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AN INVESTIGATION INTO CAUSES OF BUILDING COLLAPSE IN ABUJA, NIGERIA

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ABSTRACT

It is apparent that in life, housing remains the second basic need of man after food, and as such, several individuals act desperately to secure their own personal dwelling. Therefore, the need to build solid and functional building to avoid unexpected collapse is very vital. Building Collapse occur as a result of the following factors, factors such as; Poor workmanship, bad design, use of sub-standard building materials, foundation failure, faulty construction, extra-ordinary loads, among other factors such as negligence, design flaws, ageing, material fatigue, extreme operational and environmental conditions, accidents, terrorist attacks and natural hazards. Therefore, there is need to eradicate building collapse in Nigeria, most especially, the study area which is Abuja as it is believed to have increasing number of building developments and thus requires adequate attention in order to fore stall the collapse of buildings. In view of the aforementioned therefore, this research work investigated the issues that result into collapse of building in Abuja, Nigeria whether design or construction or other related problems. The research employed the use of primary and secondary data to find out the causes of building collapse and the actions or efforts made by the appropriate authority in solving the problem of building collapse in Abuja. The research showed statistically that the use of Sub-standard materials (53.09%) and poor workmanship (17.28%) are the major causes of building collapse, however there are other causes such as bad design, deviation from approved plan etc. The research also showed that Developers (82.1%) play a huge role in the cause of building collapse. Government (84.8%) currently shoulder the major responsibility of ensuring that building collapse is eradicated. The response from the administered questionnaire showed that Professionals ensure proper site supervision (74.1%), public enlightenment (14.8%), and regulation of building codes (11.1%) as means to reduce the occurrence of building collapse. Amongst other recommendations, Government should enact a Law that will aim to curbing the use of sub-standard materials

and making sure that high quality material prices are subsidised so that all income level can afford it. Hence, if all these recommendations can be taken seriously, it would provide a lasting situation to the menace of collapsed building and the psychological traumas it causes on its victims.

Keywords: Building collapse, Professionals, substandard materials, developers, questionnaire, respondents, and eradication

1.0 Introduction

Building all over the world makes one of the most valuable assets of mankind. More so, while these buildings provide humanity with a great variation of accommodation in form of residence, churches, mosques, offices, schools, hospital etc, they also provide work for the skilled and unskilled person [1].

According to [2], Building is defined as a roofed and walled structure built for permanent use for man's living, working and storage. Buildings are structures, which serve as shelters for man, his properties and activities [3]. To obtain the desired satisfaction, they must be properly designed, well planned, constructed and maintained. A lot of buildings specifically in Port-Harcourt and Lagos State have collapsed and thereby causing a huge economic waste and loss of lives of people and properties.

Building collapse is an irreversible aspect of building failure in which failure is as a result of the development. It is the failure in building that leads to the breakdown of the building structures due to old age, design error, faulty construction, foundation failure, overloading, inadequate steel reinforcement, poor building material, lack of maintenance etc. Excessive rainfalls and poor drainage systems pose a serious problem to structures along the Nigerian coastlines. It is a common sight to see sinking old building around Lagos and within the coastal areas due to water related problems and deficient foundations, this is also applicable to many new structures as they manifest the same problem while under construction [4].

From previous research, it is observed that building failure, superstructure failure and bearing capacity failure are due to high moisture content and differential excessive settlement. However, investigation of structural failure in buildings is an extensive research work which requires a lot of laboratory test, observation and analysis, but for the purpose of this paper, effort will be made to reduce the research on those aspect considered very relevant. Natural forces outside the control of man can also be responsible for failures and collapse such as earthquakes and tremors, landslide, flooding, high wind velocities like hurricane, etc.

Several factors could lead to failure in building and these failures have various modes with which they occur, it should be realised, however that errors are major causes of structural

collapse and no matter how they are derived, little can be done to prevent collapse resulting from them.

An analysis and evaluation carried out showed that 47 reported cases of building collapses verified between 2000 and 2010 and over 300 deaths were recorded for Lagos, Abuja and Port Harcourt and these were the three major areas with high rate of casualties [5]. Most of these cases had resulted into massive economic losses and human fatality. The government also is worried about the frequency of collapse of buildings in Nigeria. However, the recurring event of collapse of building has forced some state governments to enforce and enact some laws recommending forfeiture of such buildings and prosecution of their owners [6]. Table 1 shows some occurrences of building collapse in Nigeria from 2000's till date.

Table 1: Building Collapse in Nigeria from 2000 to 2015

S/N	Building location	Types of building structure	Date of Collapse	Suspected Cause (s)	Remarks (Lives lost)
1	Idi-Oro, Mushin, Lagos	Residential Storey building	2000	Faulty Design	Not available
2	Ajah, Lagos	Estate building	April, 2000	Structural failure	Nil
3	Oke Bola, Ado-Ekiti		2000	Poor quality control, rainstorm	Nil
4	Ogbagi Street, Ikare		2001	Fire disaster	Nil
5	Odo Ikoyi, Akure		2001	Foundation problem	Nil
6	21, Buhari Street, Mushin Lagos	2-Storey Mosque building	April 2001	Unauthorized conversion of former Bungalow to-Storey Building	7
7	Iwoye-Ijesa, Osun State	1-Storey Residential Building (under construction)	2001	Structural failure/use of quacks for supervision	7
8	Odoso Compound, Ikare		2002	Fire disaster	Nil
9	Ojuelegba, Akure		2003	Poor workmanship & under-reinforcement	Nil
10	Stadium Road, Akure		2003	No structural members	Nil
11	Onyearugbulem Market,		2003	Poor workmanship &	Nil

	Akure			under-reinforcement of the cantilevering end	
12	Ebute Meta		2003	Structural defeat	8 injured
13	Elias Street, Lagos		2004	Rainstorm	8
14	Iponri		2005	Inappropriate Foundation	Nil
15	Oke Suna, Lagos		2004	Structural degeneration	1
16	Broad Street, Lagos		2006	Rainstorm	Not disclosed
17	Ebute Meta		2006	Structural defeat	37
18	Ebute-Meta, Lagos	Multi-storeyComercial residential building	2007	Unauthorized conversion/poor supervision/use of quality materials	Several people
19	Kano	Multi-Storey Building	2007	Faulty design/structural failure	Several people
20	Oworonsoki		2006	Faulty Construction	1
21	Abuja		2008	Faulty Construction	3 died, 10 Injured
22	Olomi Area Ibadan, Oyo State	A building being used as Nursery/Primary School	March 25, 2008	Use of poor materials carelessness	13 pupils
23	Wuse Area, Abuja	5-Storey shopping Complex Building under construction	2nd August, 2008	Structural failure incompetent/bad workmanship	2 people injured and 100 people trapped
24	Asero Rea, Abeokuta Ogun State	2-Storey residential Building under construction	20th August, 2008	Contravening the given planning Approval, use of substantial materials incompetency, etc	2 people
25	Ogbomoso, Oyo State	6-Storey Lautech teaching Hospital Complex under construction	19th February, 2009	Use of substandard materials, poor workmanship/supervision	5

26	Aghaji crescent, GRA, Enugu	A wall fence	10th August, 2009	No proper drainage	1
27	Oke Padre treet, Ita-	Uncompleted building	18th October 2009	Use of substandard	3 died, 11 injured
	morin, Abeokuta			building materials	
28	Isopakodowo Street Cairo, Oshodi, lagos	Building under Construction	26th April, 2010	Use of substandard building materials	4 died, 12 injured
29	Adenike street, Off new market, Oniru Estate VI	Uncompleted Storey building	2nd June, 2010	Use of Substandard building materials, non-compliance of house-owners and developers with approved building plan and weak structure	1 died, 2 injured
30	2 Okolie Street, Off Gimbiya Street in Abuja	Uncompleted 4-Storey Building	11th August, 2010	Substandard materials and disregard for building regulations	23 died, 11 injured
31	Abuja		2010	Faulty construction	Not disclosed
32	Garki, Abuja		2010	Overloading	23 died, 10 injured
33	24 Alli Street, Off Tinubu Street, V. I.	4 Storey building	28th September2010	Structural defect/overloading	3
34	Kano		2011	Rain storm	6
35	Abuja		2011	Overloading	100
36	Maryland, Lagos	Modern 5 Storey office complex	2011	Indications of an imminent failure of the structure	Not disclosed
37	Abuja		2012	Unsupervised demolition	2
38	Ikotun Egbe	Six Storey Building	12th Sept, 2014	Structural Failure	116
39	Ebute meta, Lagos	Three Storey Building	15th July, 2015	Weak Structure	Nil
40	Dolphin Estate, Ikoyi Lagos	Residential Building of Senior Politician	11th July, 2015	Gas Explosion	3 Injured

Sources: [7]

Each time a building collapses accusing fingers point at major industry stakeholders that ought to hitherto play both statutory and supervisory role before, during and after erection of a structure. These stakeholders include Structural Engineers, Building Contractors, Clients

and Statutory bodies, Architects, Town Planners, Quantity Surveyors and Lands Developers. Each of the categories of stakeholders and/or professional shares a peculiar blame in any incidence of building collapse depending on the nomenclature or causes. It is therefore important to investigate the actual causes of collapse in buildings in order to proffer an adequate solution to it rather than making guesses about the cause of collapse.

2 METHODOLOGY

2.1 Field Work

A total of one hundred questionnaire was distributed amongst private real estate developers, professional team in the building industry, and government agency concerned with building construction. Sampling size for the research dissertation was forty (40) for Private Real Estate Developers, thirty (30) for Professional Team in the building industry, and thirty (30) for government agency concerned with building construction. These questionnaires were designed separately for each group. Out of the (100) questionnaires administered, only eighty one questionnaires were completed and considered eligible for this paper. Further personal interviews was granted to some respondents in order to provide some additional information relating to the research, due to the questions asked on the research findings. A sample of the questionnaire is attached as appendix.

2.2 Data Analysis

Data analysis is concerned mainly with the analysis of data collected in view of the research study and to specify the findings as well as the data collection were the response of respondents through the use of questionnaire. Out of the 30 questionnaires that was administered to government parastatals, (26) were filled and returned, (28) questionnaires were filled and returned out of 40 by the real estate developers, while only (27) questionnaires were returned out of 30 by the professionals. The total questionnaires received is (81) in all representing 81%.

There are basically two types of statistical analysis; descriptive and inferential statistics. Descriptive statistics help to summarise, describe and organise mass row of data while inferential is to be made about population from sample. It also includes frequency distribution tables, simple statistical mode such as pie charts and bar charts.

3 RESULTS AND DISCUSSION

The study reveals that 10 respondents (12.35%) of the total sample population says it is bad design, 43 respondents (53.09%) says it is through the use of sub-standard materials, 14 respondents (17.28%) supported poor workmanship, 5 respondents (6.17%) says it is as a result of deviation from approved plan, 6 respondents (7.41%) says it is as a result of faulty

foundation and 3 respondents (3.70%) says it is due to lack of maintenance. The implication of this is that the use of sub-standard materials serves as the major cause of building collapse as shown in figure 1.

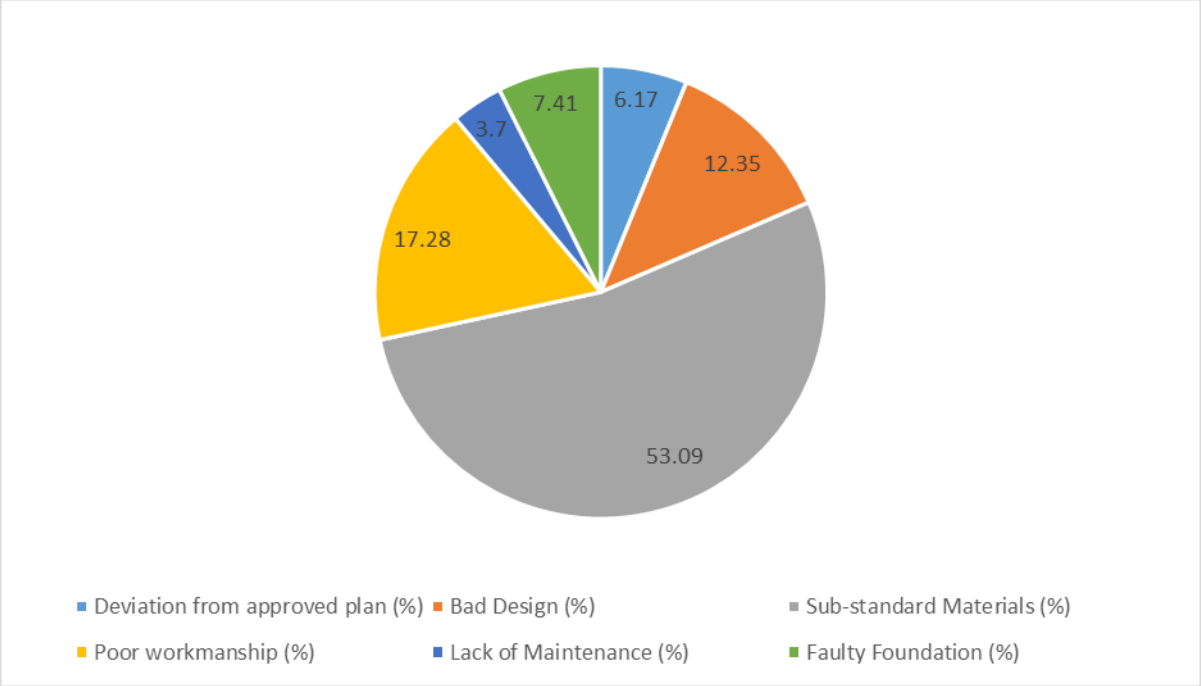

Figure 1: Causes of Building Collapse
Source: Questionnaire Administered (2019)

Figure 2 shows that 23 respondents (82.1%) of the total sample population were of the view that developers contribute to building collapse, while 5 respondents (17.9%) of the total sample population views otherwise. The implication of this is that developers contribute to building collapse.

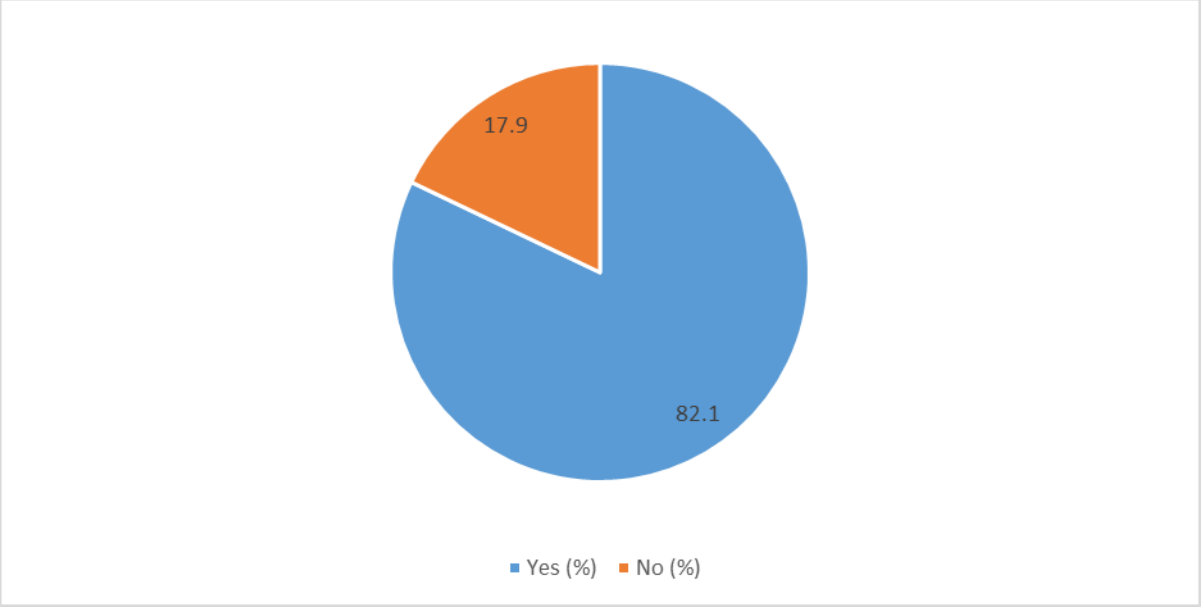

Figure 2: Does Developers contribute to Building Collapse?
Source: Questionnaire Administered (2019)

Figure 3 reveals that 22 respondents (78.6%) of the total sample population says efforts have been made, while 6 respondents (21.4%) of the total sample population says efforts have not been made to eradicate building collapse. The implication of this is that developers have made efforts to eradicate building collapse in Nigeria at large and Abuja in particular.

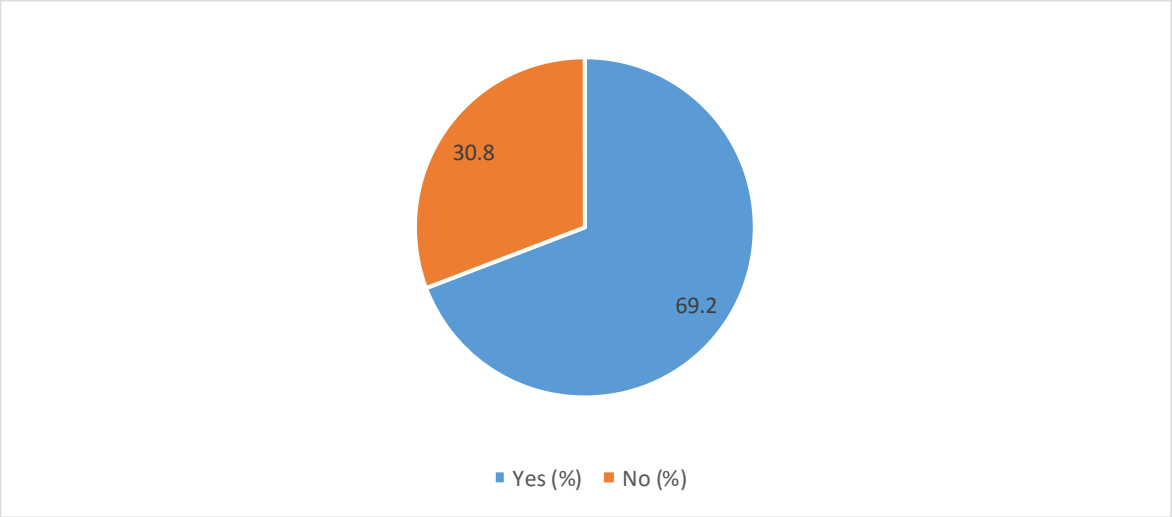

Figure 3: Developers 'efforts to Eradicate Building Collapse
Source: Questionnaire Administered (2019)

Figure 4 reveals that 21 respondents (80.8%) of the total sample population states that government has made efforts to eradicate building collapse in Abuja, 5 respondents (19.2%) of the total sample population states otherwise. The implication of this is that efforts have been made by Abuja government to eradicate building collapse.

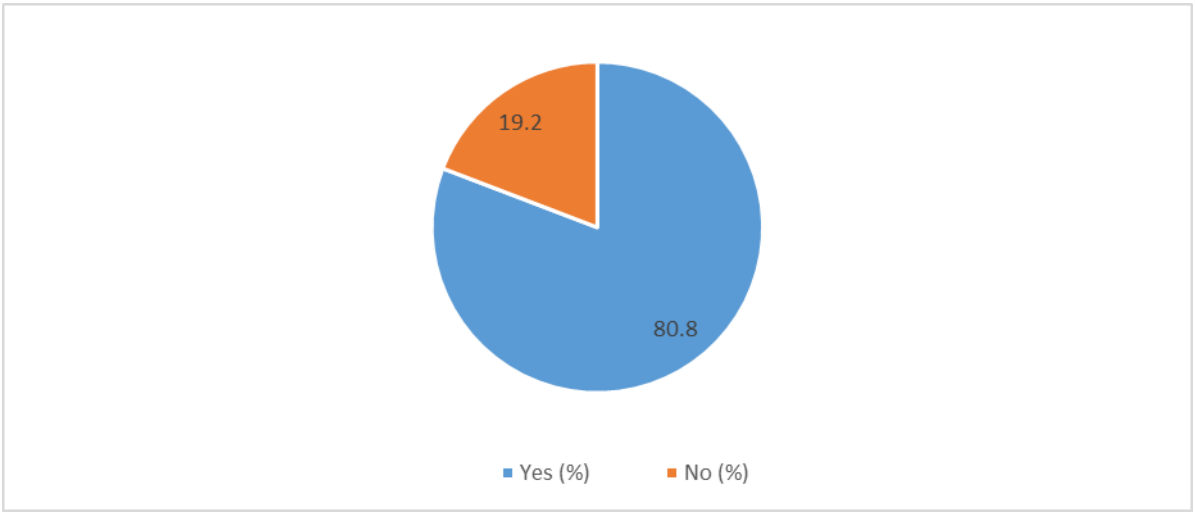

Figure 4: Government efforts to Eradicate Building Collapse
Source: Questionnaire Administered (2019)

Figure 5 shows that 22 respondents (84.6%) of the total sample population says government has made efforts presently, while 4 respondents (15.4%) of the total sample population says

otherwise. The implication of this is that the present administration of Mr. Babatunde Raji Fashola has taken drastic step to curb the menace of building collapse in Abuja, F.C.T.

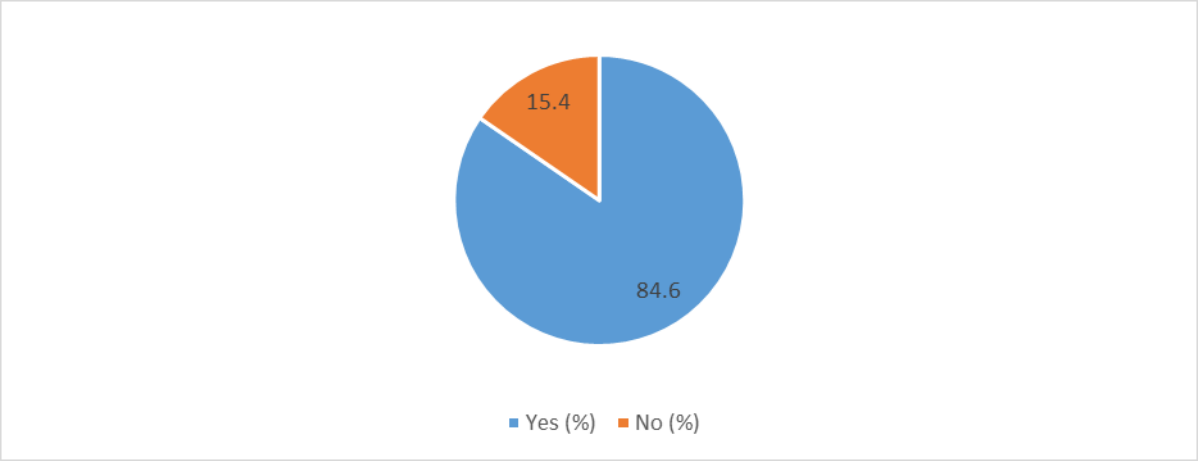

Figure 5: Present Efforts of Government
Source: Questionnaire Administered (2019)

Figure 6 shows that 4 respondents (14.8%) of the total sample population says it is through public enlightenment, 3 respondents (11.1%) of the total sample population says it is through building code regulation, while 20 respondents (74.1%) of the total sample population says it is through proper site supervision. The implication of this is that professionals concerned in the building industry are making efforts to eradicate building collapse through public enlightenment and proper site supervision.

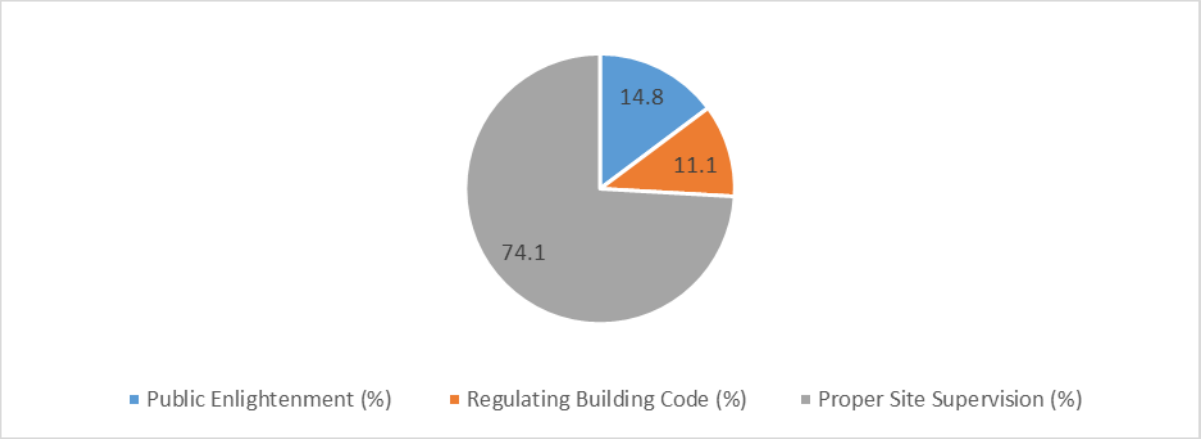

Figure 6: Efforts of Professionals in Eradicating Building Collapse
Source: Questionnaire Administered (2019)

4.0 Conclusion

The results show that:

1. The three categories of respondents agreed that the major causes of building collapse are the use of sub-standard materials and poor workmanship. Also, they agreed that defects in building leads to building collapse.
2. Both the government, developers and professionals are contributing in one way or the other to the causes of building collapse in Abuja, and making efforts to eradicate occurrence of building collapse in Abuja due to its rampancy.
3. The incidents of building collapse calls for serious site works and also to investigate the quality of materials, craftsmen and the nature of contractors involve in the construction on sites.

Therefore, recommendations given by the research and respondents should be taken with serious attention and it will proffer lasting solution to the causes of building collapse in Abuja and Nigeria at large.

5.0 Recommendation

Having carried out due analysis and interpretation of data gathered from both primary and secondary sources, the following are recommended;

1. The developers should not be in a hurry and also keep enough funds for development and deal directly with professionals with good track records and credibility.

2. Building professionals should ensure to carryout proper and efficient supervision of works on site as well as thorough inspect of materials to be used for the construction from sub-structure to superstructure.

3. The government and professional team involve in building construction ought to enlighten each other on how to embrace good and quality professional practice as well as enlightening the general public from time to time on the best professional to approach whenever the decision to go into development is made. Also, to warn them that if the right channel is not pass or using the right people, the end result could be disastrous.

4. Government should enact a Law that will aim to curbing the use of sub-standard materials and making sure that high quality material prices are subsidised so that all income level can afford it. Hence, if all these recommendations can be taken seriously, it would provide a lasting situation to the menace of collapsed building and the psychological traumas it causes on its victims.

5. Government should ensure that before any work commence on site, the materials to be used must be stamped by various professionals working on the site.

6. The menace of building collapse is one that requires all stakeholders' urgent attention. To this end, both government and private individuals make conscientious efforts to make sure that they only approved plans are strictly followed.

7. Government officials in the Housing and Environmental Ministries must continuously inspect construction sites to make sure that only the approved plan are adhered to.

8. The only way through which this problem can be solved is by engaging the service of a qualified building, civil engineer and an Estate Surveyor and Valuer for construction and proper supervision of the project.

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Appendix: Sample of Administered questionnaire

Department of Civil Engineering Questionnaire Form on Research Project

TOPIC: Structural Failure of Buildings in Abuja (Municipal and Bwari Area council Case Studies)

Please all information in this questionnaire will be treated with strict confidence.

1. Sex of Respondent: Male  Female 

2. Literacy Status: No basic Education  Primary/Secondary  Tertiary Education 

3. Purpose of Developing Properties: Personal Use ☐ Investment ☐

4. Experience in Property Development: Below 5years ☐ 6-10years ☐ Above 11years ☐

5. Are you aware of building Collapse: Yes ☐ No ☐

6. What is the Frequency of building collapse in Abuja: Very common ☐ Common ☐

Not common ☐ Undecided ☐

7. Which is the major cause of building collapse (Pick one): Deviation of approved plans ☐

Bad design ☐ Sub-Standard Materials ☐ Poor Workmanship ☐ Lack of Maintenance ☐

Faulty Foundation ☐ Structural Foundation ☐

8. Does defect in Building leads to Building Collapse: Yes ☐ No ☐

9.What are the most common defect in building: Cracks in Walls ☐ Poor Installation ☐

Fungi Decay ☐ Dampness ☐ Unstable Foundation ☐ Defect in Building ☐

10. What type of property experience most collapse: Residential ☐ Commercial ☐

Industrial ☐

11. Does building collapse have any effects and problems: Yes ☐ No ☐

12. Rate the effects of building collapse on Human Lives: Very High ☐ High ☐ Fair ☐

Undecided ☐

13. Rate the effects of building collapse on properties: Very High ☐ High ☐ Fair ☐

Undecided ☐

14. Rate the effect of building collapse on the Economy: Very High ☐ High ☐ Fair ☐

Undecided ☐

15. Rate the Effect of Building Collapse on Housing Development: Very High ☐ High ☐

Fair ☐ Undecided ☐

16. Does Developers contribute to Building Collapse: Yes ☐ No ☐

17. How does most Developers contribute to Building Collapse: Personal Greed ☐

Lack of Maintenance ☐ Lack of Funds ☐ Dealing with Quacks ☐

Deviation from Approved Plan ☐

18. As efforts been made by Developers to Eradicate Building Collapse: Yes ☐ No ☐