

Causes, Socioeconomic Effects and Potential Solutions of Incessant Building Collapse in Nigeria: A Review

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Abstract- *This study examined the causes, impacts and potential solutions to the incessant cases of building collapse in Nigeria, a serious public issue with dire consequences for the safety and development of the nation. By conducting thorough analyses of publicly available historical data, statistical trends and case studies through secondary data collection, this paper examined the major factors contributing to and responsible for building collapse in Nigeria. Also, this study determined the socio-economic effects of building collapse on the nation and the effectiveness of current preventive measures. Results of factors responsible for building collapse were; structural deficiencies, environmental factors human factors and poor regulatory frameworks enforcement. Results of socio-economic effects of building collapse were; financial loss, environmental pollution, disappointment, physical injuries and death. This study concludes that despite having regulatory frameworks, poor enforcement, corruption and noncompliance have caused the problem to persist. Based on the results and conclusion, this study recommends implementing enhanced inspection and monitoring procedures, improving professional standards and better enforcement of regulatory standards. This study contributes to fostering a culture of safety in Nigeria's construction industry through enforcement and compliance with regulatory frameworks, thereby reducing incidences of building collapse.*

Index Terms- *Building Collapse, Building Codes, Compliance, Socio-Economic, Safety*

I. INTRODUCTION

Building collapse is a serious issue that has confronted Nigeria for decades, causing significant harm to economic stability, public safety and national development. Building collapse has become a recurrent problem at an alarming rate, with dire

implications such as property destruction, undermining public confidence in the construction industry and loss of lives (Obot and Archibong, 2017; Imafidon and Ogbu, 2020). Naturally, the frequent nature of these occurrences has generated a lot of worry among policymakers, stakeholders and the general public, thereby requiring a detailed investigation into the root causes and implications, in order to come up with potential solutions. According to Okeke and Sam-Amobi, (2020), the incidences of building collapse in Nigeria are not just isolated occurrences, but they are symptoms of even deeper systemic problems in the country's construction industry and the regulatory frameworks set up to stop them. Adenuga *et al.*, (2022) reported that building collapse is so endemic in Nigeria that all the geopolitical zones and both urban and rural areas, have recorded cases of the tragedy. This tragedy has happened to religious buildings, commercial complexes and residential buildings. Thus, the far-reaching nature of this problem necessitates tackling its root causes and also implementing effective preventive measures.

According to Okunola (2021), the consequences of building collapse are more extensive than the immediate destruction of properties and loss of lives only, as often reported in the news and publications. This is because building collapse also affects the socioeconomic fabric of the nation. Adedotun *et al.*, (2022) and Ebekoziem *et al.*, (2023) equally reported that the nation often suffer significant financial losses through insurance companies, investors and property owners, which negatively impact the nation's economy. Furthermore, the cost of emergency response, rescue efforts and the subsequent clean-up activities usually places additional burdens on already strained public resources, by forcing the government to make unplanned expenses. Moreover, Anosike (2021) earlier reported that building collapse also contribute to an already existing climate of risk and uncertainty in the real estate sector, potentially preventing both

foreign and domestic investments in Nigeria's construction industry. According to Ikediashi *et al.*, (2012), building collapse also affects the nation socially as it usually leads to loss of livelihoods, displacement of residents and mental trauma for affected communities and survivors.

Thus, the fear and anxiety created by building collapse is capable of eroding public confidence in the stability of built environments, reducing quality of life and straining social cohesion. Furthermore, Alabi *et al.*, (2023) reported that the frequency of these incidents puts a blemish on Nigeria's image internationally, potentially affecting foreign direct investment, tourism and the country's general developmental outlook. However, despite the efforts of regulatory agencies in enforcing building standards, the problem of building collapse still persists, underscoring the need for a thorough investigation into the causes and contributing factors. Therefore, this study aims to bridge this existing knowledge gap by examining the technical, regulatory and socio-economic angles of building design and construction in Nigeria, in order to discover the underlying causes of building collapse.

On this basis, the objectives of this paper are; to identify and analyze the technical factors contributing to building collapse; to evaluate the critical roles of regulatory frameworks and their enforcement in preventing building collapse; to determine the socio-economic factors which influence construction practices; to assess the impacts of incessant building collapse on the nation; and to recommend measures necessary for preventing building collapse and the enhancement of building safety. This paper was limited to cases of building collapse in Nigerian urban centers alone where this problem is more common. The study covered both commercial and residential buildings from different States to have a thorough understanding of the problem. Furthermore, the study relied on secondary data gathered from major industry stakeholders, relevant literature, case studies and previous reports published between 2010 and 2024.

Historical Background of Building Collapse in Nigeria

The spate of building collapse in Nigeria is not a recent occurrence, but rather an age-long problem that has confronted the country for many decades. Historically, building collapse in Nigeria is traceable to the post-independence period which witnessed

rapid infrastructural development and urbanization, alongside other African countries that were also fresh out of colonialism (Obot and Archibong, 2017). As Nigeria experienced the oil boom of the 1960s and 1970s and the economic growth that came with the boom, there was a significant spike in construction activities across the country. There were many modern high-rise structures and large-scale infrastructure projects happening almost simultaneously during the period. This period however, also marked the onset of frequent occurrences of building collapse, especially in the urban centers (Alabi *et al.*, 2023). Perhaps, the earliest recorded major case of building collapse in Nigeria happened at Mokola Ibadan in 1974, where a multi-storey residential structure under construction collapsed, leading to many casualties (Obodoh *et al.*, 2019). This incident consequently pushed to the front burner, the need for tighter building regulation frameworks and improved oversight of construction activities.

Similarly, Windapo and Rotimi, (2012) reported that in the 1980s and 1990s, the country experienced a surge in the scale and frequency of building collapse. A notable collapse during this period was that of a three-storey structure that collapsed in 1980 at Barnawa Housing Estate, Kaduna. This particular collapse resulted in the loss of twenty eight lives, further highlighting the dangers of using substandard materials and engaging in poor construction practices. Furthermore, as the new millennium arrived, Nigerians witnessed more escalation in the occurrences of building collapse across the country. In Lagos, a devastating incident happened in 2006 where a six-storey building collapsed, leading to the deaths of more than 60 people. This particular collapsed caused nationwide outrage, resulting in calls for the implementation of comprehensive reforms in the construction industry. Recently too, there have been very high-profile incidences of building collapse in Nigeria. A guesthouse that belonged to the Synagogue Church of All Nations (SCOAN) collapsed at Lagos in 2014, resulting in the deaths of one hundred and sixteen people, with many of the fatalities being foreign nationals (Okunola, 2021). This particular collapse further escalated the pressing issues surrounding building safety in Nigeria and also led to significant international repercussions.

In the same Lagos, another five-storey building that was under construction in Lekki collapsed in 2016, killing at least thirty people in the process (Ohenhen and Shirzaei, 2022). This collapse also resulted in

the renewed scrutiny of the duties of regulatory agencies and tougher enforcement of building standards. Similarly, the collapse of a three-storey building at Lagos in 2019 which accommodated a school, led to the deaths of at least twenty people, with most of the fatalities being children (Odediran and Windapo, 2020). The collapse revealed the vulnerability of people living in buildings that were not properly built or maintained to many hazards. Thus, the historical background of building collapse in Nigeria shows a recurring trend of building failures resulting in significant loss of lives and properties. Furthermore, the cases discussed also revealed some of the factors contributing to building collapse in Nigeria. These factors include; design errors, insufficient supervision, poor workmanship, substandard materials and corruption during inspection and approval processes (Windapo and Rotimi, 2012; Ohenhen and Shirzaei, 2022). However, Okeke and Sam-Amobi (2020) reported that the regulatory agencies tasked with enforcing building standards and codes nationwide face many challenges in carrying out their duties.

Statistical Data and Trends

According to Oloyede *et al.*, (2010), the inconsistencies in data collection and reporting across different periods and regions, have made it almost impossible to understand the full scope and ramifications of building collapse in Nigeria. However, the limited available studies and data provided insights into the scale of this problem. Between 1974 and 2010, more than one hundred and twelve cases of building collapse were reported in Nigeria. However, Windapo *et al.*, (2020) in a study spanning between 1970 and 2019, found out that the one hundred and twelve cases earlier reported was a serious underestimate, because the figure only included major incidents reported in the national dailies and media houses. The more detailed study identified three hundred and sixty one cases of building collapse across the country between 1970 and 2019, with a significant spike noted from the year 2000 onwards. The other findings of the study were: the total number of deaths during the period was one thousand and ninety with thousands more injured; the collapse cases were caused by design errors (8.9%), structural failure (19.7%) and substandard workmanship/materials (37.1%) being the highest; the types of buildings involved were religious buildings (8.3%), commercial buildings (15.8%) and residential buildings (60.4%) being the highest; and the geographical distribution mostly affected revealed that Anambra State recorded 7.2%,

Oyo State recorded 8.3% and Lagos State recorded (51.8%) being the highest. Furthermore, according to The Nigerian Society of Engineers (NSE) (2018), there were at least one hundred and seventy five reported cases of building collapse nationwide, resulting in one thousand injuries and five hundred deaths.

II. METHODOLOGY

This section contains the step by step approach followed in achieving the objectives of the study. These included; identifying the causes of building collapse (structural deficiencies, environmental factors and human factors); review of some case studies (some building collapse cases in Abuja, Lagos and Ogun between 2014 and 2024); determining the consequences of the collapse (socio-economic, legal implications and public confidence); and the critical roles of regulatory agencies in developing and enforcing frameworks for preventing future collapse.

According to Adenuga *et al.*, (2022), chief among the factors responsible for causing building collapse in Nigeria is structural deficiencies and these deficiencies are often precipitated by poor design and engineering, using substandard building materials and erecting buildings through improper construction methods. These are further discussed accordingly;

i) Poor design and engineering

Poor design and engineering often includes poor calculations in structural load-bearing capacities, insufficient safety measures and errors in architectural plans. For example, failure to calculate for the stress of environmental factors or the extra weight of additional floors can result in structural failure. Furthermore, design errors of structural elements like foundations, slabs, columns and beams can also arise from improper training or oversight and sometimes from cutting corners for profiteering. More importantly, failure to implement a comprehensive design review to uncover potential structural weaknesses before actual construction will begin can also worsen and aggravate the problems (Windapo and Rotimi, 2012).

ii) Using substandard construction materials

According to Opawole *et al.*, (2022), using substandard construction materials greatly weakens the integrity and strength parameters (compressive, flexural and split tensile) of a structure. These substandard materials could include low-grade steel,

concrete and other construction materials that fall significantly short of established standards and codes. Some of the reasons given for using such substandard materials often range from outright fraud to profiteering. Furthermore, Oloyede *et al.*, (2010), in an earlier study reported that substandard materials cannot provide the required durability, strength and resistance to harsh environmental conditions, resulting in premature structural deterioration and eventual collapse.

iii) Improper construction methods

Improper construction methods simply refer to the shoddy or haphazard implementation of building procedures and processes. These include inadequate curing time for concrete, incorrect assembly of prefabricated structural components and poor welding of steel structures (Obodoh *et al.*, 2019). Consequently, construction methods that fall short of minimum compliance with established international or national standards and industrial best practices are capable of compromising the structural integrity of a building. This usually happens because of the needless desire to rush project completion, inadequate supervision or lack of skilled labour (Imafidon and Ogbu, 2020).

Furthermore, Alabi *et al.*, (2023) reported that another critical factor responsible for building collapse in Nigeria is the environment. Some environmental factors such as soil conditions and geotechnical deficiencies, climate and weather effects and natural disasters can cause building collapse. These are further discussed in details;

i) Soil conditions and geotechnical deficiencies

Soil conditions and geotechnical deficiencies can play critical roles in the stability or instability of buildings. This is because geotechnical problems such as differential settlement, land subsidence and soil erosion can result in shifting or weakening of structural foundations. Poorly conducted soil tests such as compaction, particle size distribution analyses, Atterberg limits tests, permeability, consolidation and moisture content can lead to inadequate foundation design (Okunola, 2021). Furthermore, insisting on using unsuitable soil materials for construction can hamper structural integrity leading to structural instability. For instance, building a high-rise building on an expansive clay material without putting adequate precautions in place can result in foundation cracks or failure and eventual collapse.

ii) Weather and climate related effects

Weather and climate related effects such as wind loads, extreme temperatures, heavy rains/flooding and other climate change impacts can impose stresses on buildings. Similarly, Okeke and Sam-Amobi (2020) reported that prolonged exposure to inclement weather can erode soil around foundations, corrode metal components and generally weaken building materials. Furthermore, inadequate water drainage and sewage systems can worsen these effects when water accumulates unchecked around buildings, thereby exerting additional pressure on structures. Therefore, building design and construction must take into account the local weather and climatic conditions to guarantee longevity and safety.

iii) Natural disasters

Natural disasters such as landslides, earthquakes and floods constitute significant safety risks to buildings. These disasters produce huge amounts of forces in the ground that buildings may not have been designed to withstand. For instance, when an earthquake happens, it can lead to soil liquefaction and ground shaking leading to the failure of structural supports (Okunola, 2021). Also, flooding can cause rapid erosions of the soil surface layer and equally compromise building foundations through prolonged percolation or infiltration. It is important to emphasize that some of the recent building codes now include specific requirements to reduce these risks, however noncompliance or inadequate enforcement can result in serious failures.

Similarly, Adedotun *et al.*, (2022) reported that there are a few human factors (noncompliance with building codes, corruption and poor maintenance) that can also contribute to building collapse, particularly in regions where regulatory frameworks and enforcement of building standards are too lax. These are discussed accordingly;

i) Noncompliance with building codes

The common issue of noncompliance with regulations and building codes contributes significantly to building collapse in Nigeria. Building codes have been compiled to guarantee durability, ensure safety and ascertain the integrity of structures. However, the NSE (2018) reported that noncompliance with these building codes is so commonplace that nearly 30% of buildings in Lagos State are complicit in this. According to the report also, this often is a product of profiteering, negligence or ignorance. Furthermore, the failure of regulatory agencies to adequately carry out their oversight functions by rightly inspecting and enforcing these standards also aggravate the

problem. To guarantee compliance, applying stringent penalties and sanctions for violators and defaulters can help remedy the situation.

ii) Corruption and unethical practices

Corruption and unethical practices such as collusion, fraud and outright bribery can result in compromised quality and safety of buildings. Many contractors and developers cut corners to have their contracts approved without having the technical knowhow or requisite equipment to deliver on the job. Furthermore, Alabi *et al.*, (2023) also reported that many contractors are in the habit of cutting corners to bypass critical safety inspections and even use substandard materials, because of profiteering. These practices do not just compromise structural integrity, but they also erode public trust in the construction industry and regulatory authorities.

iii) Poor maintenance

Poor maintenance and neglect are usually discountenanced as unimportant, but Awoyera *et al.*, (2021) reported that they are also significant causes of building collapse, especially in Nigeria where most contractors and developers are known to cut corners and compromise the quality of buildings under construction. As such, periodic maintenance where damage repair, reinforcement of structural components and wear and tear are quickly attended to can be critical to prolonging the service lives of buildings. Furthermore, neglecting periodic maintenance of buildings through refusal to conduct nondestructive tests to determine structural integrity can lead to the gradual deterioration of buildings, thereby making them vulnerable to failure and collapse. Regularly defaulting in carrying out maintenance may arise from paucity of funds, a lack of awareness and commitment to preserving building safety.

According to the NSE (2018), Foundation for Investigative Journalism (2022) and Ebekozien *et al.*, (2022), Abuja, Lagos and Ogun being the places with the with the most construction activities in Nigeria have the highest number of building collapse cases in Nigeria. Some of these incidences in Abuja, Lagos and Ogun are discussed here as case studies to further underscore the frequency and severity of these incidences.

i) The synagogue church of all nations (SCOAN) collapse (2014)

The collapse of SCOAN guesthouse in Lagos led to the deaths of one hundred and sixteen people. Investigations revealed that the collapse happened

because of poor construction practices, unapproved addition of extra floors to the guesthouse without adequate support and a series of other structural failures. This particular incidence brought to the fore the grave dangers attached with inadequate construction techniques and unauthorized structural modifications. The incident generated widespread calls for stricter building codes enforcement and more rigorous oversight of construction projects.

ii) Lekki gardens building collapse (2016)

This was a five-storey building which was under construction in the Lekki axis of Lagos State, the building collapsed and killed thirty-four people. This collapse just like the SCOAN was also linked to poor construction procedures and the use of substandard construction materials. This collapse again highlighted the widespread problem of engaging in poor construction practices and using substandard materials. The collapse led to criminal charges being preferred against the developers and also increased the advocacy for improved regulatory frameworks and enforcement in the Nigerian construction industry.

iii) Itoku market building collapse (2018)

A four-storey building under construction in Abeokuta, Ogun State, collapsed leading to multiple deaths. This collapse was caused by poor workmanship and structural deficiencies just like the SCOAN and Lekki gardens incidences also. This collapse further demonstrated the crucial roles that proper supervision and skilled labour plays in the construction industry. Furthermore, the collapse emphasized the need for more rigorous quality control measures and improved training programmes for construction workers.

iv) Fourscore homes limited 360 degrees building collapse (2021)

The collapse happened in November 2021 and nearly five days after, forty two people were already confirmed dead. Investigation revealed that the owner of the real estate firm added extra floors to the high-rise building without due approval. The investigation further uncovered that an initial stop and desist order had been issued to the project by officials of the Lagos State Building Control Agency (LASBCA) on account of a whistleblower complaint earlier lodged. The deaths recorded generated uproar in the State because it was an avoidable tragedy, especially given that similar incidences had happened before. The collapse also highlighted the

critical roles of better regulatory frameworks and stricter oversight or enforcement activities.

v) Three-storey building collapse Yaba (2022)

In February 2022, a three-storey building under construction located at Akanbi Crescent, collapsed and trapped six of the workers and a security guard under the rubble. Out of all the trapped victims on the project, only one person was recovered alive. This collapse was also a result of using substandard materials and poor construction practices, fueled by corruption and unethical practices.

vi) Three-storey building collapse Lagos Island (2022)

This three-storey building located in Alakayi lane, Lagos Island, collapsed in May 2022 after severe and heavy rainfall. Nine people who were in the building at the time of the collapse were trapped in the debris that ensued. Four of the nine were recovered dead, while the remaining five people had sustained life threatening injuries. This collapse called into question the maintenance practices and water drainage systems around the house, because floodwater from the rainfall that could not flow freely was responsible for the collapse.

vii) Three-storey building Abuja (2022)

This three-storey building that was under construction on Hamza Abdullahi street, off Gado Nasco road, Kubwa Abuja, collapsed and trapped five people in the debris. Only three out of the five people trapped in the debris were recovered alive with even many more people in the vicinity of the collapse sustaining serious injuries. Investigation revealed that this particular collapse happened because the original structure (shopping mall) was converted into a residential block of apartments. This collapse is also similar to many before it, because it happened due to unapproved and unethical construction practices.

viii) Three-storey building Ebute-meta (2022)

This building collapse happened at Ebute-Meta area of Lagos State on May 1 2022 and trapped at least twenty people who were residents. Confirmed reports noted that two of the trapped residents were critically injured, while ten of them were immediately confirmed dead. Investigation uncovered that the building had serious structural

defects that should have warranted its demolition before it eventually collapsed under its own self weight and imposed loads.

ix) Seven-storey building Oniru (2022)

This seven-storey building which was under construction collapsed on September 4 2022, in Oniru area of Lagos State. Six people were reported trapped in the ensuing rubble and none of them was rescued alive. The officials of Lagos State Emergency Management Agency (LASEMA) stated that the Agency had warned the builders severally to discontinue the project, on account of the many building standards being violated on the project. Furthermore, the Agency mentioned that it sealed the building on three occasions and the builders still found ways to repeatedly break the seal in order to continue the project. This collapse again underscored the importance of enforcing building standards and dishing out stiff penalties to violators, especially repeat offenders.

x) Two-storey building collapse Ebute-meta (2023)

This two-storey building collapse happened in November 2023, Ebute-Meta, Lagos State. The building which also had a penthouse collapsed killing three people, among whom was a twelve year old boy. Investigation revealed that LASBCA officials had issued several eviction notices to the occupants to no avail. This collapse was an avoidable one, just like many that have been earlier described. This is also a failure of building standards enforcement and it undermines public trust in government regulatory agencies.

xi) Four-storey building collapse Lagos Island (2024)

This four-storey building collapse happened at Iga Iduganran, Lagos Island on May 31 2024. The building collapsed under its own weight after failing repeated structural integrity tests. Officials of LASEMA blamed the residents of the house for stubbornly staying in the building until it collapsed, because the Agency had sent eviction notices to them earlier. The ten occupants trapped in the rubble were rescued alive and immediately taken to the hospital. This collapse also emphasized the important role of enforcing building standards and regulations no matter who is affected.

According to Adedotun et al., (2022), most of the impacts of building collapse are felt in terms of the economy, the legal or civil liabilities incurred and

the perception of the public about the construction industry. These are further discussed;

i) Socioeconomic impacts

Whenever a building collapses, it has far-reaching socioeconomic impacts for the society, because the injuries and loss of lives that immediately follow cause untold grief and suffering. Furthermore, the dead, survivors and their loved ones often experience prolonged psychological and emotional trauma after the collapse. Economically also, building collapse cases often cause significant financial losses, such as lost productivity, medical bills, burial expenses and cost of reconstruction. Also, communities can suffer diminished investor confidence and reduced property valuation after building collapse has occurred.

ii) Legal or civil liabilities

The legal consequences of building collapse could include civil and criminal liabilities for contractors, developers and regulatory authorities. Also, legal proceedings can result in fines, penalties and jail time for those found culpable, because victims and their families are eligible for compensation through lawsuits. These legal tussles usually underscore the many systemic problems within the regulatory agencies and the construction industry, repeatedly generating calls for reforms and stricter enforcement.

iii) Public perception in the construction industry

Building collapse cases often erode public confidence in the construction industry and regulatory agencies. Communities could become suspicious of new building projects, fearing a repeat of familiar tragedies. As such, restoring public confidence demands transparent investigations, accountability for those culpable and enforcement of measures to avoid future occurrences. Furthermore, effective community engagement and communication are also critical for rebuilding public confidence in the integrity and safety of buildings.

Similarly, Okeke and Sam-Amobi (2020) reported on the critical roles of regulatory frameworks and how their enforcement can help prevent building collapse. Through the establishment of procedures, guidelines and standards, regulatory agencies and professional organizations can ensure that practitioners in the industry have a uniform code to work with. When these building and ethical standards are thoroughly designed and enforced (such as the Nigerian National Building Code requirements for material specifications, fire safety and structural stability), they are capable of

significantly reducing the spate of building collapse nationally. Some of the advantages of regulatory frameworks include the following;

i) Ensuring accountability

Regulatory frameworks clearly outline the responsibilities and roles of various stakeholders in the construction industry, from engineers and architects, to contractors and government agencies. This also makes it easier to appropriately issue sanctions and disciplinary measures to the culpable parties whenever a building collapse happens (Alabi et al., 2023).

ii) Quality control

Regulatory frameworks also provide the right mechanisms for quality control through testing procedures, inspections and approval processes during building construction. This also provides a template for either accepting or rejecting a structural component or building member, in terms of its fitness or compliance with building standards. Furthermore, quality control can also extend to construction workers and all stakeholders in the industry. This could be achieved by developing a framework that provides minimum requirements for the qualifications and credentials of professionals in the industry, to ensure that only qualified persons are allowed to execute jobs.

According to Windapo and Rotimi, (2012), Nigeria currently has some regulatory frameworks and professional bodies that govern the construction industry through policies. Some of these are; the National Building Code (2006), Urban and Regional Planning Laws, State-level building regulations, Environmental Impact Assessment Act, Council for the Regulation of Engineering in Nigeria (COREN), Architectural Council of Nigeria (ARCON) and Council for Registered Builders of Nigeria (CORBON). However, having these frameworks and professional bodies in existence has still not been enough to prevent building collapse. Furthermore, the study and other similar ones such as Windapo and Rotimi (2012), Windapo et al., (2020) and Alabi et al., (2023), argued that despite the existence of regulatory frameworks and agencies in Nigeria, still the effectiveness of the frameworks in preventing the regular cases of building collapse in Nigeria has been limited. Some of the factors responsible for this limitation are discussed accordingly;

i) Fragmentation

The duplication of regulatory agencies and laws have resulted in conflict and overlap of jurisdictions, thereby making enforcement difficult.

ii) Capacity

Some of the regulatory agencies do not have the resources, manpower and technical capacity to effectively monitor and enforce adherence to building standards and codes (Owei et al., 2010). For example, there are usually not enough qualified personnel to move around all active sites to inspect ongoing construction works.

iii) Corruption

Bribery and corrupt practices within regulatory agencies have also affected the integrity of building inspection and approval processes (Alabi et al., 2023) and (Ebekozi et al., 2023). This has resulted in the widespread and unchecked proliferation of poor construction practices in the construction industry.

iv) Low awareness

According to Olatayo et al., (2022), there is a general low level awareness among stakeholders regarding the importance of having building regulations, especially the recently updated ones. This ignorance often results in unintentional non-compliance.

v) Political interference

Political exigencies sometimes interfere with enforcement of building regulations, especially building collapse cases that involve highly influential individuals or organizations (Anosike, 2021).

vi) Inadequate sanctions

In some building collapse cases, the sanctions for contravening building regulations are not often severe or stiff enough to serve as an effective deterrent to violators (Oseghale et al., 2015).

vii) Informal sector

A huge portion of construction practices, particularly in the rural and peri-urban centers usually happens in the informal sector, outside the scope of formal regulatory frameworks. This is why it has been difficult to obtain data about building collapse in these areas and to measure compliance with regulatory frameworks.

viii) Inconsistency

There is a huge disparity in the levels or degrees of enforcement across different localities and States, leading to inconsistency in compliance and enforcement of building safety standards across the country (Windapo and Rotimi, 2012).

Having outlined the factors causing building collapse, the examples of building collapse, the impacts of the collapse and the factors preventing the effective implementation of frameworks in Nigeria, it is equally important to state that there have been some positive developments in the

construction industry over the years. Some of these are;

i) Improved awareness

The many high-profile building collapse cases that have happened overtime have increased public awareness about the issue and the importance of building safety regulations (Okunola, 2021).

ii) Reforms

Some of the States, especially Lagos, have implemented reforms aimed at strengthening their building control agencies, while also improving enforcement mechanisms (Ogunbiyi et al., 2017).

iii) Technology

There have also been growing trends towards the adoption of technology and technological tools in building design, construction, inspection and approval processes, which has the potential to enhance enforcement capabilities (Amusan et al., 2019).

III. RESULTS AND DISCUSSION

From the review and analyses of the different cases of building collapse that has occurred in Nigeria between 2010 and 2024, the results obtained (potential solutions or mitigation strategies) from the study, which will effectively prevent future occurrences of building collapse, are hereby presented;

i) Improving compliance and enforcement of regulatory frameworks

By ensuring compliance and adequately enforcing existing regulations among all stakeholders in the construction industry, the prevalence of building collapse in Nigeria can be effectively reduced. This could be accomplished by strengthening existing national and State regulatory agencies such as COREN, ARCON, CORBON, LASBCA and LASEMA through improved staffing, funding and technical resources. This would sufficiently empower the agencies enough to execute their duties more effectively (Windapo and Rotimi, 2012). LASBCA can serve as a good example in this regard for other agencies as it has shown some success in improving building control measures (Okunola, 2021). Furthermore, by simplifying and digitizing the building approval processes, the system becomes streamlined such that corrupt practices and bureaucratic bottlenecks are reduced. According to Olatayo et al., (2022), the use of e-planning systems as being done currently in Lagos State will help achieve this and still enhance efficiency.

Similarly, stricter penalties and sanctions must be meted out for defaulters who contravene building standards and codes, especially repeat offenders. Sanctions such as withdrawal of professional licenses, longer prison terms, closure of companies and shaming in media publications will go a long way in deterring offenders (Ogunbiyi et al., 2017). For instance, life sentences have been proposed by the Lagos State government, especially for serial offenders who cause the deaths of people through building collapse. Also, the enhancement of inter-agency coordination especially between national and State-level regulatory agencies is critical to achieving improved enforcement. One way of accomplishing this is the creation of a national or central database for all building inspection reports and approved building plans, where all the agencies have direct access to view and download seamlessly (Obodoh et al., 2019).

Likewise, implementing a periodic update and review of building codes and standards, to accommodate technological advancements and international best practices can guarantee the continued effectiveness and relevance of the codes to the construction industry. Furthermore, implementing a whistleblower policy that provides a quick and confidential opportunity for whistleblowers to easily lodge complaints against erring contractors or agency officials is another potential solution. This policy should also include the assurance of adequate protection for the whistleblowers in order to gain the confidence of the public. This approach has been tested and proven to be effective in other sectors and could be adopted for the construction industry as well (Okeke and Sam-Amobi, 2020).

Furthermore, conducting public awareness campaigns in order to educate the general public and industry stakeholders about the importance of complying totally with building standards is critical. This could be done through updating school curriculum with building safety topics, organizing community outreaches and sponsored media (social and print) campaigns. Also, the introduction of a reward system or incentives for individuals and corporate entities that adhere strictly to the building codes will enhance compliance as well. This could be done through issuance of merit award for individuals, tax breaks for corporate entities and public recognition through media publications for both individuals and corporate entities (Amusan et al., 2019).

ii) Enhancing professional standards through training and re-training

Developing the ethical standards, knowledge and skills of professionals in the construction industry is critical for the prevention of building collapse in Nigeria. More importantly, making the developmental and training process a continuous exercise will be highly beneficial, as the professionals will be regularly aware of new trends and developments in the industry. This could be achieved by strengthening the existing professional bodies such as CORBON, the Nigerian Institute of Architects (NIA) and the NSE in order to better discharge their duties. According to Obodoh et al., (2019), granting these professional bodies more autonomy and authority to rightly discipline and sanction erring members through revocation of licenses, will make both the members and the professional bodies more effective.

Furthermore, implementing and mandating continuous development programmes for professionals in the construction industry will keep them updated with latest industrial technologies and standards. According to Alabi et al., (2023), these programmes should include topics on ethical practices, material science and construction techniques. If this is implemented and monitored well, it will make the Nigerian construction industry professionals more relevant even internationally. Similarly, encouraging specialization among professionals within the construction industry and even organizing certification programmes for specific skills will enhance the overall standard of workmanship.

For example, having certification programmes for high-rise construction works, steel fixing, ethical practice or concrete mixing could be introduced as the pilot and later scaled up to accommodate other ones as may be necessary (Anosike, 2021) and (Ikediashi et al., 2012). According to Olatayo et al., (2022), organizing apprenticeship and practical training workshops for industry professionals will also bridge the gap between theoretical knowledge and practical skills required in the industry. This should include engineers, architects, builders, technologists, technicians and craftsmen in the industry. Likewise, Windapo and Rotimi (2012) reported that facilitating exchange programmes and collaborations with international professional organizations will expose Nigerian industry professionals to global standards and best practices.

Furthermore, encouraging research among industry professionals to aid their development and expertise is crucial. This could be done through the allocation of funding for this purpose in the yearly budgetary provisions of the regulatory agencies. Doing this will open the door for the discovery of new methods, improved materials, safety protocols and innovative solutions to the numerous challenges confronting the construction industry. Research partnerships could be developed for this purpose among professional bodies, academic institutions and the construction industry (Oseghale et al., 2015). Similarly, implementing regular recertification processes and stricter licensing requirements for professionals will guarantee that only competent and qualified persons are practicing in the construction industry (Mansur and Tahar 2017).

iii) Implementing enhanced inspection and monitoring procedures

The effective inspection and monitoring of construction processes are crucial in the prevention of building collapse cases. This is because most of the corrupt practices and substandard materials involved in the industry happen while the actual construction is ongoing. Therefore, developing practicable and effective strategies to bring this under control is highly important. According to Windapo and Rotimi (2012), the adoption of a risk-based approach for handling building inspections where the intensity and frequency of inspections are determined by building location, size and type, will help in the optimization of scarce resources used during inspection. Furthermore, Ogunbiyi et al., (2020) reported that leveraging technological tools such as mobile applications, internet of things sensors and drones will improve the accuracy and efficiency of building inspections. For instance, internet of things sensors can be used to provide building performance data in real-time, while tall building aerial inspections can be done with drones. Also, the introduction of accredited third-party inspections as a supplementary effort to government inspections can lessen the burdensome duties of government regulatory agencies. According to Alabi et al., (2023), this system has been successfully implemented in the United States of America and can be carefully adapted to suit the Nigerian context also. Similarly, a mandatory stage by stage inspection regimen that allows the regulatory agencies check and approve the work progress before proceeding to the next stage is important as well. This could be done by first inspecting the foundations, then the slabs, columns, beams and the

block works progressively. This is a stark contrast to the current inspection process where the regulatory agencies only visit at the beginning and the end of the construction activities (Anosike, 2021).

According to Obot and Archibong (2016), extending inspection and monitoring activities to post-occupancy evaluations will also assist in identifying possible problems in occupied buildings, while also preventing collapse due to unapproved modifications and poor maintenance. Similarly, developing and implementing a transparent system for seamlessly accessing inspection results will promote accountability and improve public confidence. An open database where inspection results are regularly uploaded and kept open to the public can be the best approach to achieving this. Furthermore, Olatayo et al., (2022) emphasized the important role of involving the local communities in ongoing inspection activities, especially about projects that will serve the entire community. This will provide an extra layer of oversight and can be implemented by training the community members about basic safety or failure indicators in a building. Also, creating channels where the community members can quickly report their concerns or suspicions before it results in a tragedy is highly recommended.

Likewise, enhancing quality control and material testing during construction activities could be better achieved by encouraging more on-site testing processes. According to Oseghale et al., (2015), conducting strict chain-of-custody processes and setting up mobile testing laboratories will make on-site testing easier. This could also be complemented with collaborative inspection efforts on the site. Professionals from the various disciplines (builders, engineers and architects) in the industry can form collaborative teams to provide a more detailed evaluation of building materials and components safety (Obot and Archibong, 2017). Furthermore, making periodic structural audit compulsory for occupied buildings, especially those in high-risk categories or those belonging to a certain age bracket will assist in identifying possible problems before they worsen and result in eventual collapse (Oloyede et al., 2010).

CONCLUSION

The investigation into the numerous cases of building collapse in Nigeria shows that collapse is often caused by a complex interplay of

socioeconomic, regulatory and technical factors, contributing to the persistent problem almost simultaneously. The historical background and statistical data analyzed in the study revealed that building collapse has been an age-long problem in Nigeria, with the frequency increasing at an alarming rate as time passes.

From the results obtained, this study concludes that the primary causes of building collapse in Nigeria are structural deficiencies, environmental and human factors. Poor design and engineering, using substandard materials and improper construction methods were the major structural deficiencies identified, underscoring the essential roles of adequate supervision and monitoring in building construction. Soil conditions, weather and climatic impacts and natural disasters were the major environmental factors identified, highlighting the critical roles that conducting appropriate soil tests and building on suitable soils play in structural durability. Noncompliance with building standards, corruption and unethical practices and poor maintenance were the human factors identified, emphasizing the important roles of regulatory enforcement and professional bodies in ensuring building safety.

Furthermore, the study also concludes that there are existing regulatory frameworks governing construction in Nigeria, but they have been significantly ineffective in preventing building collapse. This study revealed that the ineffectiveness arises from insufficient sanctions for noncompliance, corruption, lack of technical knowhow among officials and fragmentation of regulations. The persistence and increasing frequency of building collapse in the country despite existing regulations, shows there is an existing gap between policy and implementation. Similarly, this study concludes that resolving these problems requires a multi-faceted approach. This approach includes the improvement of compliance among stakeholders and enhancement of regulatory enforcement among officials of relevant agencies. Achieving this requires streamlining approval processes, implementing stiffer sanctions for violators and strengthening the existing regulatory bodies.

Likewise, this study concludes that the improvement of training and professional standards for industry professionals such as ethical training, certification programmes, specialization and continuous

professional development is highly important. Furthermore, this study concludes that implementing improved inspection and monitoring activities is essential. Achieving this requires the adoption of risk-based inspection, leveraging on technological tools for more efficient inspections and the introduction of third-party inspection systems. Similarly, post-occupancy regular inspection and structural audits will reveal potential problems in occupied buildings before they eventually collapse.

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