



# NBRI

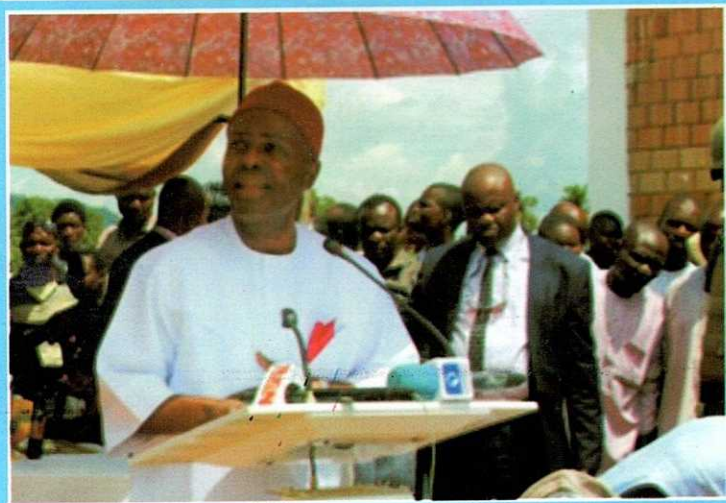
## Newsletter

Vol. 6, No. 7, July, 2018  
3RD QUARTER EDITION

The Quarterly Newsletter of the Nigerian Building and Road Research Institute

## SCIENCE AND TECHNOLOGY MINISTER

DONATES HOUSE TO  
NATURAL MEDICINE  
PRACTITIONER

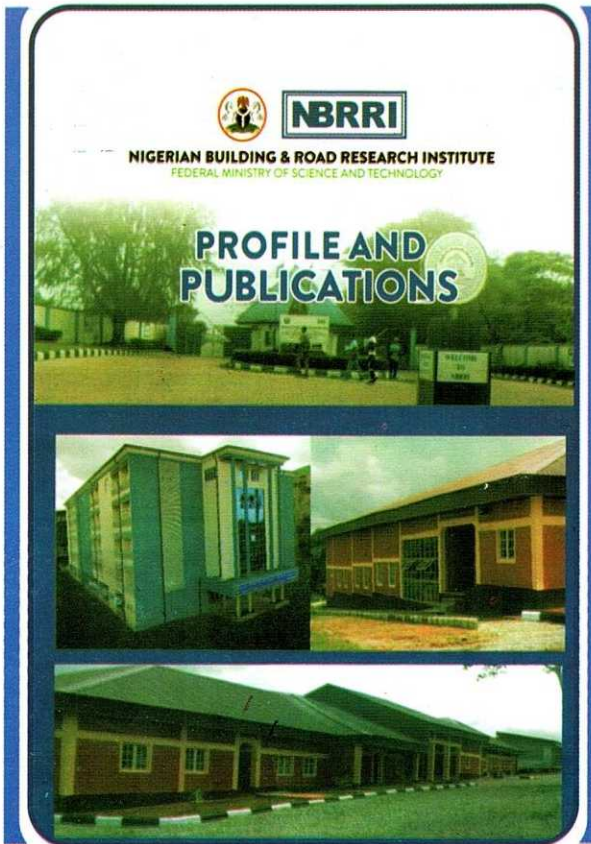


HON. MINISTER, (FMST)  
DR. OGBONNAYA ONU



**WE NEED  
POLICIES IN  
NIGERIA THAT  
ENCOURAGE RESEARCH  
& DEVELOPMENT**

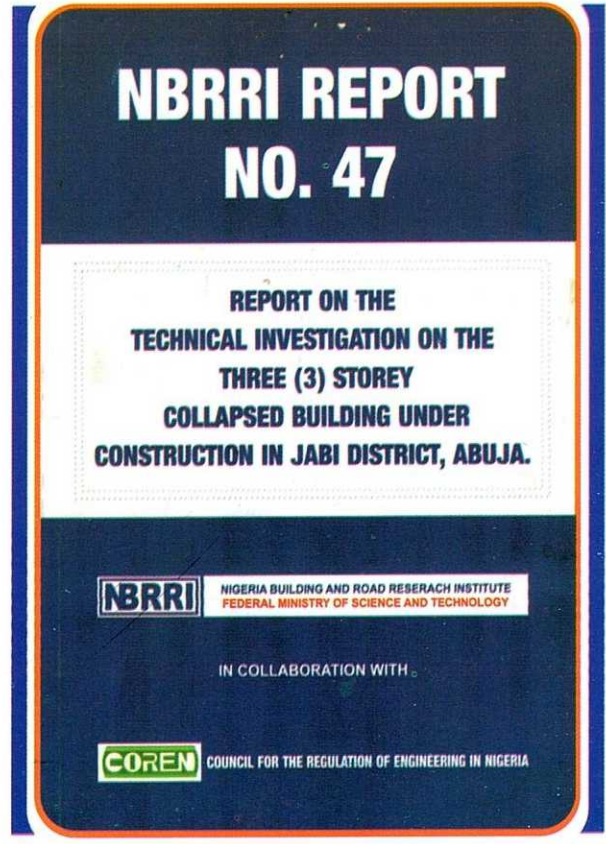
- Dr. Samson Duna,  
Director Research (Abuja)



**NBBRI**  
NIGERIAN BUILDING & ROAD RESEARCH INSTITUTE  
FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY

**PROFILE AND PUBLICATIONS**

The cover features three photographs: the top one shows the NBBRI building complex with a sign that says 'WELCOME TO NBBRI'; the middle one shows a modern building with a glass facade; the bottom one shows a long, single-story building with a green roof.



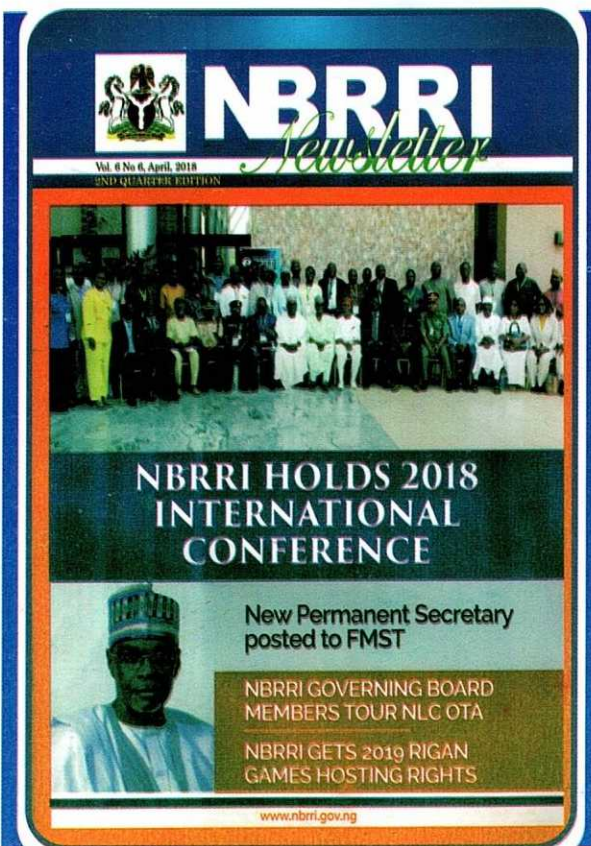
**NBBRI REPORT NO. 47**

**REPORT ON THE TECHNICAL INVESTIGATION ON THE THREE (3) STOREY COLLAPSED BUILDING UNDER CONSTRUCTION IN JABI DISTRICT, ABUJA.**

**NBBRI** NIGERIA BUILDING AND ROAD RESEARCH INSTITUTE  
FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY

IN COLLABORATION WITH

**COREN** COUNCIL FOR THE REGULATION OF ENGINEERING IN NIGERIA



**NBBRI**  
*Newsletter*

Vol. 6 No. 6, April, 2018  
2ND QUARTER EDITION

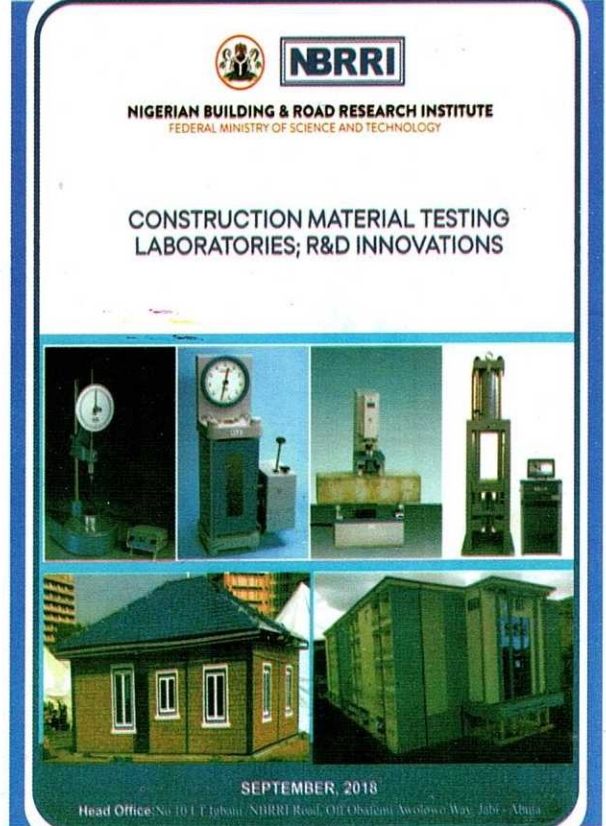
**NBBRI HOLDS 2018 INTERNATIONAL CONFERENCE**

**New Permanent Secretary posted to FMST**

**NBBRI GOVERNING BOARD MEMBERS TOUR NLC OTA**

**NBBRI GETS 2019 RIGAN GAMES HOSTING RIGHTS**

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FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY

**CONSTRUCTION MATERIAL TESTING LABORATORIES; R&D INNOVATIONS**

The cover features four photographs: two images of laboratory testing equipment (a universal testing machine and a compression testing machine), and two images of buildings (a small brick building and a modern building with a glass facade).

**SEPTEMBER, 2018**

Head Office: No 101 Ugbasani, NBBRI Road, Off Obafemi Awolowo Way, Jabi - Abuja

## EDITORIAL

we come you all to the third quarter of the 2018 NBRRI newsletter. We have quite a handful of news information that will enable you know NBRRI has accomplished a lot in the months under coverage.

You will all agree with me that the journey so far wasn't an easy one. 2018 has proven to be one of its kind; despite all the challenges and disappointments, we are still standing tall and very strong.

In this edition, Prof. Danladi S. Matawal honoured by the FCT administration to head the FCTA panel of inquiry on Abuja building collapse so as to unravel the cause(s) of the incident that took place on August 17, 2018 in Jabi, Abuja.

Also, an educative and informative writing about the Italian Genoa bridge collapse: Any lessons for Nigeria by Prof. Danladi S. Matawal is well captured in this edition; as he also stated his take on the earth Tremor that was experienced in Mpape, Abuja.

The DG Prof. Danladi S. Matawal receives another excellent award based on his hard work, competence and acceptance to societal and development responsibilities.

An educative and informative interview with an erudite, brave and vibrant academician and the Director of Research, NBRRI Dr. Samson Duna stating, "We need policies in Nigeria that encourage Research and Development" is not left out in this edition.

Feature articles and much more are included to keep you informed, entertained and educated.

I know you are anxious already, enjoy your reading.

**MR. DANIEL MAKAVA**

*Acting Editor-in-chief.*

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**NBRRI**

**(VISION, MISSION & CORE VALUES)  
BUILDING CAPACITY & SETTING THE  
PACE IN INDIGENOUS CONSTRUCTION  
TECHNOLOGY DEVELOPMENT**

**VISION**

To evolve and use a comprehensive and integrated approach in capacity building and investment promotion so as to foster the application of environment-friendly and energy-efficient innovation construction materials, manufacturing technologies and cost-effective building and road construction practices.

Which will enhance job-creation, wealth generation and poverty reduction as well as nurture the emergence of vibrant, knowledge-based and highly competitive indigenous construction companies capable of meeting global standards.

**MISSION**

Integrated R&B, Capacity building and robust extension services in which technology innovation and knowledge-based practices in the fields of building road and engineering materials will be used to provide adequate and affordable housing and road infrastructure as well as increased economic empowerment.

**CORE VALUE**

Professionalism Resourcefulness  
Commitment and Integrity Innovativeness

# WE NEED POLICIES IN NIGERIA THAT ENCOURAGE RESEARCH & DEVELOPMENT

- Dr. Samson Duna, Director Research Abuja



*In this segment of our interview session, the NBRI Newsletter crew veered into the world of a subtle observer, salient achiever, and a passionate Engineer per excellence. Dr. Samson Duna who seats solidly as the Director of Research at the Nigerian Building and Road Research Institute speaks on his drive for coordinating, teaching and guiding young and experienced talents through the workings of the research world. Duna also speaks on how academic and scientific Research can help improve and better a community in general besides its economic relevance. Excerpts:*

**NBRI NEWSLETTER:**  
Sir, may we know more about

you?

**DR. SAMSON DUNA:** I was born 50 years back at Makurdi, Benue State from there I moved with my parents to Jos. I started my primary school at St Luke's Primary School in Jos, after which I moved to complete it at Hwolshe Giring Primary School Anglo Jos; from there I proceeded to Government Science Secondary School, Toro in Bauchi State where I got my SSCE. From there I got admitted for IJMB programme, before the completion of my IJMB, in ABU Zaria. I got admitted through JAMB to Abubakar Tafawa Balewa University (ATBU), Bauchi where I studied civil engineering within a course of 6 years.

After graduation, I was posted to Osun State where I did my one year NYSC programme, I was posted to Civil Engineering Department, Obafemi Awolowo University, Ile-Ife. I never knew what faith had for me but it was a preparatory ground for me to become a lecturer. After the completion of my NYSC programme, I came back to the University I graduated (ATBU) and was offered a job as a graduate assistant (GA) instantly I was the first staff to graduate from Civil Engineering and come back as a lecturer. Two years after lecturing, I proceeded to the ABU Zaria for my Masters programme where I specialized in Structure Engineering. Since then I have

been teaching in the University (ATBU) and I have risen from the rank of Graduate Assistant to Professor subject to external assessment. In March 2018, I was given an appointment in NBRI as a Director

**NBRI NEWSLETTER:** Can you please tell us more about the Research Department in Abuja?

**DR. SAMSON DUNA:**

Research is all about identifying a problem and providing solutions to it. The mandate of **NBRI** is centered on research. Presently we have Ten (10) identified mandates that the institute was

established which is centered on building, road materials etc. All these mandates are centered on research.

Basically what started as a unit has now transformed into various departments. If you remember the history of research as far as this Institute is concern; initially research was in Ota alone as a single unit but today the unit has really increased to departments. The department in Abuja has been broken into various divisions, after divisions, we have different sections so that staff can specialize in a particular area and grow in a particular

field. We have Building Research Department, Engineering Materials Research Department, Road Research Department and Science Laboratory Research Department; and each of these departments is broken down so that the mandate of the institute can be achieved. I will say that the departments are growing and staffs are learning more from the departments.



**NBRI NEWSLETTER:** What are some of the challenges faced by the department?

**DR. SAMSON DUNA:** Challenges come as work continues. However, we can classify it into four major headings: Lack of funds, Facilities, Conducive Environment and finally, Working and bringing something from your efforts and no one is appreciating it. Our products are not being publicized enough, people do not know what we are doing. In addition, Publishing is also a challenge facing the department.

**NBRI NEWSLETTER:** Sir, how has your transition from lecturing to the civil service been so far?

**DR. SAMSON DUNA:** It is true I have been in the academic sector for a long time as a lecturer in the university. The main responsibility of a lecturer is Teaching, carry out Research, and Community service. With teaching been the primary responsibility

while in the Research Institute like **NBRI** is more of extension of the academic environment. Here we have research and we do community services, the only difference

is the teaching component but sometimes we teach here in the institute, there was a time some new staff were employed, I took my time to teach them how to write research proposals. There are a lot of similarities between the research institute and the academic sector like the university. For me I didn't find much difference, it is just an extension of what we do in the university.

**NBRI NEWSLETTER:** What are the challenges you are facing in the institute so far

compared to your lecturing experience?

**DR. SAMSON DUNA:** The challenges can be similar but a little bit different. As I mentioned earlier challenges in the university are availability of funds, the funds budgeted for research are not always available similarly in the institute the funds at times comes late, due to late release of funds from the government but the institute's funds are better as compared the one in the university. The research funds in the university at times are difficult to access. In the institute, publishing of products is a major problem.

**N B R R I NEWSLETTER:**

How do you think PR can project the institute?

**DR. SAMSON DUNA:**

The idea of research work is to help the poor and make things cheaper by producing or using alternative materials or modify material for better performance. In a situation where by the money is not available, can we get an alternative that is cheaper and better in terms of performance that is research. To assist in these, PR can come in. The layman in the village should know that there is cheaper way of doing things and cheaper alternative materials. The PR unit can publicize these research findings and products

through the media e.g. Radio, TV, Social media etc. and various forms of advertisement so that people in the rural areas can be aware of these cheaper alternatives and products.

NBRRRI has come up with a dismantlable building which is purely her research products from the beginning to the end. The question here is how many people are aware of these alternative products?

Research department cannot do research alone without

Research means to improve on something that is already in existence and a community is made up of different people, if you look at the community around, you see buildings, roads, bridges etc. Now to some extent how do we improve these facilities? Has NBRRRI played a role in helping the community?

Let's take laterite that NBRRRI blocks are made from. NBRRRI blocks were meant to be



involving the PR department, for publicity; it plays a major role in research findings.

I want PIT department to work in collaboration with research department. Every breakthrough in research should be communicated to the media, newspaper etc. through the PR unit.

**NBRRRI NEWSLETTER:**

How has research in NBRRRI been helpful to community development in Nigeria?

**DR. SAMSON DUNA:**

affordable, it's supposed to be cheaper and some of the properties of the NBRRRI blocks is conducive and better in terms of human health. If communities patronize NBRRRI blocks, it will go a long way in reducing the cost of building, ensuring that houses are affordable, cheaper and with better local contents that will stand the test of time.

NBRRRI is well known for its Pozzolana cement and the idea

of Pozzolana is basically to supplement the quantity of cement. Where you are expected to use 100 bags of cement, you end up using 70 bags. The other 30 percent may

**DR. SAMSON DUNA:** There are courses that are related to NBRRI mandates, they are Engineering courses; Building, Architecture, these are courses that give you the opportunity to

throw waste. But in Nigeria, a waste carrier can come and pick the waste and takes it to a dump site.

Government should come up with a policy for people in the cities on how to dump waste, they can come up with a policy on all the waste dumped, they can share them into different areas by sorting the waste, is it domestic waste or industrial waste? Is it farm products waste? So the government should share this waste in such a way that it can be useful.

The waste needs to be sorted out, then the ones that can be converted, you can convert them, and the ones that need to be

destroyed should be destroyed, so it cannot be harmful to man.

Am so happy because in Cross River, there is a big refuse ground of waste of pure water bottles, they put it in a machine, it melts, they convert it and gets new things done.

We need to have a culture to obey the policies the government will introduce. It's not easy to implement government policy but as a country, we will get there someday.

**NBRRI NEWSLETTER:** Sir, what recommendations can be given to further help research and its implementation in the Institute and the Nigerian construction industry at large?

**DR. SAMSON DUNA:** There is a big problem in terms of



be produced from waste. If you use Pozzolana in cement products, it reduces the quantity, it makes the environment friendly, it reduces pollution level in it, it reduces the cost and at the same time it creates jobs for people. NBRRI has taken a big step in producing Pozzolana which will go a long way in improving the condition of people staying in the community. The NBRRI Bamboo Panels are also good innovation that NBRRI has been doing. NBRRI Research has gone a long way in making things better which also brings positive change in community development.

**NBRRI NEWSLETTER:** What are the relevant fields needed to become a research officer in NBRRI?

be a research officer in NBRRI. Some other courses that are relevant are: Geology; Town Planning and Pure Sciences courses.

**NBRRI NEWSLETTER:** Sir, in a country like Nigeria where people dump their waste products anyhow, what can be done to address the situation so as to achieve this idea of "Waste to Wealth"?

**DR. SAMSON DUNA:** For issues of conversion of waste, every country has its own way of using waste. Government has a responsibility as a body, human being, also has a responsibility on how waste is managed e.g. in the western world, people have what is called a waste dump, people go and put their waste there, no restriction on how to

implementation and promoting research in Nigeria. We need a policy that encourages R&D or government can come up with a policy stipulating that 1% of the clearing fee of all imported products for building and road should go to R&D. if that is done, it will go a long way in ensuring that R&D activities pick up because funds will not be a problem, instead of waiting for budget allocation all the time.

Motivation is also needed, our salaries should be improved to help us work better and the best of us can be seen in R&D output. If these things are put in place am sure the sky will be our limit.

**NBRRI NEWSLETTER:** How do you assess the Management style of the DG?

**DR. SAMSON DUNA:** Our DG, I call him the "Goal setter". I have known him for over 30 years. He is someone that turns a desert to a greenland. He is the type of person that once he leaves a system, the shoe is always too wide for the next person, to fit in.

His records are there to see especially when he was in the Polytechnic and University. He was one time the head of Civil Engineering Department before coming to NBRRI. In all these areas that he has worked, the impact he has made is overwhelming. Some of the policies he made in the University are still the policies being used today because of his

achievements. I never heard about NBRRI until when the DG, Prof. Matawal came here. He involves everybody in bringing ideas and solutions to problems. He does not take decision on his own; he works with his Management Staff hand in hand.

**NBRRI NEWSLETTER:** On a lighter note, how do you unwind after a hard day at office?

**DR. SAMSON DUNA:** I am not an outgoing person, but I like watching football. After work, I spend most of my time watching TV; sometimes I go out for visits, talk to people and friends mostly on weekends. I am God fearing person, I like making friends.



# FLOOD AND ITS EFFECTS ON BRIDGES: A CASE STUDY OF MOKWA

## **INTRODUCTION:**

Transportation of people and goods play important role in general human activities and better standard of living. Therefore, when a major disruption, naturally or human-induced tragedy occurs to a transportation network, that will lead to significant changes in freight movement and negative impacts on the economy. In the light of this, flood is seen to be one of the most frequent and widespread of all environmental hazards in Nigeria. It has been an annual environmental hazard confronting many states in Nigeria. It also has been known to be caused by anthropogenic activities and human interventions in the natural processes such as increase in settlement areas, population growth and economic assets over low lying plains, valleys, or marginal lands which are prone to flooding leading to alterations in the natural drainage and river basin patterns, deforestation and climate change. NiMET and NIHSA listed River Basins of Sokoto-Rima, Niger-Benue and Anambra as those states that are prone to high flooding. Niger state being one of the states in the country prone to annual flooding experiences, has witnessed several bridge collapses from 2015 to 2018. As part of its effort in providing solutions in the built environment, Nigerian Building and Roads Research Institute (NBRI) since its establishment in 1977, has continued to intervene to find reason(s) for structural failure especially in roads, bridges and buildings. This intervention is aimed at providing case –history

documentation for literary application to avoid future failures. Hence, the efforts of this institute have led to full investigation of a number of collapsed structures in Nigeria. In this regard, the Institute upon receiving a distressed call for the bridge collapses in Mokwa Local Government Area of Niger State, constituted a research team to investigate the possible causes of the bridges failure. Also to put this investigation into proper perspectives, NBRI collaborated with Nigerian Hydrological Services Agency (NIHSA) in the area of providing hydrological data of the catchment areas of the locations of the bridge collapses. The hydrological data of the case area, from January 2015 to January 2017, had clearly shown a steady increase in precipitation throughout the period.

## **UNDERSTANDING BRIDGE COLLAPSES/FAILURES**

A phenomenon is often better understood if it is pinged on a solid literature review of the subject matter; so understanding bridge collapses/failures relies on good literature review. Studies have shown that a substantial component of the body of scientific knowledge concerning bridge engineering has been generated from the previous failures of bridges; however each bridge failure has its distinctive features, thus it is hard to give clear-cut causes of failures. Bridge failures do occur as a result of a combination of factors which usually build up to trigger a collapse, because a single factor may not potentially cause a

bridge to collapse; for example severe winds may not be enough to cause a structure to come down, but when they hit a bridge that is structurally too rigid to withstand them, it leads to failure. For the causes of bridge failures, there are two major schools of thoughts. The first group believes that bridge collapses are caused by natural and manmade factors. While the second group is of view that there exist the internal (manmade), the external (natural), and cascading factors i.e. a mix of other factors triggering a bridge failure. Typically, it has been established that, combined dead load stresses with one or more external transient forces lead to a mix of external stresses; thus when the dead load stress is already high and getting to the elastic limit of the member of the bridge, any applied stress or force may exceed the allowable limit thereby causing the failure of bridge. This means that a single factor hardly cause a bridge to fail, but a combination of other successive external or internal factors.

## **NATURAL CAUSES OF BRIDGE COLLAPSES/FAILURES**

Today's changing climate and the extreme weather events associated with it are causing more flood-related damage to bridges. Most of this damage isn't from water alone. During a flood, rivers pick up debris, such as trees and buildings, and push it forcefully against bridges, causing their foundations to wash away and structural elements to break apart. Most

collapses happen on bridges that were built a long time ago when designers couldn't imagine the kind of storms they'd have to withstand today. This is an important lesson for bridge designers. They must plan structures and drainage systems that can hold up against today's storms and potentially more extreme weather events in the future. However, common among natural factors are floods, scour, earthquake, landslide, wind, etc. Prominent among scholars who hold that majority of bridge failures are caused by natural factors such as floods, scour etc; they concluded that, in United States, the most common causes of bridge failures were not due to design and construction fault but due to floods and collisions. This is so because of the prevailing climatic changes and their resultant intense weather events which cause more floods around the world. This is perhaps due to distinctive geographical and climatic differentials inherent in some regions of the investigations; and of course the prowess of the engineers in bridge design and construction in certain parts of the developed world.

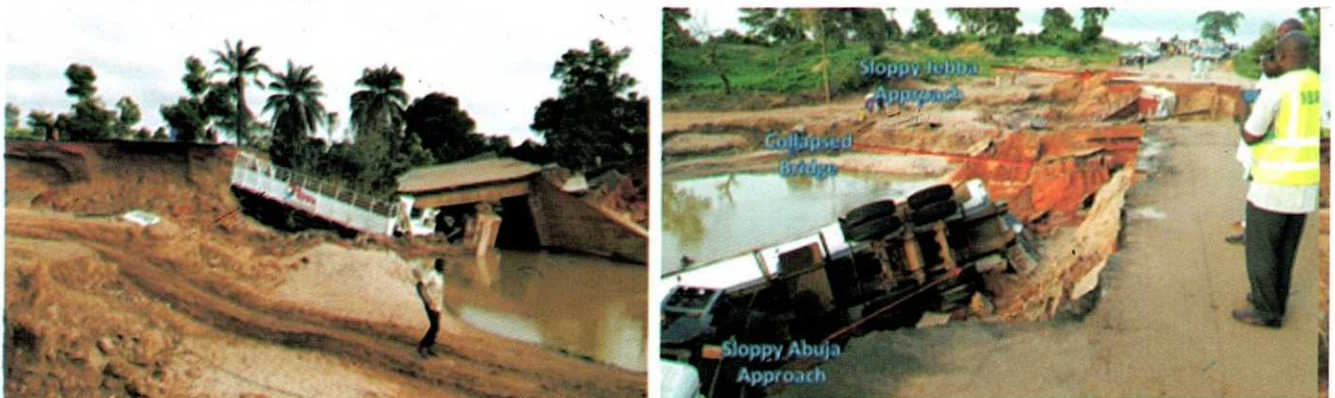
**TATABU BRIDGE COLLAPSE/FAILURE**

With regard to the flood disasters in Niger State, findings revealed that large parts of the State are located in low terrain and have proximity to River Niger: the largest river in Nigeria; coupled with the presence of three hydro Electric power stations (KAINJI, SHIRORO & JEBBA) in the state. Niger State has been confronted annually by flood disaster that has destroyed many lives and properties.

A typical example of such a scenario was the bridge collapse in Tatabu, Mokwa Local Government Area of Niger State that occurred in June 2017 as a result of severe flood as would be presented in the following headings. Although no casualty was recorded, the bridge collapse incident hindered the movement of people and goods either crossing to northern or the southern part of the country.

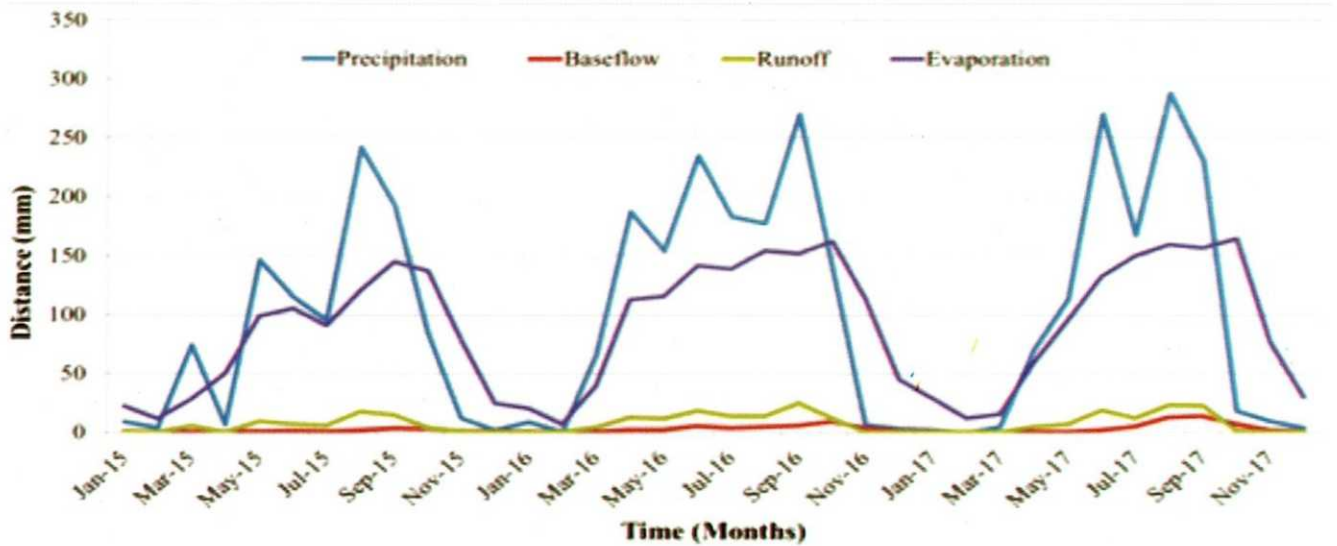


**Figure 1: Location map of collapsed Tatabu (Mokwa) bridge taken from google map**



**Figure 2: Showing Site of collapsed Tatabu Bridge**

Mokwa and its environment experience annually precipitation around March - April. From the result presented in Figure 3, it can be observed that the peak period for the 3 years data collected fell within June-September. In 2015 the peak period was in August with precipitation of 241.93 mm/month while 192.377mm/month in September and 84.114 mm/month day in October respectively. A steady increase in rainfall from 2015 to 2017 was also noticed. The steady increase in precipitation from the past year may have caused the rise in river level and subsequently flood. The team measured the flood height to about 1.7 meters above Jebba approached.



**Figure 3: Trend in Rain data variation (Source: NIHSA, 2017)**

Therefore, these results proved that the increase in water volume may have been part of the reasons for the flood and subsequently overtopping of the bridge and its embankments as shown in Figure 4.



**Figure 4: Image showing remnant debris**

A finite element method was also adopted using ANSYS-Fluent structural analysis software to calculate the meandering path of the flood waters by applying pressure to the fluid onto the structural elements and to determine the velocity profile of the flood and it entered the channel and exited after passing under the single span bridge as shown in Figure 5. The simulated pressure value obtained was then exported to the structural model as input forces. The ANSYS-Fluent software uses the finite volume methods to solve the equation at each node. Smaller mesh value was used in order to obtain accurate results. The minimum and maximum sizes of the mesh were selected as 15mm and 2000mm respectively. The standard k- $\epsilon$  mode was used for the turbulence modeling. The density of water also was increased to 1500 kg/m<sup>3</sup> to consider the weight of particles and mud in the water during the flood.

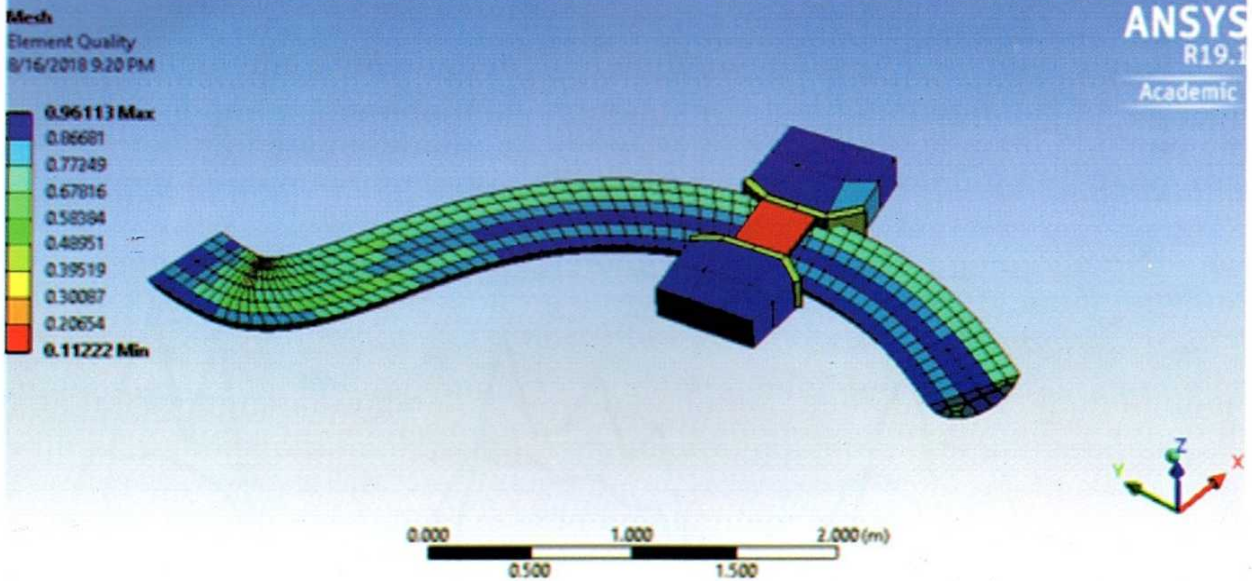


Fig. 5: Geometry and mesh diagram of Tatabu Bridge Site

Velocity Inlet and Pressure Outlet was calculated from the stream flow results using Manning Equation below. The velocity of the flood used was 133 m/s from Equation 1.

Manning Equation:  $Q_s = A \times V$

$V = Q_s / A$  .....Equation 1

$V = 3978 / 30 = 133 \text{ m/s}$

- Where A - Area of the stream,
- V - Velocity of the stream
- Q<sub>s</sub> - Stream flow/Discharge

The contours adaptation of velocity and pressure during the flood are shown in Figure 6. As presented in Figure 7, the pressure of the flow within the Abuja approach bridge abutment is higher than the other parts. Possibly, this happened as a result of the meandering nature of the flood path. This high pressure flood collides and wash off the relatively soft in-fill soil providing support to the embankments resulting to collapse of the entire structure.

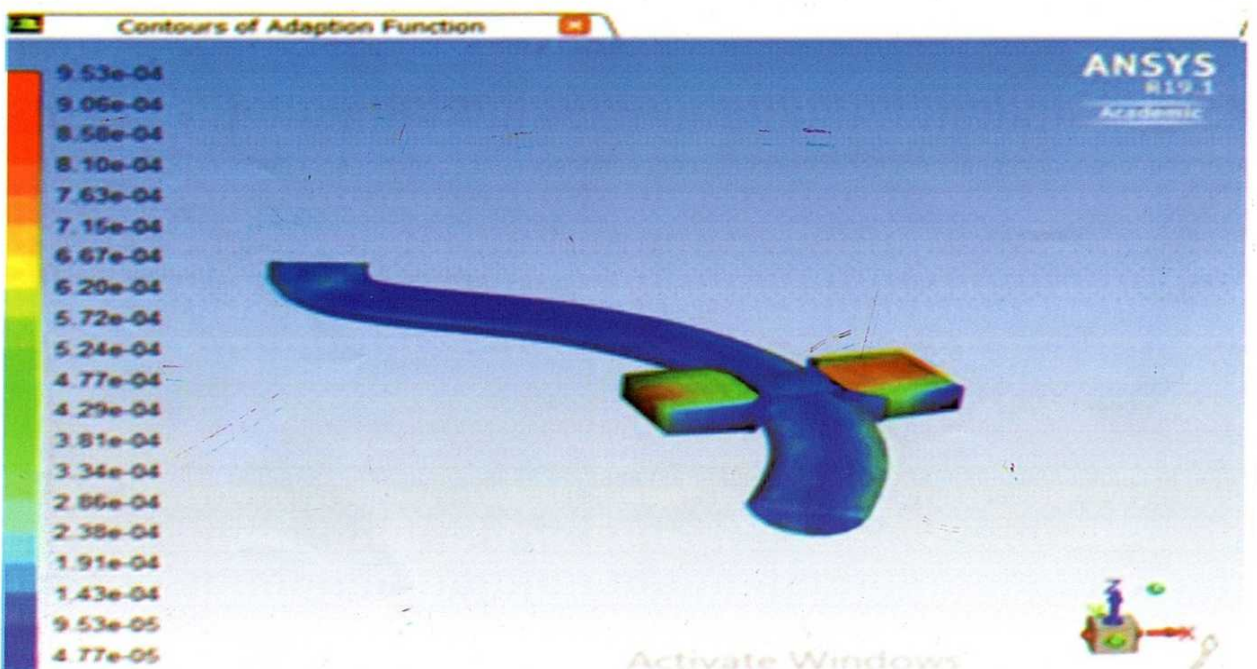
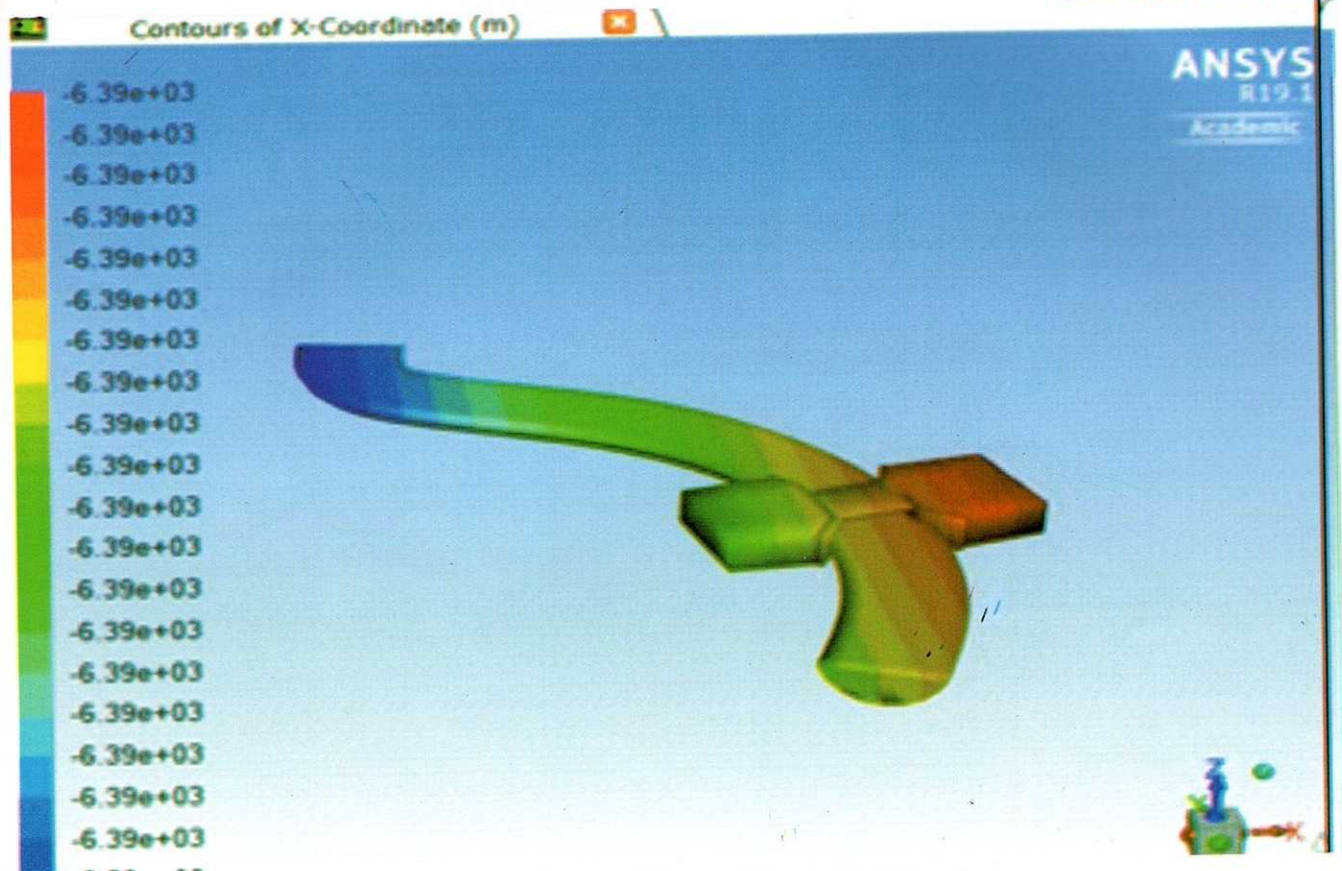


Figure 6: Image showing Fluid Flow.



*Plate 1: Pressure Contour of the Fluid Flow*

### HUMAN FACTOR

Improper design and construction method, collision, overloading, fire, corrosion, lack of inspection and maintenance, etc are classified as human factors. Some engineers argue that the main causes of bridge failures emanate from deficiencies in design, detailing, construction, maintenance, use of weak materials, and paying less attention to external factors. This, maybe, has to do with engineering capability of bridge designers and adequate resources in terms of budgetary allocation, man power and priority of government in providing adequate infrastructure especially in developing nations. In the era of climate change we have just entered, extreme rainfall events are going to become increasingly common. Uncontrolled growth at the expense of the environment will severely aggravate the impacts of climate change. Our cities and bridges are simply not prepared for extreme weather events. There is need to avoid building of houses and dumping of refuse on riparian land that choke the flow of water and contribute to severe annual floods. Bridges build at the bottom of the valleys need to be redesigned and elevated higher above the valleys to protect the bridge and its embankment from being overwhelmed by flood.

Compiled by:

**Ibrahim A Inuwa,**

*Surajo Lawan Abdullahi*

# GENOA (ITALY) BRIDGE COLLAPSE: LESSONS FOR NIGERIA

- by Professor Danladi S MATAWAL



I listened this week, over and over, to the news of the collapsed bridge in Genoa, Italy and wondered if there are any lessons for Nigeria and cognate Nigerian Engineers and Policy makers. The collapsed Italian bridge is government owned but privately operated and is a Cable bridge. That is lesson number One because the concessioning, from preliminary news, includes maintenance from generated income. There were planned foundation, cable and superstructural repairs when it collapsed.

The Genoa bridge carries about 70,000 passengers every day and over 30 Vehicles were on it when it collapsed while the lives lost so far has been put at exactly thirty-eight (38). Lesson number two is that bridge collapse being a very rare occurrence was least expected in

Italy but this bridge had warnings from experts. The Private operating company has been blamed by the Italian Minister of Transport and their top management staff asked to resign. Lesson no.3 is that response was rapid, rescue is still ongoing as I write this short note while government has put up, instantly, the sum of US\$5million equivalent (~N1.8billion) as rescue and operations fund.

So are there other lessons for my dear country Nigeria? Indeed, Bridge collapsed as I observed is a rare, very rare, occurrence and yet it happens. Smaller bridges have failed in this country in the Kontagora and Mokwa areas of Niger state in 2017 and 2018 on road and railway bridges and culverts. We have looked at the pictures of collapses, the Vehicles that plunged into the rivers and streams and as long as we create

alternative routes for vehicular flow after a while, we are unconcerned about long term sustainable solutions. Example, NBRI sent a team to the sites in Mokwa area in 2017 and there is a definite report and opinion but who cares? After all it occurred again in 2018 and NBRI raised a team to visit again, this time with some FERMA engineers, but funding has held the team back and they will ultimately be there anyway. Now these are small bridges and even culverts whose failure has not been unexpected because they were hydraulically underdesigned and the floods simply overwhelmed them, created new channels and led to the collapse of existing structures by eroding away the soils on the sides and beneath toes of these bridges. All these hydraulic structures should have been lifted higher above the flood plains by more extensive embankments and

the water openings designed and constructed to be of higher capacity. However, the Italian Genoa collapse is absolutely catastrophically structural and can Nigerian bridges be exempted from suspicion in structural integrity suspicions?

In 2016, following some public outcry, NBRRRI Bridge Research team visited a certain Tamburawa bridge near Kano. A Technical report of what was discovered was released and in 2017, the Federal Ministry of Works (and Power) awarded contract for the remediation of Tamburawa bridge (for about N1.5billion, I learned but subject to be corrected). NBRRRI got the impression that other bridges needed to be studied and it is not easy to go beneath a bridge deck but NBRRRI has currently completed field work on all bridges from Abuja - Kaduna - Kano using drone inspections and a report is being processed. It is revealing because it was not only Tamburawa bridge alone, after all, that had its Piles extensively exposed representing structural risk of a very high severity rating but literally all bridges on this route have now

been identified to be in the same state as Tamburawa. Additionally, there is severe cracking on most of the substructural and superstructural elements of these bridges, the bearings displaced or malaligned, beams distressed, etc. The logical thing is for NBRRRI to immediately dispatch different teams to all routes in the country. Indeed, the programme has already been mapped out but there are serious funding and personnel shortages. Experience gained needs to be taught to other teams to perform, more field Vehicles and Drones are needed and maybe a Central coordinating unit directing studies and analyzing measurements taken from the field set up in the headquarters in Abuja.

Therefore, my preliminary conclusion is that even Italy with such history of magnificent bridge and road building achievements and pride has been badly hit by the Genoa collapse and its pride bruised. However, can we say that anyone is paying attention to our bridges in Nigeria for maintenance and remediations? Huge sums being committed to roads are primarily for resurfacing only and

not certain if anyone believes the bridges also need attention. Let us not forget the very immediate past experiences that we had on Building collapse that warranted a fairly energetic R&D intervention by NBRRRI to reduce to a bare minimum over the years this ugly occurrence.

There is the need to allocate parallel R&D funds to NBRRRI as roads and bridges are constructed. Example, when "SUKUK" funds were raised and spread on roads rehabilitation in the country, did we think' that the premier cognate Research Institute (NBRRRI) in the country would need some small percentage of the US\$100billion(?) fund to continue to support with sustainable solutions? The Italian Genoa Morandi bridge collapse poses serious questions to our engineering technical and policy makers and we cannot sit and fold our arms when risks of catastrophe. The Italian government has declared a 12-month emergency after this collapsed and declared that in modern society with so much technological prowess, these types of catastrophes cannot be allowed to occur. Can Nigeria take a queue and empower NBRRRI to help out on its bridge R&D initiative? Surely attention is desired.



**Professor Matawal**

***Indeed, Bridge collapsed as I observed is a rare, very rare, occurrence and yet it happens. Smaller bridges have failed in this country in the Kontagora and Mokwa areas of Niger state in 2017 and 2018 on road and railway bridges and culverts.***

# ABUJA BUILDING COLLAPSE:

**PROF. DANLADI S. MATAWAL**

**HEADS FCTA INQUIRY PANEL**

The Director General of the Nigerian Building and Road Research Institute (NBRI), Prof. Danladi S. Matawal, has been appointed the Chairman of the panel of inquiry on the building collapse incident at Plot 711, Cadastral Zone B04, Jabi District, Abuja.

The Minister of Federal Capital Territory, Malam Muhammad Musa Bello inaugurated the high powered Panel on Thursday 6th of September, 2018

It would be recalled that the three-floor building under construction went down on August 17, 2018 leaving three persons dead and six others injured.

The Permanent Secretary, FCT Administration, Mr Chinyeaka Ohaa who represented the FCT Minister at the inauguration, said the FCT administration was desirous of unraveling the causes

of the incident with a view to checking recurrence. He revealed that officers who were to monitor the project have been suspended pending completion of investigations.

Members of the Panel include: former Director of Engineering Services, Federal Capital Development Authority (FCDA), Engr. S. O. Ugonabo;



Managing Director, Fola Consult – a planning firm, Mr S. A. Olajide; Managing Director Z-Habit Concept – architectural firm Mr Philip Iortyer. Also on the panel are: representatives of Council for the Regulation of Engineering in Nigeria (COREN), Architects Registration Council of Nigeria (ARCON), Town Planners

Registration Council of Nigeria (TOPREC) and Council of Registered Builders of Nigeria (CORBON), as well as the FCTA General Counsel, Barr. Mohammed Babangida Umar.

The committee which has three weeks to complete its work is to assess the quality of the subsoil, foundations and designs that were available for the structure, establish the quality of supervision and nature of construction materials used as well as the experience of the technical personnel at the site.

The committee is also expected to assess the level of regulation at the site and recommend appropriate sanction(s) against any person found

wanting.

Speaking on behalf of the Panel after the inauguration ceremony, chairman of the panel, Prof. Matawal stressed that the frequency of building collapse in Nigeria is unacceptable given the level of professionalism in the industry in the country.

He commended FCTA for tackling the incidence of collapsed building in the territory, noting that the last time this happened was in August 2016.

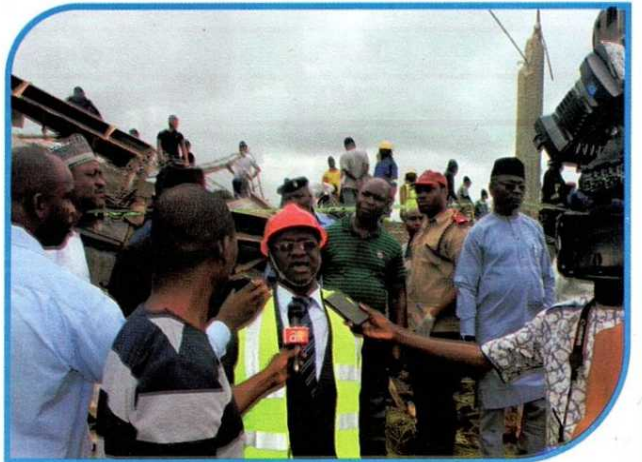
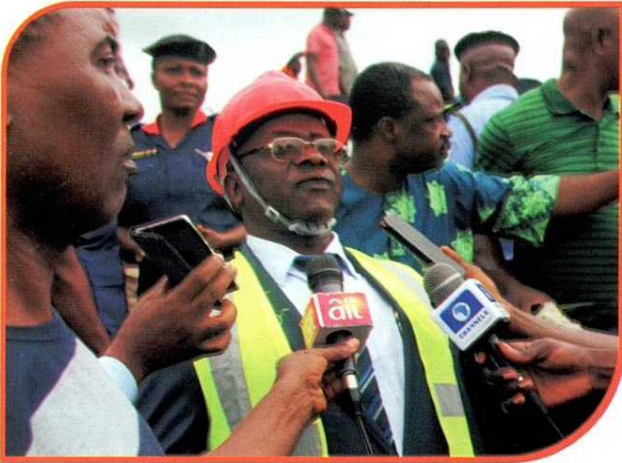
He recalled that in 2012 alone, there were over 20 recorded cases.

Prof. Matawal appreciated the confidence reposed in the committee members and assured that the panel will give the assignment the seriousness it deserves and perform its work with decorum, sincerity and attention to details.

He said the committee will also work with a vision for the future to ensure that occurrences of this nature which are very much avoidable are checked.



# MORE PICTURES FROM THE BUILDING COLLAPSE SITE IN JABI, ABUJA



## SCIENCE AND TECHNOLOGY MINISTER DONATES HOUSE AND CAR TO NATURAL MEDICINE PRACTITIONER



The place of Science and Technology in achieving economic stability and the general wellbeing of humanity has once again been emphasized by the Honourable Minister of Science and Technology, Dr. Ogbonnaya Onu.

The Minister made this known at Adavi-Eba community in Adavi LGA of Kogi State on the 13<sup>th</sup> of August, 2018 when he presented a 4-Bedroom bungalow and a brand new Car to a renowned traditional medicine practitioner, Pa Aliyu Giwa Ejiyade.

Onu reiterated the need to patronize locally developed

herbal products rather than flood the Nigerian market with traditional medicines from especially Asian countries, stating that, Pa Giwa has distinguished himself as a herbal practitioner in his ability to cure diseases that appear incurable by orthodox medicine.

He also assured that the Federal government and other relevant government ministries and agencies such as the Federal Ministry of Health, the Nigeria Natural Medicine Development Agency, will work closely to develop herbal medicine.

The four-bedroom bungalow was facilitated and built using

the NBRI low cost housing technologies from start to the finish; which made NBRI a sole partner and contributor to the success of fulfilling the Hon. Minister's promise to Pa Aliyu Giwa. However, the project from inception was meant to be built within 6 weeks but due to some logistic delays, it was started and completed within a period of three months. The bungalow includes a court yard, sitting room, kitchen and 4 conveniences.

The final handover of the house was in fulfillment of Dr. Onu's promise towards ensuring the expansion of Pa Giwa's herbal clinic to enable him accommodate more

patients and a means to enhance mobility. In his speech before the handing over, the Hon. Minister of Science and Technology, Dr. Ogbonnaya Onu commended the DG/CEO of NBRRI and her staffs for the great outcome of all her R&Ds for the growth of Nigeria's economy. He also stated that NBRRI has been so helpful to the Ministry in actualizing the set goals of this administration in promoting local contents. He urged all traditional herbal practitioners to emulate Pa Giwa in combating life-threatening ailments. He also advised Pa Giwa to allow the Nigeria Natural Medicine Development Agency (NNMDA) a scientific experiment on his herbs so that pharmacists can further produce drugs out of them for the benefit of Nigerians. He then proceeded to the commissioning by cutting of the tape and presentation of the keys of the building and the car to Pa. Giwa.

In his response, an obviously elated Pa Giwa thanked His Excellency President Muhammadu Buhari and Dr. Onu for the benevolent gesture and promised that it will spur him to do more to humanity.

On the entourage of the Minister were top government officials including the Honourable Minister of State for Labour and Productivity, Prof. Stephen Ocheni, Representative of the Minister of Health, Director General, Nigeria Natural Medicine Development Agency, Dr. Sam Etatuvie, the Representative of the Director General, Nigerian Building and Road Research Institute Mr. Daniel Makava among others.



HON. MINISTER, (FMST) DR. OGBONNAYA ONU AT THE MIDDLE WITH HEAD, CES NBRRI, MR. DANIEL MAKAVA AT HIS RIGHT AND THE HONOURABLE MINISTER OF STATE FOR LABOUR AND PRODUCTIVITY, PROF. STEPHEN OCHENI



HON. MINISTER, (FMST) DR. OGBONNAYA ONU PRESENTING THE CAR KEY TO PA ALIYU GIWA EJIVDE



PA ALIYU GIWA EJIVADE



HON. MINISTER, (FMST) DR. OGBONNAYA ONU PERFORMING THE CUTTING OF TAPE CEREMONY AS HE PRESENTS THE HOUSE KEYS TO PA ALIYU GIWA EJIVADE

## DG NBRRI, RECEIVES YET ANOTHER AWARD



Apart from Research and Development responsibilities, the DG/CEO has also concerned himself with social responsibilities. It is in light of this that the institute recently granted audience to the delegates of the Female Students Vanguard for Girl-Child Education in its headquarters in Abuja. The delegation was received by the DG/CEO of NBRRI along with some top management staff of the institute.

Speaking at a brief but remarkable session, the vice president of the delegates, Comrade Divine Otu said that NBRRI has no doubt significantly impacted on the construction industry and national development at large.

Comrade Divine Out who briefed the DG/CEO of NBRRI on some of the Association's activities which will

require the support of NBRRI, and further appreciated the efforts made by the DG/CEO in areas of gender tolerance, policy making without bias, administrative acumen and prudence and the successful completion of the NBRRI headquarters (permanent site) among other achievements.

It was based on this that the association deemed it fit and worthy to bestow the "Distinguished Leadership" award on the DG/CEO. The student group urged the institute not to relent but push further to make the institute a world class agency that will make Nigeria and Africa at large proud.

Prof. Matawal thanked the delegation and also appreciated the association for the award. The DG/CEO expressed his delight that such association singled itself in

monitoring the good activities of the NBRRI and that such gesture will further encourage the institute to achieve more.

The DG/CEO disclosed several activities that the institute has lined up and assured the student group that the institute will continue to play its role not only in the construction industry but national service and development as a whole.

The DG/CEO encouraged the students to work and study hard and continue the good work which they have started in the continent as the little that they are doing will continue to change the society. He also pledged his support to the group in promoting good governance and unity in Nigeria and Africa at large.

The highlight of the visit however was the presentation of the award to the DG/CEO by the Exco of the students' group



# MY TAKE ON THE EARTH

## TREMOR IN SOME PARTS OF NIGERIA

- Prof. Danladi Matawal DG/CEO, NBRI

In 2011 or 2012, NBRI, NASDRA and some officials of FMST rushed to Lapai in Niger state over the report of an earthquake in the area. Because I took one course on engineering seismology in my PG at Imperial College in 1980 and had also written about it after some tremors in 1983/84 in the Nigerian South West, I joined the team to Lapai.

What we found was a huge, truly massive rock outcrop bursting and cracking, a Weathering phenomenon. The huge strain energy released by the cracking mass of rock actually shook the area for some days as it released Primary (compressive) and Secondary (Shear) seismic waves that frightened everyone.

No Scientist can disprove that the entire Nigeria is not extinct because there are no records of recent Volcano or Earthquake in recorded history in Nigeria. However, all it takes to translate from Extinct to Active is one major Seismic activity. Therefore, no tremors should be taken for granted. There is need to search immediately for the focus from where these recent tremors are being propagated and design a set of actions to mitigate its effect if it is man-made and artificial, whether from deep explosives or mining. Are we constructing a tunnel in Abuja? Then the explosive waves must be attenuated and dumped at the source of the explosion. City residents also need to be warned and trained on responses to such an impending disturbance. If natural, then we should prepare for evacuation because major earth tectonic activities are always preceded pre-shocks and minor

tremors due to the straining and splitting of pieces of plates near the epicenter. Volcanoes and Earthquakes are calamities and Nigeria is not prepared for that and we must believe that with the calm already established, that we can still claim our extinct innocence.

For the purposes of Scientific and engineering technocrats, let us watch out for the reasons for these tremors. It is expected that by now, a set of experts and non-experts from Ministry of Defence, Mines and Solid Minerals, Police, Science & Technology, Transport, NASDRA, NEMA, Fire Service, COREN, Geological Society, et al, should be brainstorming somewhere in FCT over the matter.

Yesterday, we had account of someone who lives in Mpape who said that dogs, in particular, barked relentlessly. While we pray fervently that this is not a natural phenomenon because of the extinct nature of our geomorphology, nonetheless the first warnings of seismic activity in active regions of the world are animal behaviour. Dogs will bark wildly, Cats will run frantically, rats will run frenzy in the house, horses will break their enclosures, etc. This is because their extra sensory senses from whiskers makes them sense activity in the earth's crust when bits and pieces of the crust are fracturing along a prospective fault line instigated at the fracturing epicentre. The same happens in a major rock burst because it is principally the same process of release of huge strain energies.

Therefore, we also watch out for signs and the solution of tremor is of high risk (Rickter Scale of 2.5 and above) is to run to open parks and fields with your family and pets.

All seismic activities are accompanied by four waves. I already mentioned the P-waves which are the most destructive because they crumble the earth's surface and any structure on it. They are cause compression of the ground surface. The second is the S-waves which are shear waves. If you see a fault on the ground surface, they are cause by these shear waves.

The others are Raleigh and Love waves which cause no damage but temporary dumbness in human beings because they compress the air pretty much like slapping in the ear.

The major cause of death is buildings and infrastructure created by mankind. Imagine if a Dam breaks due to Seismic Activity as well as falling buildings and bridges, City Fires, etc.

I am currently sitting in my Office as I don't believe there is anything else to expect than for us to locate where the engineering activity is taking place in Abuja resulting in this minor tremors. We await assurance as soon as possible but I disagree with the quoted Professor of OAU and I assert that so far, we are a Seismically Extinct region. Thank you all.

\*PROF. DANLADI S. MATAWAL WROTE THIS ARTICLE FOLLOWING THE EARTH TREMOR THAT OCCURRED AROUND MPAPE, ABUJA ON 6<sup>TH</sup> OF SEPTEMBER, 2018

A KEYNOTE ADDRESS PRESENTED BY PROF. D.S. MATAWAL, DG/CEO NBRRI, ON  
**STANDARDISATION AS A PANACEA  
TO BUILDING COLLAPSE**  
ON THE OCCASION OF THE BUILDER'S CONGRESS HELD AT YARADUA'S CENTRE, ABUJA

## 1.0 INTRODUCTION

Standardisation can be regarded as a process of making or producing a product to conform to a particular standard; it entails a process of developing, promoting and possibly mandating standards based and compatible technologies and process within a given industry. It is simplified as a way of bringing to or making of an established standard size, weight, quality, strength or the likes.

### 1.1 What is the difference between Norm and Standard?

Norm as the name implies is that which is regarded as nominal or typical way of doing things example are customs, folklore and the likes while standard is regarded as a principle or measure used for comparison, it's an absolute measure of what things should be. The concept of standardisation in the construction industry involves the process of specification, which is widely used and accepted for its purpose across all areas in the construction industry. It begins with the Regulation of Building Materials; then the National building code/regulation which is set to provide minimum standards for building materials and to

guide construction methods in the Nigeria's building construction industry. In view of the relevance of National building code, a department of building standards was established in the Standards Organisation of Nigeria (SON) to address the issues related to building construction. This was disclosed by the then former Minister of Housing and Urban Development, Chief (Mrs.) Mobolaji Osomo at the 33rd Annual Conference/General Meeting of the Nigerian Institute of Building (NIOB), in the year 2003 in Abuja.

to curb the menace of building collapse. This takes us to the focus of discussion. 'Standardisation as a panacea to building collapse'. Panacea can be explain as a solution, remedy to a problem which in this case is building collapse. Therefore I will like to reframe the topic to read 'Standardisation' as a solution or remedy to building collapse. It should be noted here that a building which is properly constructed is expected to be in use for as many as 50 -100 years. It is worth noting that Nigeria is blessed with favorable weather when



There are so many challenges when it comes to standardization of products, materials and workmanships in the construction industry, if overcome, it will go a long way

compared to other climatic conditions in the rest of the world. The question now is why do we allow man made conditions to affect the safety

and durability of our building? I called it man made because the man made mistakes that leads to building collapse can be avoided completely if adequate measures are put in place.

Building, bridges, and road pavement collapse as the case maybe, occurs when the structure crumbles and falls fully or partially thereby rendering the structure unsafe for the original desired use and purpose, Ike (2012). A Building does not just collapse at once, its continues to deteriorates at different stages before it reaches its final stage after which it collapse; Serviceability stage is a stage in building when building components like beams, slabs and sometimes doors/windows begins to deflect and at times do not close effectively; Distress stage occur as the stress increased, the building and its components begins to show signs of distress like cracks, bending of beams and deflection of column suffices; Failure stage is associated with wider large cracks and induced stresses on structural members which can cause collapse if nothing is done; Finally, collapse stage is when the building and components completely fail due to disintegration,

this can be refer to as the ultimate limit state failure.

In line with its mandate, NBRI organised a conference in 2012 with the theme "Curbing the incidences of building collapse in Nigeria. Matters relating to building collapse in Nigeria, was discussed extensively, also recommendations in curbing this menace were provided by the different stakeholders. Proceedings of the conference are available for the public consumption online through NBRI websites, copies of technical reports can also be NBRI libraries or other libraries of research institutes and other higher institutions.

## 2.0 REVIEWS ON BUILDING COLLAPSE

The issue of building collapse is of great concern to all of us, it affects not only the economy, it causes psychological trauma to the affected victims which cannot be quantified. Let me take you down the memory lane, if you recount, building collapse incidences was not prevalence and rampant as compared to what we have

now. Study by Nicholas & Patrick (2014) reveals that about one hundred and forty (140) recorded cases of buildings collapse occurred between 1974 and 2012 with over seven hundred and ninety eight (798) lives lost during the same period. The reported cases of collapsed buildings has 54.17% as residential buildings of which 15.83% are residential buildings under construction. 10.00% of the buildings are used for commercial purpose. 8.33% of the buildings are educational institutions. 5.00% are used for religious purpose (churches and mosques). Hotels, courts, hospitals and sport buildings account for 2.50%, 1.67%, 1.67% and 0.83% respectively. The location distribution of the collapsed building shows high prevalence in Lagos and Abuja. And if you can agree with me, between the years 2012 –till date, we have recorded over 40 cases of building collapse including one of the recent ones that happened in Jabi here at FCT, Abuja, and Portharcourt in November 2018.

### 3.0 CAUSES OF BUILDING COLLAPSE

Omenihu, Onundi, & Alkali (2016) studied the possible causes of building collapse in Nigeria. The results of their finding shows that the leading cause of building collapse within the period (1971-2016) were structural failures (24.9%), use of substandard materials (13.2%), poor workmanship (12.2%), faulty design (8.8%), use of quacks (7.3%) and inappropriate foundation (6.8%). It also noted though that, factors such as approval, design, geotechnical and regulation violations or excessive loadings and carelessness ranged between (2.4 to 4.4%). The summary of the review causes are presented in figure 1.

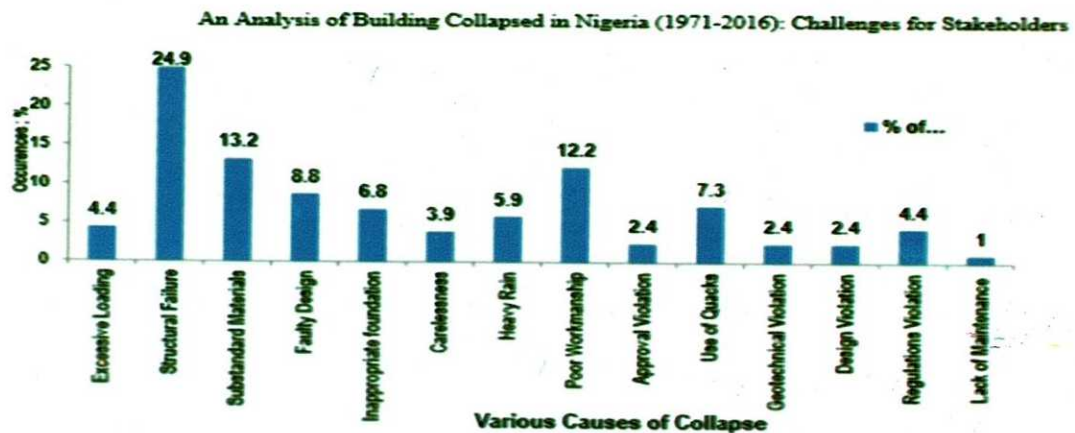


Figure1. Occurrences and Causes of Collapsed Buildings in Nigeria (Omenihu et al, 2016)

Matawal (2012), reported that from the field investigation conducted on debris of collapse buildings revealed that the use of poor materials (especially concrete) and the reduction in the sizes of specifications of structural elements (foundations, columns, beams and floor thicknesses) are primarily responsible for the unabated rate of failures of on-going and existing structures in the country. The report also deems minimal knowledge of concrete behavior as imperative and essential to curbing building collapse. He emphasized that Cement especially OPC is the critical component being the main binder in mortar and concrete, some basic theories, specifications and standards are available and many laboratories test results are presented and it's been confirmed that most of Nigerian cement meets the national and international standards. Due to this fact, standards of construction

material like steel rods and cement which are industrially controlled can be exonerated from directly contributing to building collapse, Matawal (2012).

**In view of that, the reasons for collapse of buildings in Nigeria can be enumerated as follows;**

1. Structural failure; poor design and specification of structural members which are inadequate in distributing the load in the building thus leading to induced stress on the building.
2. Substandard material; the use of materials like concrete requires great attention in the mix; it should be rich with minimum compressive strength of  $20\text{N/mm}^2$  and use which must be adhered to. Also the quality of aggregate to be use in concrete production is of great importance.
3. Poor workmanship; when specifications are not properly followed, especially when it comes to mixing and placement of concrete. This

can lead to cracks in the long run.

4. Improper foundation and lack of subsoil investigations; geotechnical investigations, test and reports are needed for proper design of foundations.

5. No proper supervision machinery. In the actual sense, if there is good supervision, handled by certified professional, construction flaws can be identified and corrected accordingly. Structural elements can also be redesign in line with the environmental and site conditions.

6. NBRI over the years has also identified lack of skilled artisans, craftsmen and construction workers as one of the basic problems in the industry responsible for collapse of building. NBRI therefore believes that if these categories of personnel are trained, they will not only deliver good construction according to their trade but they will be empowered with skills to detect poor design and poor construction materials,

just to mention a few.

7. Scaffolding, formwork faults, early stripping of formwork, extraordinary load that was not taken into consideration at the design stage can also lead to building failure as such the concrete needs to be hardened, the low bond stress must be overcome before removing of formwork. When the aforementioned causes of building collapse in Nigeria are closely examined, it will be observed that non enforcement of standard is the single most important factor that is responsible for most, if not all of these problems in the built environment in Nigeria. Danwata (2017), stated that 'Unless and until the National Assembly pass a bill on The National Building Code into law, Nigerian construction industry will continue to face series of problems'. The Building Code will serve to establish consistent minimum standards for the quality and durability of construction materials and building systems.

Fadason, Danladi, & Sharon (2017), from their findings, discovered that the construction industry in Nigeria is characterized with problems which hinder the use of standards in construction industry, most of the hindrances are hinged on quality of materials and workmanship but this can be controlled by proper use of the appropriate regulations. Unfortunately, specification/standards and construction regulations as drivers of good standard of construction are faced with lots of challenges. The challenges when it comes to the regulation and standards in the construction industry as mention by Fadason et al

(2017) are; there exist few National Standards relating to general construction (buildings, roads etc) and many of them are not known, as a result of this, British and American Standards and Codes are used by designers regardless of the fact that local requirements are often different; the development process of standards is difficult, cumbersome and unstable, this aggravates the situation with respect to regulations; most designers in Nigeria lack adequate knowledge with respect to the function and performance of the materials and components they specify. As a matter of fact, substantial part of the materials used in the construction industry are imported, therefore, there is need to ensure that such materials satisfy the minimum standard and are compatible with our environment.

I will like to state categorically that standards must be adhered to from inception of any construction project, monitoring and control up to the completion of the project irrespective of the challenges that may occur, this can actually mitigate the catastrophe of collapse that may occur in the long run. Take for instance, if the cost of construction can be reduced through cost reducing measures, it will be easy to adhere to standards by professionals in the industry, as well as the contractors. As opined by Muazu & Alibaba (2017), the rise in the cost of constructing houses has remained a major concern for the government in Nigeria because of the over reliance on the use of imported construction materials. Traditional building materials

which are sustainable are readily available in large deposits such as laterite, bamboo, thatch, stones, timber, coconut trees, etc. can reduce cost of housing when appropriate technology is used to harness this materials. NBRI as an institute has delved into different alternative constructional materials such as compressed earth blocks stabilized with 5% cement, pozzolana cement, bamboo, rubberized asphalt etc.

#### 4.0 CONSTRUCTION REGULATIONS AND STANDARDS

Improvements and adherence to the standard of construction can only be made possible through organized and dedicated input of all stakeholders in the industry, whereby appropriate regulations are used as the key guide and document for quality management. This is of concern especially as there has been increase in cases of building collapse in Nigeria in recent times. There are further needs to raise the level of awareness on the need to adhere to construction standards. May I use this medium to state here that this subtheme is timely, it will create awareness in the use of standards of instituted as it will serve to bring to the forefront the effectiveness of instituted construction regulation in curbing building collapse in Nigeria.

Construction regulation authorities like the development control and FCDA are established agencies saddled with the responsibilities to harmonize construction laws which may contradicts each other, curb uncontrolled and unchecked

physical planning of buildings and construction, control and enforce the mechanisms on the application of the Building Code in the construction industry, prevent easy entry and penetration of unqualified contractors, and improve on the bureaucratic requirements and procedures in approval of building plans, eliminate corruption cases in the building industry. It will also emphasized on both material quality, contractor performance, and revise the Building Codes to ensure its relevance.

### 5.0 CONCLUSION

Incessant building collapse is a challenge that must be tackled with all seriousness as its concern all stakeholders in the Building construction industry. The building code should be pass into law by the National Assembly, this will establish consistent use of minimum standard which is centered on quality and durability of construction materials and building systems. Nigerian needs to be more serious than

what it is operating now; even buildings already completed should be examined periodically by relevant authority, to ascertain its reliability.

### 6.0 RECOMMENDATIONS

1. Concrete is known to be good in compression but poor in tension while steel is good in tension. There should be proper bonding between the concrete and steel; which entails that there should be a good grip (bond) between steel and concrete. It can be said therefore that a structure may fail but will not collapse if there is proper bonding. High strength concrete that meets the standard requirements should be used in construction.

2. The use of Building Information Modeling (BIM) should be adopted in the Building construction industry, this will harmonize all professionals working in a project.

3. There should be periodic assessment carried out on

cement products from retailer so as to detect possible change in the quality of the product which may arise due to adulteration, poor storage conditions, defective bags or re-bagging

4. It has been confirmed that if the quality of requisite 'skilled manpower' on construction sites can be improved upon and proper supervision machinery is installed on all sites, the problem of building collapse can be minimized or solved completely.

5. The need for the training of Skilled manpower' and retraining professional through the continuous professional development (CPD) is recommended

6. Integrity test should be carried out on all structural members for any building that has been left uncompleted for a long period of time (minimum of three years) before commencing any further construction works.

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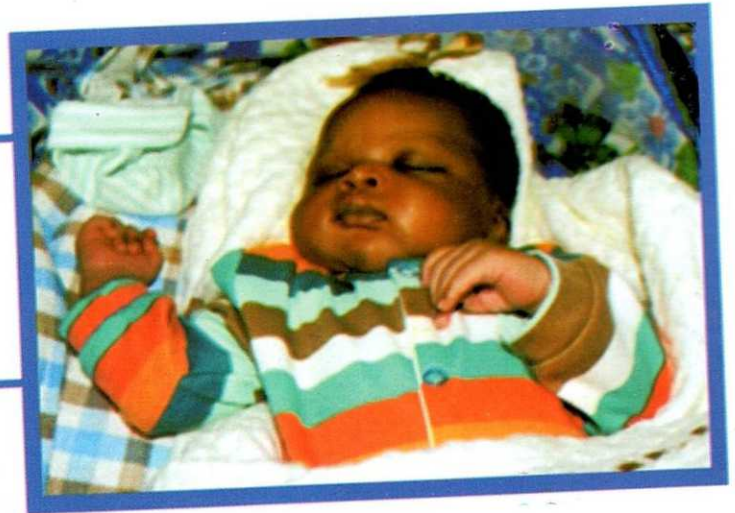
**SOCIAL DIARY***Birthday*

Egege Chimeziri C.	1st July	BRD
Ibrahim Solomon	1st July	EMRD
Sarah Musa .L. A.	1 <sup>st</sup> July	DG/CEO
Nten Thankgod Sylvanus	1 <sup>st</sup> July	BRD
Okoi Yemi Joseph	3 <sup>rd</sup> July	CES
Aileku Ayedime Patience	4 <sup>th</sup> July	CES
Ayegba Martin Ojogbane	5th July	RRD
Obi Emeka Michael	5 <sup>th</sup> July	
Ogwu .A. Angela	5 <sup>th</sup> July	CES
Dalyop Garos	6 <sup>th</sup> July	A/P
Tavaku Wisdom .M.	7 <sup>th</sup> July	RRD
Tenimu Ahmed Isah	7 <sup>th</sup> July	P/M
Metu Francisca U.	8th July	EMRD
Modi Musa	8 <sup>th</sup> July	ADMIN
Danjuma Golesh .A.	9 <sup>th</sup> July	BRD
Umanah Ikouwem I.	10th July	SLT
Francis Zakariah .M.	10 <sup>th</sup> July	P/M
Dauda Paul	13 <sup>th</sup> July	RRD
Kpanaki Martins	14th July	CES
Iyabode Gbemisola .F.	14 <sup>th</sup> July	F/A
Amos David	14 <sup>th</sup> July	BRD
Otoide E.D	16th July	EMRD
Mbaso Ebele	17th July	A/P
Eriogogu Rita Chioma	17 <sup>th</sup> July	A/P
Buba Alfred .Y.	17 <sup>th</sup> July	BRD
Makinde W.O	17 <sup>th</sup> July	EMRD
Emole Charles U.	18th July	PPM
Ochei E.S	20th July	EMRD
Akin Oso Oladapo	21 <sup>st</sup> July	RRD
Egbe Sunday Enyi	21 <sup>st</sup> July	CES
Uham Bass Juku	21 <sup>st</sup> July	PIT
Afom Funmilola Adenike	22 <sup>nd</sup> July	F/A
Adekunle Aminat	23rd July	PIT
Chika Obinna .I.	23 <sup>rd</sup> July	
Bala Ibrahim	24 <sup>th</sup> July	P/M
Ibrahim Samuel	27th July	A/P
Alex Kassim	27 <sup>th</sup> July	

Samuel Okpute P.	27 <sup>th</sup> July	RRD
Siyanbola Imaobong .I.	28 <sup>th</sup> July	BRD
Ezeh Emeka	1 <sup>st</sup> August	AIP
Ajanah Hakeem	3 <sup>rd</sup> August	CES
Abu Y.	4 <sup>th</sup> August	PIT
Ozoemena Grace Ngozi	4 <sup>th</sup> August	CES
Zacchaeus J.E.A	6 <sup>th</sup> August	A/P
Matawal Malan Peter	7 <sup>th</sup> August	RRD
Ogboji F. A	8 <sup>th</sup> August	A/P
Francis Ameh	8 <sup>th</sup> August	EMRD
David Abraham	10 <sup>th</sup> August	AUDIT
Yakubu .D. Bello	10 <sup>th</sup> August	
Akinyeye O.J	11 <sup>th</sup> August	EMRD
Magaji Grace Simon	12 <sup>th</sup> August	CES
Ajayi Samuel	14 <sup>th</sup> August	BRD
Ezeh Edwin	15 <sup>th</sup> August	ADMIN
Agala Joshua Ndubuisi	15 <sup>th</sup> August	P/M
Akorah Jude	17 <sup>th</sup> August	RRD
Bitrus Albert	17 <sup>th</sup> August	
Ismaila Abdullahi	17 <sup>th</sup> August	
Adekunle Adebayo	19 <sup>th</sup> August	BRD
Inoh Augustine Gordian	20 <sup>th</sup> August	CES
Faniyi Aniyor Mabel	20 <sup>th</sup> August	PIT
Adamu Isah Katagum	20 <sup>th</sup> August	RRD
Oki Gbenga	22 <sup>nd</sup> August	BRD
Izabi Helen	22 <sup>nd</sup> August	A/P
Onoja Patrick .O.	24 <sup>th</sup> August	F/A
Okonkon Edem	24 <sup>th</sup> August	
Mahmoud Usman	25 <sup>th</sup> August	
Ananso Georgina .N	26 <sup>th</sup> August	BRD
Abdul Amina Ile	28 <sup>th</sup> August	PIT
Okpanachi John .A.	29 <sup>th</sup> August	CES
Bello Kabirat O.	29 <sup>th</sup> August	RRD
Igweonu Mabel	1 <sup>st</sup> September	A/P
Ngozika Chidolum P.	1 <sup>st</sup> September	
Aruna Francis	2 <sup>nd</sup> September	PPM
F.O Aitsebaomo	2 <sup>nd</sup> September	RRD
Quadri Habeeb Adedeji	4 <sup>th</sup> September	RRD

Olaifa Kayode	4 <sup>th</sup> September	A/P
Nwanade Ocean	5 <sup>th</sup> September	BRD
Makava Daniel	6 <sup>th</sup> September	CES
Nyadar Mutah Birmah	6 <sup>th</sup> September	BRD
Ikong Aboyi Pius	7 <sup>th</sup> September	BRD
Tsammani Victoria	7 <sup>th</sup> September	
Udo Itoro Gabriel	9 <sup>th</sup> September	RRD
Auwalu Abdulkarim	10 <sup>th</sup> September	
Juliana Tyodem	12 <sup>th</sup> September	RRD
Okougha Ayemere F.	13 <sup>th</sup> September	SLT
Oghele Emmanuel	13 <sup>th</sup> September	P/M
Umeobika Ndilichukwu	14 <sup>th</sup> September	SLT
Daniels Andrea .O.	15 <sup>TH</sup> September	A/P
Mohammed A.L	16 <sup>th</sup> September	PIT
Rose Ali	19 <sup>th</sup> September	A/P
Salifu Blessed Ugbede	20 <sup>th</sup> September	PIT
Adewale Adefolarin K.	20 <sup>th</sup> September	BRD
Jafun Adamu	20 <sup>th</sup> September	
Abigail Daniel M.	20 <sup>TH</sup> September	F/A
Okewole Babatunde O.	20 <sup>th</sup> September	CES
Hassan Musa	22 <sup>nd</sup> September	
Ismaila Joseph	22 <sup>nd</sup> September	RRD
Oko E. John	23 <sup>rd</sup> September	BRD
Sanusi Folake O.	23 <sup>RD</sup> September	PITD
Yisa Godwin Lazhi	24 <sup>th</sup> September	RRD
Cosmas Omini	24 <sup>th</sup> September	P/M
Kigun Philip	24 <sup>th</sup> September	BRD
Inyang Millicent	25 <sup>th</sup> September	A/P
Sulaimon N.A	25 <sup>th</sup> September	RRD
Nwannenna Olachi C.	26 <sup>th</sup> September	EMRD
Adebukola Abisola .O.	26 <sup>TH</sup> September	A/P
Cinfwat Kishak Zakka	26 <sup>th</sup> September	BRD
Yahaya Babatunde	26 <sup>th</sup> September	EMRD
Abubakar Baba Yerima	27 <sup>th</sup> September	RRD
Oladejo Abideen	29 <sup>th</sup> September	
Nwadinobi Nneka E.	30 <sup>th</sup> September	A/P
Umbule Mahwel John	30 <sup>th</sup> September	A/F

**Adamu Abduljalal Garkuwa,**  
*born on 29th June 2018 to the Family of  
Mr. Abduljalal Adamu Garkuwa  
of PIT Abuja*



**Khadija Isa Ya'u,**  
*Born on 14<sup>th</sup> of July 2018  
to the Family of Mrs. Zainab Sa'id  
Muhammad OF PIT, Abuja*

**Former Miss Adekunle Aminat of  
PITD Ota got married to Mr. Jubril  
Bright on September 22nd 2018 in  
Ogun state**



# NBRRI

## COUNTDOWN TO COMMISSIONING OF THE NBRRI HOUSE

