BUILDING COLLAPSE IN GEIDAM AND ENVIRONS: CAUSES, EFFECTS AND REMEDIES

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ABSTRACT

This study investigates the causes and financial effects of building collapse and its associated risks on developers and other stakeholders of building industry. This cross sectional study was carried out in Geidam and its environs. In this study, participants were drawn from key professionals in the construction industry and clients/developers. A sample size of 200 was adopted using purposive sampling technique. The data generated from 150 respondents representing 75 % of the distributed questionnaires were presented using tables and analysis was done using percentages and weighted mean. The findings of the study show that building collapse risks have multifarious factors which were categorized as financial risks and other related risks. Some of the negative effects of building collapse include but not limited to: loss of property, loss of reputation and integrity of the contractors, etc. Based on the findings from this study, it is recommended that all hands must be on deck to curtail the menace caused by building collapse as the effect is usually felt by all parties involved.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Since independence, the Nigerian government has desperately continued to make concerted effort in the area of quantitative supply of mass housing through huge budgetary and policy provisions but surprisingly, the rate at which existing ones are becoming unstable hence, resulting in cracks and collapse of buildings becomes enormous. The site of building instability scattered across the length and breadth of Geidam is quite alarming that it is unimaginable what effects it will have on the building industry, economy and the community as a whole. One could imagine what edifices these buildings would have been if only they were constructed accordingly. It is quite unimaginable that a county blessed with so great potentials in its construction industry can experience such magnitude of building instability. Fadamiro in 2002 defined building as "an enclosure for spaces designed for specific use, meant to control local climate, distribute services and evacuate waste". Buildings can be defined as structural entities capable of securing self by transmitting weights to the ground. More so, buildings are defined "as structures for human activities, which must be safe for the occupants" (Odulami, 2002).

Building instability as a whole occurs when part or whole body of a structure fails and suddenly gives way, the structure, as a result of this failure, could not meet the purpose for which it was meant for. Building instability is an extreme case of building failure. Building failure occurs when there is a defect in one or more elements of the building caused by inability of the material making up the components of such building elements to perform its original function effectively, which may finally lead to building collapse. Buildings are meant to provide conveniences and shelter to the people, but the same building has been a danger trap to the same people. Building is expected to meet certain basic requirements such as buildability, design performance, cost effectiveness, quality, safety and timely completion (Olusola *et al*., 2002). Generally, buildings are expected to be elegant and functional but many projects are constructed that do not meet any of these basic requirements. The recurring incidence of building instability, some of which claimed innocent lives is a consequence of this. Many studies were carried out and various

workshops organized in major cities of the country by various bodies, government agencies and institution in order to look into causes of the incidence of building instability in Nigeria, but none has been able to come out with how each of the determined factors directly lead to building instability in the country. Thus far, this study is designed to determine factors responsible for building instability in Geidam and its environs with the view to come up with policies which would address these problem in Geidam, Yobe and Nigeria at large.

1.2 STATEMENT OF THE PROBLEM

Building collapse is a defect or imperfection, deficiency or fault in a building element or component. It may also be as a result of omission of performance. The degree of building instability/collapse can therefore be related to the extent or degree of deviation of a building from the "as – built" state which is in most cases represent the acceptable standard within the neighborhood, locality, state or country (Ikpo, 1998). However, building collapse can simply be defined as a total or partial/progressive failure of one or more components of a building leading to the inability of the building to perform its principal function of comfort, satisfaction, safety and stability. The incessant buildings collapse in Nigeria has become a great concern to all the stakeholders the professionals in building industry, government, private developers, clients and users, as well as the neighborhood residents. Fall out of the researcher's concern about the increasing incidents of building instability/collapse and its effects on developers in Geidam and its environs formed the basis of this study.

Building collapse has many effects on the economy of nations as a whole and as a result, the following have been identified as the effect of building collapse:

Abrupt Loss of Lives and Property

Instability of building affect many individual lives that occupy such property at the moment, building collapse occur in such building without any notice, therefore, individuals in the building may lose their lives if there is no quick response/intervention and attention from the people around. Also, it causes high degree of injuries on people like; broken legs, hands, waist etc. and other injuries that may cause permanent disability to the victims.

Waste of Properties

Property worth millions of Naira has been wasted in Nigeria due to building collapse. People invest for the purpose of making profit and/or personal uses and when it collapses, it discourages

investors for further investment in property. The instability property most time cannot be regained except such property has been insured, which most developers hardly do these days.

Discouragement of Property Development

Persistent collapse has discouraged many developers to invest in property development, most especially those who are new in the system. As a result of this, they may move into other investments e.g. stock and shares.

Scarcity of Property

Continuous instability/collapse of property may lead to scarcity of property in a particular area as the demand for property may go higher. Also as it discourages investors or property developers, the units of dwelling will also reduce and this will lead to scarcity of property or short falls.

The outcome of this study will educate the general public and the government of the day on the causes, effect and solutions to the causes of building collapse in Geidam and its environs. This research will also serve as a resource base to other scholars and researchers interested in carrying out further research in this field subsequently, if applied will go to an extent to provide new explanation to the topic

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 Aim of the Study

The aim of this study is to identify the major causes of building collapse and its effect among developers and other building stakeholders within Geidam and environs.

1.3.2 Objectives of this research work are:

- To determine the causes of building collapse in Geidam and its environs.
- To determine the effects of building collapse on developers and building stakeholders within the study area.
- To identify the remedial measures or approaches that would address the issues of building collapse in Geidam and its environs.

Research Questions

1. What is the magnitude of building collapse in Geidam and its environs?

2. What factors are linked to the incessant building collapse in Geidam and its environs?
3. From the economic point of view, what is/are the direct effect(s) of building collapse on both the occupants and developers?
4. What measures could be applied to address these problems once and for all?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Glimpse of History

Structural failure has a much longer history than other types of buildings failures. Cowan (1989) investigated and stated that in the ancient world structural failures were often severely punished. For example, the legal code promulgated by Hamurabi, a Babylonian king (1792 – 1750 BC), stated among other things that if a builder has built a house for a man and his work is not strong, and if the house he has built falls in and kills the occupant then that builder shall be slain. This shows that there were building collapses in very distant time past and the government then set Code of Laws, first in history. It was a very harsh code dealing with the social structure, industries, law, economic conditions and family life. On the contrary, the Romans attitude to building collapses was not quite harsh. Cowan (1989) affirmed that there was also a tendency to make sure important structures do not fail by using materials generously, and that is, of course, one reason why so many of the Roman architecture survived till today.

In the European Middle Ages, structural materials were often used far more sparingly. The reasons were partly religious and partly economic. People were more inclined to look for supernatural causes of structural failure. With traditional materials, buckling was not a major structural problem, and multi-storey structures were rare. The emphasis was therefore on size of horizontals spans. In the Roman times, the arch and dome came into use for horizontal spans, with a consequent increase of several hundred per cent in the predictable length of spans. Arches, vaults and domes remained an important part of European structure thereafter.

Cowan (1989) further revealed that there was no structural theory of any sort before the fifteenth century, and none that was practically useful before the seventeenth century.

2.2 The Stakeholders of Building Construction

The essential principle of building design is to produce a building that meets client‟s requirements (Dimuna, 2010) and be fit for purpose. Although owner’s requirements are the term of reference, standards in terms of architectural considerations, building services requirements, structural provisions and safety issues must be fully considered. Therefore, the most economically safe, functional, and aesthetic building is expected; and to produce these, three

major professionals are involved: Architect, Structural/Services Engineers and Contractors. Architect is the first professional who get involve with a client, drafting building design from a client‟s brief (needs and requirements). He/she is responsible from inception of design, architectural materials‟ quality control and physical look for both structural and services elements. In a nutshell, the Architect is responsible for the building to finally be faithful to the original design, hence trends to lead the design-construction team. The structural engineer is a professional that works based on the architect‟s layout and provisions to make sure the building stands, and be safe both at ultimate and serviceability limit states with the most economical structural members (Ellingwood & Dusenberry, 2005; Mosley *et al*., 2012). The structural stability of a building is fully dependent on in-depth design and construction of the following structural elements: Slabs, Beams, Columns, walls and Foundations. The design process must be thorough, starting with analysis (to calculate bending moments and shear forces) of the structural elements; to the design (at ultimate state) for sections and reinforcements required considering the adopted code of practice (BS 8110 in the UK). Several checks are done at serviceability limit states; and often structural performance simulations are also done. Therefore, to achieve sound structural carcass of a building, proper design and implementation (at construction stage) of structural element must be achieved. These include specification of materials (i.e. reinforcement steel, concrete aggregate, cement, structural steel etc.) and adequate site supervision. Sound design and proper implementation (at construction stage) of the design from all angles is the role of the structural engineer and anything short of that, is a potential risk to building stability. Building Services engineers, also known as Mechanical, electrical and plumbing (MEP) engineers are responsible for design of services in a building, such as heating/cooling systems, electrical and communication installations, fire suspensions safety etc. They are much inclined to the provision of services that aid functionality as well as mitigating equipment against disaster in a building. Hence, have no responsibility to ensuring building structural stability. A succinct definition of a contractor and their under role is provided by the UK Health and Safety Executive (HSE) under the Construction Design Management (CDM) regulations as follows: A contractor is anyone who directly employs or engages construction workers or manages construction work. Contractors include sub-contractors, any individual self-employed worker or business that carries out, manages or controls construction work. They must have the skills, knowledge, experience and, where relevant, the organizational capability to carry out the work safely and without risk to

health (CDM, 2015). Delivering a construction project of any scale requires not only expertise and experience but most critically an ethical responsibility to the client, design team and society as a whole. Beyond the professional and legal requirement, all of which are enshrined into Law as well as professional codes of conduct, a building must be completed to design specifications, established standards and rules of health and safety during construction and throughout the building life cycle. Supervision and quality control (materials, workmanship, performance, testing etc.) are key in the process of construction, a role normally shared between the relevant design team members and main contractor as defined in contract and the relevant legislation.

2.3 Causes and Effects of Building Collapse in Nigeria

Oloyede *et al.*, (2010) attributed causes of building collapse as due to man's negligence in some vital areas in construction such as soil investigation, incorporating design for extra loads, stress from winds, earthquakes, uneven terrain, use of substandard building materials, poor monitoring and overall poor workmanship.

Madu 2005, identified causes of building failure as due to natural occurrences such as earthquakes, tornadoes, flood, etc. Other causes according to him include factors such as omission, carelessness, leading to use of deficient structural drawings, absence of proper supervision of projects, alteration of approved drawings, use of substandard materials, corruption in the Nigerian system, building without approved drawings and translocation of building plans to different sites.

Adebayo (2000) opined that efficiency in skill and experience is important in creating valuable workmanship in building construction. Ayinuola *et al.*, (2004), pointed accusing finger to all parties in the building industry, clients, architects, engineers, town planners in the local authorities and contractors stating that they have contributed to building failures in various dimensions. Tyagler *et al.*, (2007) traced the causes of building failures to defects or deficiencies at design and construction stages.

The causes of building collapse in Nigeria have been traced by Ede (2010a) to abnormal factors not obtainable in many other developing nations. Ede (2010b) was further of the opinion that apart from the generally known causes of building collapse such as design flaws, ageing, material fatigue, extreme operational and environmental conditions, accidents, terrorist attacks and natural hazards, that the 'Nigerian factor' become a prominent issue to contend with. The 'Nigerian factor' in the building industry in the word of Ede (2010b) rears its ugly head in

different forms such as corruption, lawlessness and the presumption that any engineer or professional in the built environment can assume all forms of responsibility in the building process even in the absence of basic skill required for such job. Corruption is made manifest in greed and tendency to cheat in virtually every aspect, starting from poor materials and quality of work to the quantities used for construction works. Just as disobedience to civil laws is common in Nigeria, the case in the building industry cannot be different. For this, lawlessness finds a fertile ground in the non-adherence to the building codes and hasty construction. The use of unskilled labour, inexperienced professionals and tendency of some professionals as pointed out by Ede (2010b) to cross-carpet to lucrative specialist duties where they lack the necessary skill, ignorance and abundance of quacks in the building industry are all facts to contend with. Excessive rain falls and poor drainage systems equally pose a serious problem to structures along the Nigerian coastlines. Adebayo (2000) opined that skill, experience and personal ability of the workmen

Involved in the building construction is of utmost importance in creating value. He was of the opinion that the so-called ready-made hollow sandcrete blocks sold by some block-making industries do not measure up to standard in an attempt to make abnormal profits. Once these lapses are tolerated intentionally or otherwise, the quality of the sub-structure or super-structure cannot be guaranteed. The quality of the workmen is a measure of their effectiveness and efficiency at all times during construction while the level of building maintenance after its occupation depends on the performance of workmen. The conclusion of Adebayo (2006) can only be relied upon where the building developer or the contractor are capable and willing to appreciate quality and ready to pay for same. In addition, the developer or client must be able and willing to provide the contractor handling the construction work with high quality building materials and at the right quantity. Moreover, he must be ready to hire competent Project Manager or Site Supervisor for the supervision of works at site.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

This is a cross sectional study designed to study the causes and effects of building collapse in Geidam and environs with the view to come up with measures that would address these problems once and for all.

3.2 Study Area

These cover all the construction sites and collapse structures within Geidam and environs. Geidam is a Local Government Area in Yobe State (northeastern region) Nigeria. Geidam remained the headquarters of the Local Government. It is located in the Eastern part of Yobe State. Its coordinate is between latitude 12°53′49″N and longitude 11°55′49″E. It has an area of 4,357 km² and a population of 157,295 based on 2006 census. The major occupation of the inhabitants is farming and other businesses especially livestock business. Been the hub of livestock and farming business in Yobe State, and to a lesser extent area affected by insecurity especially the one ravaging the north-eastern region of Nigeria, Geidam has witnessed massive influx of individuals in search of either greener pasture or safety with respect to insecurity. As such, this creates an increase demand for both business and residential buildings. This in turn has given room for some individuals to engage in developing both business and residential buildings which they sale or rent. This unprecedented rush by developers to increase the stock of business and housing units partly accounted for great activities in the construction work during these periods whereby many of the construction activities lacking proper monitoring either crack immediately after completion or collapse during or shortly after completion.

3.3 Method of Data Collection

The method employed in the collection of data includes the administration of questionnaires and case studies for the sites. A purposive sampling technique was used in this survey for selecting the sites visited and selecting the construction professionals. The selection of Geidam Local Government as the case study was due mainly to scanty or absence of study in that direction within this locality and its surroundings despite the numerous cases of building collapse been observed.

The questionnaires were administered on the participants in the construction industries. Two hundred (200) copies of questionnaires were administered but one hundred and fifty (150) were returned. Two collapse building sites were purposively selected and used as case study for this research work. In order to effectively determine the factors that are responsible for failure of building, the 5-point rating scale was used to rate the causes and effect of building failure. Two case studies were chosen and used in this research work. They were analyzed with respect to quantum of the cost lost as a result of building failure. Physical measurements in the collapse sites were taken as the information used in this study. Costs from similar buildings were used in order to obtain cost per metre of the floor area of the collapsed buildings. Mean response analysis was used to analyze issues that relate to the causes, effect of building failure, and factors that would help checkmate the incidence of building failure.

CHAPTER FOUR

4.0 RESULT

Findings with respect to working experience of the construction workers show that 26.7% of the respondent were within the working experience of less than 5 years, 25.3% were within the working experience of 5-9 years, 29.3% were within the working experience of 10-14 years, 13.3% were within the working experience of 15-19 years and 5.3% were within the working experience of 20 years and above (Table 1).

Findings with regards to educational qualifications of the respondents show that 1.3% of the respondents were SSCE/NECO/GCE holders, 10.7% were ND/OND holders, 74.7% were HND/B.Sc holders and 13.3% of respondents were MBA/M.Sc holders (Table 2).

Findings from this study with regards to professional qualification of the respondents have shown that 9.3% of the respondents were Town planners, 22.7% were Architects, 29.3% were Builders¸ 14.3% were Engineers and Estate surveyors while 7% of the respondents were Quantity Surveyors (Table 3).

Table 1: Working Experience of the Construction Workers

Working Experience	Frequency	Percent	Cumulative Percent
<5 years	40	26.7	26.7
5-9 years	38	25.3	52.0
10-14 years	44	29.3	81.3
15-19 years	20	13.3	94.7
20 years and above	8	5.3	100.0
Total	150	100.0	

Table 2: Respondents' Academic Qualification

Academic Qualification	**Frequency**	**Percent**	**Cumulative Percent**
SSCE/NECO/GCE	2	1.3	1.3
ND/OND	16	10.7	12.0
HND/BSc./B. Tech	112	74.7	86.7
MBA/M.sc	20	13.3	100.0
Total	150	100.0	

Table 3: Professional Qualification of the Respondents

Professional Qualification	**Frequency**	**Percent**	**Cumulative Percent**
Town Planners	14	9.3	9.3
Architects	34	22.7	32.0
Builders	44	29.3	61.3
Engineers	22	14.7	76.0
Estate surveyors	22	14.7	90.7
Quantity surveyors	14	9.3	100.0
Total	75	100.0	

Table 4 show the mean response analysis calculated for the factors responsible for structural failure and building collapse. The result show that faulty construction ranked number one, followed by bad design, the use of quacks, overloading of structure, non possession of approved drawings, possession of approved drawings but non compliance, poor quality of materials, poor workmanship, and error in design, lack of maintenance culture, flood, bad communication and inadequate fund.

Table 4: Factors responsible for building collapse

Causes of structural failure/ building collapse	Mean	Ranking
Faulty construction	4.6667	1st
Bad design	4.5600	2nd
The use of quacks	4.3867	3rd
Over loading	4.2933	4th
Non-possession of approved drawings	4.2667	5th
Possession of approved drawings but non-compliance	4.1867	6th
Poor quality of materials	4.1733	7th
Bad workmanship	4.1733	8th
Error in design	4.0267	9th
Lack of maintenance culture	4.0133	10th
Flood	3.8000	11th
Bad communication	3.5200	12th
Inadequate fund	3.5067	13th

Table 5 show the effect of building collapse from the economic point of view. Findings show a case study of a 2 blocks of 3 bedrooms flat that collapsed at No. 45 along Kusurmari Street, Hausari Ward Geidam, Yobe State. On the spot assessment revealed that the cost of the collapsed building was estimated as Ten million one hundred and forty seven thousand, three hundred and eighty four naira only (#10,147,384), which is about twenty five thousand five hundred and eighty nine dollars ($ 25,589) at three hundred and ninety six naira to one U.S dollar exchange rate according to CBN as at Tuesday 16th February, 2021.

Table 5: Effect of building collapse with respect to Economy. A Case Study of 2 Blocks of 3 Bedrooms Flat

Similar project:	Collapsed building:
Case study of 4 block, 2 & 3 bedroom flat Base year 26th of December, 2019 Contract sum = #30,572,093.75 Gross floor area = 466 m^2 Cost/m^2 =	Case study of A block of 4 flats, 2& 3 bedroom Current year 3rd of July, 2020 Contract sum = ? Gross floor area = Cost/m^2 = ?

Cost/ m^2 = The contract sum/Gross floor area
Cost/ m^2 = 30,572,093.75=
#65,605.35 466
Cost/m^2 = #65,605.35

Gross floor area

Ground floor area = 9.5*23.7= 225.15
1st floor area = 9.5*23.7= 225.15
Total gross floor area= 450.30 m^2
The total contract sum of the collapsed building is
65,605.35*450.30 = #28,191,189.11
Add 10% adjustment factor
= # 2,819,118.91 #31,010,308.02

Note Adjustment factor are interest rate on capital and inflation.
Deduction of element not yet constructed
Doors #4,330,000.00
Windows #1,485,000.00
Plumbing #1,951,218.75
Electrical #2,601,625.00
Fitting & features #1,350,000.00
Wall finishes #2,460,670.00
Floor finishes #2,523,050.00
Ceiling finishes #1,100,200.00
Paint & decoration #1,158,530.00
#18,966,293.75
Add 10% adjustment factor # 1,896,629.34
#20,862,923.09
Note
Adjustment factor is use to validate the cost of construction of the project of the base year so as to bring it to the present cost of construction of the current year.
Contract sum - elemental not yet constructed
#31,010,308.02 – #20,862,923.09 = #10,147,384.93
Therefore, the cost of construction before building failure is #10,147,384.93

Table 6 show a case study of three bedroom bungalow that collapsed at no. 23 along Kolori Street, Geidam while the building was already in use. On the spot findings show that the estimated cost of the collapsed building to the client was twenty eight million two hundred and thirty eight thousand, three hundred and thirty seven naira (#28,238,337) which is about seventy one thousand three hundred and eight dollars (#71,308) at three hundred and ninety six naira to one U.S dollar exchange rate according to CBN as at Tuesday 16th February, 2021. This is inclusive of cost of demolition and cart away debris offsite.

Table 6: Effect of building collapse with respect to Economy. A Case Study of Three Bedroom Bungalow

Similar project:	**Collapsed Building**:
Case study of 3 bedroom bungalow Base year-13th of October, 2020 Contract sum = #24,917,110.00 Gross floor area = 582 m^2 Cost/m^2 = Cost/ m^2 = the contract sum/Gross floor area Cost/ m^2 = 24,917,110.00 = #42,812.90 582 Cost/m^2 = #42,812.90	Case study of 3 bedroom bungalow Current year 12th of January, 2021 Contract sum? Gross floor area = Cost/m^2 = Gross floor area Panel 1 = 2(4.88 X 26.03)= 254.05 Panel 2 = 7.2 X 4.88 = 35.05 Ground floor area = 289.19 First floor area = 289.19 Total gross floor area = 578.38m^2 The total contract sum of the collapsed building is 42,812.90 X 578.38 = #24,762,125.10 Add 10% adjustment factor = # 2,476,212.51 #27,238,337.61 Add Cost of demolition # 800,000.00 Cart away debris offsite # 200,000.00 # 28,238,337.61 Note Adjustment factor are interest rate on capital and inflation

Table 7 show the mean response analysis computed for factors that would help to checkmate the incidence of structural failure and building collapse at pre-construction and post-implementation phase of building development. The result shows that design strictly to code of practice came first followed in order determination of soil bearing capacity, ensuring that buildings are constructed in accordance to designs, adequate supervision, carrying out proper site investigation, strict adherence to working drawings, avoiding the use of quacks and adherence to specification, proper presentation and interpretation of working drawing, design with experience, produce working drawings before commencing construction on site, and obtaining approval before commencing construction on site.

Table 7: Factors that could help to checkmate the incidence of Structural Failure and Building Collapse at Pre-Construction and Post Implementation Phases of Building Development.

Factors that could help to checkmate the incidence of structural failure at Pre-construction and post implementation phases of building Development	Mean	Ranking
Design strictly to code of practice	4.8000	1st
Determination of bearing capacity of soil before designs	4.7733	2nd
Adequate supervision	4.6267	3rd
Carried out site investigation	4.5867	4th
Strictly adherence to working drawing	4.5333	5th
Ensure buildings are constructed in accordance to designs	4.4267	6th
Avoid the use of quacks and follow specification	4.3733	7th
Proper presentation and interpretation of working drawing	4.3600	8th
Design with experience	4.3467	9th
Produce working drawings before commencing construction on site	4.0933	10th
Getting approval before commencing construction on site	3.2000	11th

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 DISCUSSION

This study measured the strength of some identified factors responsible for structural failure and building collapse within the study area.
Findings from the study revealed that the major factors responsible for building failure were bad design, faulty construction, over loading, non-possession of approved drawings, possession of approved drawings but non-compliance, quackery, error in design, bad workmanship, bad communication, flood, lack of maintenance culture, poor quality of materials and inadequate fund.

In the first case study (A case involving 2 blocks of 3bedrooms flat), findings revealed that an estimated cost of Ten million one hundred and forty seven thousand, three hundred and eighty four naira (#10,147,384) which is about twenty five thousand five hundred and eighty nine dollars ($ 25,589) was a direct loss to the building owner. In the second case study (A collapse building of 3 bedroom bungalow), an estimated cost of twenty eighty million two hundred and thirty eight thousand, three hundred and thirty seven naira (#28,238,337) which is about seventy one thousand three hundred and eight dollars (#71,308) inclusive of cost of demolition and cart away debris offsite was a direct loss to the building owner.

Findings from this study suggest the factors that could help to checkmate the incidence of building failure/collapse as: design strictly to code of practice, determination of bearing capacity, ensuring that buildings are constructed in accordance to designs, adequate supervision, carrying out proper site investigation, strictly adherence to working drawing, avoiding the use of quacks and adherence to specification, proper presentation and interpretation of working drawing, design with experience, produce working drawings before commencing construction on site, and obtaining approval before commencing construction on site.

5.2 CONCLUSION

It is a concluding fact that Nigeria has witnessed collapsed buildings in various dimensions, either those under construction or those already in existences. Causes were identified as mainly man-made but less often by forces of nature. Corruption as man-made factor manifest in greedy contractors and the tendency of clients or landlords to cheat resulting to the use of substandard materials, use of quacks and poor remuneration for building works and services. The building consultants are guilty of negligence, incompetency, poor supervision and the tendency to allow defective works intentionally for a fee or due to ignorance or inexperience. There should therefore be a review of existing building laws that should guide standard code of practice and that should cover all grey areas in order to guarantee safety of buildings.

5.3 RECOMMENDATIONS

Based on the findings from this study, the following recommendations were drawn:

i. Proper planning, supervision and monitoring of construction activities should be institutionalized by policy makers to ensure that all buildings are constructed according to design, specifications and planning regulations.

ii. Professionals in the building industry should maintain their integrity and professional ethics and work in accordance to standard practice procedures laid down by the standard form of building contracts especially when they play in the hands of ignorant clients.

iii. Urban or Town development agencies at various levels of government should enforce control of building works in their localities as laid down in urban and regional planning decree 88, of 1992 and as in section 13 of National Building Code 2006.

iv. There is need to organize periodic public awareness campaign through electronic and print media to sensitize the public on advantages of using professionals as the way of realizing safe buildings.

v. Standard organization of Nigeria should be vigilant to ensure that building materials imported into the country conforms to standard requirements.

vi. All building professionals play key roles to actualize their respective obligations during building production, using the wrong professionals at any stage of the building process put the building in danger.

vii. It is the duty of the architect as the prime consultant to direct the client to use the right professionals. This he achieves by ensuring that the structural and services drawings brought to his office are stamped and signed by professionals registered by their respective professional bodies before proceeding to planning authority for “building permit”.

viii. Soil investigation, material tests and environmental impact assessment should be made compulsory for all institutional, industrial and commercial buildings.

ix. All building plans tendered by any developer for approval must comply with the Nigeria's new building code and local bye laws and regulations.

x. Standard organization of Nigeria should monitor the standard of blocks moulded in block industries and impose minimum standard in terms of sand-cement ratio.

xi. There is need to empower and restructure available materials testing laboratories in the country.

xii. The National Assembly to make speedy passage of the bill on National Building Code.

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APPENDIX I

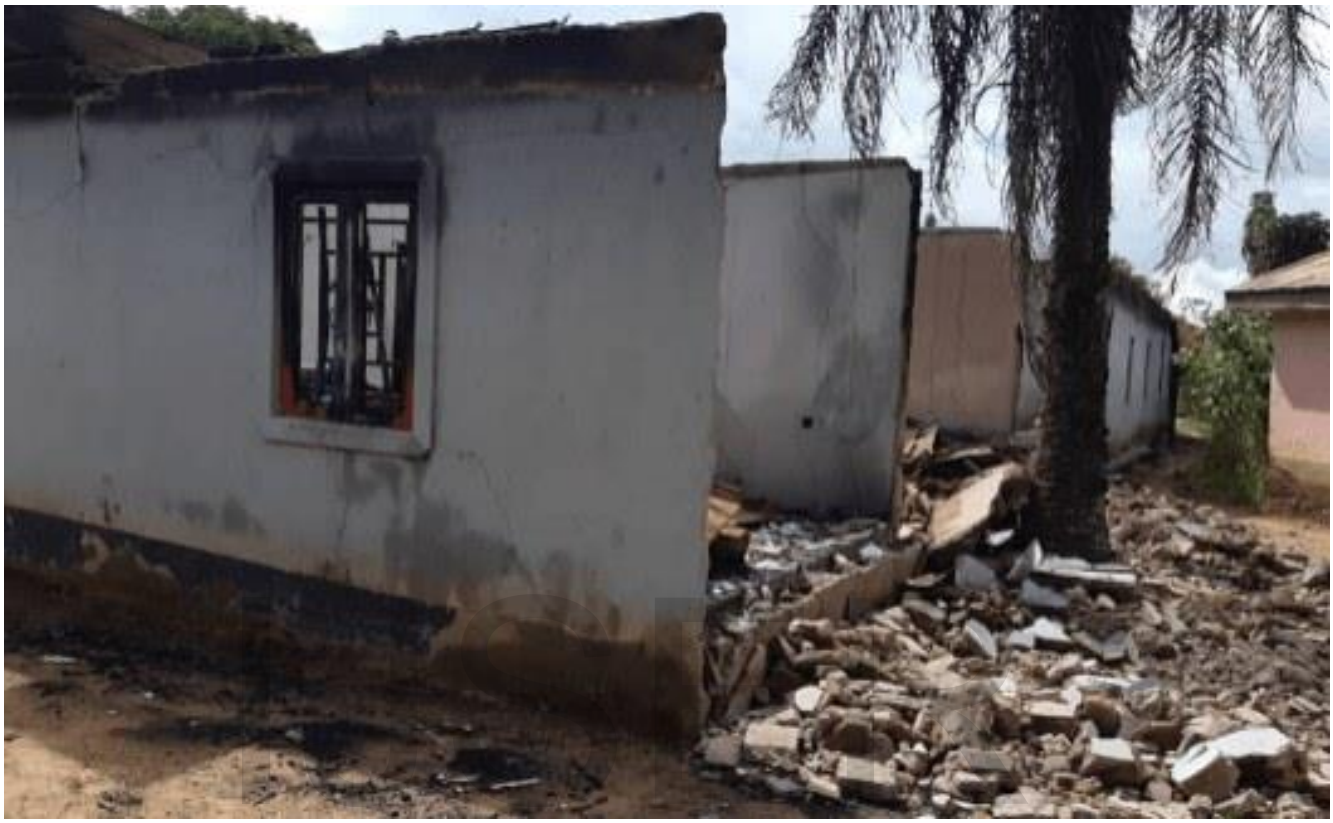

Figure 1: Picture involving case study number 1; A collapsed 2 block of 3 bedroom flat at No. 45 along Kusurmari Street, Hausari, Geidam, Yobe State, Nigeria.

APPENDIX II

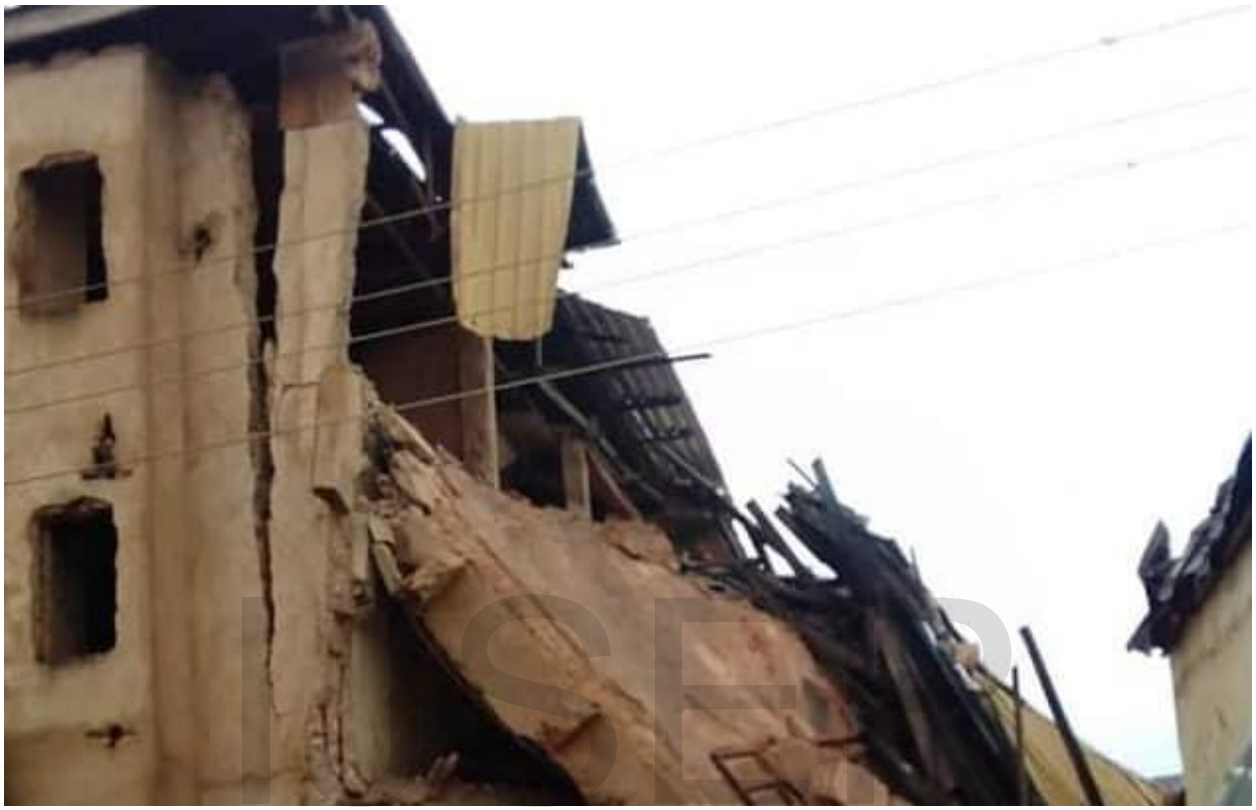

Figure 2: Picture involving case study number 2; Collapsed 3 bedroom bungalow at no. 23 along Kolori Street, Geidam, Yobe State, Nigeria.