

An Appraisal Of Collapsed Building In Lagos And Kaduna Metropolis

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ABSTRACT

The research work is aimed at identifying the causes of building collapse in Nigeria and proffer solutions that would help the combating the menace. Two prominent cities, Lagos and Kaduna were taken as case study. Questionnaires were administered to some project architects, building engineers, civil engineers, town planners, building control/regulatory bodies (KASUPDA – Kaduna state urban and planning and development authority) and some very few reluctant clients. Observations were recorded from field trip to ascertain some structure collapse. Important data were obtained from professional institute that has been monitoring and evaluating building processes and procedures, such as the Nigeria institute of Building (NIOB), the Nigeria institute of Architects (NIA), the Nigeria society of Engineers (NSE), the Nigeria Institute of Town Planners (NITP), and planning authorities. The rate of losses incurred by the country both in terms of human and material resources is enormous each time a building collapses. The use of competent professional and the untiring monitoring of structures by regulatory authority would assist in reducing the problem to the minimum if not eradicated completely. However, building code can also assist in reducing the menace of building collapse in Nigeria through the administrative processes and evaluation methods of regulatory bodies from design stage to construction stage.

Keywords: Building, Collapse, Professionals, Kaduna and Lagos

INTRODUCTION

According to Aronsi (2007), the concept of housing is generally defined for statistical purpose as a dwelling unit comprising a great variety of quantities and qualities. Aronsi (2007) also said that housing is a home, resting place, which tries to fulfill the fundamental purpose of society namely, secured, rewarding, happy or at least a livable life. Buildings are structures which serve as shelters for man, his properties and activities. They must be planned, designed and erected according to laid down rules and regulations governing that sector of our social life. Housing therefore to all intents and purposes is more than a mere shelter as it embraces all the social services and utilities that makes an environment habitable (Chapman 2016).

The factors to be observed in building constitution include durability, structural stability, building climatology, fire outbreak, adequate finance and material usage. Construction trends are changing globally due to the persistent changes in technological development. Innovations and techniques of construction. Consequently, the work involved in the design and construction stages of buildings are basically material selection, components and structure that will meet building standard and satisfy the aesthetic quality of the designer, bearing in mind the financial implications of all additions or subtractions. Building codes of practice that are universally accepted for the design and construction of buildings should be used as a guide to attaining perfection in construction works. Competent professionals should also be commissioned to handle building designs and construction, so as to ascertain the structural stability of houses/buildings (Ibrahim, 2008; Fredrick and Ambrose, 1989).

Building Collapse in Nigeria

Buildings tend to collapse when there is an uncontrollable difference between expected and observed performance. This is attributed mainly to building components, when that component can no longer be relied upon to fulfill its principal functions. Those who investigate and report on collapsed buildings are in good position to identify trends leading to structural safety problems, and to suggest topics for critical research to militate against this trend (Chapman 2016). When building consultants visit construction sites, they see the mistakes made day-in-day out. Many of these are indicators of a lack of knowledge on the part of the people undertaking the construction. It is strange to see a well-fitted house that has associated poor construction details that result in large subsequent repair or eventual collapse. Unfortunately, many of the explanations given for these poor practices results in building collapses (Akinpelu, 2002 and Guardian Newspaper, 2014). The solution provided is to engage qualified professionals from design to construction stage to ensure solidity of the entire process.

Building collapse results from two different

fundamental actions; they are cosmetic and structural failures. Cosmetic failures occur when something is added or subtracted from the building, while structural failures results from both the outlook and the structural stability of the building (Ibrahim, 2008; Chapman 2016). In Nigeria, building collapse has been attributed to the following causes: Design faults (50%), faults in construction sites (40%) and product failure (10%).

Oyewande, {1992} and Olalusi et al (2004), ascribed faulty design, faulty execution of work and use of faulty materials as major causes of building collapse. Fredrick and James (1989) suggested that the overturning of structures due to heavy wind loads, sliding of structures due to high wind, roof uplift or sliding, and building away due to lateral loads are major types of failures recorded in buildings. On the other hand, Akinpelu (2002) categorized the following as major causes of structural failures: environmental changes, natural and man-made hazards improper presentation and interpretation of designs, Richard (2002) opined that deterioration of reinforced concrete could occur as a result of: Corrosion of the reinforcement caused by carbonation and chloride ingress, cracking caused by overloading and use of substandard materials and components, subsidence or basic design faults, and construction defects.

In order to restore its defective elements of a building to an acceptable standard, Ivor (1993) recognized three major types of maintenance namely: Day to day maintenance, Cyelies maintenance and planned maintenance.

Every individual that dwells in one place or the other is a stakeholder when housing issue are discussed. The data of some buildings that collapsed in Kaduna metropolis in the last ten years are as shown in Table 1.0

Table 1.0: Evidence of Building Collapse in Kaduna Metropolis

NO	YEAR	STRUCTURE	LOCATION	REMARK
1	2005	4 bedroom duplex building	No. 18 Abuja street, Rigasa, Kaduna	1 person died
2	2007	Nigerian airforce clinic	NAF, Base Mando road, Kaduna	No death recorded
3	2009	Two flats (Three bedroom Tenamental houses)	No. 16 and 17, swimming pool road, kabala costain, Kaduna	2 persons were reported dead
4	2011	Office complex building	No. 14 Rimi road, Ungwan Rimi, Kaduna	No death recorded
5	2015	Uncompleted blocks of flat	Along Kawo new extension, Kaduna	2 death recorded
6	2015	Church building (Multipurpose hall)	Ibrahim Taiwo road, by Lagos street, Kaduna	No death recorded

Source: Fieldwork 2017 and AJST (African Journal of science and technology)

Information collected revealed that:

- i. A large number of buildings collapse on a monthly basis without Government paying due attention to the cause and rampant situation.
- ii. Building collapse is not limited to a particular soil, client, organization of contractor
- iii. Lagos state recorded the largest and most rampant building collapse in Nigeria, with highest rate of loss of material and human resources.

The Study Areas

Kaduna is estimated to cover 498,006 square kilometers with a population of 2,801,258 people from 1991 census and 6,066,562 from the 2006 census. Kaduna is an industrial area and the central never of the north, which is responsible for the spontaneous and persistent increase in its population and the subsequent need for shelter to house the resident of the great city. On the other hand, Lagos lies on latitude 6.270N and longitude 3.280E. Its metropolitan district occupies the Lagos Island and part of the mainland. It is the second largest city in Africa. Being the industrial as well as commercial centre of Nigeria, the city has a high population density of 9,013,534 from the 2006 census and abundant economic opportunities, which in turn had led to over utilization of available utilities and resources.

Results and Discussions

Table 2.0 Clients Contribution to Building Collapse

Parties	No. of Architect	% of Architect	No. of Engineers	% of Engineers	No. of Builders	% of Builders	Average %
Monetary delays	28	70%	32	80%	36	90%	80%
Non Competent professionals	30	75%	34	85%	38	95%	85%
Cutting corners	24	60%	22	55%	34	85%	67%
Work variation	18	45%	20	50%	26	65%	53%
Building without approval	28	70%	29	72%	32	81.5%	74%

Source: Field work 2017

Questionnaires were administered to 40 professionals each (Architects, Engineers and Builders) to define their response to the question of monetary delay, non-competent professional, cutting corners, work variation and building without approvals. 80% of the professional believes monetary delay contribute to building collapse. Buildings left or abandoned for a long period due to delay in funds which in turn result to weak concrete/slab as a result of persistent rainfall, reinforcement repositioning or omission and poor workmanship from semi-skilled labour used on site. 85% responded to the use of non-competent

Research Methodology

Methods used in obtaining data for the research includes: questionnaire administration and consultations with stakeholders and field survey.

(a) Questionnaire administration

Structured questionnaires were administered to architects, building engineers and structural engineers in the study area by selective random sampling techniques. The questionnaires were stratified into three: "A" on client, "B" professional bodies (NIA, NIOB, NSE, and NITP). "C" Building Regulatory / Planning agencies)

b) Stakeholders consultation

The Nigeria Institute of Building (NIOB) was consulted for information on collapse buildings in Nigeria from 1970 to 2006. also three key personnel were interviewed: An Architect, Builder and Engineer. These are the professionals that are directly involved with building works from preliminary stage to completion stage.

c) Field survey

Three samples of soil were collected from each study area. (Kaduna and Lagos) for soil characteristics analysis so as to determine their water holding capacities.

professionals, this arises when clients are dodging the cost of paying chartered/competent professionals and result to engaging the services of quacks. This usually affects the overall result of all construction works. 67% attributed it to cutting corners, this is usually practiced by both the clients and supervising engineers so as to safe cost and invariably injury the construction process which could result into subsequent building collapse. 53% of the professionals attributed building collapse to persistent work variation which happens as a result of continuous changes in the initial design which may in

turn affect the structural stability of the structure and this may result to structural failure if not handled with check and professional expertise. However, 74% of the professionals interviewed attributed the cause of building collapse to building without approval. The refusal of some clients and professionals to boycott the planning authorities contributes immensely to building collapse due to lack of check and corrections is from the regulatory bodies.

The numbers of people who take their drawings for building approvals are tabulated in Table 3.0, blames are apportioned to Clients, planning authority and engineers. Clients and engineer, planning authority, engineers and architects and finally the client, planning authority, engineers and architects. A total number of 40 respondents were interviewed. 2 respondents which correspond to 5.5% of respondents blame the clients only for buildings without construction approval. 8.5% of respondent and 16% of the respondents apportioned blame on the client / engineers and client/planning authority/engineers respectively. 25% of the respondents solely blame the

Table 3.0 buildings without construction approval

S/NO	Who to blame	Respondent (40)	Percentage %
1	Client only	2	5.5%
2	Client and Engineers	3	8.5%
3	Client, Planning authority and Engineers	6	16%
4	Planning authority Engineers and Architects	10	25%
5	Client, Planning authority Engineers and Architects	18	45%

Source: Fieldwork, 2017

planning authority, engineers and architects for buildings without construction approval.

18 of respondents which constitute 45% largely apportioned blame on the client planning authority, engineers and architects for building without construction approval. It is axiomatic therefore, from the data above that collapse of building is due largely to nonchalant attitude of the professional bodies in the building industries as well as planning authority.

Table 4.0 percentage of people going for building approval

No	Opinion	Architects	% architect	Engineers	% Engineers	Clients	Average %	Period
1	People that do not seek approval	5	12.5%	12	0%	18	9%	2016-2017
2	People seeking approval	35	87.5%	28	70%	22	55%	2016-2017

Source: KASUPDA, 2017 (Kaduna state urban planning and development authority)

A total number of 40 respondents were interviewed to determine the rate and number of people seeking building approval before construction work. 87.5% of the Architects and 70% of the Engineers interviewed are of the opinion that people take their drawings to planning authorities for building approval while

12.5% of the Architects and 30% of the Engineers agreed that people do not seek for building approval. 45% of the clients also concurred that people take their drawings to Planning authorities for approval. In general, approval is more than those who do not seek for building approval.

Table 5.0 Some identified causes of building collapse

No.	Causes	Arch.	Engr.	Plnr.	Client	Total	%age	Period
1	Inadequate funding/cutting corners	25	15	10	5	55	55%	2007
2	Non-competent professional during supervision	15	20	30	18	83	83%	2007
3	Absent of technical knowledge on design interpretation	25	25	30	20	100	100%	2007
4	Climate and environment conditions	25	20	15	10	70	70%	2007
5	Material usage and maintenance culture	15	28	7	30	80	80%	2007
6	Lack of strict compliance with building codes	12	13	25	15	65	65%	2007
7	Laxity on the part of planning authorities	25	25	10	15	75	75%	2007

Source: Field work, 2017

55% of the respondents believe that the cause of the building collapse could be attributable to inadequate funding which always results to client cutting corners. Inferior and the cheaper materials are thus used at the expense of the stability of the building. 83% of the respondents are of the opinion that the involvement of non-professionals during the supervision of the construction of buildings also contributed to the major cause of building collapse in Nigeria. There was a general consensus as 100% of the respondents unanimously agreed that the absent of technical knowledge on design interpretation is the major bane

on the collapse of building especially in Lagos and Kaduna metropolis. 70% and 80% of the respondents agreed that building collapse in Nigeria could be attributable to climate and environmental conditions and materials usage and maintenance culture respectively. Lack of strict compliance with building codes was also identified as one of the causes of building collapse as observed by 65% of the respondents. Lastly, 75% of the respondents heaped the blame of building collapse on the planning authorities for not having enough manpower to cover all areas under going building construction processes.

TABLE 6.0: Water holding capacities of soils

Location	Soil profile	Land area	Weight of wet soil (gms)	Difference in weights (dry/wet soils)gms	Water holding capacity (%)	Average water holding capacity
Some selected areas in Kaduna	AI	Upland	15.0	5.0	50	51%
	AII	Landslope	15.1	5.1	51	
	AIII	Depression	15.2	5.2	52	
Some selected areas of Lagos metropolis	BI	Upland	17.1	7.3	73	76%
	BII	Landslope	17.3	7.3	73	
	BIII	Depression	18.0	8.0	80	

Source: Fieldwork, 2017

The water holding capacity of each of the study area has been calculated. Though variations exist as a result of the different settlements selected for the research work. The average percentage of the water holding capacity of the soils in Kaduna metropolis is less compared to that of Lagos areas. This indicates that the clay fraction of the soil in Kaduna area is less and that sand/silt fraction is high and therefore such soil is suitable for strip foundation footings. The high clay content of the soils in Lagos metropolis makes it more excellent for raft, pad and pile foundations footings.

Conclusion and recommendations

The cumulative impression gathered from the data collected revealed that: Majority of building clients tends to prefer the services of non-competent professionals because it is less expensive and readily accessible. The absence of professional on sites gives room for cutting corners and usage of substandard materials, non-professional have taken over the services of architects, builders (especially), and engineers, leading to the construction of defective buildings.

However, the use of competent professionals (architects, engineers, builders and planners) should be encouraged so as to be sure of the structural stability of the buildings housing us. All professional institutes (NIA, NIOB, NITP and NSE) should collaborate together by making their services

available and reachable at moderate rates and charges.

The buildings codes would help in reducing building collapse by enforcing a law that strengthens the administrative and evaluation procedures/processes of regulatory bodies (KASUPDA, KEPA and FEPA) to monitor building processes from design to construction stage.

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