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A Mixed use Development in Port Harcourt

(Enhancing movement and connectivity in a multi use development)

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ABSTRACT

This study aim is to design a Mixed use development for the Urban unit that will produce a vibrant new neighborhood for people, promote flexibility, openness and a model for sustainability approach to development in Port Harcourt. The most persistent problem in PH is lack of adequate infrastructure. There are other issues which include poor transportation network, low productivity and high rates of unemployment and underemployment. Research studies showed that the quality of life and the environment has been on a rapid decline as compared to the rapid population growth in the metropolis. These numerous metropolitan issues could not be addressed in a single use development hence the mixed use development. This study was explored, using a quantitative case study approach that combined both primary and secondary data collection in an interpretative nature. Findings from the study reveal that the mixed used development will help tackle the problem of traffic congestion in PH metropolis, due to the problem of increasing population by reducing the need for vehicle travel, it ensure easy use of public transport, walk, or bike in the metropolis of Port Harcourt, which will help to efficiently connect the metropolis's vicinity to create inclusive, connected communities. More so it will introduce shared vicinity space: Plazas, parks, and sidewalks foster interaction among vicinity members. The study recommends that the state government should engage in a continuous study and research about the dynamics of the metropolis. i.e. its demography, density, Urbanization rate and trends. Data collected from these studies should be used to create a database which will aid in making metropolitan policies and decisions

Introduction

Background to the study

One way or the other, everyone has been involved in social interactions during our lives even though we do not usually see them with such title. Making decisions about where to live, selecting children's school, deciding whether to conceive or not, involving in social services, learning from one's peers and classmates, and naming one's baby result from interpersonal social interactions always occurring in the areas, at schools and work (Ioannides, 2014). Since people living in a certain metropolis are in fact vital metropolitan elements, from which cities absorb their vitality, equipping the vicinity with shopping area, providing services, developing diversity,

mixed uses, and creating opportunities are among characteristics of a valued metropolis. Also, of the most significant necessities for cities to flourish and thrive is to assemble most of the citizens in vicinity of metropolis area, as a result of which an energetic, dynamic, or in other words, a 24-hour metropolis is yielded (Mirmoqtadaie, 2010, p. 44). In recent decades rapid growth of Urbanization aspects, and formation of a new metropolitan development scale have caused modern cities and urbanization to face new challenges including increase in social disorders, fading social identity and belonging, and in general decreased quality of life (Abdollahie, 2010, p. 83). Also, integration of performances, functions, and activities to create environmental unity and various areas such as semi-private, semi-public, and public are regarded as the major background for social relations and interactions (Kashfie, 2012, p. 7). The overall goal of mixed-uses plans is to improve citizen's social welfare and health, which can be achieved in some ways like integrating and combining living and work environments with each other, and also removing single-function metropolis areas (Downs, 2005).

A mixed use development is a real estate study with planned integration of some combination of retail, administrative area, housing, 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. When examined carefully, Nigeria's housing patterns reveals that knowledge of MUis conventional, well recognized and adopted regardless of the locality within the country. Efficiency of land did not start with high rise structure but has since started with many low rise structures and bungalows bringing about a mixed use development. This is more evident in some localitys especially in PH sinceof the high population density and scarcity lack of vacant land for construction. MU structures are seldom emerging within PH metropolis due to demand or necessity especially in the central business district where there is huge demand for commercial spaces revealing MUD is a key feature in the development of our modern cities. The adoption of MUD in PHis not new sinceof the need to efficiently maximize the available land especially in the central business districts, it is equally important to emphasize that MU high rise structure' modelers and architects spend most of their time and effort on the exterior appearance of these structures with little of the functionality consideration of interior spaces. The glamour of MU high rise structures must not be limited to the exterior façade but also the human-structure relationship. Living in a MUD structure should not create a very finite and encapsulated world in and of itself . The high rise should not become your entire world, especially those with all-inclusive functions that include a restaurant, market, gymnasium, bank and other amenities. In the world's contemporary urbanization, taking account of citizens, on the basis of which cities are developed, has changed into an accepted principle to consider interactions, behaviors, and resulting issues, and also to create a vital, dynamic, and livable metropolis. It is an undeniable fact that the presence of people is a requirement for vitality of metropolitan spaces. It is thus in this light that the researcher wishes to model a mixed use development for the metropolitan unit that will produce a vibrant new neighborhood for people, promote flexibility, openness and a model for sustainability approach to development in Port Harcourt.

Problem Statement:

Life for the average citizen in PH metropolis has been made hard due to the rapid metropolitan growth in the metropolis. Some of the challenges experience by the citizens are inadequate housing and basic amenities, people living in substandard environments, insufficient social amenities, poverty experienced by people and the environment itself. The most persistent problem in PH is lack of adequate infrastructure. There are other issues which include poor transportation network, low productivity and high rates of unemployment and underemployment. Research studies showed that the quality of life and the environment has been on a rapid decline as compared to the rapid population growth in the metropolis. These numerous metropolitan issues could not be addressed in a single use development hence the mixed use development. Practically this study focuses on bringing about proper developments in order to revive, energize, strengthen and revitalize the metropolis cape for better economic, cultural and social welfare of its people. The argument is that integrating MUDs with proper planning can bring good effect and impact to the physical composition of our environment. The investigation of the potential of a mixed used development as a driving force for upgrade in the quality of the livelihood of the people in PH metropolis would be viewed from diverse perspectives:

- Reacting to the metropolitan environment by restoring the damaged name of the physical metropolis.
- Encourage and Stimulate vicinity revitalization
- Creating a metropolis that is economically, environmentally and socially sustainable, and which meets the challenges of population growth.
- Attracting Economic Investments into the Metropolis

Aims & Objectives of the Study

The main aim of the study is to model a mixed use development for the metropolitan unit that will produce a vibrant new vicinity for people, promote flexibility, openness and a model for sustainability approach to development in Port Harcourt.

This aim can be achieved through the following objectives:

- To evaluate extensively the concept of mixed development as an metropolitan model approach
- To identify the various types and functions of mixed-used developments.
- to come up with an architectural model that will help improve human structure performance by introducing liveability character as it relates to MU high-rise structures
- to ascertain the direct and indirect impact on the dynamism and vitality of the metropolitan space
- to redefine public spaces within mixed use development through liveability character principles
- To evolve an metropolitan revitalization through the mixed used development.
- To show how the concept of mixed use development can be used to solve some of PH metropolis's metropolitan issues

- to investigate ways to improve the development of MU and its impact on metropolitan development

Literature review

Conceptual clarification

Mixed use development

Mixed-used means any combination of commercial (e.g., retail, administrative area, and entertainment), and noncommercial uses, such as housing uses, mixed either vertically (Intensive Development) and horizontally (Extensive Development). It maximizes space usage, has amenities and architectural expression and tends to mitigate traffic and sprawl. The essence of mixed use development is that it brings people closer to the things they need on a day-to-day basis thus reducing time spent commuting. MU tend to help efficiently manage the available land space and public infrastructure. Mixed use development is an advance based on broader concept of new urbanization. mixed use development" is an expression applied to any plan which is not merely composed of one use. In single structures, uses can be vertically integrated with each other. Cases, in which a housing scheme is taken into account, vertical combination of uses is presented in the form of commercial area being on the first floor while housing one on the higher floors. Moreover, horizontal combination of uses refers to adjacent structures (Biddulph, M. 2007). MUD does not indicate that several diverse uses should be mechanically combined. Rather, it is a negotiable process encompassing various interested groups. Unless interests of MU are taken into consideration through reciprocating topdown and bottom-up activities, encouraging social benefits, and involving individuals in such developmental process, no other model is complete enough to result in MUD (Kong Hui, et al. 2015). Employing diverse and various uses in work and living environments at varying levels of human communities such as integrating shops, administrative areas, apartments, and houses in one site, establishing mixed-uses in a vicinity, block, or a structure, diversity of individuals with varying ages and incomes, cultures, and races are of high significance in new metropolitanism. Adopting MU process leads to metropolitan area becoming more active, higher security and safety, increases in social interactions, decrease in daily journeys (amid work and home), as a result of which traffic is reduced and horizontal development of metropolis is also prevented (Asgharzadeh Yazdie, 2011, p. 50).

Concept of space

Space is the boundless three-dimensional extent in which objects and events have relative position and direction. Physical space is often conceived in three linear dimensions, although modern physicists usually consider it, with time, to be part of a boundless four-dimensional continuum known as space time (Yannis,2014). Our physical space helps our experiences feel more authentic. And gives us a sense of stability and control. In a time when we joke about how much people have their face buried in a digital screen, collaborative spaces in our schools, administrative areas, medical clinics, and campuses are even more important than ever.

Enhancing Movement & connectivity, in a multi-use development

The idea of a single structure where you live, work and play may seem very much of the moment, driven by advances in communications technology. But MUDs have been around for as long as mankind (Kashfie et al,2012). Research has revealed that complex cave systems hosted dual uses hundreds of thousands of years ago. The Romans built large multi-use complexes across their empire. And during medieval times, people used to manufacture, sell and live in the same structure. It wasn't until the industrial revolution that industry and trade were separated from homes. Advances in mechanical and agricultural technologies brought on board processes that were highly toxic and dirty, while instances of plague and infestation grew, as larger volumes of food were stored to feed a growing metropolitan population. Large-scale industrial automation also required special access and ample spaces to accommodate large and noisy machinery and production systems. To address these issues, cities around the world began to segregate uses, by either locating diverse functions in separate structures, or through the regulatory zoning of land.

Benefits of Mixed Use Development

Diverse developers, metropolis administrators, choose MUfor diverse reasons. Some see it as an excellent way to incorporate a mix of housing types on a small scale with other uses in order to enhance the metropolis's character. Others see it primarily as a vehicle for revitalizing struggling areas and spurring economic development. Still others use it to create or enhance central business area. Some other benefits of MUD include (Schwanke,2003): I. MUDs encourage compactness, maximum utilization and development of public spaces in a way that shortens trips, and lessens dependence on the automobile, thereby reducing levels of land consumption, energy use, and air pollution. II. It promotes full utilization of metropolitan services, such as water lines, sewers, streets, and emergency services, by taking advantage of existing public facilities and minimizing the need for new facilities. III. MUDs provide more housing opportunities and choices for increased population, inward migration and social change. IV. MU encourages green environment where reduction in car and other vehicular use helps to reduce carbon emissions and pollution.

The Role of Mixed Use Development in PH metropolis

This study establishes a framework to not only deal with the current issues of this area, but also improve its formal and functional character in a way which will be proportionate to the development of the metropolis and resulting demands in future.

Social Role

Due to the convergence of the metropolis's people to an area, contact increases and consequently creates social link and relationships i.e. social proximity encourages positive interaction and diversity.

Security

Security is achieved due to securing the permanent movement in the area. It enables more and better integrated social housing.

Economic Role

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

Environmental Role

It can increase the density of land use in addition to integration since it has mixed uses.

Reduction on the dependence on cars, reducing road crowd, traffic congestion and air pollution respectively. It increases energy efficiency. To ensure proper organization of the mixed used development in PH metropolis, there must be proper incorporation of all component 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. Structure a day/night balance.

Metropolitan Revitalization

Metropolitan revitalization is a process by which a part of the metropolis in social, metropolitan or economic crisis undergoes a transformation, more or less deep, in order to reverse the trend of environmental declination. This is a set of initiatives aimed at reorganizing an existing metropolis structure, particularly environments in decline due to economic or social reasons. The idea of metropolitan revitalization is to balance the ever-increasing population in an Metropolitan Metropolis. Using PHas our focal point, this would best be done by integrating mixed use development. Metropolitan revitalization will help to recreate the lost identity of PH metropolis.

Challenges, Obstacles or Barriers to mixed use development

Various challenges, obstacles or barriers affecting MUD are identified or listed in the literature. These items appear below without any ranking or relative importance associated to them.. MUD must contend with (Grant,2012):

- Extraordinary planning, management, political patience, capital resources and risk
- Assembling land parcels
- Inadequate capital planning
- Lacking knowledge of available public/private benefits

- Maneuvering through zoning regulations
- Addressing environmental issues
- Working with planning agencies
- Working with the vicinity
- Working with dual development teams
- Working with dual owners
- Securing study finance/capital
- Addressing transportation issues
- Modelling parking
- Modelling a pedestrian-friendly environment
- Managing the financial challenges of a sequenced roll-out of study parts

Theoretical framework

This research, will be reviewing some models and theories that will be supporting the Proponents of MUDs as an metropolitan model approach. These theories were derived from research into efficient old and new cities. The theories are: Transit-oriented development (TOD), Smart growth theory, New Metropolitanism theory and the intelligent Metropolitanism.

Transit oriented development (TOD)

A transit-oriented development (TOD) is a MUhousing or commercial area modeled to maximize access to public transport, and often incorporates features to encourage transit ridership (Kashanijou,2010). A TOD neighbourhood typically has a area with a train station, metro station, tram stop, or bus station, surrounded by relatively high-density development with progressively lower-density development spreading outwards from the area. TODs generally are located within a radius of one-quarter to one-half mile (0.4 to 0.8 km) from a transit stop, as this is considered to be an appropriate scale for pedestrians[7].

Some of the characteristics of TOD's include:

- MUD that will use transit at all times of day,
- excellent pedestrian facilities such as high quality pedestrian crossings,
- narrow streets, and tapering of structures as they become more distant from the public transport node.

Contribution to Knowledge

Most researches into MUD structures totally neglect the livability character within it. Livability character has to do with the structure's effect on its occupancy as it relates to enjoying cultural, environmental and social character that is obtainable within the metropolis since a high-rise structure is a vertical metropolis within a metropolis. This research seeks to unravel the total neglect of human-structure interaction in Mixed use development structures. It stress the fact that occupancy comfort and energy performance are largely sidelined in favour of aesthetics, concept and the quest to use structure mixed use development structures as an architectural statement or national edifice. The focus of this study is not to reintroduce the idea of MU sinceit's not new

but to accentuate that mixing uses works best when it grows out of a thoughtful plan. The study seeks to redefine public spaces within MU structures through livability character principles. This is the gap it intends to fill

RESEARCH METHODOLOGY

Research Methodology

Research methodology encompasses the research model, research approach, variables, description of background, population, sample and sampling techniques, progress and illustration of research tool, pilot study and process for data collection and plan for data analysis (Polit and Hungler, 1999). The Methodology of a research demonstrates the overall model for organizing the approach for the empirical study in collaboration with the procedure for obtaining valid and reliable data for an investigation. Research can be exploratory, descriptive or explanatory Robson (2002). Research for this thesis was conducted in several diverse ways. First it was important to establish a framework of information that will lead to the proper model of a MUD.

Geographical Area of Study

The study area was chosen in Port Harcourt. PH which is the capital of Rivers state is located in southern Nigeria. It lies along the Bonny River (an eastern distributary of the Niger River) 41 miles (66 km) upstream from the Gulf of Guinea. Founded in 1912 in an area traditionally inhabited by the Ijo and Ikwere (Ikwerre, Ikwerri) people, it began to serve as a port (named for Lewis Harcourt, then colonial secretary) after the opening of the rail link to the Enugu coalfields in 1916. Now one of the nation's largest ports, its deepwater (23 feet [7 metres) facilities handle the export of palm oil, palm kernels, and timber from the surrounding area, coal from Anambra state, tin and columbite from the Jos Plateau, and, since 1958, petroleum from fields in the eastern Niger River delta. PH has bulk storage facilities for both palm oil and petroleum. In the 1970s the port was enlarged with new facilities at nearby Onne.

PH metropolis was chosen due to the following reasons:

- PH is is the capital metropolis in Rivers State and is densely populated with estimated of over 2.1 million people
- Due to search for better standard living, the migration to the metropolis is on a top rise.
- PH is an administrative and economic place.

Sources of data

Success of a research depends on ease of asses of the data (Collis & Hussey, 2003).Primary and secondary data were collected for this quantitative research approach. The primary data used are as seen in the table below.

Types of data

Research Tradition	Primary *Original data, generated for the specific purposes of a research project*	Secondary* *All available data that are 'out there' for a researcher to collect and analyse.*
Positivism	"Quantitative Data" surveys, questionnaires, web-based surveys	Publically available surveys, census reports, public databases & reports, archival records, computer based databases,
Interpretivism	"Qualitative data" Interview transcripts, observation notes, field notes, photos, video material	Publically available documents, company reports, public speeches & interviews, journal articles, books, archival records

** Secondary data can be used both as the only sources of data (see for example historiometric studies) or as complementary sources of data to primary data for triangulation purposes.*

Source: (O'Gorman & Maclntosh, 2015)

Survey

A survey was made in the geographical area to collect data. Specific areas were selected due to their peculiar function within the metropolitan environment. The survey was conducted in the following areas

- Housing areas
- Commercial areas
- Recreational areas

Primary Data Collection

Case Studies

Studies were also conducted over the internet and journals on planned mixed use development. These were chosen to enable the researcher see the practical implementation of some of the metropolitan model theories discovered in the Literature review in the previous chapter.

Criteria for choosing Case Studies

As specified by the Department of Architecture, Rivers State University, the standard number of case studies should be five in order to give the researcher a detailed understanding/ in depth knowledge of how the solution to the Architectural problem will be. These should be selected based on the following:

a) Similarities to the study (shared functions and nature of spaces, facilities).
b) Uniqueness or relevance to the study.
c) Geographical locality

DATA/MODEL PRESENTATION AND ANALYSIS

Criteria for Appraisal of Case Studies

Model Objectives of Whole Structure Model' (Prowler, 2009)

The case studies are appraised based on outline considerations in the 'Neufert Architects data: 4th Edition', the 'Model Objectives of Whole Structure Model' (Prowler, 2009). These considerations include the following.

a) Locality: Viability as to whether the study is properly situated.
b) Ease of asses: This involves consideration for ease of reach or access for the users.
c) Structure Character/ Visual Access: Concerned with how easily the physical structure relates with its purpose of use, making it easy to identify.
d) Site zoning/ Arrangement: This reviews the allotment of land area for various structure structures or outdoor functions.
e) Site Circulation and Movement: Considers the organization and planning of vehicular, cycling and movement routes within the site, as well as user/customers and service/delivery routes.
f) Orientation/Layout: involves the positioning of structures of facilities on site in response to certain natural elements and conditions.
g) Structure/ Spatial Requirements: this considers the individual structures required for district functions and the necessary spaces they contain to serve diverse purposes. It also considers movement patterns amid spaces.

- 'Model Standards for MUD'

Case Studies

Case Study 1:Nestoil Towers, Victoria Island, Lagos

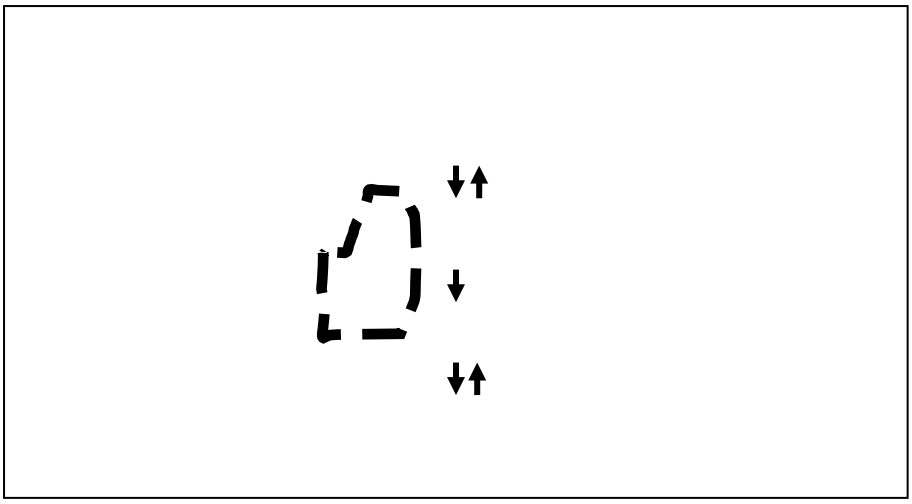


Figure 1.1: Locality plan of Nestoil Towers (source: Wikipedia)

The Nestoil Tower is strategically located at the intersection of two major business districts (Akin Adesola Street and Saka Tinubu Street) in Victoria Island Lagos.

Plate.3.1: Aerial view *(source: Wikipedia)*

Appraisal on siting

- Sited on a land size of 3900 sq.m with 10,000 sq.m leasable commercial space on 15 floors.
- The Nestoil Towers is a fifteen storey MUD consisting of 7,500 m² of administrative area space, 3,50m² housing space
- A multi-storey parking facility as well as a recreational facility.
- Sitting on a land size of 3900sqm on 15 floors
- The Nestoil Tower is an iconic structure with 9904 leasable commercial spaces and 23 housing apartments.

Plate 3.2: Night view *(Source: Wikipedia)*

Structure

i. Because of the high ground water level a secant bore pile wall and a jet-grouting plug are necessary to prevent the structure pit from flooding.
ii. Raised Floor for underground cabling, and flexible configuration of administrative area spaces.
iii. Double Glazed Curtain Wall Systems to minimize solar heat gains;
iv. The structure form was made using gentle curved surfaces of high-performance glass with horizontal tubular details which accentuate the sweeping effect of the curved façade

Plates 3.3: Rear view at night (source: Wikipedia)

Services

i. Water treatment plant
ii. Sprinkler and latest firefighting equipment
iii. Dedicated transformer with generators
iv. Disabled facilities
v. 8 restrooms per floor (including disabled toilets).
vi. 4 passenger lifts/Elevators.
vii. Car Parking Facilities for over 225 cars on 18 split levels;

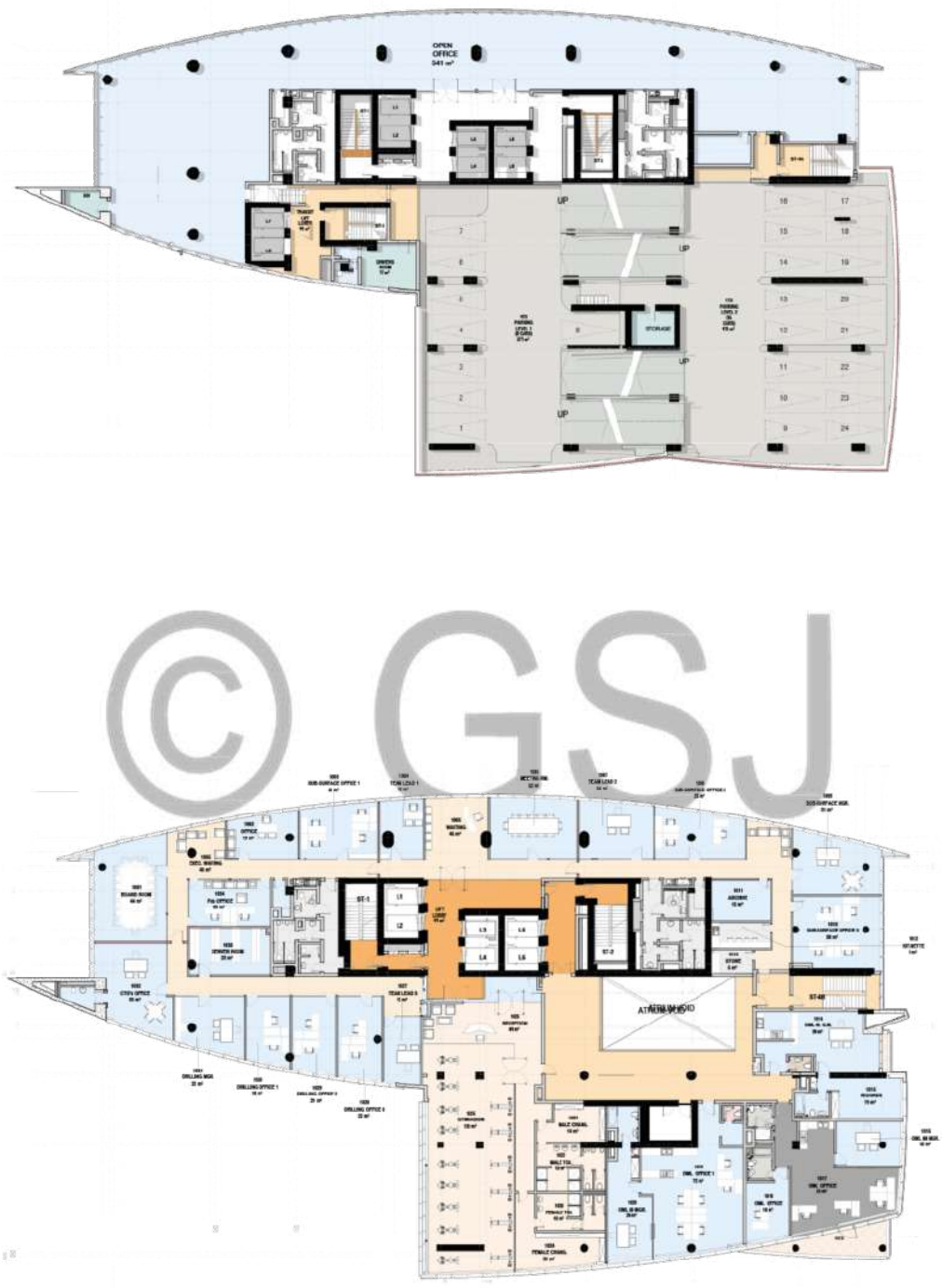
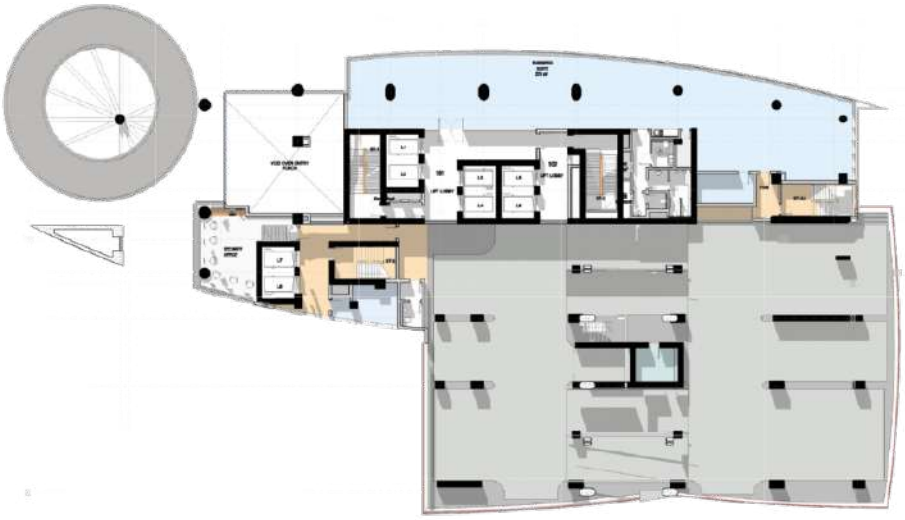


Figure 3.3: Typical floor plan (source: Archdaily)



Merits

- Strategic sitting of the tower
- Flexible model
- Double glazed glass for facade
- Regular and stable power supply
- Multi-level car park

Deductions

- The locality of development is vital to its successful use.
- Flexibility is as well vital in the model of a MUD.

Case Study 2: Church gate Towers, Victoria Island, Lagos

Architect: ECAD Architects

Figure: Locality map of Churchgate Towers (source: Wikipedia)

Structural appraisal

- The structure comprises a concrete core and post-tensioned concrete slab and spandrel beams.
- The average area to area distance amidcolumns is 7.5m.
- The column is of 0.6 x 0.6 m.
- This assembly of columns and beams forms a rigid frame that amounts to a dense and strong structural wall along the exterior of the structure.
- The façade consists of faceted unitized aluminum curtain walls with provisions for high performance double glass façades on the tower

Figure: Site block Layout (source: Wikipedia)

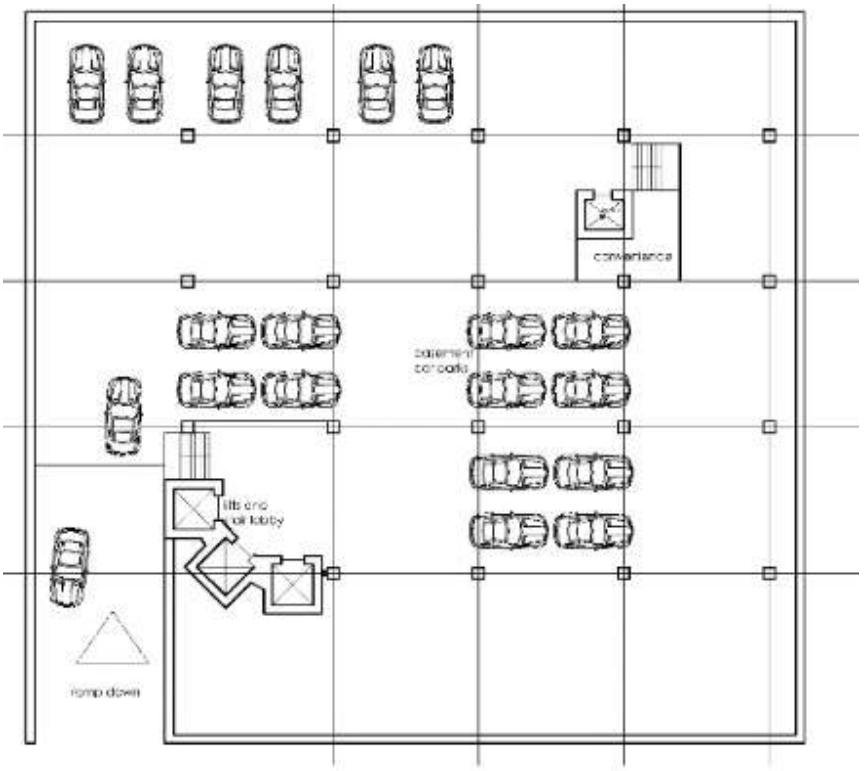


Figure: Basement floor plan *(Source: Google)*

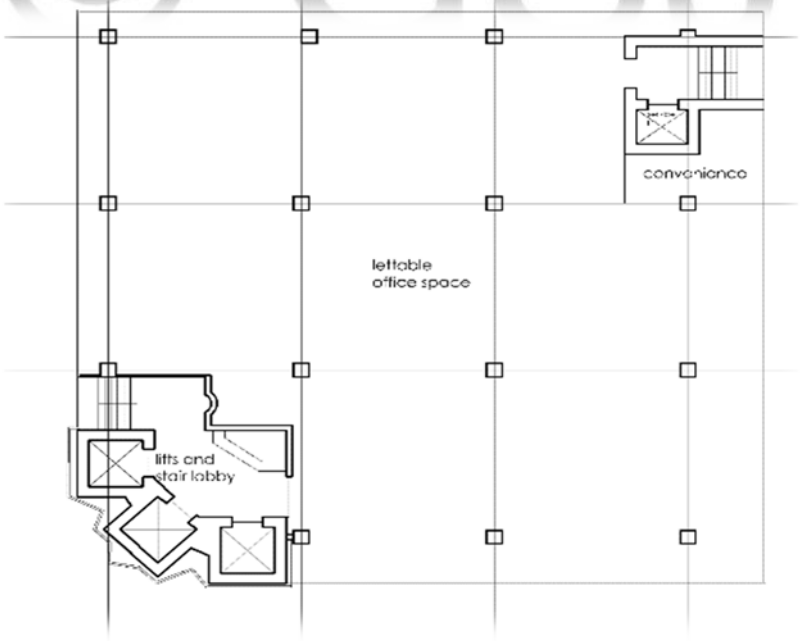


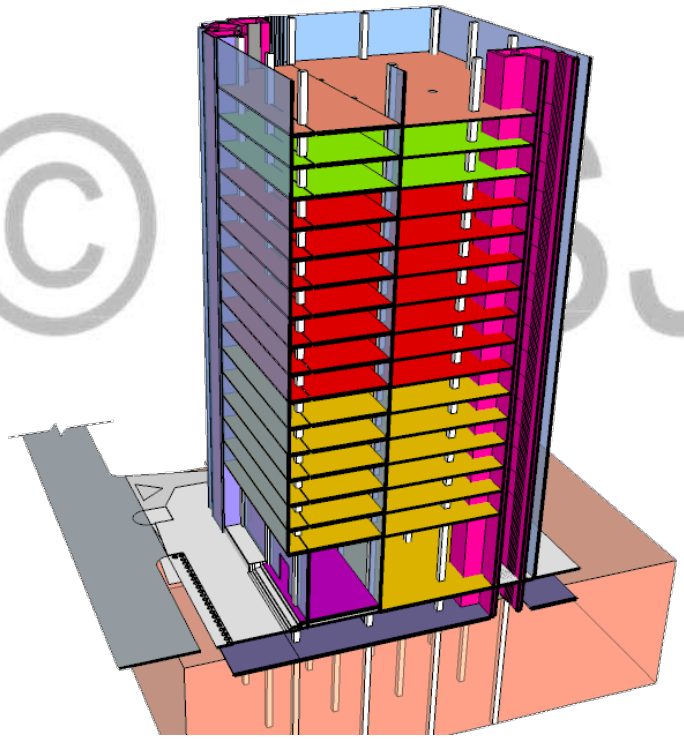
Figure: Third Floor *(Source: Google)*

Services

- Dimmer lighting systems
- Automated doors
- Public address systems
- Underground water tank with line boosters
- Power supply from mains
- Standby generators
- Sprinkler systems
- Fire alarm systems
- Data cable and CCTV systems
- Central air conditioning systems

Several companies on a floor Executive administrative doors Roof Level

One company per floor Core Areas ment park



Plates: Axonometric section (source: Google)

Merits

- Dimmer lighting systems
- Strategically located

Demerits

- Bare façade model

Deduction

- Glass façade
- Use of sustainable model construction and materials

Case Study 3: British American Tobacco, Victoria Island, Lagos
Architect: ECAD Architects

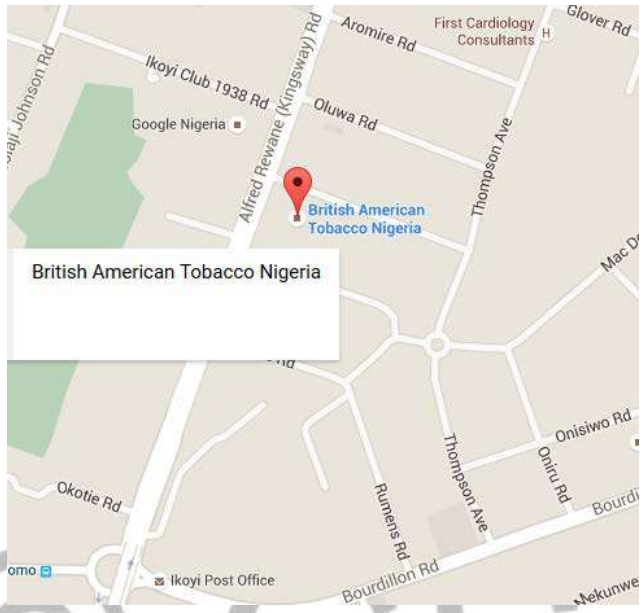


Figure: Locality plan of British America Tobacco

Brief Description

British American Tobacco developed their new HQ on Kingsway Road (Alfred Rewena Way) in Ikoyi. This study, which has been named BAT Rising Sun, consists of a 13-story mixed use tower that will serve as headquarters and also provide accommodation for high level management. Similar to Heritage Place, it was modeled by ECAD architects & Capita Symonds. However, the contractor for this study is CAPA& D'alberto.

British American Tobacco – BAT Rising Sun, Ikoyi Lagos is located one a corner piece site. It has 3 entrance – one along Kingsway Road and two along Brown Road. Two of these entrances are used for the commercial part of the structure and the other is used for the housing part. The structure although centralised on the site has been model in such a way that the people and the administrative areas staff do not cross parts. The white panels, are however more than meets the eye, they are Larcore A2 aluminum composite panels. These international grade panels are ventilated, fire rated, recyclable, energy efficient and effective for insulation. They give the upper levels of the structure, a clean look, and the finish will also be less prone to weathering from constant rainfall and dirt. This is a problem in many exposed concrete structures in Ikoyi and Nigeria as a whole.

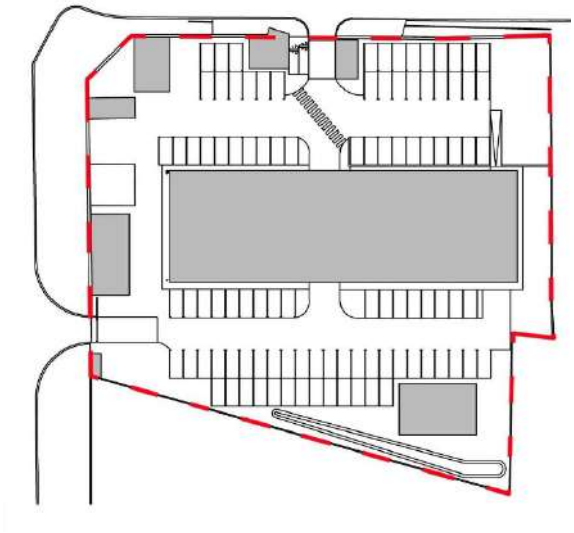


Figure: Basement car park

Exposed concrete structures are especially prone to weathering, regardless of the quality of their finishing, which can only be prevented with careful model. The BAT rising sun has inherent qualities that reduce maintenance, while providing a subtle aesthetic boost

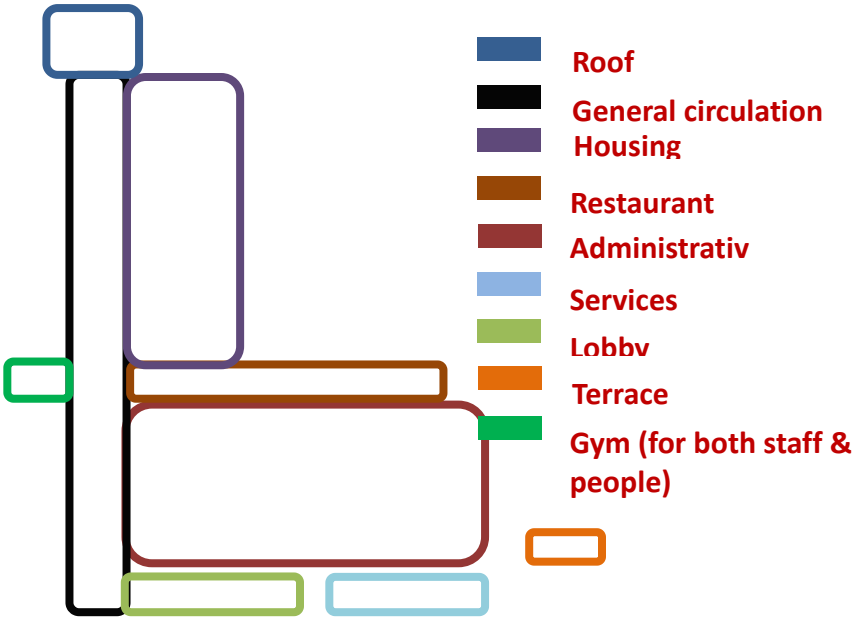


Figure: Section (source: Google)

Merits

- Strategically located
- It is very aesthetically pleasing
- It has a good site and model zoning
- Use of sustainable materials

Deductions from Case Studies

From the case studies sited, conclusion can be drawn that MUDs continues to revitalize our cities, sustains the metropolitan metropolis and is a viable component of the metropolitan revitalization.

Despite the challenges of mixing uses and functions, mixed Use developments are a wonderful structure type that has come to stay. Reasons being that;

- It boosts metropolitan opportunities for people to have various functions within their metropolis.
- This metropolitan lifestyle takes full advantage of the public amenities in the metropolis.

It additionally provides something that has been lacking for some time; a more secure 24-hour character of our metropolitan areas.

- Most importantly, it fosters vibrancy and makes the environment liveable thereby improving life in the metropolis.

INTERPRETATION AND DISCUSSION OF FINDING/MODEL DISCUSSION

In discussing the findings of this research, the following factors were considered:

Factors considered

The Car park: One of the major issues associated with this kind of structure is the issue of parking. Parking is vital in a MUD. It is an important factor due to its extremely costly nature. The parking facility will always add to the investor's cost. Also, it takes away valuable scarce land resources from the site. Even with this, it is a necessity that must be provided. Although, in some places viable mass transits are provided, these developments still demand for a large committed parking facility/space. It is not an easy task to model a MUstructure and style it to operate as a singled-use structure.

Structure Spatial : From a developer's perspective, based on the functionalities provided by a study, MUD can be further categorized into administrative area, housing, hotel, retail,

entertainment, cultural, public and civic, convention, recreational, and parking, with each function produced by a specific combination of complementary land uses (Schwanke and Flynn 2003). Thus, the selection of land uses in a MUD study can be evaluated based on the demand in local, regional, and transient drive-by market (Schwanke and Flynn 2003).

Enhancement of shopping experience

This thesis proposal took cognizance of the need to represent the ideas which is helpful in creating a comfortable, conducive learning environment. The appraisal of this scheme shall be based on the following parameters;

i. Study Objectives
ii. Site Analysis
iii. Study Analysis

Study Objectives

The outlined objectives earlier mentioned in section one of this work , were carefully observed and implemented in the course of site selection, site planning, using efficient landscape components or features, adopting the principles of landscape model composition, choosing materials that are sustainable; low e materials, environmental friendly, cost effective, durability and so on, as well as model synthesis.

Construction Techniques and Materials

The MU structure is a framed structure, which requires a degree of expertise for its construction.

Sub-structure

Pile foundation was used since of the terrain of the study site. It is recommended that the foundation be bored to reach a solid stratum. Reinforced concrete of mix ratio 1:2:4 cast-in-situ will be used. The details of the sub-structure will be to the engineer's details and specification.

Super-structure

Reinforced concrete frame structure, cast-in-situ to engineer's detail and specification. All external walls are amid columns will be 200mm precast concrete interlocking block.

Roof

The roof model of the mixed use is simple, it is a combination of roof gardens and aluminium roof panels. Long span roofing sheet will be used. For easy floor of water, the roof model includes roof drainage that channels water to a water recycling plant through 100mm or 150mm PVC pipe.

Floor

The basement floor is a suspended reinforced concrete floor, on the pile caps are also connected together with underground beams. All floor slabs excluding the basement are ribbed/ waffled, for reduced cost and long span.

Exterior Works

All external works will be constructed as planned in the model. It was modeled to include walkways for pedestrians, road for vehicles and as well drainages. Rain water on site is expected to drain from the road to the green areas and drainage. The vehicular path is 150mm higher than the green area.

The pedestrian walkways will be finished with concrete interlocks, and the vehicular path will be finished with asphalt.

Services, Circulation, Ventilation and Lighting

Services

All electrical and mechanical services are to be installed in the various duct systems provided. The structure is to be serviced by a central air conditional system. Fire extinguisher will be placed in strategic localities in case of fire outbreak.

Circulation

At the outdoor, several circulation spaces were provided for free movement and direct ease of asses to diverse part of the structure. The outer circulation spaces made are the main entrance porch, the exit porches, all corridors, concourse, lobbies, walkways, and strategic locality of stair cases. Within the structure, adequate spaces are provided for circulation in relation to furniture arrangement

Ventilation

The peculiarity of the structure does not permit emphasis on natural ventilation throughout the model. Regardless, all administrative area spaces, and housing floors have access to natural ventilation. The orientation of the structure also aids the maximal use of the trade winds.

Lighting

All spaces were modeled to have natural lighting apart from few spaces like the cinema halls, board rooms, studyor room etc. This also applies to lobbies, stair halls and conveniences

Factors considered for Site Selection

The specified land area for the proposed MUD has been chosen in an area that depicts metropolitan character of the metropolis of Port Harcourt. The site could possibly have been selected based on the following considerations:

1. Nature of the soil: The soil composition presents an adequacy for the study from an analysis of the existing study surrounding the area
2. Availability of useable space: The site is an open piece of land, free of permanent infrastructure and can sufficiently accommodate the facility with extra consideration for future expansion.
3. Topography: The site is relatively flat and this minimizes the challenges associated with complexity in model and construction.
4. Drainage: No features of water logging on the site, even during the peak of rainy season.
5. Ease of asses: The site is easily accessible to both pedestrians and vehicles.
6. Nature of activities: The site is positioned within the vibrant part of the metropolis where everything seems to now be happening. There is an influx of people to this area.
7. Degree of privacy: The study could house activities which can attract people from within and outside the metropolis. As such, the site provides an acceptable level of security.
8. Utilities: The site is within proximity to existing utilities which include water and power supply.

Study Analysis/ Model Criteria

Model Brief

The rapid metropolitan growth in PH will lead to serious congestion (human and vehicular), metropolitan sprawl, housing shortages, sanitation and infrastructural issues. Consequently, will help create a better relationship with the inhabitants of the area, one that contributes socially, environmentally and economically to the country. A vibrant new neighborhood for people, promote flexibility, openness and a model for sustainability approach to development in Port Harcourt. It should have recreational facilities, hospitality, shopping malls, restaurants etc. It should as well accommodate a minimum of 200 apartments,

Study Brief

The MUD of 25 floors which would be located at D-line, Port Harcourt, Nigeria will consist of the following:

i. Commercial use
ii. Socio-cultural use
iii. Housing use- luxury apartments
iv. Recreational facilities
    a. Soccer fields
    b. Gymnasium halls
    c. Swimming pools
    d. Lounge/ Bar

e. Recreational parks

v. The support facilities for the development would include:
   a. Multi-level parking
   b. Service areas: mechanical, electrical, plumbing, fire safe.

Conclusion

This study's aim was to model a MUD for the metropolitan unit that will produce a vibrant new neighborhood for people, promote flexibility, openness and a model for sustainability approach to development in Port Harcourt. From the case studies in PH and examples cited in the previous chapter, it can be concluded that most settlement whether planned or unplanned will end up becoming some sort of mixed use development since residence will gravitate towards activity and likewise, activity toward residence**.** The renaissance of the mixed use structure continues to revitalize our downtowns, sustains our small neighborhood commercial areas and has become a viable component of the metropolitan and sub metropolitan pedestrian metropolitan village concept. Even with the challenges inherent in mixing housing and commercial, the density impacts on our established neighborhoods, and the continued skepticisms of lenders, this is a wonderful structure type that enhances the human experience because: It promotes convenient metropolitan opportunities for people to work shop and play within a small vicinity, This life style takes advantage of public amenities such as parks, green and public transport and in addition, it provides something that has been lacking for sometime; a more secure 24-hour character of our metropolitan areas .

In considering the future of PH metropolis, one of the greatest considerations is how to achieve a sustainable living environment. Mixed use developments help people 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. The effort made to model MUDs to revitalize the metropolis of PH is important since it can help the government to have a framework as a basis for starting these kinds of development in the Metropolis. Mixed use developments will boast a sustainable vicinity, continuous connectivity and an environmentally friendly atmosphere since it integrates mixed use functions such as administrative areas, housing, retail and supporting facilities. Without proper revitalization of the metropolis, there will be no proper development of the metropolitan space that exists. This will make the metropolis lose attraction and the activity of visitors.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

- We live in a dynamic, ever changing world. Increasingly, today's cities need smartly modeled structures and spaces that can perform many functions. Properly planned mixed use developments are recognized as an excellent way to achieve metropolitan revitalization and promote sustainable living environment, as well as creating attractive and vibrant communities by providing several uses within a development. Mixed use developments help people to establish frequent contact and long-term relationships with

others. In response, the MUD must adapt, offering greater flexibility and efficiency, while helping citizens to reach for a richer, better and healthier future.

- The state government should engage in a continuous study and research about the dynamics of the metropolis. i.e. its demography, density, metropolitanization rate and trends. Data collected from these studies should be used to create a database which will aid in making metropolitan policies and decisions.

- Accurate data base on demographic and infrastructural dynamics in Rivers state will serve as a guide to investors and developers to know the investment potential of various areas in the state .

- Also this database will enable the government to know the specific situation and need of a particular area. For example if people of a particular area, live and work in diverse places, thereby creating vehicular congestion, plans could be developed to promote some form of commercial development in that area. Although not all residence will live and work in the same place, this will however go a long way to reduce vehicular congestion since some of the residence will not need to commute long distances.
- The government can use this database to make metropolitan proposals and this will be made available to the private sector. This will ensure the planned and controlled growth of the metropolis, thereby preventing the ongoing haphazard growth.

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