

# Journal of Hospitality and Tourism (JHT)



**Space and Functional Efficiency for Waterfront  
Architecture: Ibom Power Company Housing Estate,  
Ikot Abasi, Akwa Ibom State, Nigeria**

*Usen P. Udoh & Luna E. Bassey*



## Space and Functional Efficiency for Waterfront Architecture: Ibom Power Company Housing Estate, Ikot Abasi, Akwa Ibom State, Nigeria

Usen P. Udoh<sup>1\*</sup> & Luna E. Bassey<sup>2</sup>

<sup>1,2</sup> Department of Architecture, University of Uyo, Uyo-Nigeria

\*Corresponding Author's Email: [usenudoh4favour@gmail.com](mailto:usenudoh4favour@gmail.com)

### Article history

Submitted 15.04.2023 Revised Version Received 25.04.2023 Accepted 03.05.2023

### Abstract

**Purpose:** This paper seeks to demonstrate the technical, structural, professional, legal, ethical, and financial setup involved in designing Ibom Power company housing estate within the waterfront of the Qua river estuary in Ikot Abasi Local Government Area of Akwa Ibom State.

**Methodology:** Field observation/measurement, base map, site analysis and weather analysis were employed to generate data for the study. The qualitative study approach was further used to highlight the specific innovations brought into the design to overcome the spatial impediment posed by the waterfront and guarantee space and functional efficiency for the housing estate.

**Findings:** Findings showed that space and functional efficiency can be achieved by adopting common design elements for managing site shape and topography to foster storm water drainage as well as providing well landscaped open spaces and play areas for enhancing outdoor spaces.

**Recommendations:** Based on these findings, Architects and other allied professionals are encouraged to be flexible, innovative and creative while adopting common design elements for enhancing space and functional efficiency for waterfront development.

**Keywords:** *Space Efficiency; Functional Efficiency; Waterfront; Housing Estate; Ikot Abasi; Design.*

## 1.0 INTRODUCTION

The design of housing estates at waterfront requires technical, professional, and innovation in order to provide the spatial ambience as well as ensuring the functionality of the housing to meet the desired purpose. Waterfront architecture means the interaction between urban development and water (Yasmin et al, 2010). Waterfront architecture is a major phenomenon in developed countries and emerging trend in some cities in the developing nations such as Nigeria. According to Socrates (2011), the key factors for waterfront developments include integration of the site into the city and into urban life, paying attention to accessibility and security as well as planning flood control and fitting the site contextually within the existing landscape. The other consideration required is to give the building more character and making them look aesthetically beautiful.

Historically, waterfront Architecture began in the West. The earliest being the waterfront development on the River Thames in London (Davidson, 2009). Subsequently, many more waterfront architecture has been established along favorable waterfront areas both in the developed and developing nation; such as Falmouth in UK, Toronto Harbor Front in Canada, Riverfront development in Malaysia, Mumbai waterfront in India, Bahery waterfront in Egypt and the Lekki waterfront in Lagos, Nigeria to mention but a few.

However, the case study analysis of water front development across these countries reveals significant difference in the structural, and the technical built up of the areas (Amireh, 2020). The structure of waterfront landscape in most developed countries are sophisticated with high degree of land suitability mapping, rigorous site analysis, weather analysis, site accessibility, modern design concept, detailed site plan and the use of common design elements to improve space and functional efficiency (Amireh, 2020). Waterfront Architecture appear to be sustainable and formidable in developed countries compared to the developing countries owing to environmental, economic, cultural, social and technological factors. Some waterfront Architecture in developing nation such as the Carter Road waterfront in Mumbai lacked easy accessibility and functionally designed facilities that are satisfactory to all users. (Shimul and Aril, 2017). This is so because stakeholders including the Architects compromise the principles underlying sustainable waterfront design and development as proposed by Torre (1989).

The purpose of this paper is to demonstrate how the technical, structural, professional, legal, ethical and financial set up were integrated into the design of Ibom power company Housing Estate in Ikot Abasi, Akwa Ibom State, Nigeria. The essence is to highlight the intrinsic issues involved and show how they were properly harness to guaranteed space and functional efficiency.

### 1.1 Theoretical Framework

This paper is underpinned by two key theories: the efficiency theory and the theory of sustainable waterfront development. Overtime, the efficiency principle has been demonstrated in the main stream Architectural design in managing limited land resources. According to Liberto (2022), the efficiency principle states that action achieves the most benefit when marginal benefits from its allocation of resources equal marginal social costs. The application of this theory guarantees creating products with the lowest possible costs, eliminating dead weight loss or misused resources. Space efficiency is one of the most important design considerations in architectural design especially for tall buildings and housing estates (Huseyin, 2021). In his study of space efficiency and the main architectural and structural design consideration affecting it, Huseyin (2021) found out that space efficiency for tall buildings decreased as the building's height increased and that the planning of such spaces was critical to the outcome. Mustapha (2014) applied the term "spatial configuration" to underscore the role of space efficiency in

mediating on the processes and functionality of housing estate in Erbil city, Iraq. According to Daniel and Sirbu (2012), the purpose of good design is to identify the aspects that contribute to obtaining the most functional aspect from a given space. It further noted that the aspect of space efficient design connotes reduction of exceeding space, evaluating the necessary functions destined for the building and a study of a spatial form in order not to create any unnecessary spaces. Furthermore, the architect should evaluate the construction methods that facilitate a certain type of opening, producing a flexible design and a balanced proportion between the used area and the built area (Udoh and Etteh 2019<sup>a</sup>). According to Ali (2020), adherence to the above schemes is by far necessary for enhancing functional efficiency especially at waterfronts. In line with the above review, space efficiency in the context of this report means providing a design that circumvents the spatial impediments posed by certain environmental factors such as a water body in such a way that ambience of space is guaranteed (Udoh and Etteh 2019<sup>b</sup>). Functionality is achieving the desired purpose of the housing such that comfort, accessibility, orientation, lighting, ventilation, etc. is guaranteed.

The theory of sustainable waterfront development is hinged on ten key areas as outlined by Torre (1989). He emphasized the functionality component of the development in terms of accessibility and circulation, adequate parking capacity, ease and comfort of pedestrian movement, visitors' overall experience as well as meeting the capacities on peak activity days. Accordingly, Torre highlighted the elements that drives sustainable waterfront development to include: effective management of the project, financial feasibility, environmental approvals, public perception of need, functionality, authenticity, image of the project, and construction technology. In furtherance of the above, Bertsch (2008) added three key principles to include integration of the history, culture and existing architecture for a new waterfront development as well as balance between public benefit and developer profitability through a public-private partnership and stakeholder participation – government agencies, developers, community, organization, environmental group and the public.

## **1.2 Statement of Problem**

Akwa Ibom State is a largely littoral State and has the longest shore line among the States of the Nigeria Federation. With her abundant water resources including waterfront, it boasts of high potentialities of becoming an emerging tourism hub in Nigeria (Essien, 2016). In spite of these geographical advantages, the level of utilization and development of her waterfront for residential, recreational and urban renewal is low. In areas where waterfront development exists, their sustainability in terms of space and functional efficiency is in doubt. The underlying question is: How can stakeholders including Architects harness their professional skills, technology, legal provisions, technical capabilities and other resources to design and develop waterfront architecture that guarantees space and functional efficiency? Are there theoretical assumptions and principles that can be leverage upon to produce this feat? Which innovative design elements can Architects adopt to enhance the quality of space and functionality of waterfront development? These issues are some of the contextual gaps in knowledge that the present paper seeks to bridge by demonstrating and highlighting the technical, professional, legal, structural, technological, financial and ethical considerations applied to create waterfront Architecture on the Qua River Estuary in Akwa Ibom State, Nigeria.

## **1.3 The Study Area**

Ikot Abasi is located in the south west corner of Akwa Ibom state, Nigeria. It is bounded by Oruk Anam Local Government area in the North, Mkpato Enin and Eastern Obolo Local government areas in the East and the Atlantic Ocean in the South. The Imo River forms the natural boundary in the west separating it

from Rivers State. It lies at the mangrove swamp and rainforest of the Eastern part of the Niger Delta region.

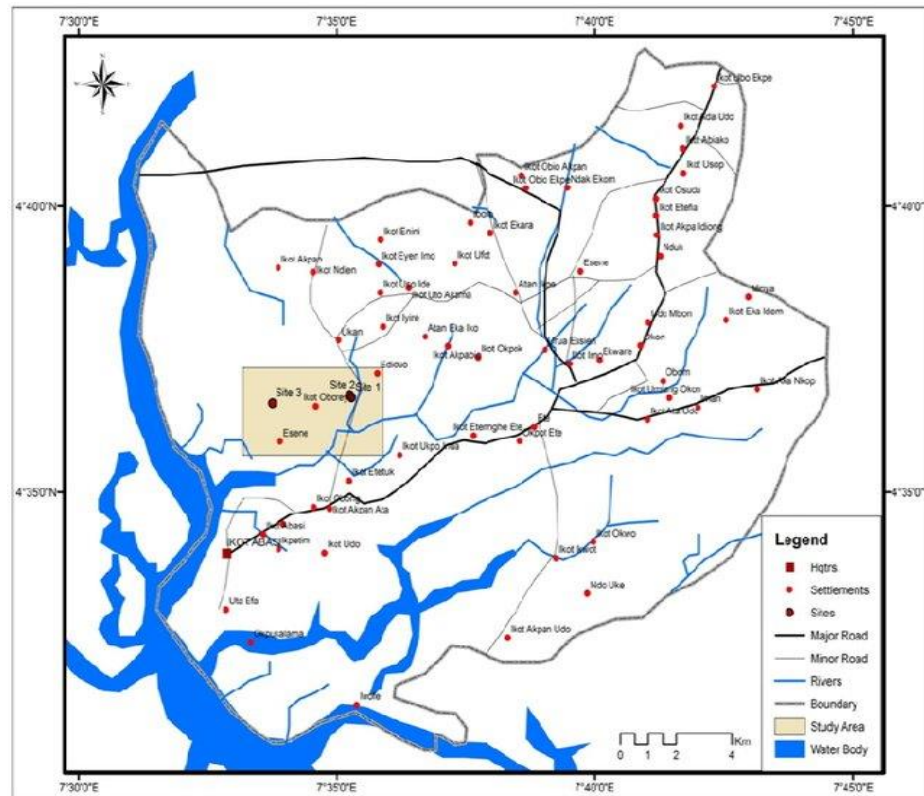


Figure 1: Map of Ikot Abasi Local Government Area

The study site is located in the heart of Ikot Abasi Local Government headquarters and is bounded in the north east by Ibom Power plant with a space of undeveloped land covering a distance of about four hundred meters between them. On the south-west, it is bordered by the Aluminum Smelter plant conveyor belt, while the entire southern border is a vast expanse of land extending to the Jaja Creek, which opens into the Imo River. The site is irregularly shaped and covers an area of two hectares with undulating topography and seasonal ponds of water at some parts of the site.



Figure 2: The Ibom Power Housing Estate Project

The main purpose of the project was to develop a housing estate that will serve Nigerians and foreigners working in Industries and other facilities located within the Ikot Abasi local government area and adjoining local government areas. The project was to be handled in such a way that the several challenges presented by the site topography and environment are taken care of and the advantages it has with sharing a common boundary with a waterfront are promoted and enhanced. The designs of the several components of the estate were done in such a way that a symbolic and iconic facility meeting the basic requirements in term of spatial efficiency, functionality, structural stability and aesthetics are fully attained.

#### **1.4 The Project Design/ Work Processes**

The project focused primarily on designing a housing estate in a site with a waterfront. Stage one of the project were the preliminary and sketch designs. The work team had to undertake a comprehensive site analysis and studies. This was done to determine the site topography, things found in them and the sub-soil situation. This was followed by the definition and detailed analysis of the client's brief which showed clearly the requirements of the client, feasibility and viability of those requirements for the site setting.

The design team provided the description and illustration of outline proposals for the client's consideration and action. The cost of the different components of the project was worked out to determine the total cost of the project. The design also prepared the schedule for drawings production and project execution with the exercise showing drawings to be produced and the number of drawings to be submitted at each stage. Above was followed by the provision of a register of contract documents with proper identification, annotation and numbering of each of them. Furthermore, the other professionals like the Quantity Surveyors, Structural Engineers, Service Engineers such as Mechanical and Electrical Engineers were brought in while the Architects coordinated the activities of all of these consultants. The above activities led to the generation of the full report of the project complete with the estimated cost for the client's approval.

Stage two of the exercise involved the production of full-scale detailed designs and specifications, production of work details and schedules and the coordination of the activities of allied consultants on the project. The other aspects of the work entailed pre-tendering process where suitably qualified contractors were invited to tender for the construction of various aspects of the works. Thereafter there was appraisal, analysis, evaluation of tenders and making recommendations to the client as to the most suitable company to carry on the task of construction based on their quotation, experience, availability of equipment and personnel.

The last stage involved Contract Administration and supervision. The Architect leading the Contract Administration team handed over the site to the contractor after ascertaining some basic things at the site to confirm their conformity with work drawings and bill of quantities. This was followed by approval of contractors' program of work, checking and confirmation of setting out of the buildings.

The other aspects of the work included coordination of the activities of allied consultants, contractors and sub-contractors on the site, holding site meetings, issuing payment certificates and submission to the employer, quarterly reports and photographs. The next part of the service included giving instructions on matters so empowered by the contract, handing over of completed buildings to the client and provision of final inspection/ issuance of completion certificate, final account and final payment certificate.

The applicable code used is the National Building Code of the Federal Republic of Nigeria (2006) which seeks to clearly and broadly define minimum standards applicable for the various building types,

construction, and performance classifications. All the players were to adhere strictly to the policies on Community Relations, Safety, Health and Environment.

### 1.5 The Design Concept

The overall scheme was conceived as a residential complex that is habitable, adaptable, self-sustaining, and conducive to healthy and comfortable living. In arriving at the concept for the proposed project design, various factors were considered. Recent happenings in the Niger Delta Region of the country made security of prime consideration due to serious security challenges observed in the region and therefore influenced the placement of the various blocks, arrangement of internal spaces, and location of communal facilities. The clubhouse, a separate centrally located block housed a large estate kitchen with ancillary rooms. A Restaurant, Snack Bar, an indoor sports hall, and lounges, as well as a multi-purpose hall, were strategically positioned to service the whole complex. The sitting of the swimming pool, other sporting facilities and Shopping Center was to allow for ease of operation and accessibility, yet they were zoned away from the living quarters to shield estate occupants from the unnecessary nuisance of noise, traffic, and food smells expected to be generated by these facilities. For obvious reasons too, the layout of both the residential and communal units and blocks possessed well-defined entrance ports and reception foyer that enabled an efficient and air-locking system, aside from their enhancing order and direction of movement of residents, guests and service staff. Sufficient storage rooms, emergency escape routes and “safe rooms” were also provided.



Figure 3: Site Layout



*Figure 4: Site Landscaping Plan*

Physical connectivity and linkages of the various blocks were achieved via roads, walkways, and footpaths. The overall design ensured clear separation of vehicular and pedestrian traffic whereas, the well-articulated key landscape features checked noise and dust pollution and also enhanced overall site functionality. The rich preservation of user- friendly indigenous flora was done to highlight the beauty of the natural surroundings for visual comfort and active recreation purposes.

Worthy of note is the fact that the site topography influenced the juxtaposition of the various building units as well as the primary and secondary roads network layout within the estate. The full advantage of the site's topography was taken into consideration by ensuring that all the roads and dwellings were placed where their construction cost was highly minimal.



*Figure 5: 2 Bedroom and 3 Bedroom Bungalows Floor Plans*

The gatehouses were structured to accommodate functional and operational requirements at their optimum. Provision was also made for the location of Security Shelters or Sentry Booths at well



designated points within the bounds of the estate to markedly complement the security lighting, alarms, cameras, and CCTV monitoring systems also provided in the estate.

For ease of operation, the Utility Building was set to house service load controls for the entire scheme within rooms of minimum comfort levels as well as provision for supervisor's offices, staff changing/cloak rooms, two stores and a delivery bay/ maintenance yard. Facilities were placed such that it gave the users a sense of community and belonging by the way they were juxtaposed.



*Figure 6: 3-Dimensional View of 2 Bedroom Bungalow*

### **1.6 Special Features/ Innovations**

The building designs although contemporary moved away from the standard house types due to the variety of users and security concerns to have such facilities as security holding spaces within some buildings. All buildings were bungalow type structures and having good quality and contemporary building elements to fit into the waterfront placement. Site shape and topography was considered for storm water drainage and total avoidance of flooding at all seasons of the year. Provision of well landscaped open spaces and play areas deliberately and imaginatively incorporated into the design to make the outdoor spaces inviting.

The street design considered place before movement. The natural features on the site such as water ponds determined the direction, size and construction methods used for streets within the estate. The elements of the streetscape contributed to sense of peace not just for the houses but for the hard standing, the landscaping, the street pattern, parking layout, boundary treatment, public/ private spaces coming together to create a unique development.

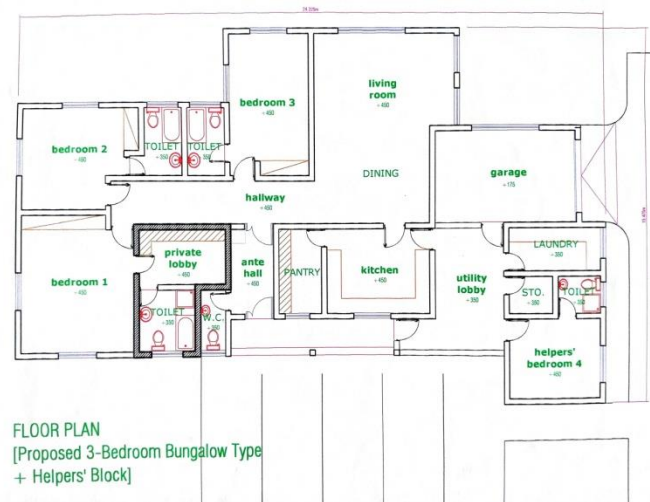


Figure 7: 2 Bedroom Bungalow with Safety Holding Space

The facility had to be in tune with and provide direct response to the tropical rainforest climate, vegetation and other environmental conditions of Ikot Abasi. It also needed to enhance the traditional and contemporary way of operations majority of its prospective users, the economics of construction, the factors of durability and maintenance as well as to give due attention to the tropical ideals of functionality, aesthetics, and tropical stability very useful most times of the year. The concept of green infrastructure involving use of ecosystems, green spaces and water in strategic land use brought to existence by uniting different elements together in the site. The design approach also took due cognizance of other subsisting site conditions like sub-soil characteristics, local climate, natural vistas, socio-cultural factors, and aesthetics. The scheme achieved the harnessing and integration of local manpower, the use of available construction materials, and technical resources. The entire process was geared towards reaching an endpoint that satisfactorily meets the client's specifications on time, schedule, budget, and quality.

## 2.0 CONCLUSION AND RECOMMENDATIONS

### 2.1 Conclusion

Space and functional efficiency remain the hallmark of a good design. Far more challenging are the issues of overcoming certain geographical impediments to provide space and functional efficiency for an elaborate design such as a housing estate. This report has offered a ray of hope for those architect who are interested in harnessing their professional, technical, structural and ethical expertise in designing housing that guaranteed optimal space and functional efficiency especially on a waterfront. The present paper focused on issues surrounding the design of a housing estate within the waterfront of Qua Iboe river estuary in Ikot Abasi L.G.A of Akwa Ibom state.

Specifically, the report has highlighted the structural innovations in the building design with good quality and contemporary building elements that fit into the water front placement. Furthermore, site shape and Topography were given priority consideration for storm water drainage and total avoidance of flooding at all seasons of the year. Also, the provision of well landscaped open spaces and play areas for enhancing outdoor spaces remains a masterpiece in the design. Apart from the practical design features highlighted in this report, there is ample evidence of advances in theoretical architecture embedded I this report as a way of bridging the yearning gap in theoretical architectural research.

## **2.2 Recommendations**

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

- i. Architects should adopt and apply the principles of sustainable waterfront development outlined in this paper for maximum space and functional efficiency.
- ii. There is need for Architects to be flexible in developing and executing design concept as well as demonstrate innovation and creativity in developing waterfront.
- iii. Common design elements such as paving, lighting, art and history are critical for enhancing the functionality component of waterfront architecture and should be utilized by Architects.

## REFERENCES

- Ali, H. (2006). Analysis of Functional Efficiency in Houses of Tabriz City in Qajar-Renod Based on Quality of Access to Space. *Real Estate Economics*, 20: 52-70
- Amireh, R. (2020). Urban Waterfront Planning and Design. A Dissertation in the Department. of Urban Planning Engineering, An-Najah National University, Nablues.
- Bertsch, H. (2008). The key elements to Successful Waterfront Design. *Real Estate Weekly*. 54(39).
- Daniel, G. and Sirbu, M. (2012). Space Efficiency in Building Design. Available online@ <https://www.researchgate.net>. Accessed on 6 March, 2023.
- Davidson, M. (2009). Waterfront Development. *International Encyclopedia of Human Geography*, 2009, Pages 215-221
- Essien, A. (2016). Tourism Structure, Patterns and Socio-economic Development in South- South Nigeria. A thesis in the Department of Geography, University of Uyo, Nigeria
- Hou, D. (2009) Urban Waterfront Landscape Planning, Master thesis, Blekinge Institute of Technology Karlskrona, 53p Sweden
- Huseyin, E. (2021). Space Efficiency in Contemporary Supertall Residential Buildings. *Architecture I*(1):2
- Liberto, D. (2022). Efficiency Principle. Available online @ <https://www.investopedia.com> Accessed on 6 March 2023
- Mustapha, F. (2014). Spatial Configuration and Functional Efficiency of House Layouts. LAP LAMBERT Academic Publishing.
- Shimul and Anil, K. (2017). Social Sustainability of Urban Waterfront: The case of Carter Road Waterfront in Mumbai, India. *Procedia Environmental Sciences*, 37(37): 195-204
- Torre, L.A. (1989). *Waterfront Development*. New York: Van Nostrand Reinhold
- Udoh, U.P and Etteh, D. (2019<sup>a</sup>), Multi-functionality and Adaptability in Building Design: Lessons and insight from the Center for Research and Development, Uyo, Nigeria. *The Artist Journal 3*(1): 158-170, April 2019.
- Udoh, U.P and Etteh, D. (2019<sup>b</sup>), Enhancing the performance of Multi-Purpose through the Manipulation of Volumes and Sub-Components. *The Artist Journal 3*(2): 41-50, November 2019.
- Yasin, A. B., Eves, C. and McDonagh J (2010). An evolution of waterfront Development in Malaysia. 16 Pacific Rim Real Estate Society Conference Wellington pp. 1-17
- Yassin, A., Sandy, B. and Mc Donagh, J. (2012). Principles of Sustainable Riverfront Development for Malaysia. *Journal of Techno-Social*, 4(1): 21-36