold at the various points of sales. Some families even specialize in making things that are also sold either in their homes or at least close to their homes. Markets and market towns emerged because of increase in population which has effect on the way people lived their lives in the region that practice this kind of lifestyle. A medieval village is a typical example of a functional mixed-use community or settings. It is most likely protected by walls around it, thereby making every activity of living, buying, selling, working, recreation and even worship centers within the confines of the walls and the lands within can span up to hundreds of acres.

Concept of Mixed-Use Development

Mixed use development is a kind of urban development that combines several uses in one building or structure or group of structures – residential, cultural, commercial, office, and entertainment uses in any fusion. These functions and activities are fully integrated and provide complete pedestrian networks (Grant, 2012). The best explanation of the concept of Mixed-Use Development was described by Alan Rowley as an aspect of the internal texture of settlements (Rowley, 2016). This settlement texture determines the character/quality of an area and is defined by grain, density, and permeability (Rowley, 2016). Another explanation was made by Brouwer and Louw (2015) which described it as the typology of urban mixed use that is in the time dimension, where the theme of the whole building or premises are transformed or changed to another theme. In his explanation the author stated that the functional component of mixed-use development refers to individual land uses, consisting of the utilization of residential and office spaces, which is flexible to expand and integrate other uses.

Downward Thrust of Mixed-Use-Development and the Surface of Zoning

Mixed use development faces a sporadic reduction during birth of industrialization in most regions of the world. This decline favoured the early capitalist-style of manufacturing in single buildings thereby making it impossible for workers to live within the premises. This made the workers look for business elsewhere and most likely is farther away from their places of work. A lot of people moved from the rural areas to the cities which had some form of industries and factories in addition to places with factories where related businesses sprang up rapidly. Most of these factories produced materials which cause pollution of different types and in such a case; they had to keep the far distance from the residences to minimize the adverse effects from noise, dirt, poisonous fumes, and dangerous substances. Even at that, most industrialized cities were large enough to allow people maneuver the different areas and activities of the city.

Integrated Approach to Mixed Used Development

Mixed use development, as defined in the mixed-use handbook, means any combination of commercial (Retail, office, and entertainment) and non-commercial uses, (residential uses, mixed vertically or horizontally). Mixed use development handbook described mixed use development as one that provides three or more significant revenue-producing uses to foster integration, density, and compatibility of land uses and creates a walk-able community with uninterrupted pedestrian connections (Levitt & Schwanke, 2013). Mixed land use enables for a wide range of land uses including residential, commercial, and industrial integrated in one structure or area. This can be a single structure, a collection of several buildings, or an entire neighborhood development area combining retail outlets, outdoor/indoor restaurants, and apartments/condos. It can bring a lot of life to a city corner while allowing for greater density. It brings people to live together, work, and relax in the same space.

Resurrection of Mixed-Used-Development as Urban Design Concept

As the population of villages grew and urbanization expanded in nearly all towns and

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

cities during the twentieth century and this growth rate was way more than the growth rate of infrastructural development that was taking place then. The development brought about some urban problems like traffic congestion, human congestion, slums, urban spread out, pollution and the pressure were much on the available infrastructure and services (Urban Land Institute, 2003). The amount of time being spent on the road to and from work was on the increase because of vehicular and human traffic, environmental and sanitation issues came up as well because towns and cities have developed without the necessary layout of services. Fuel consumption was on the increase by commuters for their vehicles, part of their income was spent on transportation to and from work, market, entertainment. The overall health of the people too was also affected due to the stress involved in going long distances to and from work every day. Another problem was the pollution of the environment by carbon emissions as vehicles are the major means of movement around.

The Role of Mixed-Use Development in Port Harcourt City

This project establishes a framework to not only deal with the current problems of this area, but also improve its formal and functional character in a way which will be proportionate to the development of the city and resulting demands in future (Grant, 2002).

Social Role

i. Due to the convergence of the city's people to an area, contact increases and consequently creates social link and relationships i.e., social proximity encourages positive interaction and diversity.
ii. Security is achieved due to securing the movement in the area. iii. It enables more and better integrated social housing.

Economic Role

i. It encourages a mixed land use thereby creating job opportunities near to homes and reducing the energy wasted in daily moving between home and work.
ii. Raising the value of residence
iii. It enhances economic viability of development.

Environmental Role

i. It can increase the density of land use in addition to integration since it has mixed uses.
ii. Reduction in the dependence on cars, reducing road crowd, traffic congestion and air pollution respectively
iii. It increases energy efficiency.

To ensure proper organization of the mixed used development in Port Harcourt City, there must be proper incorporation of all components uses. Also, day and night activities need to be balanced so that everything on the site does not shut down at the end of the workday i.e., Building a day/night balance (Grant, 2002).

Urban Revitalization

Urban revitalization is a process by which a part of the city in social, urban, or economic crisis undergoes a transformation, deep, to reverse the trend of environmental declination. This is a set of initiatives aimed at reorganizing an existing city structure, particularly environments in decline due to economic or social reasons. The idea of urban revitalization is to balance the ever-increasing population in an Urban City. Using Port Harcourt as our focal point, this would best be done by integrating mixed use development to create sustainability of tall development. Urban revitalization will help to recreate the lost identity of Port Harcourt city.

Mixed Use Developments: Sustainable Living Environments

The essential feature of a mixed-use building is that it brings back space in the city, and so enhances its livability. According to Ezema and Oluwatayo (2014) sustainable mixed-use developments are those that address social, environmental, and economic issues at a master planning and individual building level. Mixed use integrates both domestic and non-domestic activities such as office, retail, community, etc. It is based on creating communities or urban villages that reduce the need to travel, thus creating a more vibrant area for the residents or users of the space.

The most important goal of mixed-use developments is creating environmental sustainability by bringing working, living and leisure activities into one area thereby reducing environmental impact. It also brings about economic sustainability because allowing businesses to be established and grow. Thirdly, it creates social sustainability and provides good quality place making, with a community focus.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Sustainable Living Environment through Mixed-Use Developments in Port Harcourt

In the future, major changes will be seen how buildings are powered. In creating a sustainable living environment, the first step is finding the right mix of uses. Increase in the adoption of mixeduse developments minimizes the need for automobiles or other vehicles, thereby maximizing opportunities for its citizens. Where there are synergetic uses, you don't have to go far to get what you need. In terms of mixed use and urban development design, one must keep in view, situations that are already existing/ the mixed-use typology. As every city is unique, so is its urban typology and pattern (Gibbered, 2008). When one learns from the various mixed-use precedence, it allows for the creation and continuation of authentic urban spaces.

High rise in mixed use buildings will contribute to the process of giving the public domain the people and enhanced the quality of life of the residents of Port Harcourt city. This is because buildings with multiple functions boost the synergetic effect. Intelligently designed, mixed use buildings adapt themselves to their use and users. Establishing high rise of mixed-use developments for sustainability of tall development in Port Harcourt will give back space to the city through creation of public areas within and outside the buildings such as parks, gardens (Levitt & Shwanke, 2003). The following designs are example of making mixed-use developments in Port Harcourt environmentally sustainable which have been highlighted as follows:

1. Energy and Carbon Reduction Strategy- Passive measures and daylight access.
2. Energy and Carbon Reduction Strategy- Active measures.
3. Energy Recovery and Re- use.
4. Speculative Buildings.
5. Potable water use reduction strategy.
6. Visual Sustainability

Principles of Mixed-Use Development

Mixed use development creates a sense of identity and place for residential use, and more populated and safer city environment. The key to successful mixed-use development is adherence to several basic principles combined with an assessment of the economic and amenity synergies between prospective uses (Okolo and Okolie, 2010). These principles include:

1. Physical factors.
2. Economic and market factors.
3. Design factors.

Basic Planning Considerations

Basic planning considerations for mixed use developments include the following parameters:

i. The cultural, political, and social aspects of the city where the building will be located
ii. A strong relationship within the city
iii. Sustainability
iv. Safety and security issues

In establishing an effective mixed- use structure, the following must be taken full consideration to ensure safety, functionality, and aesthetic appeal of the spaces (Okolo and Okolie, 2010).

Integrated Theme

The mixed-use development should have an integrated architectural theme that includes complementary materials, colours, and design details. The site should exhibit a unified theme that includes landscaping, amenities, signage, and lighting. Also, the following design consideration should also be introduced in the mix-use development framework (Okolo and Okolie, 2010).

Sustainability Issues in Housing Development

The concept of sustainable development encompasses several pillars: social equity, economic development and ecological sustainability. As it has been stated earlier, a precise application of the concept of sustainable development to sustainable housing is difficult to achieve. However, all the pillars are also in place when defining sustainable housing, although without similar application of the global dimension as it is for the sustainable development. However, only environmental or ecological aspects of the sustainable housing have been researched on in the current work. Energy efficiency has been seen as one of the aspects of the sustainable housing concept (Pilkington et al., 2011).

III. METHODOLOGY

Research Design

A research design is a logical plan of how a study is expected to start and finish. This research is divided into three stages which are: Exploration stage, data collection and analysis stage and framework, guide development and validation stage. The first stage is to explore and evaluate the need for spatial planning and to develop a framework for addressing mixed used development in Port Harcourt City Local Government Area with focus on sustainability of tall development. The second stage considered the most appropriate

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

research methodology for the study. It also identified the appropriate research methods needed to answer the research objectives and the techniques to be used for the analysis of the data collected (Creswell & Plano Clark, 2011). The third stage considers the development of the framework and its validation as well as the guidance document. It also reports on how the analytical results meet the stated research objectives of the study.

Population and Study Sampling Technique

Information about mixed used development in the Port Harcourt, Nigeria was obtained during the first phase of data collection. The population size was drawn from the federal, state and local government ministries urban development, land and housing and ministry of environment Nigeria and was considered in order to present an overview of the urban and regional planning system in Rivers State, Nigeria. Sampling strategies are divided into two main groups; probability and nonprobability sampling. Probability is the most appropriate for quantitative research whilst non- probability sampling is most appropriate for qualitative research (Walliman, 2011).

Hence, documents such as; the Nigerian Urban and Regional Planning Law Decree No. 88, 1992 approved by the Town Planners Registration Council established by Decree No.3, 1988, the establishment of planning agencies in the 1999 Nigerian Constitution. The 2009 National Population Commission, Population and Housing Survey Report and the 1978 Land Use Act, amongst others, were purposively selected (Nwaka, 2005). Multiple sampling methods were adopted to enhance the multiple methods of data collection bringing validity and reliability to the study shows the multiple sampling techniques employed for the multiple methods adopted in this study.

Data Collection Methods

Data were sourced primarily or secondarily. The primary data sourcing mode is where the researcher carries out studies firsthand by the following ways:

1. One-to-one interviews with key informants in an organization (these might be face to face or through telephone or e-mails).
2. Focus group discussion and interviews
3. Direct observations in a relevant social circumstance, e.g., shopping mall or parks
4. A questionnaire survey e.g., of relevant people in an organization or of the consumers of a product or services, customers, this can be done using printed or electronic copies of questionnaire.

Area of the Study

The study area which is Port Harcourt metropolis was investigated from two perspectives.

Historically, Port Harcourt (Pidgin: Po-ta-kot) is the capital and largest city of Rivers State, Nigeria. It is the fifth-largest city in Nigeria after Lagos, Kano, Ibadan and Kaduna. It lies along the Bonny River and is located in the Niger Delta. As of 2016, the Port Harcourt urban area has an estimated population of 1,865,000 inhabitants, up from 1,382,592 as of 2006. The population of the metropolitan area of Port Harcourt is almost twice its urban area population with a 2021 United Nations estimate of 3,171,076. In 1950, the population of Port Harcourt was 59,752. Port Harcourt has grown by 150,844 since 2015, which represents a 4.99% annual change. The area that became Port Harcourt in 1912 was before that of a farmland of Rebisi people of Ikwerre ethnic group. The colonial administration of Nigeria created the port to export coal from the collieries of Enugu located 243 kilometres (151 mi) north of Port Harcourt, to which it was linked by a railway called the Eastern Line, also built by the British.

Traditionally, the people of Port Harcourt are into subsistence agriculture such as: farming, fishing and hunting but urban sprawl associated with the exploration and exploitation of oil the rich crude hydrocarbon industry caused a sharp decline in the amount of land available for such subsistence agricultural activities. Several businesses (ranging from auto mechanics, to telecommunications, to computers, to different forms of buying and selling at different locations) now thrive in the city's capital and are making a wave in changing how the city used to be previously.

Table 3.4: Description of the Study Area

Name of Metropolis	Administrative Capital	Area (Sq. km)	Census Population, 2021	Geographical Location

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Port Harcourt	Port Harcourt City Council	369km^2 (142 sq mi)	3,325,000	Lat 4^0 49^I 27^{II} and Long. 7^0 2^I 1^I E

Source: Brinkhoff, (2016).

The specific location of this project site is at Rumuokoro. Rumuokoro is a town in Obio-Akpor
Local Government Area of Rivers State, Nigeria. It is the meeting point of five major roads in Nigerian Economy and the gateway to and from the city of Port Harcourt. It is the first point of call when arriving from Warri, Benin City, Lagos, Abuja, Owerri, Onitsha and the Port Harcourt International Airport. It houses multiple bus stops and travelers catch buses or taxis into any part of the Port Harcourt city from there. Its geographical coordinates are longitude 4° 52' 3" North, and latitude 6° 59' 53" East and its original name (with diacritics) is Rumu-Okoro-Odomey. The proposed site which is located inside the Rumuokoro central motor park at the Rumuokoro Junction could properly be accessed via several connector roads and streets as shown in the figure 3.3.

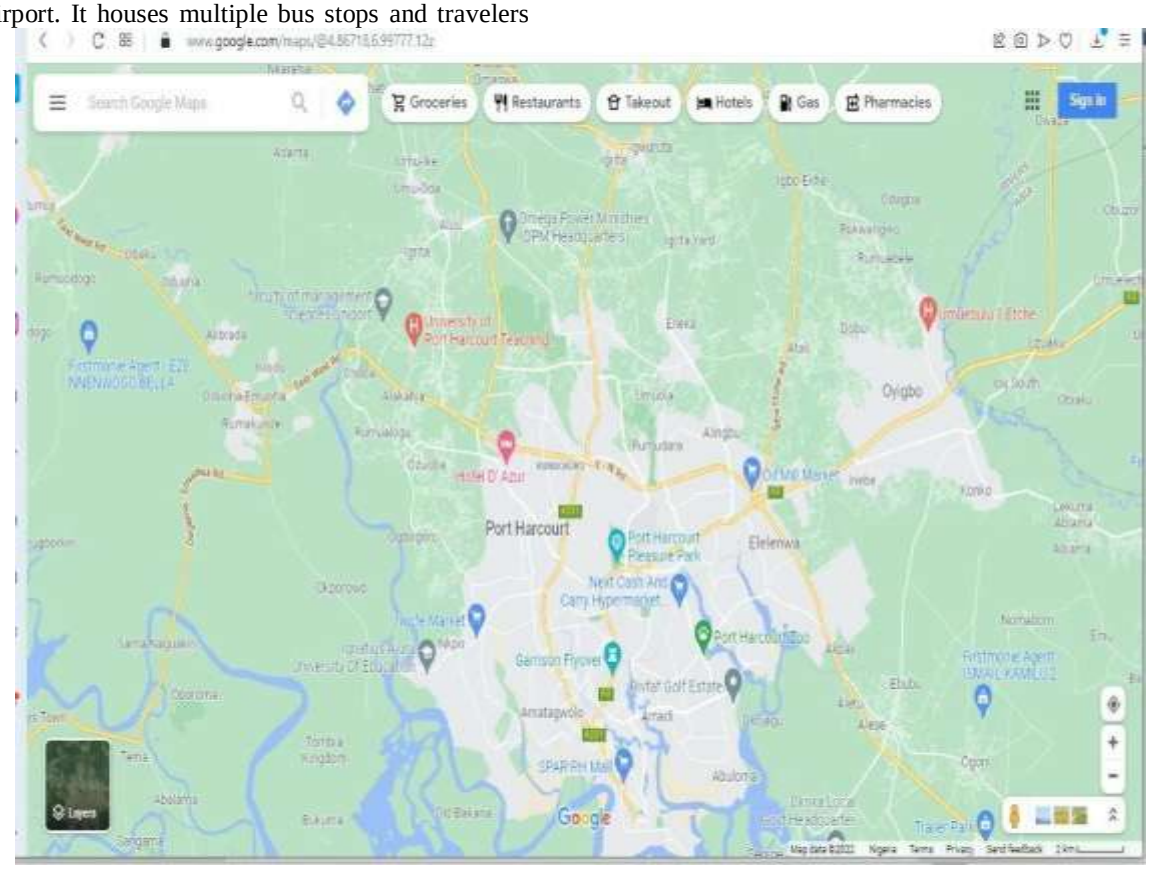

Figure 4: Map of Rumuokoro Showing streets and road connectors to the site (round-about). In the year 2011, the world population prospects highlighted Port Harcourt Metropolis as one of the most populated cities in Nigeria just a little less than Lagos state.

IV. DATA/DESIGN PRESENTATION AND ANALYSES

Findings and Analysis

A few case studies were conducted on existing mixed-use building and the various findings are analyzed in this chapter. The mixed-use projects selected for these studies were analyzed based on the appropriate design standards and conditions hereinafter.

The next phase of this chapter deals with data gotten from informal interviews and copies of questionnaire from residents, shop owners, office workers around the proposed site as they will be the ones to major purpose of these studies is to identify the problems associated with the different activities in the neighborhood and find possible means to fix it with the aid of the design.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Selection of the Study Area(s)

The case studies chosen, meet almost the same requirements as what would be expressed to be built in this location.

Criteria for Appraisal of Case Studies

Design objectives of Whole Building Design Prowler (2009) were the basis for the appraisal of these case studies. The following were put into consideration: aesthetics, location, accessibility, plan layout, human factor, sustainability, functional requirements, safety and security of inhabitants as well as users.

Figure 5: Marina One

Source: Google.com, 2022

Project Information: "Marina One", is a high-density mixed-use building complex in the heart of Singapore's new Marina Bay financial district, it complements the Urban Redevelopment

Authority's (URA) vision of making Singapore a "City in a Garden" (www.worldarchitects.com, 2021). Marina One is "green" in both a factual and performance sense. It comprises of two large urban parks, it also consists of two (2) offices, two residential towers and a retail podium set around flourishing foliage. The outer face of the four towers strictly follows the city's grid, the maximized inner space is a free three-dimensional biodiversity garden. The "Garden Heart" as it is called will be the largest public Plaza in CBD. Openings between the high-rises, sky gardens in-between the podium, the elevated towers, as well as the shape itself, improve the air flow within the building and creates a comfortable microclimate within the multiple levels of the central garden that covers over 125% of the entire site area.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Figure 6: View of Marina One from the top

Source: Google, 2022

Figure 7: Singapore de Ingenhoven Architects

Source: Google, 2022

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

The Heart

The heart has an estimated net floor of 140,000 sqft retail podium in the core of Marina One and offers gastronomic and lifestyle options. The centerpiece of The Heart will be a biodiversity garden designed and developed by Kathryn Gustafson Porter + Bowman. Architect Christopher Ingenhoven was the one who envisaged The Heart as a sanctuary and a green civic space for communities to come together at the heart of Singapore's Central Business District. It will comprise of an array of flourishing foliage at the center of the development and also will have waterfalls and rooftop gardens in it.

Figure 8: Novo Town Designing Building Source: Google, 2022

Figure 8: Novo Town Leisure Park Source: Google, 2022

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Figure 9: The Eko Towers **Source:** www.google.com, 2021.

Eko Pearl Towers is the first residential development in the Atlantic City. It is a set of high-rise building, privately owned and developed by Eko Pearl Construction Company in Lagos. The development which is situated about 500 meters away from the financial center of Lagos on Eko Atlantic City, consist of five (5) high-rise residential towers, each topped with deluxe penthouses, two- and three-bedroom apartments excluding a luxurious home experience with a view coastline. In unveiled the first tower, the Black Pearl with the second Champagne Pearl tower in the year 2017.

Project Development:

The Eko Pearl Towers range from 24 to 33 floors; it consist of four(4) apartment per floor, two apartment on the royal penthouse floors, it also has a technical floor, terrace floor, a ground floor and a basement floor. Facilities at the residential portion include a swimming pool, a tennis court, squash court, fitness center, meeting rooms, lounges and leisure are areas suitable for families and visitors to the families and visitors to the facility (www.ekoatlantic.com, 2021).

Design Features

The facility has the following to boast of, they are:

i. An independent 24-hour power supply
ii. Water and waste treatment plant
iii. iii. Fiber optic communication connections to every plot of land in the environs iv. Plots of land are delivered with connections to available utility services
v. Value added amenities within the city include:
vi. 10.2 km long waterfront promenade
vii. vii. large marinas connected by an internal waterway.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Figure 11: Oceanwide Plaza

Source: google.com, (2022).

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Project Title: Oceanwide Plaza

Oceanwide Plaza is a residential and retail complex. It is composed of three towers in downtown of Los Angeles, California. It is just across the street from Staples Center and the Los Angeles Convention Center. It is owned by Oceanwide Holdings and is also being developed by Oceanwide holdings. The building was designed by Callison RTKL, it features a five-star Park Hyatt hotel with interiors done by Studio Munge, as well as 504 residences and a collection of retailers and restaurants. It also provides home to the city's tallest residential tower. Its construction commenced in year 2015 and was completed in 2020.

Figure 12: Oceanwide Plaza **Source:** google.com, (2022).

The tower houses a 184 – room five-star Park Hyatt hotel along with 164 – Park Hyatt serviced residences, a live in hotel option. It has a total height of 675 ft in 49 floors. Towers two and three have 504 residential condominiums and a total of 530 ft in 40 floors in height, at completion, they the 11th and 21st tallest buildings in Los Angeles, rapechirchy. The Park Hyatt project marks the luxury brand's first hotel and branded residence on the West Coast. That 49-stories building consist of 184 – room hotel topped by 164 serviced hotel residences. The other 340 apartments housed in two-40 stories towers, the residence at Oceanwide Plaza.

Location adjusted to the Staple Center and Los Angeles, the complex's design offers a departure from the standardized glass curtain and masonry architecture of the city's business districts. The developer Oceanwide Holdings enlisted the architect as a consultant to design features such as the 700 ft LED ribbon wrapping the perimeter of the building. Asides from that, the firm also plans to create glass elevation LED.

The 9th floor has a two-acre private park. The features here will include a private cantilevered deck pool, viewing platforms, basketball court, a dog park, green space and a running track. Ocean while Plaza offers a truly 1 lifestyle, anchored by the five-star park Hyatt Los Angeles hotel. At the gateway to Los Angeles, live the address that offers one of the city's largest private resort parks, luxury retail and discerning

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

culinary experiences at The Collection at Oceanwide Plaza. Elegant and stylish condominium residences rise 675 – feet offering floor-to-ceiling glass walls framing the city's most recognized landmarks and endless views. In a city of superlatives, Oceanwild Plaza introduces an elevated level of glamour and sophistication.

Ocean wild Holdings redefine the skyline in the world's most iconic destinations. The developer at Ocean wild Plaza is one of the largest global conglomerates with a focus on real estate, financial services, energy, education, and media. Ocean wild is boldly making its mark in North America with the most significant mixed-use development in the history of downtown Los Angeles. Oceanwild Plaza will be joined by signature multi-faceted development in San Francisco, New York, and Hawaii.

Project Summary

The building is located at the heart of a small retail environs and fronts a busy street and a new pocket park. Development on this site was sped up by up-zoning along street corridors and the economy of timber construction in the multi-level apartment buildings in the region. The ground floor of this long building faces the arterial road (Main Street) and is entirely meant for retail purposes. A central arcade running through the building at the ground floor connects to rare lane. The entrance lobby to the apartment axis is accessed off this arcade. The development contains 91 single level units 1,2 and 3 bedrooms over four (4) floors, with seven (7) town townhouses facing a rare lane.

The building is located at a point where Main Street swings to the east. This has been taken to turn the previous traffic island into a pocket park, that the south end of the building fronts. All apartments have large balconies and residents have access to private landscaped areas on the rooftops.

Parking is provided in a basement and is accessed through the back lane built as part of the development.

One fascinating features of the building is that the basement parking and the first-floor retail areas use a concrete structure, upon which the four (4) residential floors are constructed using timber framing. Many units include effectively small rooms that can be used as storage, studies or for other uses. The project makes significant contribution to the public realm and the pedestrian environment, and achieves good environmental performance reflected in the LED Silver certification.

Data from the Interviews

Inquiries were made from the residents in the area for the past few years;

Data from the Questionnaire

Thirty five (35) copies of questionnaire were distributed to several residents on the need to have a

mixed use in their vicinity. The following paragraphs give detailed analysis of the data gotten from the questionnaire.

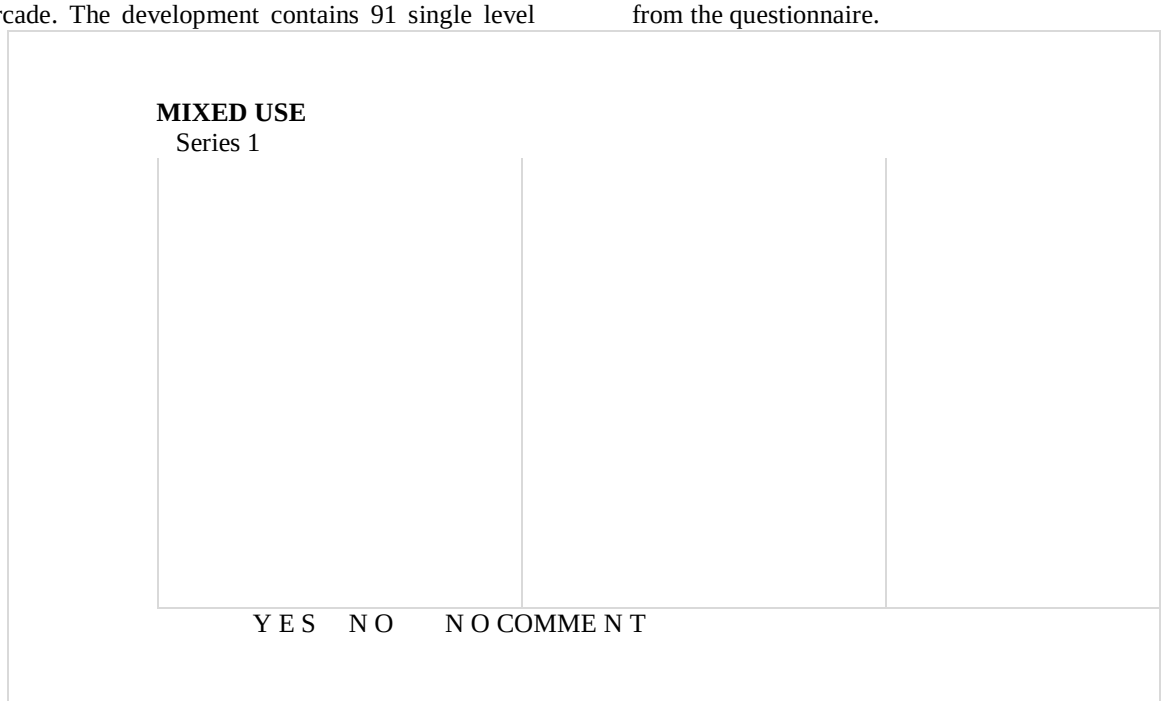

Plate 4.1: Percentage of Respondents

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

From the Bar Chart above, it is noticed that;

1. A large number of the respondents want a mixed use to be cited in their vicinity.
2. Only a few persons do not agree on the citing of a mixed use in the area.
3. About 17% remain indifferent and do not care if it is being cited there or not.

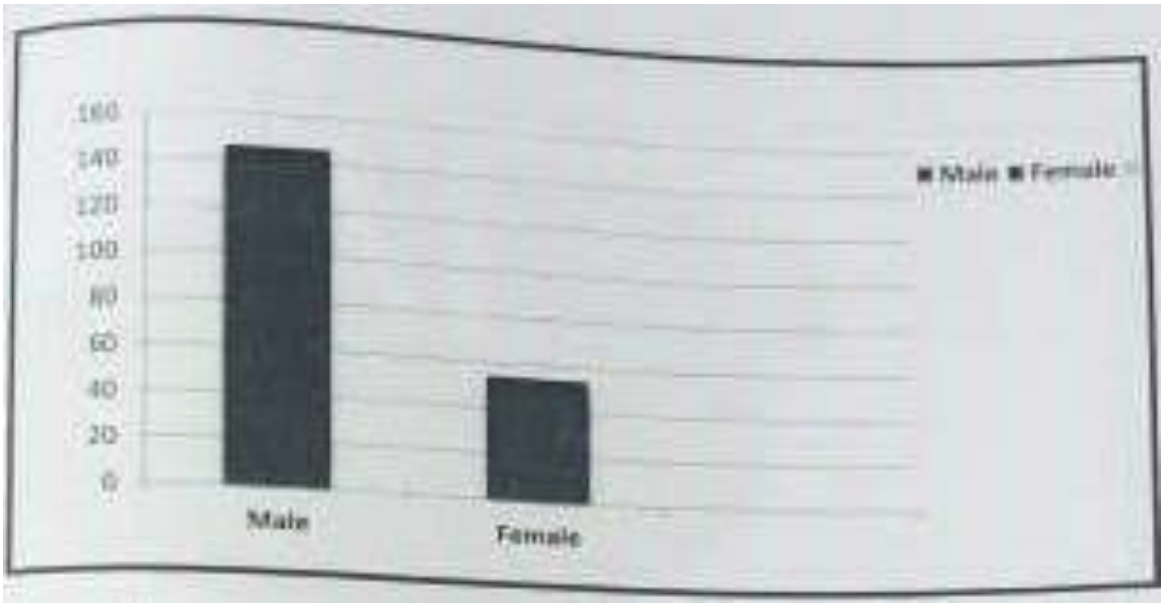

Plate 4.2: Percentage of Respondents According to their Gender.

From the Bar Chart above, it is noticed that the number of males that agree on citing of a mixed use in the area were more than the number of females.

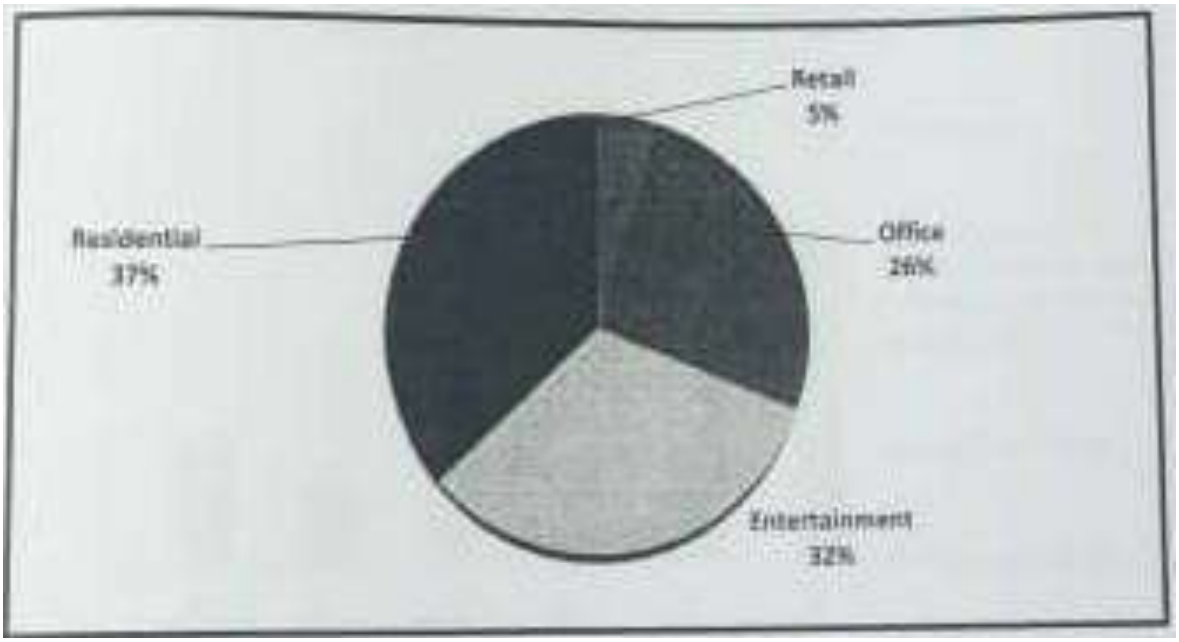

Plate 4.3: Percentage of Representatives According to their Preferred Priorities.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

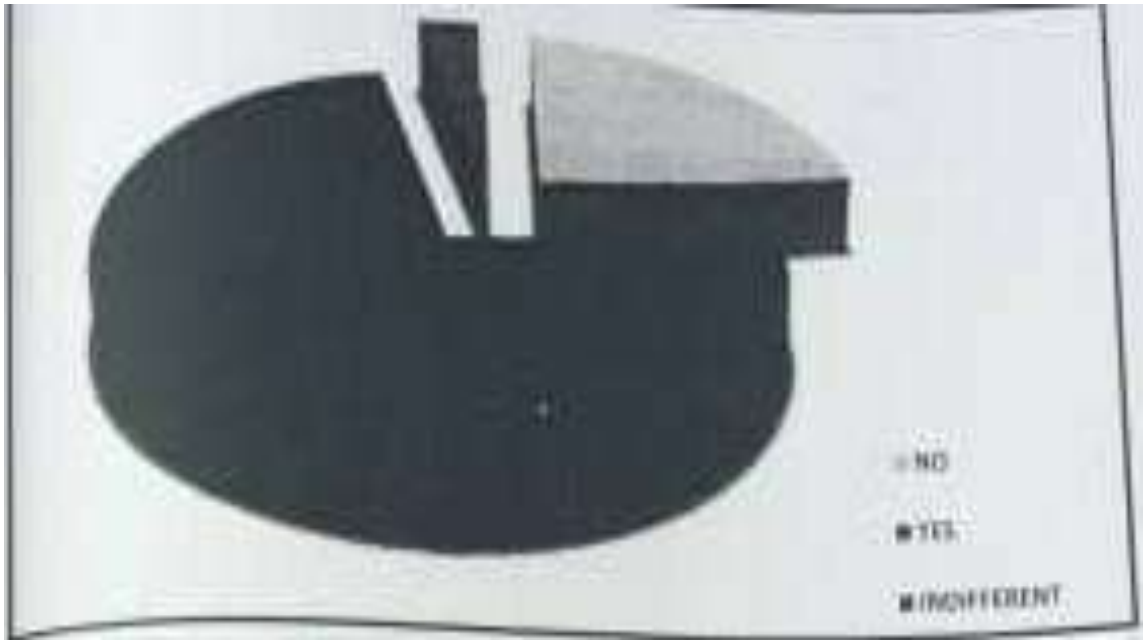

Plate 4.5: Number of Respondents According to their Willingness in the Mixed Use.

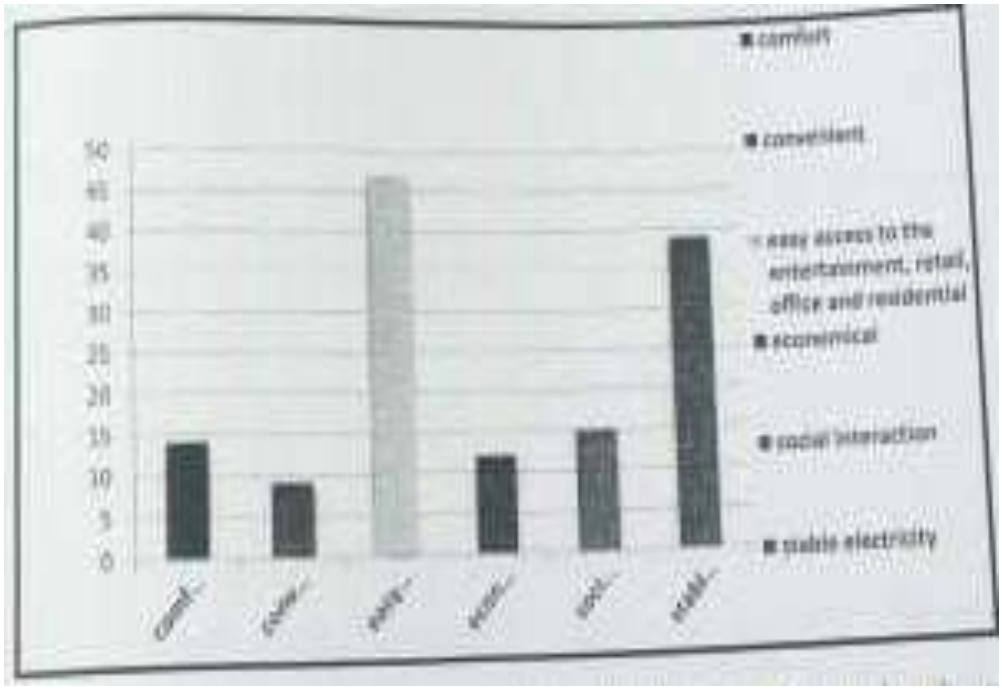

Plate 4.6: Number of Respondents According to their Reasons to Stay in the mix use.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

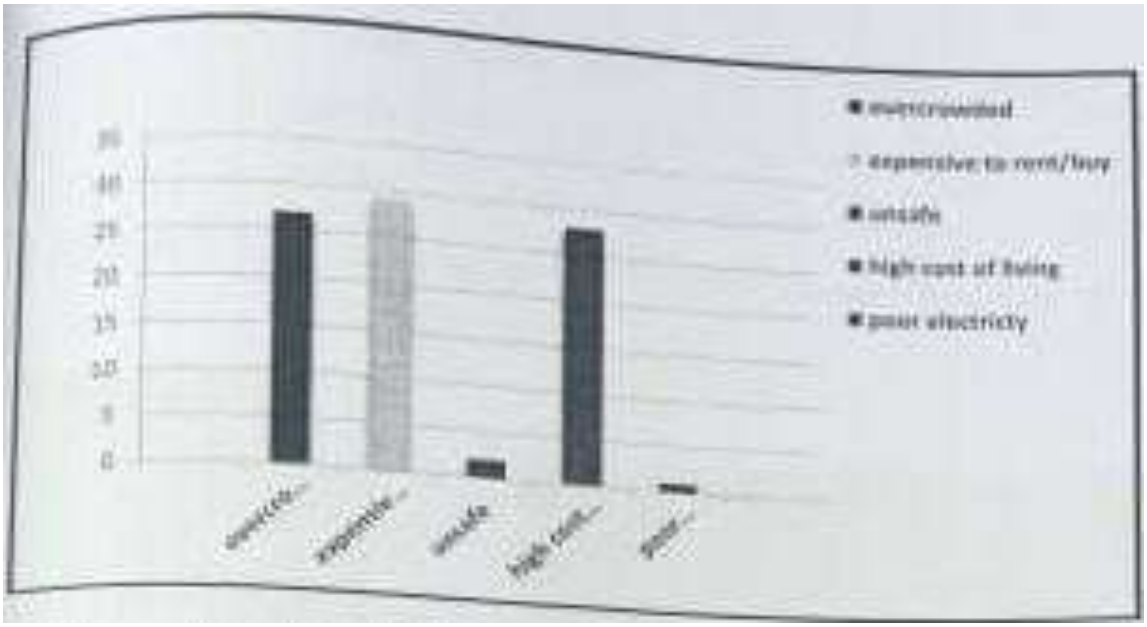

Plate 4.7: Number of Respondents According to their Response not to Stay in the Mix use.

The above data analysis aims at giving an idea of the current mind set of residents in the D/line area. Although a few who complained that it will be expensive to live in such a development. Conclusively, the information gotten from this analysis can help in designing a mixed use that will not just have lots of comforts, it will also have to be built not so expensive so it can be fully occupied.

Site Characteristics and Analysis

The climate of Rivers State is like most other Southern States of Nigeria. In Southern Nigeria, there are four (4) seasons:

i. The long-wet season which starts in mid-March and lasts till July. It is the season of heavy rain and high humidity.
ii. The short dry season which is known as the August break.
iii. The short-wet season follows the August break and last from September to October. The rainfall is not usually as heavy as during the first wet season. The long dry/harmattan season, which last from November to mid-March. Harmattan: Afternoons are full of haze because of the particles in the air brought by winds from the North.

INTERPRETATION AND DISCUSSION OF FINDING/DESIGN DISCUSSION

When designing a mixed use, the needs of all the various users' needs to be taken into full consideration. The following guidelines focus on providing a facility that is supportive of it's users' psychological, social, financial and emotional needs.

Function: The mixed-use development should provide its users an enabling environment to meet, socialize and to relax (lounge). It should also provide spaces designed basically for recreational purposes.

Interaction: The mixed-use development should provide a serene environment where its users can meet and interest with each other, irrespective of their age, class or belief systems.

Satisfaction: The mixed-use development should always provide a safe environment to users. They should have a sense of security and satisfaction whenever they are within the vicinity and its environs.

In planning and design of a Mixed-Use Development, the following are the major factors to be considered:

Location, Outcome

i. It has to be located in the CBD of the metropolis for it to function properly and to it's full capacity.
ii. Access to public transportation system is of high importance as people will come from far and wide in and out of the complex.
iii. To ensure that mix used project has convenient access to the commercial, retail, entertainment, recreational and social facilities in the complex.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

Guidelines: The "preferred Location" for the use of a site for the mix use development should meet up with the following criteria:

1. It should be located around vicinity where educational, religious, healthcare facility is within walking distance from the whole facility.
2. It is preferably located within a few meters to railway station.
3. It should be within 200 meters to a bus route that provides direct access to other parts of the city.
4. It should have access on one or more sides of the site for easy flow of people and vehicles. Any development of Mixed use that does not fit into one or more of the above criteria is discouraged (Tonye, 2018).

Neighborhood Character, Outcomes

1. To ensure that mixed use development is designed in accordance with the appropriate Desired Future Character Statement for the relevant urban character precinct as detailed in the Neighborhood Character Study.
2. To ensure that the bulk, mass and height of the mixed-use development does not visually overwhelm the scale of existing developments in that area
3. To respect the existing character and scale of the surrounding built form.
4. To encourage creative and quality design solutions.
5. To ensure that the design respects the existing neighborhood character or contributes to a preferred neighborhood character
6. To ensure that development respondents to the features of the site and the surrounding area

(Tonye, 2018) Guidelines:

1. The Mixed-use development should be designed to respect the predominant characteristics of the built form, of the surrounding area, including:

a. Built form, mass and proportion
b. Roof form and pitch
c. Façade articulation and detailing
d. Window and door proportions
e. Corridors, eaves and parapets
f. Building materials
g. Building heights
h. Visual impact

2. Development should consider privacy and amenity of adjacent neighbors and surrounding streets:

I. Provide an appropriate setback and screening to private open space of adjoining properties (Tonye, 2018).
II. Development should incorporate canopy screening trees or similar landscape protection along boundaries and interfaces.
III. Development should be designed so it contributes to the safety and amenity of it's neighborhood and immediate surroundings.
IV. Provide an attractive interface of habitable living spaces, offices and lounges with adjacent street frontages.
V. Encourage ground floor uses that generate activity and surveillance, such as retail or hospitality uses or entry lobbies in business and mixed-use zones (Tonye, 2018).
VI. Organize units so they maintain visibility and surveillance of public space.
VII. Good security should be provided by passers-by in streets and neighbors across streets.
VIII. Provide clear links and access to and from private and public spaces for both pedestrian and vehicles.

Car Parking Outcomes

I. To ensure adequate car parking and bicycle storage is provided along to meet the needs of users and visitors to the development (Tonye, 2018).
II. To ensure that car spaces and access ways are positioned in convenient and safe locations and do not adversely impact on streetscape character.
III. To ensure that vehicle movement throughout the car park is efficient.
IV. To ensure that the design car park and access areas practical, provide an attractive and safe environment and can be easily maintained.

Guidelines: Car spaces must be provided on site at the rates of;

1. Min. 0.2 car spaces per person for sites located within the "Preferred Location".
2. Min. 0.2 car spaces per person for sites located outside of the "Preferred Location" to ensure adequate onsite car parking is provided to meet the needs of users, car spaces must be:

I. Undercover
II. Well lit, including lightening for safe pedestrians' access
III. Designed for efficient use and management
IV. Designed to minimize the extent of hard surface area

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 154-174 www.ijaem.net ISSN: 2395-5252

V. Where a part of a basement or an indoor parking lot, it should be well ventilated

VI. Not located to the front setback area or visually dominating the front façade of the building.

A building may project into a car space if it is at least 2.1 m above the space.

Open Spaces, Outcomes:

1. To ensure that an adequate area of communal open spaces is provided on site to meet the recreational needs of the users (Tonye, 2018).
2. To ensure that the shared communal spaces combine is the functionality of the mixed use facilities and promotes interaction between the users of the various activities in the development.
3. To ensure that existing significant trees are incorporated into open space areas and sufficient space is provided for the planning of new canopy trees, this helps to shade the cars as well as beautify the environment.

Guidelines: The Mixed-use facilities should provide a communal open space area at and ground level located to the side or rear of the building, with convenient access from the various amenities having a minimum area of;

1. $75m^2$ or 4m per person, whichever is the greater, designed with a minimum dimension of 3m, including one are to the side or rear of the building of $35m^2$ with a minimum dimension of 5m ($_{Tonye, 2018}$).
2. The provision of generous communal indoor recreational and lounging areas
3. Individual or private open space areas at ground levels are encouraged in addition to the communal open space requirement.

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

The study examined mixed used development in Port Harcourt with focus on sustainability of tall development. The introductory chapter of the study provided a background to the study and formulated the research objectives and research problem. It also covered the significance of the study as well as organization of the study. The second chapter literature review provided conceptual and theoretical review of the study. The methodology section, chapter three outlined the philosophical orientation and research design of the study as well as the population of interest to be investigated. It also provided data collection and analysis techniques. The fourth chapter presented the outcome of data analysis and findings in line with the study objectives while chapter five discuss the findings of the study while chapter six summaries, draw conclusion and make recommendations.

The population of the study comprised residents and employees of ministry of environment, housing from federal, state and local governments. Data were collected through questionnaire administered to the residents and interview conducted by the researcher. Descriptive statistics were used as data analysis methods. The relationship between these space types has an important impact on how the residents and users interact with each other and the community. On the other hand, by removing the barrier, between these two types of spaces, the residents are forced to interact more frequently, therefore building the strength of the community. The consistent use and usability of a collective space, it must be active. A great way to activate these spaces is integrating the spaces with the circulation of the building or site.

A tall structure was seen as a source of identity and civil pride. This shows that tall buildings are only symbolic rather than performing any function. However, contemporary architecture has change the tone and pace of high rise building. The contemporary role of high rise buildings has come to signify a corporate image or an affluent way of life or the existence of power of the owners or occupants. The study conclude that, changes in the use of the contemporary high rise building was also increase due to scarcity of land for development purpose owning to urban density as a result of rural-urban migration, since tall buildings have been seen to have technical and economic advantages in areas with high population density. The adoption high rise mixed-use buildings are not new because of the need to efficiently maximize the available land especially in the central business district.

Recommendations

1. There is need for smartly designed buildings and spaces that can perform many functions. Properly planned mixed use developments are recognized as an excellent way to achieve urban revitalization and promote sustainable living environment as well as creating attractive and vibrant communities by providing several uses within a development.
2. Mixed use developments help residents to establish frequent contact and long-term relationships with others. Therefore, mixed-use development should adapt, offering greater flexibility and efficiency, while helping

citizens to reach for a richer, better and healthier future.

3. The effort should be made to design mixed-use developments to revitalize the city of Port Harcourt, this is important because it can help the government to have a framework as a basis for starting these kinds of development in the City.
4. Mixed use developments will boast a sustainable community, continuous connectivity and an environmentally friendly atmosphere since it integrates mixed use functions such as offices, residential, retail and supporting facilities, therefore, there is need for better structural design that enhances the development of mixed used structures.
5. Mixed use developments help residents to establish frequent contact and long term relationships with others. In response, the mixed use development must adapt, offering greater flexibility and efficiency, while helping the citizens to reach for a richer, healthier and better future, therefore the study recommend the need for government policies and policy reforms that encourage mixed used tall development.

REFERENCES

[1]. Angela, R. (2013). Sustainable Mixed-Use Developments. Ken Dale Travel Bursary. Atlanta Regional Commission (2011). Quality growth toolkit: Mixed use Developments.
[2]. Coupland, A. (2017). Reclaiming the city: Mixed Use Development, London, E&FNSpon.
[3]. Baker, S., Kousis, M., Richardson, D. & Young, S. (1997). Introduction: The theory and practice of sustainable development in EU Perspective in Baker, S., Kousis, M., Richardson, D. & Young, S. ed. (1997). The politics of sustainable development routledge; 1st edition. bebyggelsen.pdf].
[4]. Dryzek, J.S. (1997). The politics of the earth. environmental discourses. Oxford University Press.
[5]. Ezema, I.C., & Oluwatayo, A.A., (2014). Densification as sustainable urban policy: The case of Ikoyi, Lagos, Nigeria. In: CIB W107 International Conference: Construction in Developing Countries and its Contribution to Sustainable Development, January 28- 30, 2014, Lagos, State, Nigeria retrieved in March 2016. http://eprints.covenantuniversity.edu.ng/id/eprint/2448.
[6]. Gibbered, J., (2008). The sustainable building assessment tool: integrating sustainability into current design and building processes. https://citeseerx.ist.psu.edu/32
[7]. 7096/Assessing_sustainability. Retrieved 23rd April, 2021
[8]. Girardet, H. (1999). The metabolism of cities in Wheller, S. M. & Beatley, T., ed. (2004).The sustainable urban development reader. Routledge: Taylor and Francis Group; 1st edition
[9]. Grant, J. (2002). Mixed use in theory and practice: Canadian experience with implementing a Planning Principle. Journal of the American Planning Association, 68(1), 71-84.
[10]. Grant, J. (2012). Mixed use in theory and practice: Canadian experience with implementing a planning principle. Journal of the American Planning Association, 68(1), 71-84.
[11]. Hajer, M.A. (1995). The politics of environmental discourse. ecological modernization and the policy process Clarendon Press: Oxford
[12]. Herrick, S. (2005). Alternative financing for mixed use. Urban Land 64 Alternative Financing for Mixed use. Urban Land 64(3)104-114.
[13]. Herrick, S. (2005). Alternative financing for mixed use. Urban land 64) alternative financing for mixed use. Urban Land 64.3, 104-114
[14]. Hoppenbrouwer, E. & Louw E., (2015). Mixed use developments: Theory and practice in Amsterdam¨s. Eastern Docklands. 13, 15-57.
[15]. Hoppenbrouwer, E., & Louw E., (2005). Mixed use developments: Theory and Practice in Amsterdam's Eastern Docklands, 13(3), 679-694.
[16]. Levitt, R. L. & Shwanke, D. (2003). Mixed use developments handbook. Urban Land Institute.
[17]. Levitt, R.L. & Shwanke D., (2013). Mixed use developments handbook ISBN 0874208882, Washington D.C. Urban Land Institute.
[18]. Nwaka, G. I. (2005). The urban informal sector in Nigeria: towards economic development, environmental health, and social harmony. Global Urban Development Magazine, (1), 1-11.

[19]. Okolo, N., & Okolie, A. O (2010).Revitalizing urban public spaces in Nigeria through vegetative enclaves. Journal of environmental management and safety,1 (1), 124-130.
[20]. Pilkington, B., Roach, R. & Perkins, J. (2011). Relative benefits of technology and occupant Procedia Economics and Finance 6,178-185.
[21]. Rabianki J. S. & Clementus J. S., (2007). Mixed use developments: A review of professional Literature. Survey Research Projects Sponsored by NAIOP.
[22]. Rabianki J. S. & Clementus J. S., (2017). Mixed use developments: A review of professional Literature. Survey Research Projects Sponsored by NAIOP.
[23]. Ramezani, S., Aziz, Z.A. & Idid, S.Z. (2019). Public space and conservation of a historic living city.
[24]. Rowley, A. (1988). Planning mixed use development issues and practice, research report by the royal institute of chartered surveyors
[25]. Rowley, A. (2016) Mixed use development: Ambiguous concept, simplistic analysis and wishful thinking? Planning Practice and Research 11(1), 67-90.
[26]. Rowley, A. (2018). Planning mixed use development: Issues and practice, Research report by the Royal Institute of Chartered Surveyors.
[27]. Schwanke, D., Phillips, P., Spink, F., Lockwood, C. & Versel, D. (2013). Mixed-use development handbook (2nd.). Washington, D.C.: ULI- The Urban Land Institute.
[28]. Schwanke, D., Phillips, P., Spink, F., Lockwood, C. & Versel, D. (2003). Mixed-use development handbook (2nded.). ULI-The Urban Land Institute.
[29]. Tonye, B. S. (2018). Integrating Mixed-Use Developments to Achieve Urban Revitalization and Sustainable Living Environment in Port Harcourt. J. of Engineering and Applied Scientific Research, 10(3), 39-54.
[30]. Urban Land Institute. (2003). Mixed-use development handbook (2nded). Urban Land Institute.
[31]. Urban Land Institute. (2013). Mixed-use development handbook (2nded.). New York: Urban Land Institute.
[32]. Vale, B. & Vale, R. (1991). Principles of Green Architecture in Wheller, S. M. & Beatley, behavior in moving towards a more energy efficient, sustainable housing paradigm. Energy Policy, 39(3), 4962–4970
[33]. Wackernagel, M. & Rees, W. (1996). What is an ecological footprint?, in Wheller, S. M. & Beatley, T., ed. (2004). The Sustainable Urban Development Reader. Routledge: Taylor and Francis Group; 1st edition
[34]. Walliman, N. (2011). Research methods, the basics, London & Newyork, Routledge Taylor & Francis Group.
[35]. Zhang, X. Q. (2010). High-rise and high-density urban form in: Compact cities: Sustainable urban forms for developing countries (Eds Jenks, M. and Burgees, R.), Spon Press, London.