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## PREVALENT RATES OF BUILDING COLLAPSE IN SOUTHWEST NIGERIA: PROFESSIONAL CHALLENGES TO ARCHITECTS.

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### ABSTRACT

Emergency management is the consequence of natural and man-made disaster, to which collapse disaster has started gaining awareness in Nigeria. Building collapse response needs rapid decisions within a short duration, the initial response being an obligation for all; government, individual, Non-governmental agencies, professional organisations and Nigeria communities at large. The paper examines the prevalence of collapse building - disaster, preparedness, response and sustainable reconstruction. It discussed this in the framework of architectural and planning modus operandi. The main objective of this paper is to examine roles of stakeholders particularly the architects as they assist to find lasting solution towards combating the upsurge trend of collapse structures in Southwest Nigeria, while contributing through architectural planning, design and construction development strategies to help mitigate rate of building collapse. Since, building collapse is now becoming prominent form of disaster on its own. The paper takes into consideration design and construction stages of building in course of search for the problem, while it integrate areas of architectural spatial design techniques aimed at mitigating effect of collapses on infrastructures. To achieve the aim of this study, which is to examine roles of stakeholders particularly the architects in collapse building with a view to proffering solution to identified causes. In order to achieve the objectives of the research secondary data were gathered for the study and are obtained from dailies, reports and other similar research documents that records causalities.

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**Keywords:** Architecture, Planning; Disaster; Construction; Building Collapse.

### INTRODUCTION

Buildings and the provision of safe and affordable homes are major contributors to sustainable development and through the centuries (Abimbola2011), these have been important aspects of the socio-economic development of humans. In the view to meeting up with socio-economic development people building structures of various types ranging from the following purposes such as residential, commercial, industrial are built. In an advent of disaster in any of such developments. It became so common place in our country that experts blame the development not only on the quality of building materials but also the building contractor of such project, quackery and on such other factors as population density and soil topography which many professionals do not take into consideration before embarking on such projects. In the meantime the after effect or consequence of structural collapse are the responsibilities of all involved in the construction industry. This includes the Builder or contractors, engineers, quantity surveyor, quality assurance manager,

project manager and the architect. The paper tends to address the architects responsibilities, roles and the challenges to architects professional carrier. Empirical evaluation of regional geopolitical occurrence of collapse disaster in Nigeria were documented. Building collapse indicate an abrupt or steady falling down of structure or caving in of any part of the structure due to the loss of structural integrity of any building parts or due to impact of an enormous forces of nature and results in significant personal injury, death or imposing major economic loss. Nigeria is said to be God's own country where horrible natural disaster are not serious challenges confronting the nation but the advent of new chiefly man-made tragedy. According to The NIA (Nigeria Institute of Architects) -90 conditions of contract, Architect is somebody whose job is to design buildings and advise on their construction. An architect is a person who plans, designs, and oversees the construction of buildings. To practice architecture means to provide services in connection with the design and construction of buildings and the space within the site surrounding the buildings that have as their principal purpose human occupancy or use. Architectural service to mean a service provided in connection with the design, planning, monitoring or construction of buildings that is ordinarily provided by architects. There is need for strict enforcement of regulations in the building and construction industry in Nigeria. It can alone be achieved through a holistic approach by involving all involved in the building industry.

## LITERATURE REVIEW

Nigeria has a land area of approximately 356,700 sq. miles (923,800 sq. km), with varying climate and terrain like coastal swamps, tropical forests, woodlands, grasslands, and semi-desert (National Disaster Management Framework (NDMF) 2010. According to Oke, A. (2011), Structural integrity of a building is the ability of a structure or a component to withstand a designed service load, resisting structural failure due to fracture, deformation, or fatigue or unforeseen disaster. 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 residence, churches, mosques, offices, schools, hospitals etc., they also provide employment for the skilled and unskilled person. Oke (2011). It became imperative that we examine the role played by the building industry towards sustainable national development and vice versa. The major manmade causes of building collapse are mainly ignorance, negligence and greed. Ignorance has to do with when incompetent personnel are in charge of design, construction or inspection. A major area of negligence is in architects or professionals specification writing which establish exact specifications for all materials and methods of construction. In Nigeria like any other countries in the world, building collapse menace is growing at an alarming rate, seemingly uncontrollable or beyond easy control. Example of these are abound, namely Multi-storey building, Mokola, Ibadan, Oyo State (2004), Barnawa, Mosque building, Osogbo, Osun State (2006), Uncompleted Two-storey building, Isikan, Akure, Ondo State (1998), Two-storey residential building, Funbi Fagun street, Abeokuta, Ogun State (1998), Nigeria Industrial Development Building (NIDB), Lagos (2006) 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 neighbourhood residents. Fall out of the author's concern about the increasing incidents of collapse building nation-

wide form the basis for this paper to find out the major causes and probable remedial measures to collapse of buildings in Nigeria.

### **OBJECTIVES**

The objectives of this paper are:

- i. To determine the general causes of some building's collapse and especially in the South Western state in Nigeria
- ii. To evaluate the extent of loss in terms of life and property.
- iii. To make some suggestions on safe delivery of structure particularly building projects.

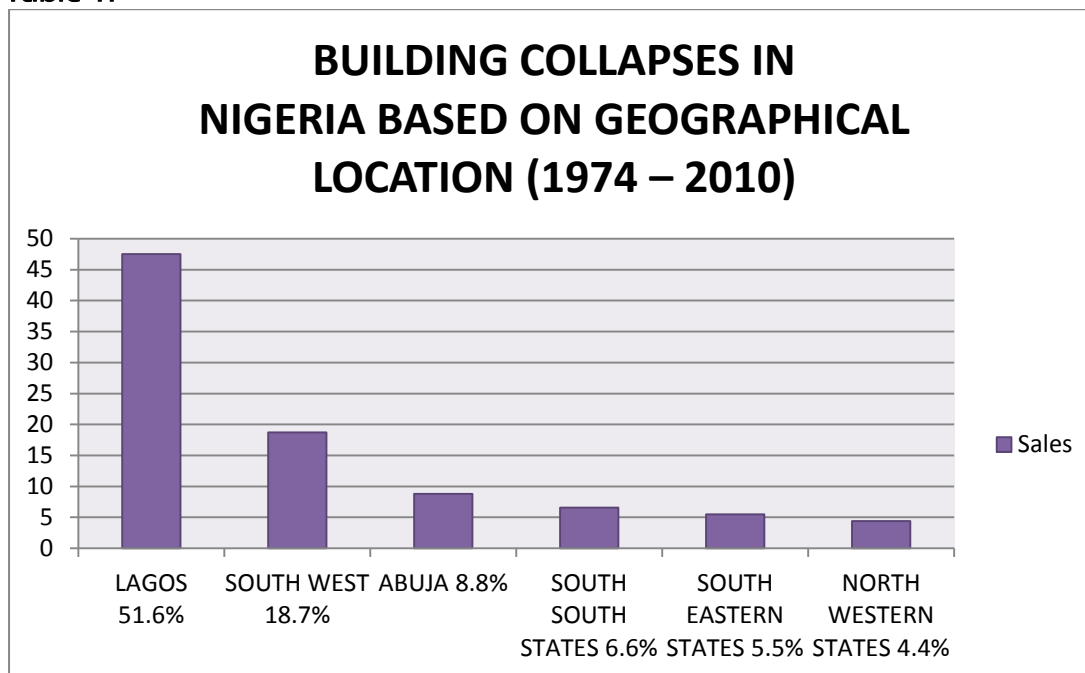
### **METHODOLOGY**

Information for the study was received from books, observations, past works, newspapers on building collapse and the internet, which is to investigate the causes and effect of building collapse in Nigeria and suggest various ways of eliminating the incidence. The data were collected through investigation of past building collapse in Nigeria. Analysis of past documents (secondary data) from both internal and external sources was adopted as their search instruments in gathering data on various incidence of building collapse in the country. The data were partly gotten from previous research works and various newspapers were also consulted (through the dailies and their website). All the available incidences of building collapse as at the date of analysis of the data were included in the historical data.

### **STATEMENT OF THE PROBLEM**

It is common to hear incidents of building failure or collapse in major Nigerian cities like Lagos, Abuja, Enugu, Kaduna and Ibadan. According to Windapo and Rotimi, from a total of 91 cases of building failures collapse in Nigeria between 1974-2010; 51.6% occurred in Lagos, 18.7% in the South Western states thereby creating awareness at the alarming rates of building collapse in the geopolitical region in the country, 8.8% in Abuja—the Federal capital city, 6.5% in the South-South states, 5.5% in the South Eastern states, 4.4% in both the North Western and North Central states and 0% in the North Eastern states. They contended that these incidents are poor construction supervision related.

**Table 1:**



Source: Windapo and Rotimi (2012).

### STUDY AREA

The study area is south western Nigeria which consists of Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States. It is also known as the south West geographical zone of Nigeria. Nigeria is made up of six geo-political zones namely: North-West, North-East, North-Central, South-South, South-East, and South-West as shown in plate 1.0 below. Thus, simple random sampling method was adopted. South-West geo-political zone was selected out of which six. The area lies between longitude 20 311 and 60 001 East and Latitude 60 211 and 80 371N (Agboola, 1979) with a total land area of 77,818 km<sup>2</sup> and a population of 27, 721, 832 (NPC, 2006). The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states, in the West by the Republic of Benin and in the south by the Gulf of Guinea.



Plate 1.0 Geopolitical Zones in Nigeria  
 Source: gaisma.com

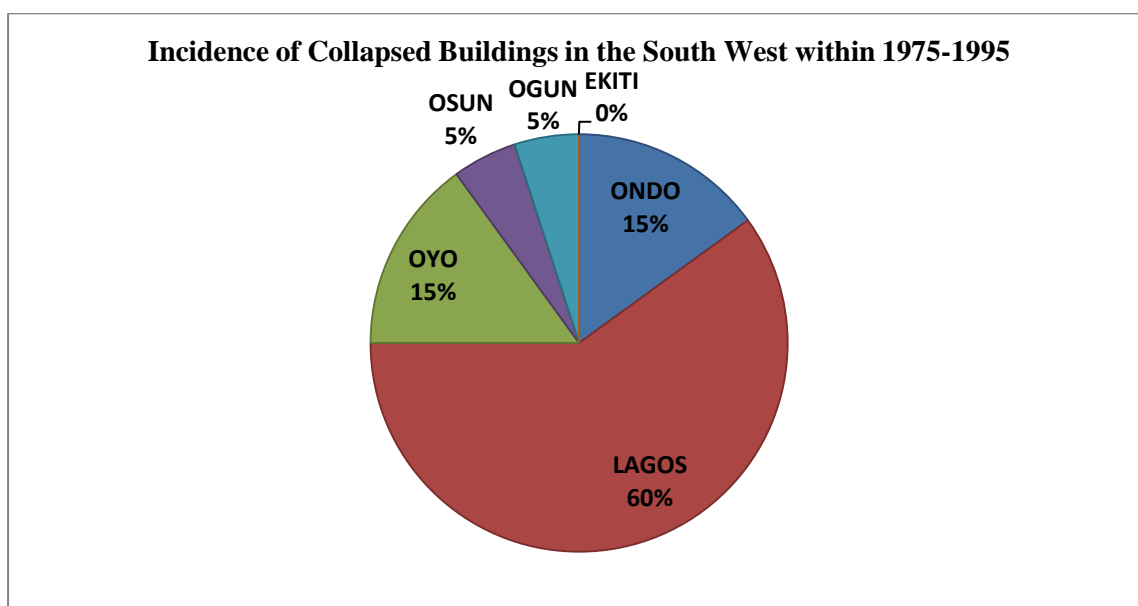
The climate of Southwest Nigeria is tropical in nature and it is characterized by wet and dry seasons. The temperature ranges between 21°C and 34°C while the annual rainfall ranges between 1500mm and 3000mm. The wet season is associated with the Southwest monsoon wind from the Atlantic Ocean while the dry season is associated with the northeast trade wind from the Sahara desert. The vegetation in Southwest Nigeria is made up of fresh water swamp and mangrove forest at the belt, the low land in forest stretches inland to Ogun and part of Ondo state while secondary forest is towards the northern boundary.

**Table 1.0A:** List of Available Records of Collapsed Buildings within the Last Two Decades in Nigeria

DATES OF INCIDENT	STATES	TYPES OF BUILDINGS	NO OF LIVES LOST/INJURED	REMOTE CAUSES
Dec, 1976	Ondo	1 Storey	8 Died	Sub-standard material/structure
May, 1977	Oyo	2 Storey	10 Died	Poor workmanship by contractors
June, 1982	Ondo	2 Storey	7 died	Structural defective
Sept, 1983	Lagos	2 Storey	8 died	Heavy down pour
Dec, 1983	Lagos	4 Blocks of flats	6 died	Heavy down pour/defects
July, 1985	Lagos	3 Storey	9 died	Structural defect/poor
May, 1987	Lagos	2 Storey	4 died	Structural defect/poor materials.
Sept, 1987	Lagos	3 Storey	8 died	Substandard materials
Nov, 1988	Lagos	School Building	4 died	Defective structural design
July, 1994	Osun	3 storey	NA	Heavy downpour
Nov, 1993	Ogun	2 storey	3 died	Sub-standard materials
August, 1991	Lagos	2 Storey	10 died	Structural defects
March, 1992	Lagos	3 Storey	10 died	Defective structural design
June, 1992	Lagos	Hotel building	2 died (many injured)	Dilapidated structures
March, 1994	Oyo	2 Storey	4 died (11 injured)	Sub-standard building materials.
June, 1994	Lagos	3 Storey	17 injured	defects/poor workmanship
Aug, 1994	Osun	1 Storey	2 died (6 injured)	defects/ sub-standard materials
Aug, 1994	Oyo	2 Storey	10 died (74 injured)	defects/poor materials
June, 1994	Lagos	4 Storey	4 died (many injured)	Structural defects
Aug, 1994	Ondo	1 Storey	1 died (many injured)	defect/sub- standard
Jan, 1995	Lagos	6 Storey	1 died	defect/sub- standard

**Source:** Boye Ajai – 1995 Factors Responsible for Collapsed Building P.19. Tell Magazine No.3 January 16th 1995. Culled from S.O. Izomoh (1997) the Provision of Housing and Management in Nigeria P.20.

Further to the analysis of the above figures on collapse building incidents in South-Western states the following was inferred from the prevalent rate of the collapse in the past decades.



**Source:** Author's Fieldwork.

Ogunsemi (2002) disclosed the basic requirements that a building must satisfy. Each and every member of a structural system should be able to resist, without failure or collapse, the applied loads under the service conditions. In other words, it must possess adequate strength. This demands that the materials of the structure must be adequate to resist the stresses generated by the loads. The shape and size of the structure must also be adequate. The components of the structure should be able to resist deformation under loading conditions. Deformation implies a change in size and shape when a body is subjected to stress. This means that the component should possess adequate stiffness. Thus the stiffness of a beam or column is a measure of its resistance to bending or buckling. A material or structure that is very strong but lacking in stiffness will so much deform that it will not be able to resist applied loads. All the structural members of the building must be firm, otherwise the whole structure is assumed to be unstable. Structural stability is needed to maintain shape since it is the ability of a structure to retain under load, its original state of equilibrium. It can mean anything from resistance to sliding, overturning, partial or complete collapse. Any phenomenon that can alter the load carrying behaviour of a structure, if not properly taken care of can lead to instability; a condition in which the support reaction is less than applied load. Thus to ensure stability, loads must be balanced by reactions, and the moments due to loads must be balanced by the moments due to reactions. Any building that cannot withstand the load applied upon it will show signs of distress which may lead to failure and invariably total collapse. The possibility of building collapse should not be underestimated. Its occurrence is usually accompanied by loss of properties and lives. A building may collapse when one or more of its essential components fail. When buildings collapse, professional bodies such as Architects' Registration Council of Nigeria (ARCON), Council for the Registration of Engineering in Nigeria (COREN), and even Governments usually set up panels of enquiry to determine the immediate and remote causes of such failures and if possible recommend sanctions against those culpable. The rate of collapsed buildings in Nigeria has been a source of serious concern to professionals, like Architects, Builders, and Structural Engineers. Building collapse has so often been associated with structural failures. Therefore, structural failures, no doubt, are very dangerous and should be avoided using all necessary precautions and machineries possible. Ultimately, the effect of collapse of a building structure, particularly at its completion stage and when it is occupied by users is devastating on human lives. Even if lives are not lost, much financial investment is wasted. Once the specifications of the building including its materials and components are not complied with during construction, the result is building failure.

#### **FACTORS RESPONSIBLE FOR BUILDING COLLAPSE IN NIGERIA**

Building collapse can be attributed to many factors. Many buildings in Nigeria have collapsed due to some of the following reasons.

**i Inadequate preliminary works:** Preliminary works are operations which include site investigation and foundation. Building collapse is imminent where these operations are carried out shoddily. Site investigation is to determine the properties of the soil strata. Seeley (1986) said that all potential building sites would need to be investigated to determine their suitability for buildings and the nature and extent of the preliminary work that would be needed. Particular attention should be given to the nature of the soil and its probable load-bearing capacities, as there may be

variations over the site. The past history of the site should be investigated with particular reference to the former existence of trees, water level, borehole log, underneath soil strata and waste dumps. A careful study should be made of adjacent structure to ascertain whether failure can result due to localized conditions.

According to Chinwokwu, G. (2000) soil is an unconsolidated assemblage of soil particles between which voids. These voids may contain water, air or both. Soil is derived from the breakdown of rock materials by weathering and erosion and may have suffered some amount of transportation prior to deposition. Chinwokwu, G. (2000) asserted that the development of soil mechanics which relates to the understanding of the physical properties of any particular soil type in relation to loads was really the main stepping stone towards a scientific approach to foundation problem and construction. However strong, rigid or structurally stable a building may be, its satisfactory performance depends exclusively upon the ground which supports it. Adequate site investigation prevents the issue of foundation problem because it would ensure that the most appropriate foundation is prescribed. Barry, R1999, defined foundation as the part of the structure in direct contact with the ground and which transmits the load of the structure to the ground which plays an important role in the construction of building structures. Foundation is expected to carry all the dead, super-imposed and wind loads from a building to the soil on which the building rests in such a way that settlement of the structure is limited, so that failure of the underlying soil is prevented. The depth of soil strata in response to the loadings from the structure has to be located properly in order to safely bear the foundation of the building. Otherwise, the structure will fail.

**ii. Poor concrete mix ratio:** Usually concrete is a mixture of cement, sand, gravel and water in definite proportion. In providing support for a building, concrete is the most common material used in Nigeria. Tomilson (1980) reiterated that poor materials do not make good concrete. The cement, sand and stone must all be sound and have the types and qualities specified. The result of poor concrete works is building collapse. The steel reinforcements are embedded in concrete, so that compressive stresses are taken by concrete, while tensile stresses are catered for by steel reinforcements. For this purpose to be fulfilled, steel rods must be bent in accordance to design. Otherwise, it will fail and cause collapse.

**iii. Improper walling:** the wall is a very important part of the building that also provides support. Other function is to enclose or divide space. A wall that will adequately provide support is a load-bearing wall which must provide adequate strength and stability, weather resistance and durability. The commonest walling material in Nigeria now is sandcrete blocks of various sizes. As a matter of fact, walls which provide support to buildings must be straight, perpendicular and produced of sound materials. The appearance of a crack line in a building is a sign of failure. Failure in block-laying may lead to eventual collapse of the building.

**iv. Lack of approved structural design:** According to Ataev (1985), the basic requirement of any structural component of a building is that it should be strong enough to carry and support all possible types of loads to which it is likely to be subjected. Therefore, building design is not just the Architectural design; it also includes structural, electrical and mechanical engineering. A building that is poorly



designed structurally will eventually collapse. The final object of structural analysis is to enable the Engineering design and construct a building structure, which is satisfactory in service, and that such design must be approved by the approving body. This means that it must not collapse when loads are applied and the deformation must not be excessive. In addition, some clients, in order to try and save cost, patronize quacks to do designs for them. This is very common in Nigeria and such designs are grossly inadequate and usually result in building failure.

**v. Poor building material specification:** the uses of poor building material specifications have been possible root causes of collapse. In buildings, the materials that are essentially used on construction sites are cement, sand, gravel, granite chipping, timber, iron rods and sandcrete blocks. Other materials are aluminium, glass and ceramics. Good building constructions are enhanced by materials of good quality. Proper handling and storage must be given to building materials. Materials specifications must relate exactly to the intended construction and must be of adequate standard. Specifications are to prescribe what materials should be used and where there is a deviation, failure, that is, building collapse should be expected.

**vi. Ineffective supervision:** Averting building collapse depends largely on effective supervision of works. Hence, improper supervision will lead to the collapse of the building structures. Supervision involves the intricate knowledge of workmanship and materials, while inspection is only to ensure adherence to contract documents, especially the drawings. The object of the supervision is primarily to ensure that employer's requirements as expressed in the contract documents are correctly interpreted and the problems which are bound to arise are satisfactorily resolved. In the case of the building under study, there was no proper supervision for the demolition works.

**vii. Climate:** Apart from failure arising from negligence or negligent behaviour, many of our buildings have failed due to persistent incidence of weather. Ogunsemi (2002) remarked that a good building is not that which merely fulfils the purpose for which it is designed and erected, but a building comely and able to withstand the onslaught of weather conditions. Other factors are: poor workmanship, use of substandard and poor quality building materials, wrong conversion of building, lack of qualified and appropriate professional, inadequate quality control, fire disaster, bomb explosion, lack of maintenance culture, natural disasters.

## THE ROLES OF THE ARCHITECTS

Architects are persons who are trained in the art and science of building design and construction. The architect is also referred to as persons who designs buildings and supervises their erection; someone who plans something (New English Dictionary and Thesaurus, 2000). The architect according to Longman Dictionary of Contemporary English (2003) is someone whose job is to design buildings and the architect of something as the person who originally thought of an important and successful idea. It is this last definition that clearly places the architect as the number one (Prime) consultant in the building industry; just as the Civil and Electrical Engineer are the prime consultants for roads and bridges and power electrification projects respectively. He is the master builder; it has always been so, because the Greek Word, *Architekton*, from which the term architect was translated from, refers

to him as a chief builder. The architect co-ordinates the activities of the other members of the building team (consultants) e.g. the Engineers, Quantity Surveyors, etc. The architect initiates and finalises the design of the building by which he ensures that the form and functions of the building are in order. He also ensures that the building meets with its owners' requirement and should satisfy public safety and should not constitute any hazard to its users. He must ensure that all consultants to a contract follow due process in project design and implementation and they must be qualified to participate in the project. As the master builder and the ultimate authority on site, he must be a man of professional integrity and, should not allow himself to be „settled“ either by the contractor or supplier to detriment of the works on site. He must inspect and approve materials used on site, and ensure they are not substandard. The architect has a great stake in buildings designed by him; because he has a name to protect and would not want to be associated with any building failure.

## **RECOMMENDATION AND CONCLUSION**

The recommendations shall be presented under subheadings that are considered as the main stakeholders in the industry. The following roles are expected in this regard.

### **1. Government**

At the Federal Government level, Standard Organisation of Nigeria should vigorously pursue all those involve in the production or importation of sub-standard goods especially building materials. It should rid the society of sub-standard construction materials. Ministry of Housing and Urban Development should, when expedient, use the zoning approach to limit the number of floors to be developed in areas where the soil is very suspect. It shall even go further to stipulate the type of foundation to be used. State Government through the appropriate ministry, should as a matter of urgency streamline the process of granting building plan approvals. It should provide a one-stop with a view to reducing the time required for such approvals. A monitoring team should be set up under the commissioner or Works and Housing to make regular visits to different construction sites with the view of assessing how well the contractors and supervisors (consultant engineers) play their roles. Penalties and sanctions should be developed and enacted by the state governments and houses of assemblies. The consequences of developing a failed structure shall be well publicized. State ministries in charge of building plan approvals should also ensure that the engineers supervising developments take responsibility for the structural integrity and are properly documented including taken main photographs. The engineer should be interviewed by a professional colleague in the relevant ministry of the rank of a director or its equivalent. This will forestall any impersonation, forgery and denials in the future. Governments should put in place a policy for checking existing building periodically, may be every 5 or ten years, to ascertain their continued suitability for human habitation. Hence, the local planning authority shall concern itself with only approval buildings of two floors and only oversee higher buildings in collaboration with the zonal town planning office or the head office.

### **2. Professionals**

Building professionals should also ensure proper and efficient supervision of workmen as well as efficient checking of materials before incorporation into building works. Professionals must be men of knowledge and integrity. In cases of jobs they

are not trained for or lack competence to execute, they must always secure the best services for their clients if requested to, otherwise they should not undertake such works. Pecuniary benefits should not be the driving force in their relationship with their clients, but they should be motivated towards providing the best professional service at reasonable price and in a timely manner. Besides, they should always strive to enter into formal contracts with their clients as this will define the scope of services/works expected of them (responsibilities), the time frame and the consideration.

### 3. Regulatory Bodies

Professional bodies like the regulatory organs and their corresponding societies or associations will be expected to conduct mandatory regular workshops or seminars for their members to keep them abreast of current developments in their chosen profession. Members will be expected to attain some basic points by attending such seminars and failure to meet up with the stipulated minimum, should result in striking off their names from the register of registered members. These bodies should set-up units to monitor the activities of their members, make random visits to project sites where those found wanting in the discharge of their duties should be sanctioned.

### 4. Developers

The design team in any building work should be very careful when selecting supplier of building materials i.e. nominated supplier. Materials supplied to site by such should also be checked and vet appropriately in conformance to the contract specification. The design for building projects should also be vetted and checked at periodic interval of the construction. Clients or developers should rely on professional advice to engage contractors to execute their projects. This will not only ensure that the right contractor gets the job, but that it gets it done correctly and on time. Developers should also endeavour to sign proper contracts with both prime consultant and the contractor, defining responsibilities and obligations. Finally, it is suggested that government should take the following steps to stem the tide of incessant building failures in cities of Nigeria

**1. Effective monitoring of building projects:** Government agencies in charge of housing development and control need to carry out stricter oversight by ensuring compliance of property developers with the building code. They also need to conduct integrity or stress test on many old buildings to see if they are still strong enough for human habitation. Buildings that fail stress tests should be pulled down if the structural defects are irredeemable. In doing this, priority should be given to multi-storey buildings.

**2. Establishment of building inspectorate:** Government should establish a building inspectorate staffed with competent professionals that will enforce the provisions of the reviewed national building code to ensure compliance by property developers and building contractors.

**3. Stiffer Penalties for non-compliance:** Government should review the penalties for contravening the national building code and make them stiffer to discourage noncompliance. The punch newspaper of Tuesday May 13, 2014, The Council of Registered Engineers of Nigeria proposed death penalty for owners of collapsed buildings that result in the loss of lives. COREN made the proposal to the National

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Assembly. It was also said that some problems lied more with the quantity and quality of the materials a developer chose to apply while erecting buildings.

## REFERENCE

- Abimbola O. Windapo 1, and James O. Rotimi 2011 Contemporary Issues in Building Collapse and Its Implications for Sustainable Development
- Adepegba, A. (2012). Collapsed building kills two persons in Abuja, The punch Newspaper. January 29, 2012. Punchng.com
- Aderibigbe, Y. (2001). Homes and Property correspondence, The Guardian, Monday, April 23, 2001, pg. 39
- Agboola S.A. (1979): An geopolitical Atlas of Nigeria, Oxford University Press, Nigeria Pp. 248
- Ataev, S. S. (1985). Construction Technology, Mir Publishers, Second Edition, pg18-19, 256
- Barry, R 1999 "The construction of buildings" Vol. 3,4<sup>th</sup> Edition Blackwell Science, United Kingdom PP. 87, 88, 89.
- Bell, F. (1987). Engineering Properties of Soil and Rocks, Butterworth-Heinemann, 3rd Edition, pgs. 1-2
- Chinwokwu, G. (2000). The Role of Professionals in Averting Building collapse. Proceedings of a Workshop on Building Collapse: Causes, Prevention and Remedies (pp. 12-28). The Nigerian Institute of Building, Lagos State.
- Fakere, R. A. (2005). Assessment of Building Collapse in Nigeria: Case Study of St. Thomas's Anglican Church, Akure. Unpublished M. Tech. Thesis. Federal University of Technology, Akure, Nigeria
- Ivor H. Seeley 1986, Building Technology, Macmillan Building and Surveying Series, 3rd Edt.
- Iyangba, R. (2000). Building Collapse. *Building International* (1), 26
- Lambe, T. W. & Whitman, R. V. (1979). Soil Mechanics, John Wiley & Sons, 3rd Edition pgs 3, 4
- MacGinley, T. J. (1998). Steel Structures Practical Design Studies, Saint Edmundsbury Press, New Delhi, 2nd Edition, pg 1, 2
- Marshall, W. T. & Nelson, H. M. (1981). Structures, Pitman Publishing Ltd, New York, 2nd Edition, pg 1
- Nnabugwu, F. (2012). One Feared Dead as Building Collapses in Ondo. The Vanguard Newspaper. May 28th, 2014. www.vanguardngr.com

- Ogunsemi, D. R. (2002). Building Collapse: Causes, Prevention and Remedies, The Nigerian Institute of Building, Ondo. Pgs 38 and 82
- Oke, A. (2011), "An Examination of the Causes and Effects of Building Collapse in Nigeria", *Journal of Design and Built Environment*, 9 pp 37-47.
- Oke, O. E. (2009). Causes and Effects of Collapsed Buildings in Nigeria (A case study of Lagos State). An Unpublished B-Tech Thesis. Federal University of Technology, Akure.
- Responsibilities of the Architect Under the Nia-90 Conditions of Contract.
- Saharareporters (2012). Breaking News: Three-Storey Building Collapses in Abuja. 28th January, 2012. Saharareporters.com
- Seeley, I. H. (1987). *Building Technology*, Macmillan Press, 3rd Edition, pg 2-3, 7-11
- Tomilson, M. J. (1980). *Foundation Design and Construction*, Pitman Advanced Publishing, 4th Edition, pg 758
- Twidale, C. R. (1982). *Granite Landforms*, Elsevier Scientific Publishing Company, Amsterdam New York, 1st Edition, Pg. 40 – 50.
- Umeora C. O. (2013), The Incidence of Building Collapse and Emergency Management in Nigeria. *Journal of Environmental Sciences and Resource Management*, Vol. 5, No. 2, Pp. 73 – 79.
- United States Department of State. (2011). "Background Note: Nigeria." Accessed May 14, 2014 <<http://www.state.gov/r/pa/ei/bgn/2836.htm>>.
- Windapo A.O, Rotimi J.O. (2012), Contemporary Issues in Building Collapse and Its Implications for Sustainable Development. *Buildings*. 2012;2(1):283-299. Doi: 10.3390/buildings2030283.

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