Prefabrication and Modular Construction (A Review of the Benefits and Challenges of Sustainable Buildings in Lagos State, Nigeria)

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ABSTRACT

Lagos State, Nigeria, faces a severe housing deficit, prolonged construction timelines, and environmental degradation due to traditional building methods. Prefabrication and modular construction (PMC) offer sustainable alternatives by enhancing efficiency, reducing waste, and lowering carbon footprints. This paper reviews recent advancements, benefits, and challenges of PMC adoption in Lagos, drawing on case studies and empirical research. Key findings indicate that while PMC can revolutionize Nigeria's construction sector, barriers such as high initial costs, regulatory gaps, and limited local expertise hinder its widespread implementation. Recommendations include policy reforms, workforce training, and public private partnerships to facilitate sustainable building practices.

Keywords: Modular Construction, Prefabrication, South west Nigeria, prefabrication modular construction (PMC), Materials

INTRODUCTION

Lagos State, with over 20 million inhabitants, requires an estimated *500,000 new housing units annually* to meet demand (World Bank, 2023). Conventional construction methods are slow, costly, and environmentally unsustainable. Prefabrication (off-site manufacturing) and modular construction (on-site assembly of pre-built modules) present innovative solutions aligned with global sustainability goals (UNEP, 2022). This allows for more freedom in design and can create a more aesthetically pleasing final product (Cianciolo, 2024). Modular building is a subset of prefabricated construction that involves assembling individual building modules to create a complete structure (Sunny, 2023). This literature review explores the benefits and challenges associated with these methods in the Nigerian context, drawing upon existing research and case studies. The rate at which construction projects are going on in Nigeria has become so rapid and spontaneous. This however, is in a response to the basic needs of our society, being one of the fastest and emerging societies in Africa. Hence, the search for an efficient method of construction has led us to the subject of Prefabrication; to make it an alternative method of construction. Prefabrication can be defined as the practice of manufacturing sections of something, especially a building, so that it can be transported to a site and easily assembled there.

Lagos is a port which originated on islands separated by creeks, such as Lagos Island, fringing the southwest mouth of Lagos Lagoon while protected from the Atlantic Ocean by barrier islands and long sand spits such as Bar Beach, which stretch up to 100 kilometres (62 miles) east and west of the mouth. Ikeja is the capital of Lagos State. Lagos state is located between latitudes 6°23'N and 6°41'E; and longitudes 2°42'E and 3°42'E. Lagos State is bounded in the North and East by Ogun State, in the South by Atlantic Ocean/Gulf of Guinea, in the West by Republic of Benin

This paper examines:

- New trends in PMC adoption in developing economies.

- Adnatges of PMC for Lagos' housing and infrastructure needs.

- Key challenges and strategies for uplifing PMC in Nigeria.

The methodology to be used is descriptive survey.

The collection and interpretation of data to solving a particular problem is paramount to a research publishable study. Hence, this chapter defines the research methods which have been applied in the process of collection and analysis of data. It includes the data sources, the modes of collection and the types, as well as the method used in narrating the results.

Purpose of Research

The purpose of this research is to enlighten the professionals in the construction industry about the viability of Prefabrication and further seek to make it a choice method for the construction of houses and most importantly, the production of mass housing and shelters.

Types and Sources of Data

The data type that was applicable to this research is descriptive data. It involved collecting descriptive data from various natural settings thereby gaining an insight to the subject matter and providing answers to questions such as finding out the way the variables are, how and why they came to be that way and whatever meanings they hold. The results of this research were descriptive and narrative in nature.

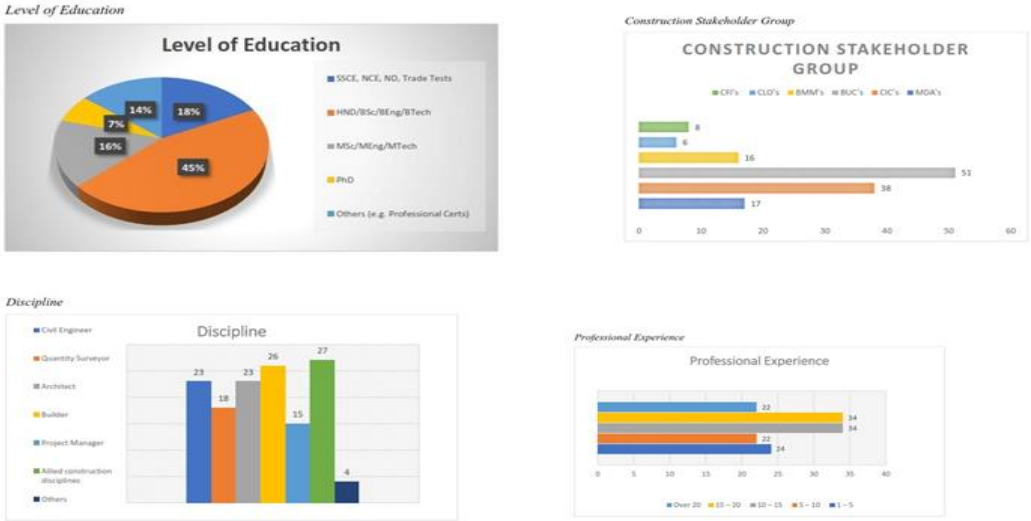

Figure 1.0 Demographic chart

LITERATURE REVIEW

Beside from the traditional method of construction known to man, which is the cement and mortar style of construction, many professionals in the construction industry are not aware that there are other ways to delivering high-quality, well-designed buildings, which are efficient, durable and easily erected within a short period of time. Efficiency in construction is as important as the end product itself. Hence, it is in this light that the researcher wishes to introduce the subject of Prefabrication as an alternative method of construction to the construction industry in Nigeria and examine how it can positively affect the system as a whole. The adequate provision of houses is critical, but the affordability of such houses is just as critical, if not more so. According to Abimaje et al. and Abdu et al. (2018), most houses on the market are unaffordable. The concept of affordable housing focuses on the needs of home buyers or renters in relation to their income. Prefabrication is a manufacturing process, generally taking place at a specialized facility, in which various materials are joined to form a component part of the final installation (Gibb, 1999). Prefabrication is also defined as manufacturing sections of an object, especially a building, so that it can be transported to a site and easily assembled there.

Therefore, a prefabricated building is a structure built through the association and or completion on site of many elements built in a factory or assembled on site. For example, *New Italian Seismic Legislation* defines a prefabricated structure as being composed of elements in prestressed reinforced concrete, assembled on sites or in dedicated factories with industrial processes and assembled on site using dry or wet structural assembly. Prefabricated units could range from stairs, windows, wall panels, columns.

History

Prefabrication, or building components off-site, has a long history, with examples found throughout various periods and cultures. While the term "prefab" is often associated with modern construction, the concept of pre-manufacturing building parts and assembling them on-site has been practiced for centuries.

The History of Modular Construction - Satellite Shelters

Here's a brief overview of the history of prefabrication:

Early Examples:

Ancient Times:

The earliest examples include nomadic peoples utilizing prefabricated structures like teepees, yurts, and other portable dwellings. The Roman Empire also employed prefabricated elements for building forts in newly conquered territories, including Britain.

16th Century:

Timber components for Nonsuch House were crafted in Holland and assembled in London.

19th Century:

The Industrial Revolution and the need for rapid construction in colonies and during events like the California Gold Rush led to increased prefabrication of buildings, including farm buildings, bungalows, and houses.

Mid-19th Century:

The Crystal Palace, constructed for the Great Exhibition in London, was a prime example of a large-scale structure built from prefabricated cast iron components.

Late 19th Century:

The Eiffel Tower, built for the 1889 World's Fair, was another iconic structure assembled from prefabricated iron elements.

Early 20th Century:

Sears, Roebuck & Co. began selling kit homes through mail order, making prefabricated housing more accessible.

Modern Prefabrication:

Mid-20th Century:

The modernist movement, with architects like Le Corbusier and Buckminster Fuller, explored the potential of prefab for creating efficient and adaptable living spaces.

Post-World War II:

Prefabrication played a role in addressing housing shortages after the war, and the concept continued to evolve.

21st Century:

Prefabrication is experiencing a resurgence as a modern method of construction, driven by factors like sustainability, cost-effectiveness, and speed of construction.

PREFABRICATION METHODS

The way in which prefab construction is carried out varies from place to place. However, there are three major methods of prefab construction. In some cases, these methods may be integrated in a particular construction i.e. all methods incorporated in one construction. They are;

1. Panel Method

2. Frame Method

3. Modular Method

Panel Method

A panel can be defined as a flat rectangular piece of hard material that serves as a part of something such as a door or wall, often raised above or sunk in the surface (Encarta 2009). The structural systems consist of planar wall and slab elements, which simultaneously form an enclosed space. The panels can either be constructed of timber, steel and concrete. The panels are usually built into frames which may be left hollow or sometimes filled with Expanded Polystyrene (EPS) or an insulating fiber board to provide a form of stability and to also provide thermal insulation. The plan of the building to be constructed is sent to a prefab factory and then all the various walls, slabs and other components are cut out to the specific dimensions including the wall openings and fabricated in the factory. Precision is very crucial with this method, as all the various building parts have to fit perfectly into one another. The various Panels are transported to the construction site using a truck or a trailer. These panels can then be assembled manually on site or with the aid of a crane. The panels have tongue and grooved edges with some integral closure mechanisms designed along the edges to provide for locking. Individual panels are connected together with the locking mechanisms and fixed into a base channel. The panels are then anchored down to the floor. The foundations are usually concrete floor slabs. When assembled, the wall panels are capped with an inverted channel onto which the next floor or roof structure is fixed.

Figure 2 .0 Showing The Panelsystem Of Prefabrication

Source: Wikipedia, 2021

The dimensions of the panels are dependent upon material selection, transport conditions and the constructional grid dimensions. The panel height is equivalent to storey height. There are two different approaches to the assembly of steel panels and they are;

1. Platform Construction

2. Balloon Construction

Platform Construction:

With this method, the building is constructed storey by storey.

The floor slabs rest directly on the high wall units.

Balloon Frame construction:

With this method, the external walls stretch over the full height of the building. The floor slabs are not connected to the wall construction, but to console elements that are welded to the stud sections.

Frame Method

Steel is the material that is used in this type of construction, not just any steel, but high tensile steel due to deflection and bending that may occur among the structural members. Frame or skeletal construction involves the use of both universal columns and universal beams. Combined with bracing elements, they provide an essentially stable construction, which is capable of withstanding both vertical and horizontal loads. Most importantly, the load bearing structure and its junctions are to be designed in harmony with the fit-out and facade systems in order to stabilize the building. The beams are designed as simply supported spanning between columns which extend the full building height, or as continuous beams supported on storey high columns. The columns take vertical loads while the beams take the horizontal load. Column grids are used to guide the construction using this methods. The structural members are held together by frictionless joints. Nuts and bolts are used to fuse the structural members to one another.

Members may also be welded to one another. The skeletal frame can then be filled with masonry blocks or expanded polystyrene (EPS) and covered with an external aluminum cladding or finished to the desired specification. Pad foundation is used in this type of construction; where the column members are bolted into a concrete footing.

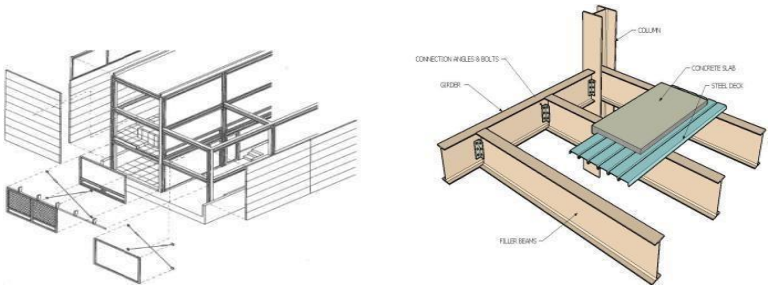

Figure 3.0 Showing the Frame Method of Construction and The Floring System

Source: Building Systems, 2021

Case Study

Nigerite is a Nigerian based construction company that deals with the manufacturing and Marketing of Fibre-Cement Roofing Sheets, Ceiling Sheets, PVC Floor Tiles and Calcium Carbonate, wall tiles, floor tiles, claddings, roofs and other building components. It was established in the year 1959 in Lagos, Ikeja. Its major operations is based at Oba Akran Avenue 41. Ikeja - Lagos. Nigeria. Nigerite has a vision to be the best in innovation when it comes to their products worldwide. This however, has been the driving factor in the production of their various distinct building materials such as the concrete roofing tile also known as "cretile", their kalsi boards, wall claddings, their floor tiles and most especially their prefabricated buildings. This section of the chapter would be focused on the prefabricated building. Base on the mass deficiency in housing, and the need for government to produce a lot of housing units within a limited period of time, the dry construction unit of Nigerite decided to venture into study that could help them to achieve the construction of mass housing units within a short period of time. This study therefore, brought about the construction of the Nigerite Prefabricated house. The building is located to the right, just inside the Nigerite compound. It was made as a prototype for

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visitors to look at as well as a model that was used to test the viability of the prefabrication method of construction. The building is a prototype of a residential duplex. it is about 6meters in height. There are no internal partitions inside the building, as the building is left open to the carcass so that viewers can understand the structural system of the building. The method of prefabrication used in the construction of the building is the Panelized system of construction whereby all the walls are cut out as panels and are then assembled and locked in place.

The building is very modular and cubical in shape conforming to regular gridded pattern. The building is about 8meteres on all sides. The name of the material used for the carcass of the wall panel is the Ultralite Galvanized steel. This material is a type of steel but is very light and helps to reduce the self-weight of the building. The major building materials used in the construction of the prefab house are; the Ultralite Galvanized steel used for the tracks(horizontal 54 wall members) and the studs(vertical wall members), the Kalsi boards made of fibre cement used for the internal walls and cladding, and the mineral wool which serves as the insulation.

Design Process

Once the architect was done designing the building, the floor plans, roof plans and the working drawings were sent to the structural engineer who then redesigned the building using a software known as "Frame CAD". After the redesign of the building, the software generated new values for the wall thicknesses based on the track width. Therefore, instead of a wall thickness of 225mm, the new wall thickness became 112mm.

Modular Method

In this method, the building is divided into several modules. These modules may include rooms, kitchens, living areas, balconies etc. These modules are enclosed by walls on the sides depending on how the design is and are then arranged on the site. Each module has its own steel frame, providing structural integrity for the building. Each module can be brought to site in a variety of forms, ranging from a basic structure to one with all internal and external finishes and services installed, all ready for assembly. The casting of modules uses the benefits of factory conditions to create service-intensive units where a high degree of repetition and a need for rapid assembly on-site make its use highly desirable. The size of a module is dependent on the medium of transport, road and the site access. The modules need to be strong enough so as to make it durable enough for transport. The modules are stacked on site with the aid of a mechanical crane. Standard sizes are 3x8m, although a maximum dimension of 6x20m is possible. Steel room modules usually measure 3.2 to 3.7 in height. A level of prefabrication of up to 90% is possible.

Depending on the size of the building project, the modules can be ready for delivery in eight weeks. These modules are adaptable; for example, if the function of the building changes or it has been transferred to another location, additional modules can be combined both vertically and horizontally as required with a maximum of six storeys. (Gerald et al. 2008)

However, modular system is predominantly employed when the assembly is to be completed as quickly as possible. It is suitable for both temporary and permanent buildings where the floor plan layouts are regular and can be organized into unified modules.

Figure 4.0 Showing How A Highrise Building Is Constructed Using Prefab And A Prefab Row

Housing Source: Components And Systems, (Newmann, 2009)

Characteristics Of Prefab Construction

refabrication in construction is characterized by its efficiency and speed, as components are manufactured off-site in a controlled environment and then assembled on-site. This method offers several advantages, including reduced construction time and costs, enhanced quality control, improved safety, and increased sustainability.

Here's a more detailed look at the characteristics:

1. **Speed and Efficiency:**

Reduced Construction Time:

Prefabrication allows for simultaneous manufacturing and site preparation, significantly shortening the overall project timeline.

Streamlined Process:

Factory production enables efficient processes and avoids weather-related delays, leading to faster completion.

2. **Cost Savings:**

Reduced Labor Costs:

Prefabrication minimizes on-site labor needs, resulting in lower labor costs.

Material Waste Reduction:

Controlled manufacturing environments lead to less material waste compared to traditional construction.

3. **Quality Control and Consistency:**

Factory-Controlled Production:

Prefabrication takes place in a controlled factory setting, allowing for strict quality control measures and consistent production.

Reduced Defects:

Factory settings minimize on-site errors and defects, ensuring a higher level of quality and consistency.

4. **Safety:**

Reduced On-Site Hazards:

Prefabrication reduces the number of workers and activities on the construction site, minimizing potential safety risks.

Improved Safety Standards:

Factory settings are designed with high safety standards, protecting workers and ensuring safer construction processes.

5. **Sustainability:**

Reduced Waste:

Prefabrication minimizes material waste and allows for better management of resources.

Efficient Material Use:

Controlled manufacturing processes optimize material usage, reducing overall environmental impact.

6. **Flexibility and Adaptability:**

Design Flexibility:

Prefabricated elements can be customized to meet specific project requirements, offering design flexibility.

Modular Coordination:

Prefabrication can be integrated with modular coordination, allowing for standardized dimensions and efficient assembly.

7. **Other Characteristics**:

Modular Construction:

Prefabrication can be taken a step further with modular construction, where entire building units are pre-assembled and transported to the site.

Benefits of Prefabrication and Modular Construction in Lagos

Accelerated Project Delivery

- Modular buildings reduce construction time by *30-50%* (Gbadamosi et al., 2023).
- Case Study: The "Modular Housing Initiative" in Epe, Lagos, delivered 200 units in 6 months* compared to 2 years for conventional methods (Lagos State Ministry of Housing, 2024).

Cost Efficiency and Waste Reduction

- Material waste is reduced by up to 60%* (Adebowale et al., 2022).
- Lower labor costs due to streamlined assembly (Olotuah & Adesiji, 2023).

Sustainability and Energy Efficiency

- Prefabricated buildings have *15-20% lower carbon emissions* (Oguntona & Aigbavboa, 2023).
- Integration of solar panels and energy-efficient materials (IEA, 2023).

Improved Quality and Safety

- Factory-controlled production ensures higher precision (Fagbenle et al., 2023).
- Reduced on-site accidents due to less manual labor (ILO, 2023).

Scalability for Affordable Housing

- Potential to address *Lagos' 3 million housing deficit* (Nigerian Bureau of Statistics, 2023).

Advantages Of Prefabrication

Quality control; the entire construction of a prefabricated home is executed under strict quality controlled conditions. Each part of the building is cut and built to the specification to ensure it abides by the local building regulations.

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Affordable: Specific designs and features can be chosen by home owners to suit their budget and add extras on as they go along. Clients will be able to determine the cost of the project before time so they can budget effectively. This is unlike the conventional methods where cost can easily go out of control. Prefabricated buildings are also not dependent on suppliers of blocks and cements etc. This is because all the building components are pre-determined and analyzed before the construction begins.

Quick construction: Unlike traditional built homes where the construction process depends on the excessive use of manual labor and favorable weather, prefab homes are constructed in less time. The construction of prefab homes is simple compared to the conventional constructions. The builder will visit the site to inspect where the building will be constructed and floor plans are drawn by the architect. Due to minimal work required on the site and the clean process of construction, it is also environmental friendly. Also, unlike the conventional method of construction, it is unaffected by bad weather conditions whereby rainfall may delay the duration of the project.

Better foundations: Due to the construction method, prefabricated houses do not need costly raft foundation especially in land filled and swampy areas. Though it is as durable as a traditional build, the building weight eliminates the risk of sinking buildings. Prefab homes have now become the home of choice for many home owners in land filled areas. (Daily times, 2012)

Design flexibility: Designs can be customized according to individual tastes and many personalized features can also be included. There are a lot of designs to choose from and homes can also be built to budget, preference and sizes. Also, buildings can be expanded from time to time as the need arises.

Safety in construction: Due to the factory controlled environment, the safety of the workers can be guaranteed. Hazards that are associated with onsite construction such as engineers falling off buildings is very minimal since the only work to be done on the site would just be the assembling of the prefab members.

Reduction in wastage of materials: manufacturers often find ways to reuse excess materials – even as fuel. Many prefab manufacturers grind leftover pieces of wood into sawdust that is then converted into fuel for heating in the mill and to run machinery! By transporting pre-assembled components to the site, the amount of construction staging area that builder needs is significantly smaller thus, resulting in less site disturbance and greater protection of the surrounding environment thus enhancing sustainability.

Rectilinear Adherence: Prefabrication makes it possible for a building to have a very straight edge without having curvy undulating surfaces. This however, is as a result of the defined molds that are used to cast the prefab components. This helps to achieve accuracy in terms of construction and thereby making the building neat.

Case Studies

Cliff Haven Project (Temp Housing, Nigeria)

This project in Lagos utilized modular construction, the project demonstrated significant time and cost savings, with buildings completed in half the time of traditional methods. It also highlighted the importance of local collaboration and skilled labour.

Figure 5.0 Pictorial representation of modular structure and its interior.

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Challenges Of Prefabrication

Prefabrication in construction in Nigeria faces several challenges including high initial costs, transportation logistics, design limitations, quality control issues, and the need for a specialized workforce. Additionally, regulatory compliance, environmental concerns, and potential resistance to change can hinder its wider adoption.

Here's a more detailed look at the challenges:

1. Initial Costs: While prefabrication can offer long-term cost savings, the initial investment in setting up a prefabrication facility and specialized equipment can be substantial. This high upfront cost can be a barrier to entry for some companies.

2. Transportation: Transporting large prefabricated modules from the factory to the construction site can be complex and expensive, especially for projects located far from the manufacturing plant or with limited access.

3. Design Limitations: Prefabrication often involves standardized modules, which can limit design flexibility and customization options. Adapting designs to specific site conditions or unique architectural requirements can be challenging.

4. Quality Control: Maintaining consistent quality across all prefabricated components is crucial. Ensuring proper quality control during the manufacturing process, as well as during assembly on-site, requires careful planning and execution.

5. Workforce: Prefabrication requires a skilled workforce both in the factory and on-site. A shortage of experienced professionals in prefabrication techniques can create bottlenecks in the construction process.

6. Regulatory Compliance: Prefabricated construction must comply with the same building codes and regulations as traditional construction. Navigating these requirements can be complex and time-consuming, especially with varying local regulations.

7. Environmental Issues: While prefabrication can reduce waste and improve energy efficiency, the environmental impact of manufacturing and transporting prefabricated components needs careful consideration.

8. Resistance to Change: Some construction professionals may be hesitant to adopt prefabrication due to a lack of familiarity with the process or a preference for traditional methods.

9. Safety: On-site assembly of prefabricated components can present unique safety challenges, particularly during lifting and installation. Additional safety measures and training are often necessary.

10. Lack of Standardization: A lack of widely accepted standards for prefabrication can create inconsistencies and complicate the design and manufacturing process.

Building Structure

Substructure

After the land was cleared, a strip foundation was made to support the building. This however, was as a result of the stability of the soil, as it could have been a different type of foundation on an unstable soil. The foundation design is not different from the conventional, method as it is in fact, the same. After the foundation was laid, the German floor was casted with the steel columns in place, as well as the tracks bolted down into the German floor by the use of holding-down bolts. The tracks serve as the horizontal rail that supports the wall component while the studs are the vertical components. The studs were connected at right angles to the tracks and were screwed to each other. The tracks also served as lateral bracings against wind as they were positioned at intervals of 1.2 meters from each other. Circular profiles were cut out of the tracks and the studs to serve as channels for electrical and plumbing fittings. The connections of the tracks and the studs made up the frame of the building.

Plate 5.1.1 Showing The Interior Of The Buildinsource: Researcher's Field Work

Walls

The walls were made up of fiber cement boards also known as Kalsiboads. These boards came in various thicknesses ranging from 8mm to 12mm. They were used for the external and internal walls. The boards used for the external walls were 12mm, while those used for the internal walls were 8mm thick due to climatic reasons. The boards were placed on both sides of the tracks thus leaving the inside of the tracks hollow for insulation. The hollow space in between the boards also helped to reduce the internal temperature of the building by trapping the heat coming from the exterior of the building and thus reducing the amount of heat that penetrated through the internal wall thereby, making the interior of the building cool and also increasing the thermal comfort.

Insulation

After the frame of the ground floor had been made, mineral wool was placed inside of the frame to serve as insulation. Mineral wool which is an insulating material of mineral origin. It is created as a result of melting at very high temperature basalt stone. For most of its advantages is primarily very low thermal conductivity. It is also non-combustible and resistant to fire. It is a material very stable in shape and at the same time flexible and very durable. Mineral wool is also impervious to water, and in any way does not react with chemicals. This material also absorbs sound. Once the mineral wool had been fixed, the interior walls were screwed to the tracks and studs to seal the frames.

Plate 5.1.2 Showing the Mineral Wool Being Used as Insulation Within The Panels

Source: Researcher's Field Work

Decking

Once the ground floor was made, the decking for the first floor began. Lattices made from Ultralite Galvanized steel were arranged horizontally from one end of the walls to another similar to the way reinforcements are

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placed inside concrete slabs. The lattices spanned the whole length of the building. There was no defined spacing for the lattices but they were closely spaced one to another. The ends of the lattices were connected to the steel columns via angle cleats and were screwed in.

Plate 5.1.3 Showing The Lattice And The Kalsi Board Used For The Floor Slab

Source: Researcher's Field Work

Staircase

A network of ultra-lite studs and tracks were arranged in such a way that they formed the steps of the house. These components were screwed to one another in an ascending manner till they finally go to the first floor. Unlike the conventional way of constructing staircases where the underneath of the staircase is usually empty, the prefabricated staircase had each riser springing forth from the base of the floor to the tread level. This however, provided a form of stability for the staircase as each tread was supported under by the risers that similarly served as columns. Staircases are a series of steps leading from one level of a building to another.

Plate 5.1.4 Showing The Staircase Carcass

Source: Researcher's Field Work

Roofing

The roof was a truss system made out of ultralite galvanized steel. The trusses were prefabricated in the factory and they were assembled on the site. The trusses had a spacing of 600mm center to center. The purlins were made out of the same ultralite steel. All of these components were screwed to each other. Roofing refers to the materials and process used to create the protective covering on top of a building, shielding it from weather elements like rain, wind, and sunlight. It encompasses both the installation of new roofs and the repair of existing ones, ensuring a durable and weather-tight barrier. Roofing also involves selecting appropriate materials and incorporating features like insulation and ventilation.

FINDIGS AND CONCLUSION

Prefabrication and modular construction offer significant potential for sustainable building solutions in Lagos State. While challenges such as high initial costs, regulatory barriers, and skill gaps exist, strategic interventions can facilitate adoption. By leveraging policy support, local manufacturing, and workforce training, Lagos can harness these innovative methods to address housing shortages and promote environmentally friendly construction. As technology and demand for sustainable building practices develop, prefabrication and modular construction are likely to play an increasing role in architectural design (Sunny, 2023). Prefabrication and modular construction offer promising solutions for sustainable building in Nigeria. The benefits, including environmental sustainability, energy efficiency, cost savings, speed of construction, and quality control, are substantial. However, challenges such as initial investment, logistical issues, regulatory barriers, skilled labor shortage, and market acceptance must be addressed. By overcoming these hurdles, Nigeria can leverage these innovative construction methods to meet its growing demand for sustainable buildings. if the various challenges mentioned before are tackled by the government, then the construction industry in Nigeria would advance in its production of high class buildings and structures through prefabrication as its choicest method of construction.

RECOMMENDATIONS

Based on my findings of this study, the following recommendations are made;

More researches should be encourage to carry out on how to reduce the overall cost of prefabrication.

This involves the identification of cheaper materials that could be used in the construction of the various prefab components, and the establishment of prefabrication factories in order to reduce monopoly. Other studies can be done comparing the cost of constructing a prefab house to a similar masonry model. This however could be achieved by accessing the bills of quantities for both buildings, and thereby making an inference on the most ideal style of build for the various building typologies and skilled laborers of technical knowhow should utilized.
Government Policy and Incentives

- Develop building codes and standards for modular construction.
- Provide tax incentives for companies investing in prefabrication technology.

Local Manufacturing Development

- Encourage public-private partnerships (PPPs) to establish prefabrication plants in Nigeria.

Workforce Training and Capacity Building

- Introduce vocational training programs in modular construction techniques.

Awareness and Demonstration Projects

- Showcase successful modular housing projects to build public confidence.

Improved Infrastructure

- Upgrade transportation networks to facilitate module logistics.

REFERENCES

1. Alaattin, Kanoglu (2009). Building Production Systems. Lecture conducted from Istanbul Technical University, Taskila, Istanbul.
2. Bruce, A., and Sandbank, H. (1972). A History of Prefabrication, The John B. Pierce Foundation, New York.

3. Colean, M.L. (1944). American Housing; Problem and Prospects, Twentieth Century Fund, New York. Gerald, S., Andreas, D. & Marcus, J. (2008),: Components and Systems (1st ed.). Birkhauser Verlag AG, Berlin., Germany.
4. Niclas, A., Jerker, L. (2017). The interface between industrialization and project base construction. Paper presented at Creative Construction Conference, Primosten, Croatia.
5. Ismaila, O. M., Adegbenga, R. A. (2018). The sustainability of health and safety construction sites in Zamfara state. Retrieved https://www.workzonesafety.org/publication/the-sustainabilityof-healthsafety-on-construction-sites-in-zamfara-state/
6. Alexander, J. (2023, September 16). Building Elements. From www.buildingelements.com:
7. https://buildingelements.com/prefab-vs-modular-homes/
8. Cianciolo, T. (2024, May 9). Prefab Frame. From www.prefabframe.com:
9. https://www.prefabframe.com/is-modular-construction-the-same-as-prefabrication
10. Jat Yuen Richard Liew, Y. S. (2019, February 20). Research Gate. From www.researchgate.net:
11. https://www.researchgate.net/figure/Modular-construction-from-manufacturing-to-siteinstallationfig 4 331306591
12. Sunny, S. (2023, July 13). Press Mach. From www.pressmach.com: https://www.pressmach.com/director
13. UCEM. (2025, February 21). University College of Estate Management. From www.ucem.ac.uk:
14. https://www.ucem.ac.uk/whats-happening/articles/what-is-prefabrication/
15. "Prefabrication." Wikimedia Foundation. Retrieved on January 29th 2014 from <http://en.wikipedia.org/wiki/Prefabrication>.