

The Influence of Artisans on Building Failure and Collapse in Nigeria

Omokanye Olabisi Ademola; Oyeyiola Oyebanji Johnson; Adenuga Babafemi Abdulsamad; Adetola Olalekan Daisi; Fadeyi Ayomipo Akintunde*; Opoko Akunnaya Pearl
Department of Architecture, College of Environmental Science,
Bell University of Technology, Ota, Ogun State

Corresponding Author*:

Abstract:- Building collapses in Nigeria have gotten more shocking and heartbreaking in recent years. A compilation of fallen structures and fatalities during the previous twelve years (2016-2022) indicates a concerning trend that should be regarded as an emergency. Each collapse puts in action a series of events ranging from the loss of investment, means of livelihood, and irreplaceable human lives, as well as the void it leaves for the loved ones of the dead buried in the rubbles at different sites of catastrophe. Beyond the losses, there is the issue of what went wrong and if it might have been avoided. Are there no rules or regulations? Is it true that no institutions exist to enforce standards? Therefore, the study highlights specific locations in which members of the architectural profession are engaged in the construction industry and looks into the reasons why buildings fall. The findings prove that structural flaws, inexperienced labour, and poor material quality are the primary reasons for building collapse, demonstrating a failure in leadership and oversight. The study found that all parties involved in the construction process share responsibility for the successful completion of building projects. The architect should ensure that his duties are carried out diligently in accordance with applicable laws while also taking all necessary steps to keep up with the trends for sustainable buildings, even in the face of formidable obstacles like extreme heat, rain, flooding, and sea level rise.

Keywords:- Artisans, Building Failure and Collapse, Architect, Nigeria, Professional

I. INTRODUCTION

One of life's most fundamental needs is shelter. To improve a person's quality of life, proper shelter is required. Goal 11 of the Sustainable Development Goals calls for everyone should be able to afford and easily get entry to decent places to live, as well as the services they need to live healthy, productive lives, as well as to rehabilitate slums, by 2030. Governments in industrialized nations and middle-income countries have been able to provide housing for their populations, however in Nigeria, providing appropriate housing for citizens remains a mammoth task. It was Predicted that Nigeria's housing shortfall in 1991 was 7.0 million, which had quadrupled by 2010, and that, as of 2018, the government needed to create 700,000 housing

units over the course of twenty years to solve the country's housing deficiencies (Akpan, 2022). Because of its vast economic activity, Lagos remains a popular destination for rural urban migrants from other regions of the country. Lagos has a surface mass of 1,171.28 square kilometers and a population of 17 million, with approximately 6,871 residents per square kilometer² (Ayedun et al, 2012).

As a result, residents have turned to self-help to address their housing demands. Building failure and collapse are common occurrences in metropolitan settings. This is due to the government's neglect of housing infrastructure development and unregulated rural urban migration, which strains existing resources and supports unwholesome practices in the building and construction business. All building types are susceptible to collapse, while residential structures appear to be on a higher scale of collapse rate, and this occurs most frequently in metropolitan places such as Lagos, which has the largest number of destroyed buildings in the country (Ayodeji, 2011).

Collapse occurs not just on ancient buildings, but also on new, completed and unfinished residential and commercial structures. The fall of a high-rise structure on Gerrald Road in Ikoyi, Lagos, highlights the repulsive and disastrous patterns of building collapse in Nigeria, especially in Lagos State. There appears to be no end in sight, and those who should rise to the situation and rescue what is left of the construction sector are overwhelmed (Babe, 2019). The recent spate and pattern of building collapses in Nigeria is unsettling for a country that has a large number of specialists and professionals in the building and construction business. However, optimism of redemption appears to be fading as investor confidence wanes amid waste of investment, an increase in the number of homeless persons, and an increase in slum regions, with the concomitant societal implications. To limit the number of collapses and boost trust in the building industry, all hands must be on deck (Babalola, 2015).

Among other things, a building's structure must be solid and effective for the whole length of its intended use. Buildings are made to endure both their dead and live loads, including the weight of people and objects as well as weather conditions like rain, wind, and snow. If they fail to do so, they will collapse. Building collapse, however, is

swiftly spreading to other countries with nothing being done to reduce its frequency, particularly in poorer nations (Chendo and Obi, 2015). It poses a serious dilemma for the field of architecture as well as other relevant professionals and players in Nigeria's building industry, such as governments, tenants, and owners who are in it for the money and users.

While many western nations have linked earthquakes, terrorism, fires, and environmental changes to building collapses (World Bank, 2015), a lack of institutional protections and the ability to avoid building collapse are seen as the primary causes of building collapses in Sub-Saharan Africa, along with human factors such as faulty design and neglect. Lack of geotechnical study, building problems, and alternative medicine have all been cited as contributing factors, and insufficient construction monitoring because of lax enforcement of building codes and physical development (Tanko et al., 2013; Agwu, 2014).

Architects create realities in building design and construction that are difficult to change once they are built (Okeke et al., 2019). As a result of the existing building business climate, the demand on architects to begin working on projects as soon as they receive a commission has increased in recent years. This is the outcome of growing client-generated engagement requirements that have heavy repercussions for the architect, larger and more complicated projects, the rise of hybrid and untested contract conditions, and more and shifts in professional norms can confuse long-established divisions of labor on construction sites (RIBA, 2004). Scholarship in the literature has encouraged a critical review of the role of built-environment professionals in addressing the frequent occurrences due to the overwhelming negative effects of building collapse. However, the study's goal is to determine the impact of artists on building failure and collapse.

II. LITERATURE REVIEW

Building collapse is becoming more common in developing countries, according to evidence in the literature (Boateng, 2020). Because it frequently happens in Nigeria, Nigerian academics have championed research on the subject (Okeke et al., 2020). Several causes have been identified for the high rate of building failures in Nigeria, including inadequate management and supervision, using unskilled workers and subpar materials, and bad architecture (Ayeni and Adedeji, 2015; Hilary et al., 2018; Odeyemi, et al., 2019). Building collapses have been linked to sloppiness in several key construction areas, including soil analysis, building load design for wind, earthquakes, uneven terrain, inferior building materials, insufficient supervision, and shoddy workmanship, according to a study by Oloyede et al. (2010)

Oseghale et al. (2015) suggest that carbonation and chloride intrusion from cracking caused by overloading the concrete structure and construction defects may damage reinforced concrete. The most common reasons of building collapse in Nigeria include subpar structural design, the use

of subpar materials, a failure to comply to authorised building design criteria, shoddy construction, and a shortage of competent and experienced personnel., as found in studies by Oseghale et al. (2015) and Folagbade (2001). Building failures, according to These problems, according to Ayinuola and Olalusi (2004), are brought on by a lack of information about how a structure will function and by external factors that have not been taken into account. According to Fagbenle and Oluwunmi, the three primary reasons of structural failures are client and contractor unfamiliarity with contemporary building rules, disobedience with authorised architectural and structural drawings prior to construction, and insufficient monitoring by responsible government bodies (2010). This claim was reinforced by Mrabure and Awhefeada (2020), who emphasized the need to uphold these laws' requirements.

Differences in levelling, building collapse, and other structural problems are three three leverage points that Hamma-Adama et al. (2020) identified as being tied to civil engineering and the root reasons of Nigeria's chronic building collapse crisis. All three of these aspects have to do with civil engineering in some way. Qurix and Doshu (2020) conducted a study to determine the major cause of building collapse in Nigeria by surveying construction professionals, government officials, and members of the general public on their perceptions of the most common reasons for collapse of businesses in the country. It was also found that the building's collapse was caused in part by the Client's late and incorrect intervention, which was done without the benefit of consulting specialists (Odunisi, 2019; Imafidon and Ogbu, 2020).

Building components, including cement, sand, granite, sand crate blocks, concrete, and reinforcing steel, have been shown to influence the stability or collapse of structures in Nigeria substantially. Low-quality building materials were shown to be behind 10–25% of Nigerian building failures. A government agency's ineptitude is to blame for the continuous building collapse in Nigeria, said Okeke et al. (2020), who studied the issue. Ayodeji (2011) revealed that improper materials delivered to the site, insufficient supplies, and inefficient site worker supervision contribute to unsatisfactory Nigeria's building industry, known for its high-quality materials and skilled labour.

Some of the causes of building collapse might be either natural or artificial. However, it appears that the Lagos issue of building collapse is primarily the consequence of man-made elements. According to Estate Intel, gas explosions account for 4% of building collapses in the state, developers' unlawful tactics account for 16%, rain accounts for 12%, dilapidated/old structures account for 20%, poor construction accounts for 36%, and distressed buildings account for 12%.

➤ *Conceptual Framework*

Local culture, raw material availability, and climatic conditions worldwide impact building techniques and architectural styles (Okeke et al. (2019). Structures ensure safety from natural and anthropogenic disasters (Okeke et

al., 2021). Buildings need adequate planning, construction, and erection to provide the required level of comfort from the environment (Odeyemi, 2012).

III. RESEARCH METHODOLOGY

The primary focus of the inquiry was the architect's leadership position in the context of building collapses in Nigeria. It employed primary data such as anecdotal evidence, the author's field observations, and the authors' own observations, in addition to secondary data gleaned from peer-reviewed journal articles, conference proceedings,

and technical reports of other authors' earlier studies on the issue. An extensive evaluation of relevant literature was done to possibly achieve the study's goals. Utilizing online databases like Google Scholar and Science Direct, among others, search engines were used to locate papers. We then employed text analysis to assess the reported building collapse causes in Nigeria from 2016 to 2022. The analysis found that poor quality construction materials were to blame for the vast majority of accidents, while unavoidable events were responsible for the remainder. This usually means that the architect is not doing a good job as team leader.

IV. FINDINGS

Table 1

S/n	Location of incident	Date of occurrence	Structure	Causes of incident	Fatality
1	Lekki, Lagos	9th March, 2016	Five storey Building Under	Heavy rainfall, foundation failure	34 dead
2	Mile 12, Lagos	19th March, 2016	Two Storey building	Structural defects	1 dead, 1injured
3	Malete, Kwara State	2016	Three Storey building	Not indicated	NIL
4	Lagos Island	27th August, 2017	Residential building	Heavy downpour, Vibration	8 dead
5	Zulu Gambari Road, Ilorin	18th August, 2017	Four Storey Building	Not indicated	3 injured
6	Abuja	18th August, 2018	An abandoned Building	Old age, Illegal conversion	2 dead, 3 injured
7	Port-Harcourt	19th November, 2018	7- Storey Building under construction	Not indicated	15 dead, 31 rescued
8	Lagos	3rd February, 2019	3-storey Building	Not indicated	2 dead, 1 injured
9	Ita-faji, Lagos Island	13th March, 2019	3-storey Building	Old age, Non-compliance to regulatory authority warnings.	20 dead, 41 injured
10	Sogoye, Bode Area of Ibadan	15th March, 2019	3- Storey building under construction	Concrete was not allowed to cure before continuing the construction	NIL
11	Gerrard road, Ikoyi Lagos	1st, November, 2021	21 storey building under construction	Illegal increment in number of floors beyond approved plan	44 dead
12	Osapa London, Lekki, Lagos state	2nd November, 2021	A storey building under construction	Heavy downpour	NIL
13	Flour Mills Estate, Magbon, Olorunda Local Council Development Area in Badagry	2021	2 storey building under construction	Not indicated	4 dead
14	Akanbi crescent, Lagos	12 February, 2022	3 storey building under construction	Not indicated	NIL
15	24, Ibadan street, off Herbert Macaulay Way, Ebutte- Metta	2nd May, 2022	3 storey building	Not reported	8 dead
16	Ago Palace Way, Okota	7th May, 2022	2 storey building	Not reported	NIL
17	4 Alayaki lane, Lagos Island	21 May, 2022	3 storey building	Substandard materials, heavy rainfall	3 dead
18	15 Oke Arin street, Ilupeju, Lagos,	13 July, 2022	2 Storey building	Abandoned old structure	NIL

*Building collapse statistics in Nigeria from 2016 to 2022
 Source: Ajayi, (2022); Nicholas, Nwalusi, & Okeke, (2022).*

V. DISCUSSION

Pre-design is the first step in the construction of a building or structure, while post-construction and occupancy are the last. Construction projects start long before the ground is broken, according to Fowode (2016). It is useful to see construction as a sequence of steps that culminate in the finished product. If you want to be successful, you need to engage a team of qualified construction specialists.

A. Functions of Building Design Team:

Property dimensions, form, and orientation are all established by the land surveyor. Construction project design, coordination, and management are within the purview of architects. The supervision of structural specification and structural design is the responsibility of structural engineers. Town planners make sure that development sites adhere to building codes and regulations such as setbacks, building height restrictions, building lines, and plot coverage. Quantity surveyors assess the estimated cost of building the home and provide figures for interim payments. After construction is complete, the Estate Surveyors take over management of the building. Despite the fact that their attempts to lessen an increase in the rate at which buildings are collapsing are inefficient and small considering the country's existing pattern of building failure, these experts ensure that structures are carefully created to avoid repeated collapse in Nigeria.

The following variables have been linked to building failure and collapse:

B. Use of Substandard materials

Several studies have linked the high incidence of building collapse to the usage of poor building materials (Odeyemi et al., 2019). Cement, steel, iron rods, and concrete blocks are among the materials used. While some of the materials are of poor quality, the needed standard for the kind of structure is dropped in order to save money. For example, if a 12mm iron rod is used instead of a 16mm iron rod, the building would undoubtedly have structural concerns at some time. Furthermore, when the concrete mix ratio is inadequate, the construction will undoubtedly have a flaw where requirements are ignored. It has also been observed that there is a lack of quality control in the production of construction materials. Because of increased expenses, material manufacturing standards are deteriorating (Odeyemi et al., 2019).

C. Poor Inspection by regulatory agencies

Poor inspection and enforcement, such as the town planning agency and other built-environment authorities, are contributing to the recurring difficulties around building failure and collapse in Lagos state. There have been cases when a structure under construction has been sealed, yet developers continue to build until it collapses; if authorities are doing their jobs properly, this should not have happened in the first place. On the three-story structure that fell at Akanbi Crescent in Yaba, an eyewitness reported that part of the building under construction had collapsed before, yet construction activity continued without interruption from

enforcement officials (Daniel, 2022). Also, whistleblowers' identities must be protected lest they face repercussions for assisting society in averting calamities, causing other people to shirk their responsibilities to the public.

D. Engagement of non-professionals

Many structures in Nigeria are created by contractors, who are mostly craftsmen dressed in the toga of contractors. Many homeowners would prefer consult and hire a bricklayer and other artisans to build their homes, even if they do not have blueprints or drawings for the purpose, especially among low- and moderate-income earners (Daniel, 2022). Reasons determined include: the high cost of hiring specialists and the high charges to be paid to municipal and building regulatory authorities in order to get a permit.

E. Circumventing approved plan

Some of the buildings that fall and collapse have been proven to be the consequence of greed and avarice on the part of building owners. The recent collapse of a twenty-one-story building on Gerrald Road, Ikoyi Lagos, which killed over 40 people, including the building's owner, was caused in part by a failure to follow the initial clearance issued by state officials. The building was supposed to have fifteen storeys, but it was subsequently enlarged to twenty-one without the necessary permits. For example, after court processes, it was determined that the Lekki Gardens Estate building collapse on March 8, 2016 did not have a building approval. Furthermore, the architect testified that the structure was planned to be three stories but was expanded to five due of the high rate of subscription, and under cross-questioning revealed he was not a trained architect (Chendo & Obi, 2015).

F. High cost of materials and the management syndrome

The high cost of building materials is a significant barrier to house development. It is unfortunate that many of the resources needed in the construction business are imported, putting building supplies out of reach for many people. This also creates a situation in which customers seek cheaper, but less secure, options. It is not news that Nigeria has a housing shortfall of millions of units for its burgeoning population. Because the government has been unable to tackle this difficult issue, residents have turned to self-help. It is even lauded in certain sectors as a source of pride that craftsmen from neighboring countries like as Benin Republic and Togo are brought in to conduct bricklaying and other artisanal activities, since there is a vote of no confidence in their local counterparts (Chendo & Obi, 2015). To that purpose, the government must urgently create capacity in technical schools and vocational centers for the training and retraining of craftsmen. Create opportunities for young people to learn the skills required in the construction industry. This will assist to increase local content and reduce dependency on expatriate craftsmen who may be unwilling to work in the country given the country's current economic situation.

G. Defective design

This is another factor that promotes collapse of buildings. This might lead to situations where architects fail to complete or do not insist on doing tests of viability, soil testing, and site inspection; the foundation for creating sufficient architectural and structural drawings (Chendo & Obi, 2015).

Proper inspection and monitoring of the construction process by the architect is the straightforward answer to the issues that facilitate building failure and collapse. It is important to differentiate between the two terms. Examining something carefully to determine if it complies with requirements is what inspection entails. It requires architects to periodically evaluate works in progress to see if they are progressing and producing work that is up to par with the contract; yet, an inspection cannot guarantee the discovery of every flaw. An architect should ideally carry out an examination without the contractor present. An architect should provide the contractor guidance on how to manage work that deviates from the contract.

Supervision includes ongoing progress monitoring. It implies that architects keep an eye on their staff members' work. The word "supervision" is frequently misused; thus, it should never be used in conjunction with the architect serving as the project's principal leader (RIBA, 2004).

VI. RECOMMENDATIONS

There is a need for ongoing training and retraining of construction experts, as well as dissemination of study findings and incorporation into legislation and building codes. The rules, regulations, standards, and construction code must be strictly enforced. To stay up to date on industry advancements, artisans and other stakeholders should have a meeting place where new ideas and innovations are shared. Erring officials should face the full force of the law if they have compromised, either through negligence in the exercise of their duty or through participation in fraudulent operations.

The tasks of experts in the construction business should be clearly defined in order to prevent conflicts in operation and supervision, as well as to determine the amount of responsibility in the event of a failure. Professionals should work together to protect their profession by pursuing ways to restrict, if not completely eliminate, the intrusion of quacks into their practice through licensure and effective supervision. Contractors and project owners should do due diligence in determining the status of experts hired for their projects. For example, the register of professionals is a public record that may be inspected to determine whether or not the professionals to be hired are licensed to practice. In the event of a failure, they become accountable for negligence and violation of duty of care.

The implementation of current laws by enforcement agents, as well as the enforcement of building rules by appropriate professional groups, is critical to reducing the frequency with which buildings in Lagos, Nigeria, are

collapsing. The building control agency's attention should be on ancient structures for audits, not simply new ones; there are many old buildings being converted to different purposes that must be monitored. Since some developers have opted to deliberately break the law, as evidenced in the fall of Lekki Gardens, which had no building permit, the Lagos Building Control Agency's compliance and monitoring teams should devise inspection methods to ensure that premises that have been sealed are not still being developed, as seen in the case of the Ikoyi building, which was reported to have been sealed four months before the collapse, but construction was still going on (Odeyinde et al, 2021).

As craftsmen work with professionals in the area, there should be a minimum qualification, training and retraining, and registration with the proper regulatory bodies through their associations. There is also a need to address the difficulties of artisan migration from neighboring countries whose building rules are incompatible with the country's code. The state should reconsider the amounts payable for licenses and certification. The excessive prices are justifications for cutting costs and skirting the law. Every developer engaging in building work(s) in the State is obliged to pay the Building Control Agency a sum equivalent to twenty per cent (20%) of the Building Plan Assessment charge payable to the Lagos State Physical Planning Permit Authority ("LASPPPA") for the award of the Planning Permit.

It is critical that stakeholders in the construction industry accept the challenges that climate change imposes on the built environment and take all necessary steps to align with the trends for sustainable buildings, even in the face of daunting challenges such as excessive heat, rain, flooding, and sea level rise.

VII. CONCLUSION

This research analyzed the leading reasons of building failure in Nigeria and identified key parameters of focus for architects and other construction professionals. The analysis found that poor-quality construction materials were to blame for the vast majority of accidents, while unavoidable events were responsible for the remainder. This usually means that the architect is not doing a good job as a team leader. When established processes are not followed, the architect's ethical responsibilities and his ability to coordinate the work of related professions are constantly jeopardized. This paper contends that although all parties involved in the construction process share responsibility for delivering building projects, the architect—who is frequently held accountable when buildings collapse—should make sure that his duties are carried out diligently and in accordance with the relevant laws. Additionally, the professional architect should warn against deontology, a matter of ethics in construction. It suggests that building development regulations (such as building codes), planning and implementation policies, and laws be strictly enforced. It also suggests that the Nigerian government, as a significant player in the construction industry, start using sustainable

construction methods and make sure that this is standard practice.

REFERENCES

- [1]. Agwu, M.O. (2014) Perception survey of poor construction supervision and building failures in six major cities in Nigeria. *British Journal of Education society and Behavioural Sciences*. 4 (4) 456–472.
- [2]. Ajayi, O. O. (2022). INCESSANT BUILDING COLLAPSE IN LAGOS STATE, NIGERIA: BEYOND A LEGAL FRAMEWORK. *Journal of Commercial and Property Law*, 9(3), 149-164.
- [3]. Akpan E., (2022). *Housing Deficits in Nigeria: Issues, Challenges and Prospects, Economic and Financial Review* Available at: <https://dc.cbn.gov.ng/efr/vol57/iss4/13/> [accessed 21/01/2023]
- [4]. Awoyera, P. O., Alfa, J., Odetoan, A., & Akinwumi, I. I. (2021, March). Building Collapse in Nigeria during recent years—Causes, effects and way forward. In IOP Conference Series: *Materials Science and Engineering* (Vol. 1036, No. 1, p. 012021). IOP Publishing.
- [5]. Ayedun, C., Durodola, O. & Akinjare, O. (2012). An empirical ascertainment of the causes of building failure and collapse in Nigeria. *Mediterranean Journal of Social Science*. 3 (1) 313–322. DOI:10.5901/mjss2012.03.01.313
- [6]. Ayeni, D.A. & Adedeji, M.D. (2015). Strategies for Mitigating Building Collapse in Nigeria: Roles of Architect and other Stakeholders in the Building Industry. *Civil and Environmental Research*, 140–146.
- [7]. Ayinuola, G.M. & Olalusi, O.O (2004). Assessment of building failure in Nigeria. *African Journal of Science and Technology*. 5 (1) 73-78
- [8]. Ayodeji, E.O. (2011). An examination of causes and effects of building collapse in Nigeria. *Journal of Design and Built environment*. 9(1) 37-47
- [9]. Babalola, H.I (2015) Building Collapse: Causes and Policy Direction in Nigeria. *International Journal of Scientific Research and Innovative Technology*, 2(8), 1–8.
- [10]. Baje, A. (2019) Lagos building collapse; another avoidable tragedy. *The Guardian News*, 10 April 2019.
- [11]. Boateng, F.G. (2020). Building safe and resilient cities; lessons from Ghana, in S. Awaworyi Churchill (Ed.), *Moving from the Millennium to the Sustainable Development Goals*, Palgrave Macmillan, Singapore,
- [12]. Chendo, I. G., & Obi, N. I. (2015). Building collapse in Nigeria: the causes, effects, consequences and remedies. *International journal of civil engineering, construction and estate management*, 3(4), 41-49.
- [13]. Daniel, E. (2022). *Casualty figure unknown as another building collapses in Lagos*, *The Guardian* (Lagos, 12 February 2022). Available at: <https://guardian.ng/news/casualty-figure-unknown-as-another-building-collapses-in-lagos/> [accessed 22/01/2023]
- [14]. Fagbenle, O.I. and Oluwunmi, A.O. (2010). Building failure and collapse in Nigeria: the influence of the informal sector. *Journal of Sustainable Development*. 3(4), 268–276.
- [15]. Folagbade, S.O. (2001). Case studies of building in Nigeria, in *Proceedings of a Workshop on Building Collapse Causes, Prevention, and Remedies*, The Nigerian Institute of Building, Ondo State Chapter, October 2001, pp. 23–24.
- [16]. Hama-adama, M., Ihekwumere, O. & Kouider, T. (2020) Analysis of Causes of Building Collapse: System Thinking Approach. *Jordan Journal of Civil Engineering* 14(2) 188-197
- [17]. Hilary, I.O., Chukwuemeka, I.O., Nkolika, J.P., James, D.O., Patience, I.A. & Abiodun, A.O. (2018) Systematic review of building failure and collapse in Nigeria, *International Journal of Civil Engineering Technology* 9 (10) 1391–1401.
- [18]. Mrabure, K. O. & Awhefeada U.V. (2020). The menace of building collapse incidences in Nigeria. The need for strict enforcement of applicable planning laws. *Commonwealth law bulletin* Doi: <https://doi.org/10.1080/03050718.2020.1804421>
- [19]. Nicholas, O. I., Nwalusi, M., & Okeke, F. O. (2022). Building Collapse in Nigeria and its Consequences on the Architect's Role as the Leader of The Building Team.
- [20]. Odeyemi, S. O., Giwa, Z. T., & Abdulwahab, R. (2019). Building collapse in Nigeria (2009-2019), causes and remedies—a review. *USEP: Journal of Science and Engineering Production*, 1(1), 123-135.
- [21]. Odeyinde, O. Omojuyigbe O. & Adewole, S. (2021). *Collapsed Ikoyi Building was sealed for four months*, *The Punch* (Lagos, 2 November 2021). Available at: <https://punchng.com/collapsed-building-in-ikoyi-was-sealed-for-four-months-lagos;deputy-gov/> [accessed 21/01/2023]
- [22]. Okeke, F.O., Chendo I. G. & Ibem, E.O. (2021) Imprints of security challenges on the vernacular architecture of northern Nigeria: a study on Borno State. IOP Conference Series: *Earth Environmental Sciences*. vol. 665 (012021) doi:10.1088/1755-1315/665/1/012021
- [23]. Okeke, F.O., Chendo, I.G. & Sam-amobi, C.G. (2019) Resilient architecture; a design approach to counter-terrorism in building for the safety of occupants. IOP. *Conference Series Material Science and Engineering* 640 (12003) doi:10.1088/1757-899X/640/1/012003
- [24]. Okeke, F.O., Chukwuali, B.C., & Idoko, A.E (2019) Environmentally responsive design; A study of Makoko floating school building, *International Journal of Development and Sustainability*, 8(8). 476-487.
- [25]. Okeke, F.O., Ibem, E.O., Udeh, C.A & Ezema, E.C. (2020) City as Habitat: Assembling the fragile city. *Civil engineering Journal*. 6(6) 1143-1154. <http://dx.doi.org/10.28991/cej-2020-03091536>

- [26]. Okeke, F.O., Okeke, F.I & Sam-Amobi, C.G (2019) Building Collapse in Nigeria and Development Control, the Missing Link. *West Africa Built Environment Research (WABER) 2019 Conference Proceedings* (August 5, 2019): Accra, Ghana, pp 242-256 doi: <https://doi.org/10.33796/waberconference2019.17>
- [27]. Okeke, F.O., Sam-Amobi, C. & Okeke, F.I (2020). Role of local town planning authorities in building collapse in Nigeria: evidence from Enugu metropolis. *Heliyon* 6(7) <https://doi.org/10.1016/j.heliyon.2020.e04361>
- [28]. Oseghale, G.E., Ikpo, J.I. & Ajayi, O.D. (2015) Causes and Effects of Building Collapse in Lagos State, Nigeria. *Civil and Environmental Research*, 7(4), 34–43.
- [29]. Oyedele, O.A. (2018) A study of control measures of building collapse in Lagos State, Nigeria FIG congress 2018; embracing our smart world where the continents connect: enhancing the geospatial maturity of societies Istanbul, Turkey May 6-11(2018) 1–2.
- [30]. Qurix, W.B & Doshu, R.G.(2020) Mitigating building collapse in Nigeria ARTEKS : Jurnal Teknik Arsitektur, 5(3), (2020) 449-458 doi: 10.30822/arteks.v5i3.596
- [31]. RIBA, In Association with Ray, C.& Alaime, H of RIBA Publications and Neil, T.P (1998, 2004). Managing Director, RIBA Indemnity Research Limited.
- [32]. Standard Form of Building Contract, SFBC, (1996).
- [33]. Tanko, J.A., Ilesanmi, F.A., & Balla, S.K. (2013).
- [34]. Design Error and Construction Defects. A Report on Building Collapse. Department of Civil Engineering, Modibbo Adama University of Technology, Yola, Nigeria.
- [35]. Victor G. & Azeez O. (2021).
- [36]. *Lagos and Burden of Recurring Collapse of Structures, The Guardian* (Lagos 7 November 2021) Available at: <https://guardian.ng/sunday-magazine/lagos-and-burden-of-recurring-collapse-of-structures/> [accessed 22/01/2023].
- [37]. World Bank, (2015). Buildi