

ANALYSIS OF BUILDING COLLAPSE TRENDS IN NIGERIA – HISTORICAL RECORDS, CASUALTIES AND THE WAY FORWARD

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Presentation Outline

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INTRODUCTION

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- ▶ In my own understanding, a Building is simply a construction on a plot of land with a roof, walls, structural elements, windows, doors and other ancillary installations for the comfort and safety of end users.
- ▶ A Building Collapses when it loses its ability to perform its intended function(s). According to Olusola K.O et al (2011), collapse of a building may be either partial, progressive or sudden.
- ▶ Building Collapse might be due to natural or man-made occurrences - Akuboh, D.O (2013).

STATEMENT OF THE PROBLEM

- The spate of building collapse in Nigeria in recent times is alarming and there has been a dearth of updated and cumulative information to indicate the reported occurrences of building collapse and the resultant fatalities and damages caused, categories of building most affected, causes of the collapse, states most affected and average annual occurrences/fatalities also need to be evaluated and established.
- So many scholarly publications had been made on this subject matter by numerous authors but the focus were on comparison of a few decades of building collapse occurrences, causes, effects, economic and professional implications.

AIM AND OBJECTIVES

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This study is aimed at enumerating and analysing the incidences of reported building collapses in Nigeria.

The specific objectives of the study are:-

- To determine total incidences of building collapse and resultant deaths recorded from 1974 – August, 2017.
- Enumerate the causes of the reported building collapses within the period.
- To rank and determine the category of buildings most affected.
- To rank and determine the states most affected.
- To establish the average annual occurrence of building collapse and the resultant fatalities in Nigeria.
- Provide useful advisories to relevant stakeholders.

Causes of Building Collapse

The causes of building collapse arising from this study includes in no particular order:

- Improper Concreting
- Sudden Collapse
- Partial Collapse
- Structural Failure
- Heavy Rain/Heavy Downpour
- Uneven Foundation Settlement
- Faulty Foundation
- Collapse of adjacent building/fence wall

Causes of Building Collapse

- Pre-mature removal of formwork for roof slab/concrete decking
- Use of Sub-Standard Materials in Building Construction
- Poor workmanship and supervision/Quackery
- Inadequate roof support
- Use of building while under construction
- Gas Explosion
- Distressed Building
- Illegal addition of floors
- Roof Gutter Failure
- No government approval for some imported building materials
- Client's penchant for cheap labour
- Client's penchant to cut corners

Effects of Building Collapse

- ▶ Loss of life, property and huge sum of capital.
- ▶ Loss of reputation and integrity leading to psychological trauma.
- ▶ Loss of new commissions and contracts.
- ▶ Loss of materials and capital investments.
- ▶ Components and materials are damaged beyond re-use.
- ▶ Capital investments are not recoverable, leading to bankruptcy and high economic implications to the nation's economy.

Source: Lamptey-Puddicombe (2016).

What the Authorities Have Done so far

- COREN-ERM established to monitor projects on a state by state basis.
- Raw Materials Research carrying out several researches in this respect.
- Other professional bodies have expressed their concern through the media and their conferences.
- Standards Organisation of Nigeria (SON) ensuring standard building materials are available in the market and have almost finalized modalities for on site inspection/testing of building/construction materials.
- Development Control Agencies/Town Planning/Physical Planning authorities vet, approve drawings and visit construction sites for compliance.
- Emergency response agencies/security agencies in conjunction with construction companies engaged in rescue activities during occurrences of building collapse.
- Some cases are still in court.
- COREN Tribunal have successfully undertook and concluded some cases in the past.

Study Area - Nigeria



Nigeria – 36 States and Capital



STUDY AREA

- **General Description:** Nigeria consists of 36 states and the Federal Capital Territory, Abuja.
- **Location:** Nigeria is situated on the west coast of Africa, lies on latitudes 4° north of the Equator and latitudes 3° and 14° on the east of the Greenwich Meridian. Shares boundaries with The Republics of Benin and Niger in the west, Cameroon in the East, Niger and Chad in the north and the Gulf of Guinea in the South. Total surface area is 923,768.64sq. Kilometers

Building Collapse Picture (1)



Plate I: Partial Building Collapse at Gwarinpa (45th Road, 1st Avenue), Abuja – 12th January, 2012

Building Collapse Picture (2)



Plate II: 6 Storey Synaguoge Hostel Building Collapse that Claimed 116 lives

Building Collapse Picture (3)



Plate III: A Victim Trapped in a collapse building

Building Collapse Picture (4)



Plate IV: 6 Storey Synagogue Hostel Building Collapse that Claimed 116 lives – 12th September, 2014, Ikotun, Lagos.

Building Collapse Picture (5)



Plate V: An uncompleted storey building belonging to Homaj private secondary school at Igoba community in Akure North local government area of Ondo State – May 7, 2014

Building Collapse Picture (6)



Plate VI: Reigner's Bible Church Collapse, Uyo, Akwa Ibom State – December 10, 2016 (50 to 200 Person's reported Dead)

Building Collapse Picture (7)



Plate VII: Bank of Industry (BoI) Collapsed Building March 22, 2006. Top 9 Floors of the 21 Storey Building Collapsed killing 1 and injuring 24 after the top 2 floors was gutted by fire earlier in the month before the collapse.

Methodology

The data used in this review were obtained from secondary sources which includes publications by various authors, Television news, Newspaper articles, online sources/Internet, Conference proceedings of the Quantity Surveyors Registration Council of Nigeria, 2016. Specifically, Edighoman I.E. (2016) reported 151 incidences of Building Collapse in Nigeria from 1974 till March, 2016. I have reviewed the list and updated it from the sources mentioned above (2012 – 2017) to 247.

RESULTS

S/No.	Year	Frequency of Building Collapse	No of Confirmed Deaths
1	1974	1	27
2	1975	0	0
3	1976	1	8
4	1977	4	55
5	1978	2	16
6	1979	1	10
7	1980	1	6
8	1981	0	0
9	1982	3	24
10	1983	2	14
11	1984	0	0
12	1985	11	41
13	1986	5	7
14	1987	6	34
15	1988	2	1
16	1989	4	1
17	1990	3	55
18	1991	3	17
19	1992	2	12
20	1993	3	5
21	1994	7	22
22	1995	34	7
23	1996	3	8

24	1997	4	20
25	1998	5	10
26	1999	10	55
27	2000	3	5
28	2001	3	14
29	2002	0	0
30	2003	5	0
31	2004	3	0
32	2005	7	9
33	2006	7	41
34	2007	2	13
35	2008	7	21
36	2009	5	18
37	2010	6	34
38	2011	5	111
39	2012	16	24
40	2013	16	39
41	2014	5	132
42	2015	6	1
43	2016	18	137
44	2017	17	29
	TOTAL	248	1,083

Figure 1

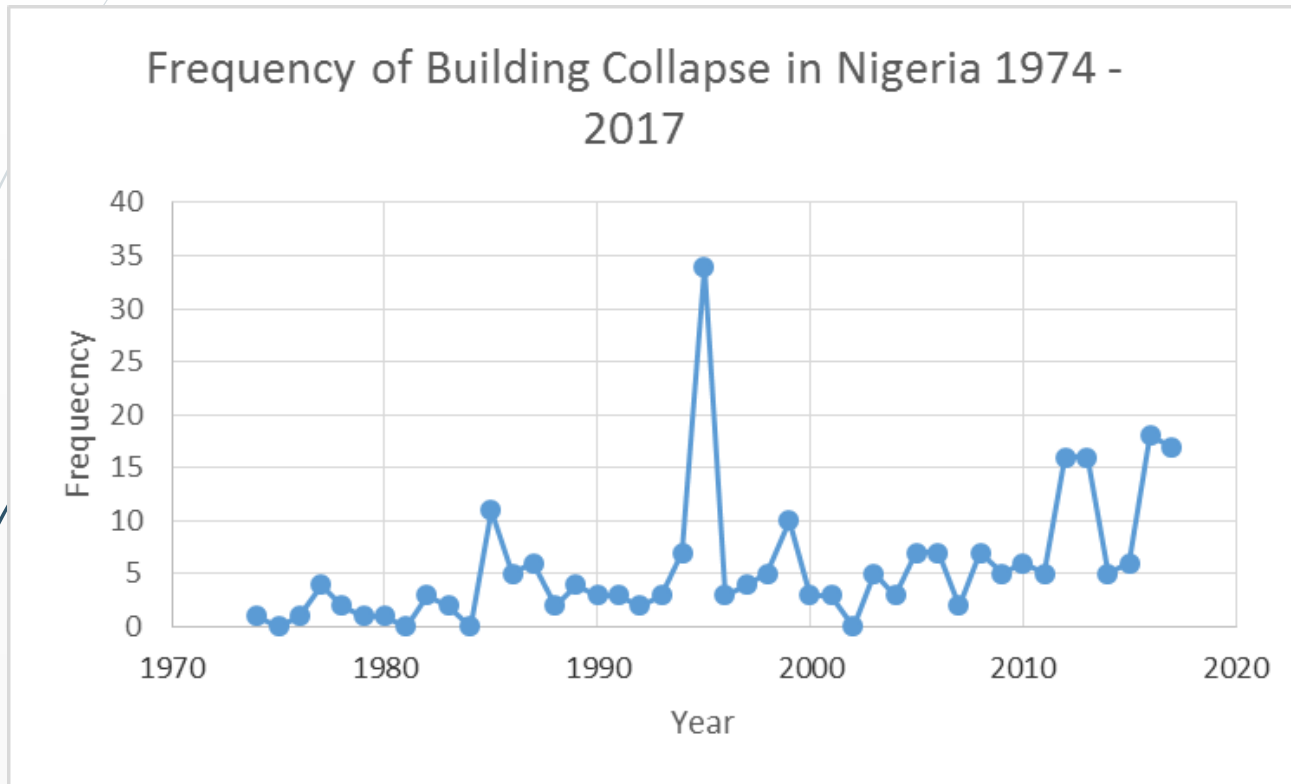
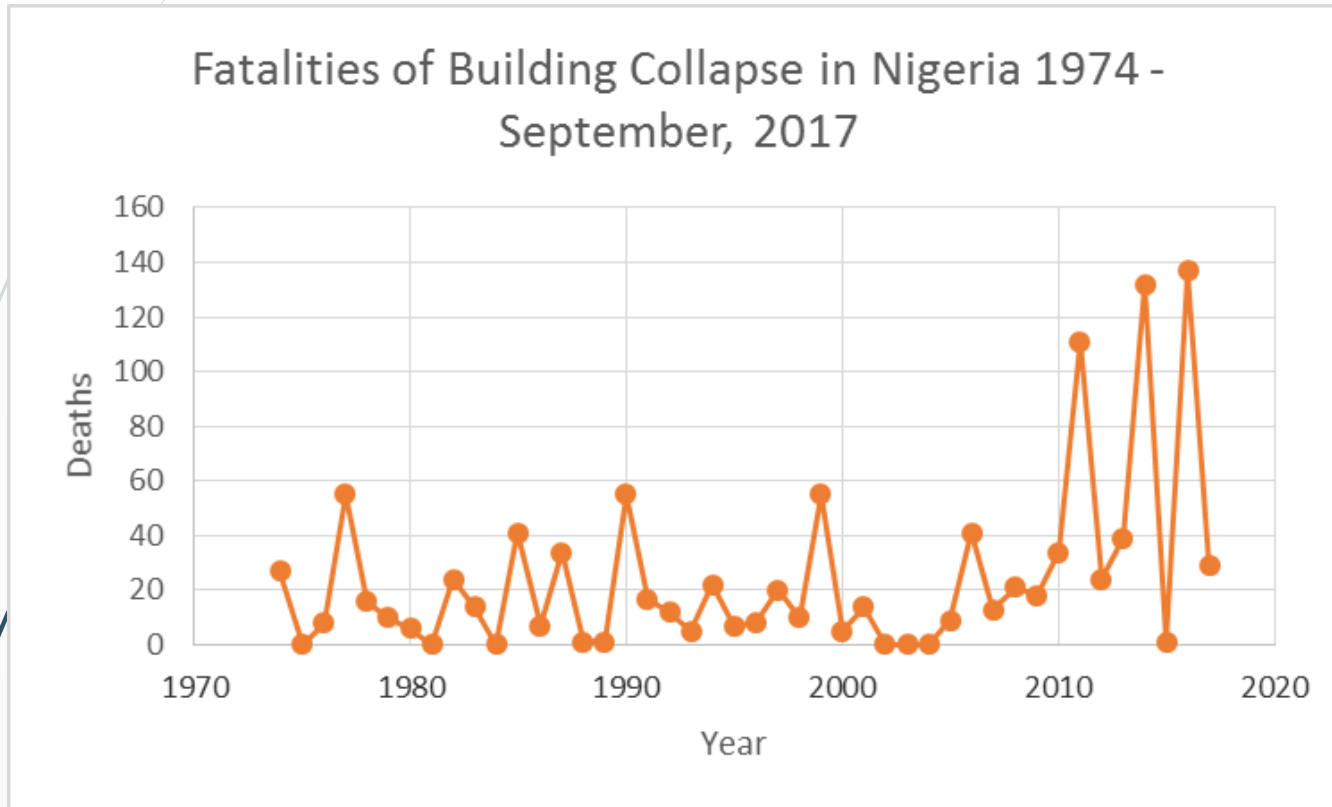


Figure 2



Ranking of Building by Category

S/No.	Building Category	Frequency of Building Collapse 1974 - 2011 (Edighomen I.E - 2016)	Frequency of Building Collapse 2012 - 2017	Total	Rank
	21 Storey	1	0	1	9th
1	6 Storey	2	2	4	8th
2	5 Storey	2	3	5	7th
3	4 Storey	10	11	21	5th
4	3 Storey	26	17	43	2nd
5	2 Storey	22	16	38	3rd
6	1 Storey	17	7	24	4th
7	Bungalow	1	7	8	6th
8	Others (Hospitals, Mosque, Fence Wall, Commercial Building, Hostels, School Building, Residential Building, Uncompleted Building, Multi-Storey Building, Duplex etc with unstated number of floors)	90	13	103	1st
	Total	171	76	247	

NB: One 21 Storey Bank of Industry Building had 9 floors collapsed in 2006 and was demolished in a controlled manner using explosives in 2008 in Lagos. It may be ranked 9 but was not included here because it is the only building above 6 floors affected.

Ranking of States of Occurrence

S/N o.	States	Frequency of Building Collapse	Percentage Occurrence	Rank
1	Abia	1	0.53	17th
2	Adamawa	0	0.00	
3	Anambra	6	3.16	4th
4	Akwai Ibom	2	1.05	11th
5	Bauchi	0	0.00	
6	Bayelsa	1	0.53	17th
7	Benue	1	0.53	17th
8	Borno	1	0.53	17th
9	Cross River	1	0.53	17th
10	Delta	1	0.53	17th
11	Ebonyi	0	0.00	
12	Enugu	2	1.05	10th
13	Edo	2	1.05	11th
14	Ekiti	1	0.53	17th
15	Gombe	0	0.00	
16	Imo	4	2.11	11th
17	Jigawa	0	0.00	

18	Kaduna	6	3.16	4th
19	Kano	5	2.63	8th
20	Katsina	0	0.00	
21	Kebbi	0	0.00	
22	Kogi	2	1.05	11th
23	Kwara	3	1.58	11th
24	Lagos	106	55.79	1st
25	Nasarawa	0	0.00	
26	Niger	0	0.00	
27	Ogun	6	3.16	4th
28	Ondo	10	5.26	3rd
29	Osun	3	1.58	9th
30	Oyo	6	3.16	4th
31	Plateau	1	0.53	17th
32	Rivers	3	1.58	9th
33	Sokoto	1	0.53	17th
34	Taraba	1	0.53	17th
35	Yobe	0	0.00	
36	Zamfara	0	0.00	
37	FCT - Abuja	14	7.37	2nd
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DISCUSSION OF RESULTS

- ▶ The analysis of the recent trends of building collapse from the above data shows that more lives have been lost in recent times (i.e. **66.58%** of the total recorded since 1974) and **33.42%** of occurrence recorded between 2012 – 2017.
- ▶ A majority of the building collapse recorded had improper building description and were categorised as **others**. The ranking of the building collapse in terms of the categories of buildings rate of collapse were determined as follows: Others – 1st, 3-Storey Buildings – 2nd and 2-Storey Buildings – 3rd.
- ▶ The ranking of the occurrence of building collapse in Nigeria according to states indicates Lagos as first with the highest occurrence (55.79%), FCT-Abuja (7.37%) as second and Ondo (5.26%) as third respectively.

AVERAGE ANNUAL OCCURRENCES OF BUILDING COLLAPSE AND FATALITIES

- ▶ Similarly, if we consider the period 1974 to 2017 (i.e. 44 years) and the number of incidences of building collapse for the period (i.e. 247), the average occurrence per year may be presented as $247/44 = 5.6$. Therefore, in any giving year in Nigeria, the average incidence of Building Collapse is 5.6.
- ▶ Furthermore, since 1,083 deaths were recorded over the 44 years record, it means that the average annual death as a result of the incidence of building collapse in Nigeria is $1,083/44 = 24.61$. Therefore, about 25 persons die each year as a result of the incidence of building collapse in Nigeria.

Comparison between my findings and COREN's Position Published by The Punch on 15th October, 2017

AKUBOH				COREN (The Punch, Sunday, 15th Oct., 2017), Okechukwu Nnodim - 436 Die in building collapse in four years)	
S/No.	Year	Frequency of Building Collapse	No of Confirmed Deaths	Frequency of Building Collapse	No of Deaths
1	2012	16	24	12	127
2	2013	16	39	22	63
3	2014	5	132	3	0
4	2015	6	1	7	131
5	2016	18	137	11	115
6	2017	10	21		
		71	354	55	436

- *NSE in collaboration with the presenter might follow up with COREN/Punch for reconciliation of data. Differences might be due to unrecorded or unreported incidences in some quarters.*
- *In 2014, the 6 Storey Synagogue Hostel building collapse alone recorded 116 confirmed deaths, I strongly object to the zero record of casualty for 2014. The records of 2012, 2015 and 2016 respectively need serious reconciliation as I painstakingly documented them.*
- *Injuries should be clearly separated from Deaths recorded.*

RECOMMENDATIONS

- ▶ **Government:** The Government should work in collaboration with professional bodies to review building codes and educational curricula especially in tertiary institutions to include relevant courses such as failure analysis, forensic science, reliability, probabilistic analysis of failure modes, geotechnical/foundation engineering and strengthen student industrial training and work experience scheme. Utmost priority should be accorded technical education at all levels too.

RECOMMENDATIONS (2)

- ▶ **Regulators/Professional Bodies:** Regulatory and professional bodies should collaborate to ensure proper supervision of design, work, quality of materials and personnel at all stages of construction projects. All cases of building collapse should be investigated to the later and all those found culpable should bear the consequences. The reports of such investigations should also be widely published to serve as a deterrent to others. Professional bodies should ensure that their members are adequately guided by their ethics and the need for team work. Structural integrity tests should be conducted on existing high-rise buildings on a regular basis with a view to determining their structural integrity and take necessary steps to avert collapse. Mandatory training and retraining of professionals especially in the area of forensic engineering should be vigorously pursued and sustained.

RECOMMENDATIONS (3)

- ▶ **Developers:** Building and estate developers should comply with all regulations pertaining to building designs, modifications, construction approvals, supervision and permits amongst others. This includes detailed geotechnical/soil investigation and land survey too.
- ▶ **Building Owners:** Building owners should not force professionals to work within limited funds at the expense of safety, quality and structural stability.
- ▶ **Tenants:** Tenants should inspect their buildings regularly for cracks and other structural defects and bring it to the attention of their Landlords and escalate to relevant authorities if no remedial actions are taken within a reasonable frame of time.

CONCLUSION

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- Incidences of Building collapse in Nigeria have no doubt led to the untimely death of many and loss of properties and investments of inestimable value even though many of such cases might not have been evidently reported.
- If human lives are valued and respected in this Country just as in the United States of America (USA) and elsewhere, then the time to take necessary steps to curb the spate of building collapse in Nigeria and the resultant damages and effects in now. This is because **30.77%** of the total lives lost to building collapse since 1974 occurred between 2012 to 2017. Similarly, **33.42%** of building collapse from 1974 to date was recorded between 2012 – 2017..

CONCLUSION (2)

- ▶ All stakeholders have to be involved in the process of curbing this menace threatening the engineering profession, the built environment, the economy and all citizens alike.
- ▶ Incessant building collapse is a challenge to the economy and a drawback to infrastructural development owing to its attendant effects.

CONTRIBUTION TO KNOWLEDGE

This paper has contributed to existing knowledge as enumerated below:

- An Updated list of the incidences of collapsed buildings in Nigeria from 1974 – 2017 has been established for reference purposes in student projects, research, professional, national and international discussions and publications.
- Number of reported Deaths and incidences estimated and re-established from 1974 – 2017.
- Categories of buildings involved ranked and buildings most affected established.

CONTRIBUTION TO KNOWLEDGE (2)

- ▶ States were ranked according to the number of occurrences of building collapse and the States most affected established.
- ▶ Average annual occurrence of building collapse and deaths established for reference purpose and proactive planning of mitigation measures.
- ▶ Reported suspected causes of the incidences of building collapse from 1974 – 2017 reviewed and enumerated.

REFERENCES

36

All materials used in this study are duly referenced as contained in the 2017 conference proceedings of the Nigerian Institution of Civil Engineers (NICE).

This Paper may be referenced as below

Akuboh, D.O (2017). “Analysis of Building Collapse Trends in Nigeria – Historical Records and Casualties”, A paper presented at the 16th International Civil Engineering Conference and Annual General Meeting of the Nigerian Institution of Civil Engineers (NICE), National Engineering Centre, Central Business District, Abuja, Nigeria.

Or

Akuboh, D.O (2018). “Analysis of Building Collapse Trends in Nigeria – Historical Records, Casualties and the way forward”, A Technical Paper Presentation made to the Nigerian Society of Engineers (NSE), Maitama Branch, Abuja), PHCN Building, Maitama, Abuja, Nigeria.

Thank you!!!