

Causes and Effects of Building Collapse in Nigeria

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**This paper is in memory of the lead author who unfortunately died before the final publication of the paper. May his soul rest in perfect peace*

Abstract. The incidence of building collapse in Nigeria has taken an alarming dimension owing to the frequency of its occurrence and the impacts it has on the nation. It became incessant that a month could hardly pass without a case of building collapse, with its attendant gruesome effects that could not be easily forgotten by its victims. The study examines the causes and effects of building collapse in Nigeria with a view to proffering pragmatic solutions. The bulk of the data used in this paper was derived from archival sources and content analysis of different research findings in relation to building collapse in major urban centres in Nigeria. A sample size of 200 landed professionals (20 each from 10 categories of landed professionals) selected randomly were surveyed through administration of questionnaire. A response rate of 94% was obtained. Data gathered were analysed by frequency distribution, percentage and relative importance indices. Findings of the study revealed that most of the causes of building collapse have been attributed to poor workmanship, bad design, substandard materials, non-involvement of registered professionals and use of incompetent contractors. The study also revealed that its multidimensional effects include economic, social, psychological and environmental impacts. The specific effects revealed are loss of life, properties, income; pollution, and phobia.

The study recommended that relevant professionals should be involved in project execution, supervision and monitoring from inception to completion; government must ensure availability of good construction materials at affordable costs and prosecution of dealers in poor quality construction materials and erring contractors.

Keywords: Abeokuta, building collapse, building construction, construction industry, Nigeria

1. Introduction

The place and priority of building to man's existence and survival as he lives and carries out his activities within them is important. The frequency of building collapse in Nigeria in the recent past is worrisome and alarming as their occurrence and the magnitude of the loss in terms of human lives and properties associated with them is becoming too high (Ibrahim, 2014). Even though, the proportion of buildings that collapsed is very small compared with the vast majority that are available for use, the human and material wastes associated with such collapse calls for urgent attention and solutions (Jambol, 2012; Oke, 2011). Apart from psychological wounds often inflicted on both the affected residents and owners of such buildings, the nation at large also garnered huge loss.

Building collapse is a global phenomenon as it occurs everywhere in the world. However, its occurrence is more rampant in developing nations, Nigeria inclusive. Several causes of building collapse were attributed to their natural or man-made phenomena. (Fakere, Fadairo and Fakere, 2012; Oloyede et al, 2010). What is therefore certain is that every cause of failure can be adequately handled if and when all stakeholders know, accept and obey the rules of the game – by complying with the law (Jambol, 2012; Adedeji, 2013). All over the World, the failure of a building structure is not unusual in the construction industry, and the developing countries are not exempted. The collapse of buildings in Nigeria is no longer news to an average citizen, as it has been happening to different kinds of building. The collapse of a multi storey building is usually more disastrous in comparison with low rise buildings (Taiwo and Afolami, 2011) due to higher investment and occupancy rates.

The aim of this study is to examine the causes of building collapse and the associated problems with a view to suggesting pragmatic recommendations that will be capable of reducing cases of building collapse. This study will also add to the scanty literature available in the area as there is the need to seek pragmatic solution the rising incidence of building collapse in the country. The research questions set to be answered by the study are what are the causes and effects of building collapse in Nigeria? To achieve the aim of this study, the paper has been structured into eight sections. After this introduction, the next section is on the background history of building collapse in Nigeria, and successively followed by literature review, the study area, methodology, results and discussion which comprises the causes of building collapse and effects of building collapse, conclusion and recommendations.

1.1 Background History of Building Collapse in Nigeria

Cases of building collapse are not restricted by status of ownership or occupancy, location or level of urbanization as they also cut across all types of construction and use. While some cases of building collapse are not reported, many cases

have been noted in Nigeria. For instance, Folagbade (2001) and Chinwokwu (2000) enumerated forty-two (42) cases of building collapse as occurring between 1980 and 1999 in Nigeria while Makinde (2007) listed fifty-four (54) cases occurring between January 2000 and June 2007 alone. Building collapse has also been observed to cut across the different categories of building – private, corporate or public. Folagbade (2001) showed that of the twenty-five (25) reported cases of building collapse between 1980 and 1999 in Lagos State, 76% were private, 12% were corporate and the remaining 12% were government or public buildings.

Also, building collapse can occur regardless of the size of the structure or number of storeys. Amusan (1991) reported that Barnawa flat disaster in 1977 was a three-storey building, a public building (Secondary School) which collapsed in March 1988 at Ibadan was two-storey building, the collapsed show-room for cars in Lagos in 1987 was just a storey building while that of the Primary School in Iioabuchi, River State in July 1991 was a bungalow building. Folagbade (2001) also reported that the Abuja building which collapsed in March, 1993 and the one at Ojuelegba in 1999 were both multi-storey buildings. Various buildings belonging to private, public or corporate organizations; or various sizes or shapes have appeared on the list of collapse. Some notable issues of building collapse in Nigeria are identified as follows:

In October 1974 when a multi-storey building under construction in Mokola in Ibadan collapsed, 27 people lost their lives. In August 1977, 28 people were killed when a residential building in Barnawa Housing Estate, Kaduna collapsed. Amusan (1991) stressed that the 1988 building collapse in Mushin, Lagos state occurred when an attempt was made to raise the existing building by another floor.

In June 1990, between 50 and 55 people lost their lives when a three-storey building collapsed in Port Harcourt. Also in 1990, operational conversion caused the collapsed of the school building of Saque Comprehensive

College, Port Harcourt when the owner attempted to construct additional floors on structurally unsafe walling. Over 50 students were reported to have died in the incident. Similar trends of conversion were reported in a collapsed Mosque building in Mushin area, Lagos state in 2001 and multi-storey commercial/residential building in Ebute-Meta also in Lagos state in which several people were killed. Some of the cases of building collapse were also as a result of ignorance on the part of developers and unauthorized conversion of buildings (Oluwunmi and Fagbenle, 2010).

On July 18, 2006, 28 people lost their lives when a four-storey building, popularly known as 'Titanic', collapsed in the Ebute Meta Area of Lagos. The building was a block of 36 flats, which housed about 180 people. Hours after the collapse, over 50 people were rescued with many more to follow, but more than 20 of the occupants were killed. In March 2006, the top nine floors of a 21-storey building belonging to the Bank of Industry, which was located on the popular Broad Street, Lagos Island, caved in. The collapse, which occurred days after fire had gutted two floors in the building, killed two people and injured 23 others. The incident was attributed to heavy winds and rain, especially after the fire weakened the structure. The remnant was brought down in a controlled demolition by a team of foreign demolition experts in 2008 (Ejembi, 2016). Also reported was the fence of a Nursery and Primary School that collapsed at Olomi Area, Ibadan, in March, 2008, thereby killing thirteen (13) pupils of the School.

A four-storey uncompleted building at No.2 Ikoli Street, Off, Gimbiya Street in Garki, Abuja collapsed in August 2010, over 30 people were inside. Twenty-one of them died and nine were injured. Some reports put the death toll at 23. In December 2011, an abandoned church building collapsed in Angwan Dosa, Kaduna, leaving five people dead. The abandoned building collapsed when about 25 workers hired to demolish it were working, killing four of them instantly. A fifth worker gave up at the hospital. The church had reportedly been abandoned as a result of the 2011 post-election violence. Poor workmanship and substandard materials used were responsible

for the collapse of a three storey building at Adigbe, Abeokuta in 2012 injuring many persons (Ibrahim, 2014).

In May 2013, a building under construction in the Agbama area of Umuahia, Abia State collapsed leaving up to seven people dead. The incident, which occurred in the night left several other people trapped and it took the efforts of the Red Cross, a construction firm and security agencies to limit the death toll. On July 11, 2013 an old three-storey building on Hadeja Road in the heart of Kaduna metropolis collapsed. A middle-aged woman was hit the most by the collapse of the building, said to be up to a 100 years old at the time it went down (Ejembi, 2016). On a Sunday evening on September 24th 2013, a two-storey building of the Abu Naima Primary and Secondary School in Bukuru, Jos South Local Government Area collapsed. Ten of about 30 pupils, who were said to be mostly below 10 years old, were killed. In July 2013, Ebute Meta suffered another building collapse. A three-story building, which had been marked for demolition a year earlier, collapsed killing seven people.

Two-storey residential building under construction which collapsed at Asero area in 2014, Abeokuta was due to use of sub-standard materials and incompetence of contractors. Two persons were reported dead in the incident. Rain storm also responsible for the collapse of several buildings including a main church, in Yenagoa Bayelsa State, on the 19th May, 2014 causing the collapse many deaths and injuries to people. (Ibrahim, 2014). On Sept 12th 2014, a six-storey guest house belonging to the Synagogue Church of All Nations collapsed in Lagos, trapping about 300 people. After rescue operations, the death toll stood at 116 with over 100 others injured. Most of those killed in the collapse (85) were South Africans. The building was originally a two-storey building said to be less than four years old, which the church decided to expand. It was also reported that the building had no approval from relevant agencies of the government. (Jumia House, 2015).

The five-storey building under construction at Lekki Gardens Horizon 1, in the Lekki Phase

1 area of Lagos which collapsed on Tuesday, March 8, 2016, shortly after a windstorm, killing no fewer than 34 persons and injuring several others. A church building (Reigners Bible Church) which collapsed on the 10th December, 2016 in Uyo killed 67 people and injured several people. The state governor narrowly escaped unhurt while some of his aides were not spared in the mishap. These are few of the hundreds of building collapse cases in Nigeria with each of them having its own reason for collapsing. The frequency of collapse building structures in Nigeria in the past few years have become very alarming and worrisome as many lives and properties have been lost (Jumia House, 2015).

From all the foregoing, it is evident that building collapse has claimed a lot of lives and caused havoc to Nigerians in the past. This therefore necessitates an urgent measures to mitigate it, hence a need for this work.

2. Literature Review

Building collapse is defined as a state of complete failure when the structure has literally given way and most structural members have caved in, crumbled or bucked (Akindoyeni, 2012). Buildings are structures that serve as shelters for man, his properties and activities. They must be properly planned, designed and constructed to obtain desired satisfaction from the environment (Ayedun et al., 2012; Olagunju et al., 2013). Buildings all over the world constitute one of the most valuable assets of mankind. More so, while these buildings provide humanity with a great variety of accommodation in form of residence, churches, mosques, offices, schools, hospitals etc, they also provide employment for the skilled and unskilled persons (Oke, 2011). The functional requirements of a good building construction include durability, adequate stability to prevent its failure or discomfort to the users, resistance to weather, fire outbreak and other forms of accidents.

Failure in a building is an unacceptable difference between expected and observed performance (Atume, 2012). A building is said to have collapsed when its structural components have failed and are not only

unserviceable but unable to adequately support intended loads or lacks stability due to excessive deformation. It has gone beyond the failure of either material or structure, or both (Iyagba, 2005; Ogunsemi, 2002; Taiwo et al, 2011). Such a building is no longer safe for habitation and therefore becomes a nuisance (Jambol, 2010). What therefore is of concern, is the situation that creates collapse, which ought to be an uncommon phenomenon or something extraordinary, an issue of incidence becoming one –too – many that requires control. A collapse can be equated to an accident or an untimely occurrence, an exception rather than the norm. It therefore does not just happen, as in failure, but it is caused and therefore needs control (Jambol, 2012).

Building collapse in most instances involves total failure of the building components, structures and fabrics to the extent that it cannot be remedied by repairs or renovation. The resultant debris is then removed as waste from the site (Akindoyeni, 2012). Building collapse is therefore the failure of all or substantial part of a building, where total or partial replacement may be needed. Failure in buildings could be of two types: cosmetic failure that occurs when something has been added to or subtracted from the building, thus affecting the structure's character; and structural failure which affects both the image and structural stability of the building (Atume, 2012).

Individual opinions differ on the causes and effects of building collapse. Several factors identified by various authors and researchers are generally accepted as the causes of building collapse in Nigeria (Adebayo, 2000; Abdurrahman, 2011; Atume, 2012; Aliyu, 2012; Windapo and Rotimi, 2012; Opara, 2007; Ayodele, 2007; Oyewande, 1992; Obiefuna, 2012; Jambol, 2012; Consumer News Nigeria, 2012; Gold, 2012; Agu, 2014; and Leadership Newspapers, 2014).

It is axiomatic to state that all pursuit of human endeavour has its attendant cost, but the cost being paid in the Nigerian building industry can hardly be justified. Each collapse carries along with it serious effects that cannot be easily

forgotten by any of its victims and neither can it be fully quantified (Ede, 2011). At times, the fear of sudden collapse may not allow a person to sleep with two eyes closed in a building which has experienced a collapse in the past (Ike, 2012).

The resultant consequences are usually in the form of economic, psychological, environmental, and social implications. These include loss of human lives, injuries, economic waste in terms of loss of property, investments, jobs, incomes, loss of trust, dignity, environmental disaster and exasperation of crises among the stake holders (Aliyu, 2012; Atume, 2012; Ibrahim, 2014). The foregoing review indicates that the causes are within limits as they in fact results from the negligent and nonchalant attitude of stakeholders like the contractors, government officials in charge of monitoring and supervision and owners. This study examines empirically the causes and effects of building collapse from the perspectives of the landed professionals with a view to suggesting pragmatic solutions.

2.1 The Study Area

Abeokuta is located in the South – West part of Nigeria, it lies between the longitude 3^o21”E and latitude 7^o9”N. It is 80 kilometres South of Ibadan the Oyo State capital, 73 kilometres North of Lagos. Abeokuta, a historical Yoruba town was founded by a group of people known as Lisabi Circa in 1830 which has a beautiful blend of anxiety and contemporary architecture. The town derives its name from the fairly massive “Olumo” rock and granite hills which are enthralling fitness of the topography of this Egba location. Abeokuta, the capital of Ogun State serves as a seat of administration and a centre for commercial activities. All developments associated with urban centres in Nigeria are found in Abeokuta. Property development activities is very active in the city as various types of properties are constructed and many other properties under construction – public and private, residential, commercial, industrial, recreational, institutional, transportation, religious and agricultural. Its location with proximity to Lagos state is a huge

advantage to its socio-economic development. This justifies the need for a type of study like this on Abeokuta. The population of the town which is ever increasing and cosmopolitan on a gradual basis is presently put at 593,140 (NPC, 2014).

3. Methodology

To achieve the aim of this study, data were collected from secondary and primary sources. The secondary data were obtained from textbooks, conference and seminar papers, Internet exploration, newspaper dailies, and other research materials that reported cases of building collapse in Nigeria. While the primary data were mainly the opinion of the professionals in the building industry on the causes and effects of building collapse. The ten categories of professionals surveyed were the Architects, Builders, Building contractors, Civil Engineers, Electrical Engineers, Estate Surveyors and Valuers, Land Surveyors, Quantity Surveyors, Structural Engineers and Town Planners in Abeokuta. Twenty professionals were selected randomly from each category of the professionals, and surveyed by questionnaire administration. Thus a total of 200 questionnaire were administered out of which 188 were returned and found useful for this study, giving a response rate of 94%. The data collected were analysed by frequency distribution and percentages while the causes were ranked using Relative Importance Index (RII).

$$RII = \frac{\sum W}{A \times N}$$

RII = relative importance Indices; EW = sum of weight for each factor; A = highest weight, N = total number of respondents

4. Results and Discussion

4.1 Causes of Building Collapse

The factors identified in literature review were subjected to empirical tests by sampling the opinion of the professionals in the building industry in Abeokuta. Their responses were analysed and ranked as presented in table 1 below. The responses of the professionals

revealed that the first ten causes of building collapse in order of importance are poor workmanship (.9521), bad design (.9362), substandard materials (.8883), non-involvement of registered professionals (.8777), use of incompetent contractors (.8777), faulty construction process (.8723), foundation failure (.8617), corner-cutting (.7979), poor monitoring (.7872) and lack of sanctions against erring landlords (.7447). The next ten factors are unethical dealings (.7287), inadequate form works (.7128), extra-ordinary loads (.7021), carelessness (.6862), lack of professional supervision (.6862), greedy promoters (.6809),

negligence (.6489), corruption and bribery (.5851), non-adherence to regulations (.5426) and insufficient quality control (.5319). The last twelve factors in order of relative importance are operational conversion of structures (.4575), lack of soil investigation (.4468), ageing (.4415), excessively rushed construction (.4255), lawlessness (.3777), ignorance (.3458), bad governance (.3404), fire outbreak and storm (.2287), terrorist attack (.2660), misuse/abuse of authority (.2021), product failure (.1809), riot / wars and environmental disaster(.0798). These are shown in table 1.

Table 1: Perspectives of the Professionals on Causes of Building Collapse in Nigeria

S/N	Factors leading to building collapse	Responses (N = 188)			EW	RII	RANK
		Yes	Undecided	No			
1	Poor workmanship	179	9	0	179	.9521	1
2	Bad design	176	12	0	176	.9362	2
3	Substandard materials	167	21	0	167	.8883	3
4	Non-involvement of registered professionals	170	13	5	165	.8777	4
5	Use of incompetent contractors	171	11	6	165	.8777	4
6	Faulty construction process	176	0	12	164	.8723	6
7	Foundation failure	162	26	0	162	.8617	7
8	Poor monitoring	158	22	8	150	.7979	8
9	Corner cutting by owner or contractor	168	0	20	148	.7872	9
10	Lack of sanctions against erring professionals and landlords	164	0	24	140	.7447	10
11	Unethical dealings between project promoters and the relevant planning authorities	160	5	23	137	.7287	11
12	Inadequate form and false work	155	12	21	134	.7128	12
13	Extra-ordinary loads	160	0	28	132	.7021	13
14	Carelessness	154	9	25	129	.6862	14
15	Lack of professional site supervision	153	11	24	129	.6862	14
16	Greedy promoters	158	0	30	128	.6809	16
17	Negligence	155	0	33	122	.6489	17
18	Corruption / Bribery	132	34	22	110	.5851	18
19	Non adherence to the approved regulation	128	34	26	102	.5426	19
20	Insufficient quality control and standards	132	24	32	100	.5319	20
21	Operational conversion of structures	126	22	40	86	.4575	21
22	Lack of soil investigation	133	6	49	84	.4468	22
23	Ageing	128	15	45	83	.4415	23
24	Excessively rushed construction	122	24	42	80	.4255	24
25	Lawlessness by owners	123	13	52	71	.3777	25
26	Ignorance on the part of the Owners	112	29	47	65	.3458	26
27	Bad governance	112	28	48	64	.3404	27
28	Fire outbreak/ storm	111	17	60	43	.2287	28
29	Terrorist attacks / Insurgency	62	114	12	50	.2660	29
30	Misuse and abuse of authority	98	30	60	38	.2021	30
31	Product failure	98	26	64	34	.1809	31
32	Riots/War	74	55	59	15	.0798	32

Source: Field Survey; 2016

4.2 Effects of Building Collapse

Analysis of the responses of the professionals presented in table 2 below indicates that the effects of building collapse can be social, economic, environmental and /or psychological. Their responses indicated loss of life (100%), injuries to persons (98.74%), injuries to properties (95.74%), exasperation of crises (58.51%), loss of dignity (67.02%), loss of trust (64.89%) and damage of reputation (92.55%). This indicates that most cases of building collapse were accompanied by loss of lives, injuries of varying degrees to persons living or working in that building and their personal properties that were kept or being used in the collapsed building. The dignity, trust and reputation of the owner, contractors and workers that are connected with the building is also at stake as it points to their weakness or negligence with regards to the collapse or failure of the construction works done on the building. The economic problems are loss of properties (100%), loss of income (100%), loss of jobs (70.21%), disincentive to investment (82.98%), and redevelopment problems (93.62%). This points to the fact that the incomes which used to accrue to the owner of the building in form of rent will be affected when the building is destroyed by collapse, money will also be spent in reconstruction and settlement of the properties after construction. Where the collapse is total, fresh investment will be required to reinstate the property to the usual condition. Most property owners affected may be discouraged by the heavy cost of reconstruction and the site remains fallow for a long period after collapse. The Environmental problems include pollution (76.06%), eye-sore (68.09%) and spread of disease (45.75%); sites of building collapse is a source of dust and bad odour to the environment, and it becomes derelict and refuse collecting place usually when it is left open for a long period. The psychological problems are phobia (59.04%), insecurity problems (53.19%) and unrest of mind (67.02%). The site becomes a ghost haven and until it is rejuvenated, people are frightened when they come nearby. These are shown in table 2.

Table 2 : Perspectives of the Professionals on Effects of Building Collapse in Nigeria

Effect category	Effects	Respondents yes	Percentage (%)
Social problems	1 Loss of life	188	100.00
	2 Injuries to persons	186	98.94
	3 Injuries to properties	180	95.74
	4 Personality/Reputation	174	92.55
	5 Loss of dignity	126	67.02
	6 Loss of trust	122	64.89
	7 Exasperation of crises	110	58.51
Economic problems	1 Loss of properties	188	100.00
	2 Loss of income	188	100.00
	3 Redevelopment problems	176	93.62
	4 Disincentive to investment	156	82.98
	5 Loss of jobs	132	70.21
Environmental problems	1 Pollution	143	76.06
	2 Eye-sore	128	68.09
	3 Spread of diseases	86	45.75
Psychological problems	1 Unrest of mind	126	67.02
	2 Phobia	111	59.04
	3 Insecurity problems	100	53.19

Source: Field Survey, 2016.

5. Conclusion

Despite the efforts of the government over the years in trying to provide sustainable infrastructures for construction industry, through provision of enabling environment, enabling legislation and codes of practice and standards for professionals, the problem of construction failure appears insurmountable in Nigeria.

Looking at the frequency of building collapse and the magnitude of human casualty and loss of other resources associated with building collapse in Nigeria, there is need to take drastic actions to make the environment safe for human dwelling. From the foregoing, poor workmanship, poor building design, use of substandard materials, lack of professional input and supervision, use of incompetent contractors, and faulty

construction process, are all responsible for building collapse. From the findings of this study, one can infer that building collapse was caused mostly by human errors.

6. Recommendations

Based on the findings of this study, it is recommended that the government must, through the appropriate standard organizations, ensure availability of good quality materials for the construction industry. Cost reducing measures should be employed to reduce the cost of essential building materials for the construction industry. Government must demonstrate adequate interest in project safety by prosecuting, with all seriousness, offenders whose activities result in collapse of structures while the owners of collapsed buildings should always be identified and sanctioned. The relevant planning authorities must not compromise on the standards established for the approval of designs and drawings. Relevant professionals must also be involved in project supervision, monitoring and control from inception to completion. The various professional bodies should sanction any of their members found to have been negligent or criminally implicated in the violation of ethics and professional codes with regards to building construction, supervision or approval. Using the media to create more awareness and sensitise the general populace about the economic, social and environmental hazards of collapsed buildings.

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