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The Review of the Historical and Recent Seismic Activity in Nigeria

Mohammed S. Tsalha[1], U.A Lar[2] T. A Yakubu[1], Umar A. Kadiri[1]
Dauda Duncan[1]

[1]*Centre for Geodesy and Geodynamics, Toro, National Space Research and Development Agency (NASRDA) Abuja, Nigeria*
[2] *Department of Geology and Mining, University of Jos, Nigeria.*

Abstract: *Seismic events had been recorded instrumentally and also historically from 1933 to 2011 in Nigeria. These pockets of activities were felt in different parts of the country with the southwest region recorded the highest number of events and moderate magnitudes of between 4 and 4.5. The geology and the structural tectonic setting of the region in question are the probable mechanisms that are responsible for the observed and recorded events in Nigeria. In 2006, the Centre for Geodesy and Geodynamics Toro, took over the management of the Nigerian National Network of Seismographic Stations (NNNSS) established by the National Agency for Science and Engineering Infrastructure (NASENI). Nowadays, the network comprises of five operational stations equipped with 24-bit 4 - channel data acquisition system and broadband seismometers form the seismicity instrumental network of Nigeria. Effort to increase the number of stations has reached an advance stage. The Centre also intends to modify the monitoring framework to collocate with Continuously Operating Reference Stations (CORS), Global Positioning System in the exiting five stations and the proposed additional one station.*

Keywords*: Seismicity Records, Nigeria, Seismographic Stations, Seismographs, Instrumental Records.*

I. Introduction

In Nigeria, seismic events from both historical and instrumental means have been recorded since 1933 - 2011 (Adepelumi et, al., 2008). It is believed that the geological framework of Nigeria is located within the mobile belt of Africa between the West Africa Craton and the Congo Craton (Figure 1). The Pan–African orogeny that occurred 600 ±100Ma was the last major deformation and metamorphism experienced within the belt with slight effect on the adjacent craton (Turner,1971). This could be the reason why the country is not experiencing major earthquakes. However, some pockets of tremors with moderate magnitudes ranging from 4.3 to 4.5 have been recorded (Afegbua, 2011). In order to be assured of the dependability of this historical and instrumental information, a group of experts were mandated to carry out research in the field of historical seismology in the past as a sub discipline in Nigeria. The experts comprised of a team consisting historians, seismologists, and database-experts whose main objectives are to compiled data and information from historical and recent seismic activities in Nigeria. The main focus of the studies on seismicity in Nigeria was carried out to compile Earthquakes or tremors catalogues that occurred in the past.

Historical earthquakes or earth tremors in Nigeria were compiled from journals, personal communications with the natives of the associated areas and newspapers written from 1933 -2011.These developments in the nations' geological history brings to question the age long belief that Nigeria is seismically safe. The possible mechanisms for these intraplate tremors could be due to the regional stress created by the West African Craton (Adepelumi et, al., 2008). In homogeneities and zones of weakness in the crust created by the various episodes of magmatic intrusions and other tectonic activities also were considered as sources of seismicity in Nigeria. Two theories were considered as the origin of the seismicity in the country, the possible faults systems were inferred based on the spatial distribution of the Earth tremors Yola- Dambata,Akka-Jushi and Warri – Ijebu Remo systems (Afegbua, 2011). Most of these fault systems are trending north west – southeast. The second assertion which was the earlier theory revealed that the tremors occurred in the inland extension of the north east- south west originating from the Atlantic Ocean and that possibly causes the activities along the Ojebu-Ode and Ibadan axis which is inferred to be associated with the Ifewara- Zungeru fracture systems (Adepelumi et.al.,2008).

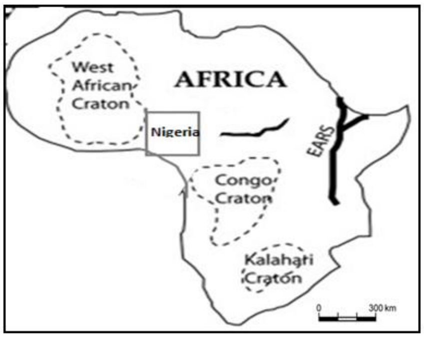

Figure 1: Location of Nigeria (in square) with respect to the Craton.

Geological Setting and Tectonic Activity

The Basement Complex covers about 50% of the total surface of Nigeria. It is composed of the following lithostructural units:- The Migmatite- Gneiss complex (MGC),The Metasedimentary and Metavolcanic rocks (The Schist Belt). The Pan - African granitoids (The Older Granites), underformed acid and basic dykes. The Migmatite-Gneiss complex (MGC) has for long been regarded as basement sensu stricto (S.S.) and it is the most widespread of the main rock units in both northwestern and southwestern Nigeria. The term "Older granites" was introduced by Falconer, (1911) who, on the basis of morphology and texture distinguished the Pan African Granitiods from the Jurassic anorogenic peralkaline "Younger Granites" of the central Plateau region. The term Pan- African granitoids is preferred not only because of its merit on age, which was not available at that time, but because it covers several important petrologic groups formed at the same time (Ajibade et al., 1979). They are composed of large volumes of granitic rocks, which intruded all preexisting rocks including the gneiss-migmatite-quartzite complex and the schist belt. They were emplaced during the late Proterozoic to early Paleozoic (160+/-150My). These granites consist of porphyritic and non-porphyritic granites, granodiorites, adamallite, tonalite and quartz –diorite. They generally occur as inselbergs in the basement. Examples of such granite hills are the Olumo Rock in Abeokuta, Ogun State; Idanre Hills, Ondo State; Ikere Hills, Cross-river State; Aso Rock, Abuja etc. It is a heterogeneous assemblage including migmatites, orthogenesis, paragneisses and a series of basic and ultrabasic metamorphosed rocks. The various rock types in this complex are exposed in the north central, north eastern, southwestern and a narrow zone parallel to the eastern boundary of the country, east of River Benue covering parts of Kaduna, Plateau, Bauchi, Kano and Sokoto States; southern Nigeria, covering the greater parts of Kwara, Oyo, Ogun; and Ondo States; southeast Nigeria, spanning the northern parts of Cross Rivers State and as far north as Yola; and north of Benue River in Adamawa State. These crystalline basement rocks have been subjected to deformation of different intensities throughout the geological period. Consequently, North-South (N-S), Northeast-Southwest (NE-SW), Northwest-Southeast (NW-SE), North northeast-South southwest (NNE-SSW), North northwest-South southeast (NNW-SSE) and to a lesser extent, East-West (E-W) fractures have developed (Sunday and Eze, 2010).

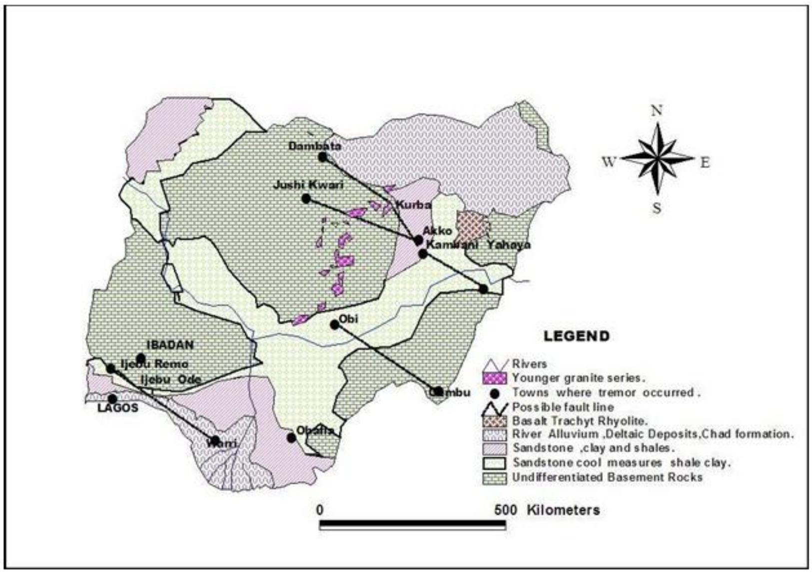

Figure 2: Geological Map of Nigeria Showing Locations of Earth Tremor. (Sources: Sunday and Eze, 2010).

Nigeria is underlain by seven major sedimentary basins ranging in age from middle Mesozoic to Recent age (Hospers, 1965). The basins are from Oldest to Youngest:the calabar flank,the Benue Trough, the Chad Basin, the Sokoto basin (SE Illumeden basin, the Dahomey Basin.The basins are broadly divided into coastal Calabar flank, Niger Delta, Dahomey Basin and interior basins (Benue Trough,Chad Basin, Nupe Basin,SE Iullemmedin Basin).The sedimentary successions in these basins are broadly divided into:

(1) Basal continental sandstones,siltstones and mudstones,
(2) middle marine shales and limestones interbedded with sandstones and siltstones;
(3) upper sandstone sequence that is continental or paralic.

Rocks of the Sedimentary Series cover about 50 percent of the surface area of the country, and can be variously sub-divided into between six and eleven basins or troughs. With respect to age of formation, five of these basins (the Niger Delta, the Bida or Middle Niger or Nupe, the Benin, the Anambra and the Benue Basin Complex) were apparently initiated in the Cretaceous, during the opening of the Gulf of Guinea and the separation of South America from Africa. The Sokoto and Chad Basins are parts of the much larger Taodeni and Iullemmeden Basins of Africa, respectively.

Superficial deposits, such as alluvium, laterite and various types of soils, often cover the bedrock in most areas, especially in the plains and lowlands. In the hilly areas such as the Jos plateau, outcrops are more extensive.

It is believed that the Dahomeyan Basin is bounded by the Romanche Fracture zones to the west while the Chain fracture zone to the East (Wright, 1976; Hastings and Bacon, 1979; Ige et al., 1985). Both fracture zones trend approximately in the NE-SW direction. In Nigeria, Cretaceous volcanic are recognized in sedimentary basins as pyroclastics, microdiorite sills and basalt dykes (Nwachukwu, 1972; Benkhelil, 1986). Magmatic intrusions are stable rock and can cause differences in geophysical properties which can results in localized stresses in one place more especially when the intrusion is weaker than the host rock. After some times, the intrusion will become weaker than the host rock. Geologically, Kano, Bauchi and Yola have been intruded during the Proterozoic to Palaeozoic volcanic activity associated with the Pan-African orogeny. Rock intrusions in parts of the sedimentary basins of Nigeria may have created enough local stress concentration to initiate or predispose the areas to seismicity (Eze et al., 2011).

Some of the important fault systems in Nigeria are the Ifewara, Zungeru, Anka and Kalangai fault systems. They are interpreted to have resulted from transcurrent movements (Garba, 2003). Adepelumi et al., (2008) conducted an integrated geophysical survey across a prominent zone of weakness clearly observable in Landsat.

The Basement Complex of the southwestern Nigeria are of the Late Precambrian times, the images are confirmed by the Multispectral Scanner (MSS) and Side-Looking Airborne Radar (SLAR) and the existence of the supposed Ifewara shear zone formed by shearing activities during this period. The NNE-SSW trending fault system was identified in the area. Ifewara fault is a mega lineament of about 250 Km long has been shown to be linked with the Atlantic fracture system (Adepelumi et al., 2008). Burke et al., (1977) and Hubbard, (1975) believe that the pronounced age differences on both sides of the fault zone suggest that the zone may indeed be a suture of Kibaran age (Figure 3).

There are also many mid-Atlantic ridge transform fracture zones (St. Paul, Romanche, Charcot and Chain fracture zones) in the Gulf of Guinea which many believe form part of the Pelusium Megashear system that cuts across the continent of Africa from the West Africa Coast to the Nile Basin in NE Africa (Neev and Hall, 1982; Ajakaiye et al., 1982). The compression trough which follows the line has been ascribed to an oblique collision between a NW African plate and a central plate consisting of southern and eastern Africa, the Arabia Peninsula and the Levant (Neev and Hall, 1982).

The causes of Earth tremors in Nigeria have been attributed to the locations of Earth movements associated with NE-SW trending fracture and zones of weakness extending from the Atlantic Ocean into the country as reported by Ajakaiye et al., 1986, Ajakaiye et al., 1987. It is also suggested that the possible relationship between the epicenters of some of the West African earthquakes and continent-ward extensions of oceanic fracture zones is attributed that the tremors are as a results of partial reactivation of fossil plate boundaries and these tremors cannot be said to be associated with the NE-SW trending extension of the Atlantic Oceanic fractures into the landmass. The tremors have most likely been caused by regional stress and zones of weakness in the crust or transfer of stress from plate boundaries. The alignment of faults marking the western flank of the Lagos Graben coincides with the Ibadan – Ijebu Ode line along which earth tremors occurred in July and August 1984. It is glaring that these geological structures are related to the seismic events considering some movements along old basement fractures that took place same time (1984).

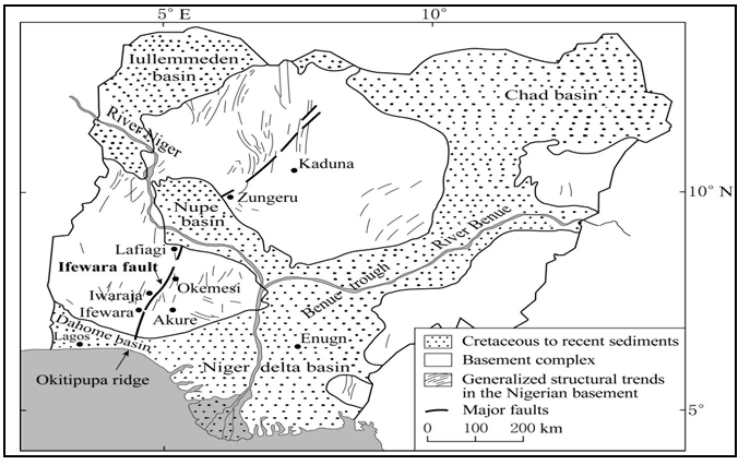

Figure 3: Map of Nigeria showing the Zungeru - Ifewara fault (Odeyemi, 2006; Akpan and Yakubu, 2010).

The Probable causes of Nigerian Earth Tremors

The coastal area of Nigeria lies in close proximity to the boundary between the African plate and South American plate. Some of the tremors that occurred in the coastal areas of Nigeria could have been possibly initiated by this process (Eze et al., 2011). The Stresses built up around plate boundaries could travel toward the centre of the plate triggering intraplate tremors especially in pre-existing faults.

The Abakaliki and Benue Troughs are regarded as examples of failed rift arms following the opening of the South Atlantic. The troughs contain folded and unfolded mainly Cretaceous sediments which were deposited in two late Mesezoic rift troughs which formed the third arm of the Niger Delta Triple Junction (Merki, 1970). Extensional stress, due to upwelling magma beneath the region, must have deformed the crust and created faults. After the extensional sets ceased, the weakened crust was covered with sediment over millions of years. Over geologic time, these zones were incorporated into mid-plate structure and became subject to tectonic compressive stresses (Sunday and Eze, 2010).

Researches revealed that Nigeria is not situated on any active known seismic belt, yet between 1933 and 2011 quite a number of tremors had been recorded (Table 1). These tremors show that Nigeria may not be as aseismic as previously thought by these researchers. The intensities of these events range from III to VI, based on the Modified Mercalli Intensity Scale. Of these events, only the 1984 tremor at Ijebu-Ode, the 1990 at Ibadan and 2000 at Jushi Kwari were instrumentally recorded. They had body wave magnitudes of 3.7 to 3.9 (Akpan and Yakubu, 2010). When these events occurred, there were no functional seismological observatories in Nigeria.

Table 1: List of Historical/Instrumental Earthquakes Felt in Nigeria

S/N	Year-Month-Day	Origin Time	Felt Areas	Intensity/ Magnitude	Probable Epicenter	Coordinates	
1	1933	-	Warri	-	-	$05^{o} 45^{1} 23^{11}$E	$05^{o} 31^{1} 42^{11}$ N
2	1939-06-22	19:19:26	Lagos, Ibadan, Ile-Ife	6.5 (Ml)	Akwapin fault in Ghana	$03^{o} 23^{1}00^{11}$E	$06^{o} 30^{1} 11^{11}$N
3	1948-07-28	-	Ibadan	-	Close to Ibadan	-	-
4	1961-07-2	15:42	Ohafia	-	Close Ohafia area	$07^{o} 47^{1} 21^{11}$E	$05^{o} 37^{1} 15^{11}$N
5	1963-12-21	18:30	Ijebu-Ode	V	Close to Ijebu-Ode	-	-
6	1981-04 -23	12:00	Kundunu	III	At Kundunu village	-	-
7	1982-10-16	-	Jalingo, Gembu	III	Close to Cameroun Volcanic Line	-	-
8	1984-07-28	12:10	Ijebu-Ode, Ibadan, Shagamu, Abeokuta	VI	Close to Ijebu-Ode	-	-
9	1984-07-12		Ijebu Remo	IV	Close to Ijebu - Ode	$03^{o}22^{1} 00^{11}$E	$07^{o} 11^{1} 45^{11}$N
10	1984-08-02	10:20	Ijebu-Ode, Ibadan, Shagamu, Abeokuta	V	Close to Ijebu-Ode	-	-
11	1984-12-08	-	Yola	III	Close to Cameroun Volcanic Line	-	-
12	1985-06-18	21:00	Kombani Yaya	IV	Kombani Yaya	-	-
13	1986- 07-15	10 :45	Obi	III	Close to Obi town	$08^{o}46^{1}$E	$08^{o} 22^{1}$N
14	1987-01-27	-	Gembu	V	Close to Cameroun Volcanic Line	$11^{o} 15^{1}$E	$06^{o} 42^{1}$N
15	1987 – 03-19	-	Akko	IV	Close to Akko	$10^{o} 57^{1}$E	$10^{o} 17^{1}$N
16	1987-05-24	-	Kurba	III	Close to Kurba village	$10^{o} 12^{1}$E	$11^{o} 29^{1}$N
17	1988-05-14	12:17	Lagos	V	Close to Lagos	-	-

18	1990-06-27	-	Ibadan	3.7(ML)	Close to Ijebu-Ode	03º 58^{1}E	07 º22^{1}N
19	1990-04-5	-	Jerre	V	Close to Jerre Village	-	-
20	1994-11-07	05:07:51	Ojebu-Ode	4.2(ML)	Dan Gulbi	-	-
21	1997	-	Okitipupa	IV	Close to Okitipupa Ridge	-	-
22	2000-08-15		Jushi-Kwari	III	Close to Jushi Kwari village	07º 42^{1}E	14º 03^{1}N
23	2000-03 -13	-	Benin	IV	Benin City (55Km from Benin)	-	-
24	2000-03-07	15:53:54	Ibadan, Akure, Abeokuta, Ijebu-Ode, Oyo	4.7(ML)	Close to Okitipupa	-	-
25	2000-05-07	11:00	Akure	IV	Close to Okitipupa Ridge	-	-
26	2001-05-19	-	Lagos	IV	Close to Lagos city	-	-
27	2002-08-08	-	Lagos	IV	Lagos city	-	-
28	2005-03	-	Yola	III	Close to Cameroun Volcanic Line	-	-
29	2006-03-25	11:20	Lupma	III	Close to Ifewara-Zungeru Fault	-	-
30	2009-09-11	-	Abomey-Calavi	II	Close to Benin	-	-
31	2011-11-05	-	Abeokuta	4.4	Close to Abeokuta	-	-

Nowadays Nigeria has a seismographic network consisting of five functional stations, and plan is underway to increase additional five more stations to the network.

Seismicity studies and monitoring in Nigeria is being undertaken by the Centre for Geodesy and Geodynamics (CGG) Toro. The seismicity map of the events from 1930-2011 has been generated in Nigeria and some from neighboring country. The data are generated from the historical approach and instrumental means (Fig.4). One of the activity centres under National Space Research and Development Agency (NASRDA) in Nigeria. The stations are equipped with 24-bit 4- channel data acquisition system and broadband seismometers. Currently, CGG has invested significant resources in upgrading the existing stations and there are plans to equip them with GPRS cellular communication (telemetry equipment) real-time data transmission is underway. Sites had been selected and all necessary requirements before the establishment of the stations were also conducted (Afegbua et al., 2011).

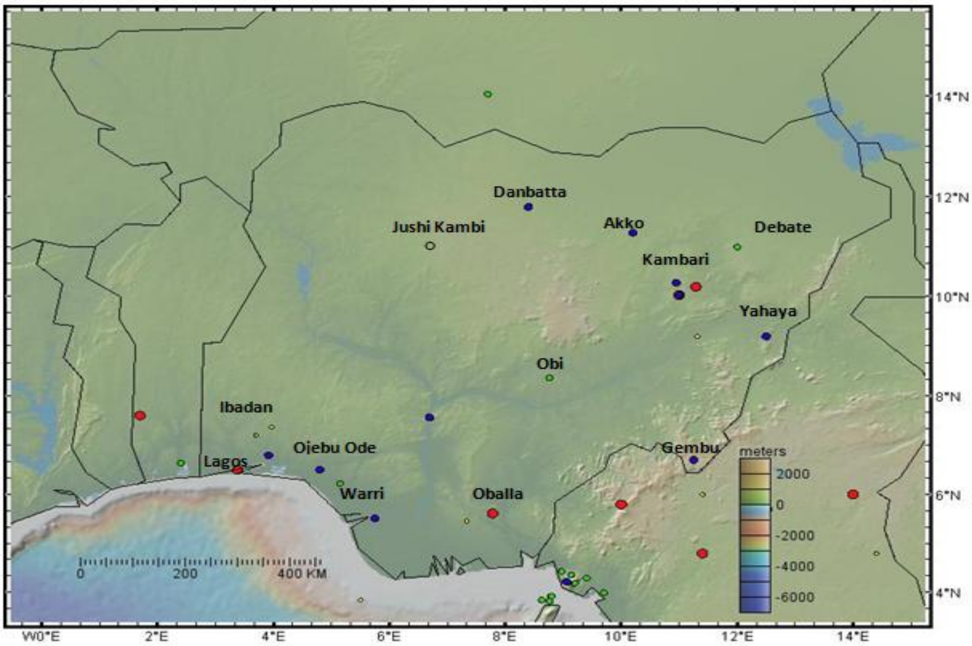

Figure 4: Seimicity map of Nigeria and some events from neighbouring countries of Cameroon and Benin Republic. Different clours and diameters are used to denote different magnitudes of mostly historical events and some instrumentally recorded ones. 3-4 magnitude=yellow; 4-5 magnitude=Green; 5-6 magnitude=Red; and blue colours represent historical tremors with unknown magnitude

The Current Status of Nigerian Seismic Stations

Since 2006, the Centre has been managing these six stations (Table 2 and Figure 5) equipped with 24-bit 4-channel data acquisition system and broadband seismometers. The seismometer triggers on local strong Earthquakes which could also be considered to monitor coastal areas of Nigeria for early warning in future. With the realization of the integrated monitoring scheme in which GPS and Seismometer can be collocated, a sound monitoring scheme can be used (Figure 6).

The principle behind this approach is that seismic signals are measured in three orthogonal directions: Vertical (Z), North-South (N) and East-West (E). The seismic sensor measures the ground motion and translates it into a voltage and recorded by the recorder (Havskov and Ottemoller, 2010).

Table 2: Locations of Current and Proposed Seismic Stations in Nigeria

N/S	Station code	Name	Geological Foundation	Instrument installed	Coordinates
1	Oyo	Oyo	Granite	SP-400 Seismometer, DR4000	07^{o} $53^{1}131^{11}$N, $03^{o}57^{1}078^{11}$E
2	IBN	Ibadan	Gneiss	No Instrument Installed	$07^{o}27^{1}251^{11}$N, $03^{o}53^{1}520^{11}$E
3	IFE	Ile - Ife	Gneiss	EP-105, Broadband Seismometers, DR4000 Recorder	$07^{o}32^{1}800^{11}$N, 04^{o} $32^{1}815^{11}$E.
4	AWK	Awka	Shale and Silt stone	EP-105, Broadband Seismometers, DR4000 Recorder	06^{o} $14^{1}561^{11}$N, 07^{o} 06^{1} 693^{11}E
5	NSU	Nsukka	Sandstone	EP-105 Broadband Seismometer, DR4000 Recorder	06^{o} $52^{1}011^{11}$N, 07^{o} $25^{1}045^{11}$E
6	ABK	Abakaliki	Sandstone	EP-105 Broadband Seismometer, DR4000 Recorder	$06^{o}23^{1}453^{11}$N, 08^{o} $01^{1}474^{11}$E
7	ABJ	Abuja	Granite	No Instrument Installed	$08^{o}59^{1}126^{11}$N, 07^{o} $23^{1}380^{11}$E
8	TOR	Toro (Central)	Gneiss	EP-105 Broadband Seismometers, DR4000 Recorder	$10^{o.}26^{1}303^{11}$N, 09^{o} $07^{1}089^{11}$E
9	KAD	Kaduna	Granite	EP-105 Broadband Seismometers, DR4000 Recorder	10^{o} $26^{1}101^{11}$N, 07^{o} $38^{1}484^{11}$E
10	MINN	Minna	Granite Gneiss	EP-105 Broadband Seismometer, DR4000 Recorder	09^{o} $30^{1}702^{11}$N, 06^{o} $26^{1}411^{11}$E

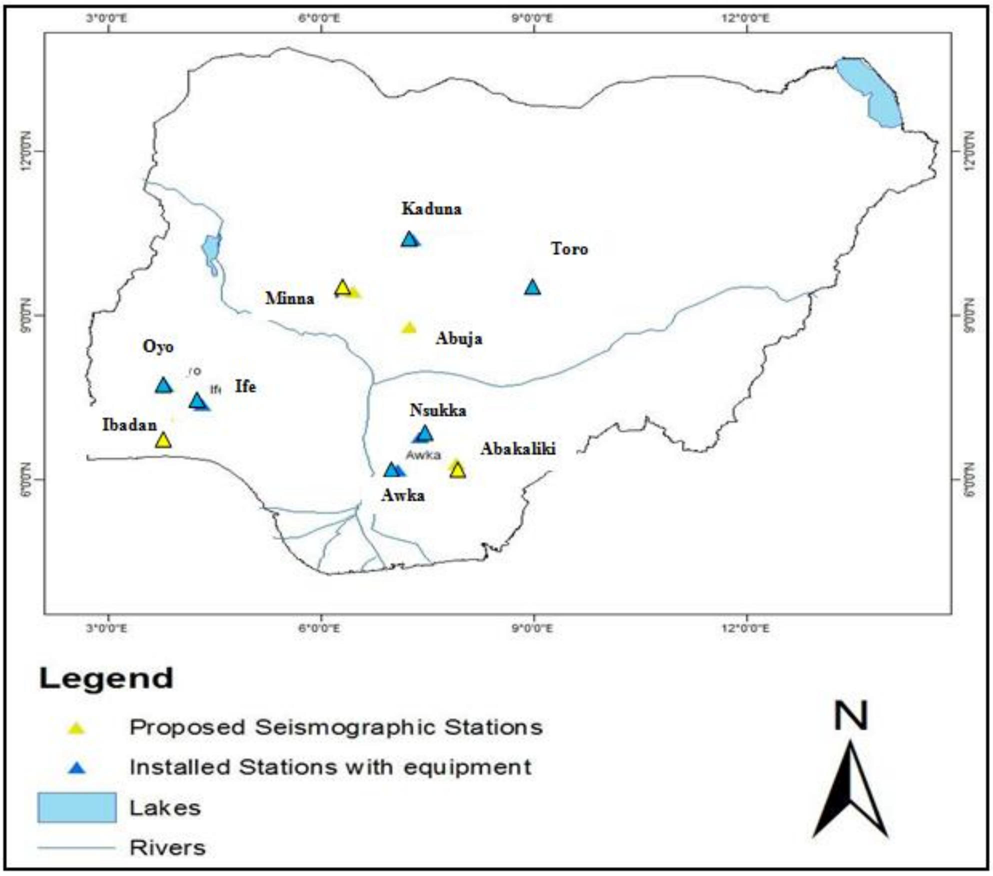

Figure 5: The Existing and proposed Seismic Stations in Nigeria (Source: Afegbua et al., 2011).

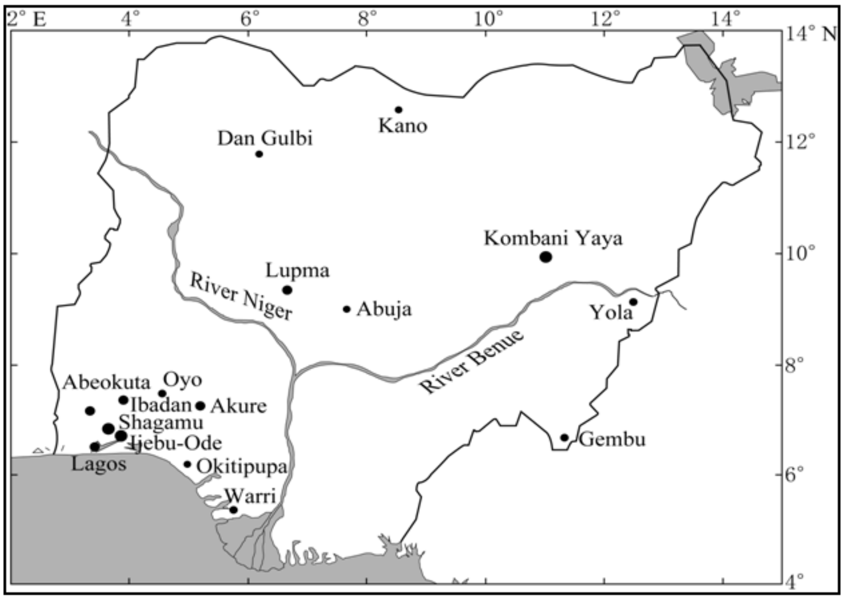

Figure 6: Map of Nigeria showing some few areas where earth tremors were felt (diameter of the solid dot denotes intensity of the events, after Akpan and Yakubu, 2010), not to scale.

Framework for Recent Earthquake Monitoring in Nigeria

The use of Global Positioning System (GPS) to monitor crustal deformations, with the ultimate aim of predicting natural disasters like earthquakes, volcanic eruptions and other seismic hazards, is one of the greatest challenges faced by scientists today. But research has shown that earthquakes could be predicted from the analysis of pre-signals in terms of changes in triangular network of GPS stations (Murai, 2010). Beyond the existing continuous GPS stations in Nigeria (Table 2 and Figure 3), Nigeria is also planning to collocate Continuously Operating Reference Stations (CORS) GPS in all the existing and planned seismographic stations in Nigeria, in triangles (Figure 3) for comprehensive monitoring of crustal deformation. Triangles are formed basically with all possible combinations of selected GPS stations regardless of distance and many large earthquakes in Japan and in other Asian regions were accurately predicted using this method, from daily area changes within the triangles (Murai, 2010). In Nigeria, GPS stations meant for geodetic measurements are not enough for a meaningful research activities. However, some reliable ones were established by Office of the Surveyor General of the Federation (OSGOF) (Fig. 6) and some states governments.

Since the earth is so complicated in the crustal movement, it would be possible in the future to predict big earthquakes in Nigeria to some degrees using pre-signals to make early warning of such big earthquakes. In the case of the Haitian quake, the GPS monitoring system helped document rising stresses along the fault which crosses southern Haiti, suggesting a large amount of force that could be released in a severe quake (Manaker et al., 2008). The effectiveness of GPS technology was dramatically used to predict the Haitian quake by a team of Purdue University researchers led by Geophysics Professor, Eric Calais (Manaker et al., 2008). They accurately predicted that an earthquake would take place in Haiti and that the quake would be greater than 7.0 magnitudes and that exactly happened (Afegbua et al., 2011).

Table 3: The Coordinates and the Ellipsoidal Height of the Nine CORS Stations (Courtesy: Space Geodetic System Department, Centre for Geodesy and Geodynamics, Toro).

Station ID	Station Location	Coordinates	Ellipsoidal height (M)
OSGF	Office of the Surveyor General of the Federation, FCT, Abuja	09º 01^{1} 39.597^{1} ^{1}N , 07º 29^{1} 10.830^{11}E	532.6447
ULAG	University of Lagos, Lagos	06º 31^{1}1 2.375^{11}N, 03º 23^{1} 51.444^{11}E	44.5752
RUST	River State University of Science and Technology, Port Harcourt	040 48’ 6.609^{11}N, 06º 58^{1} 42.677^{11}E	45.5892
UNEC	University of Nigeria Enugu Campus	06º 25^{1} 29.301^{11}N, 07º 30^{1} 17.968^{11}E	254.4055
BKFP	Birnin Kebbi Federal Polytechnic	12º28^{1} 60.876^{11} N, 04º 13^{1} 45.271^{11}E	250.0118
ABUZ	Ahmadu Bello University Zaria	11º 09^{1} 6.263^{11}N, 07º 38^{1} 55.274^{11}E	705.0666
GEMB	Gembu, Taraba	06º 15^{1}19.17^{11}N, 11º11^{1} 2.185^{11}E	1795.6424
CGGT	Centre for Geodesy & Geodynamics, Toro	10º07^{1} 23.141^{11}N, 09º 07^{1}50.922^{11}E	916.4462
FUTY	Federal University of Technology, Yola	09º20^{1} 59.073^{11}N, 12º 29^{1} 52.072^{11}E	247.4062

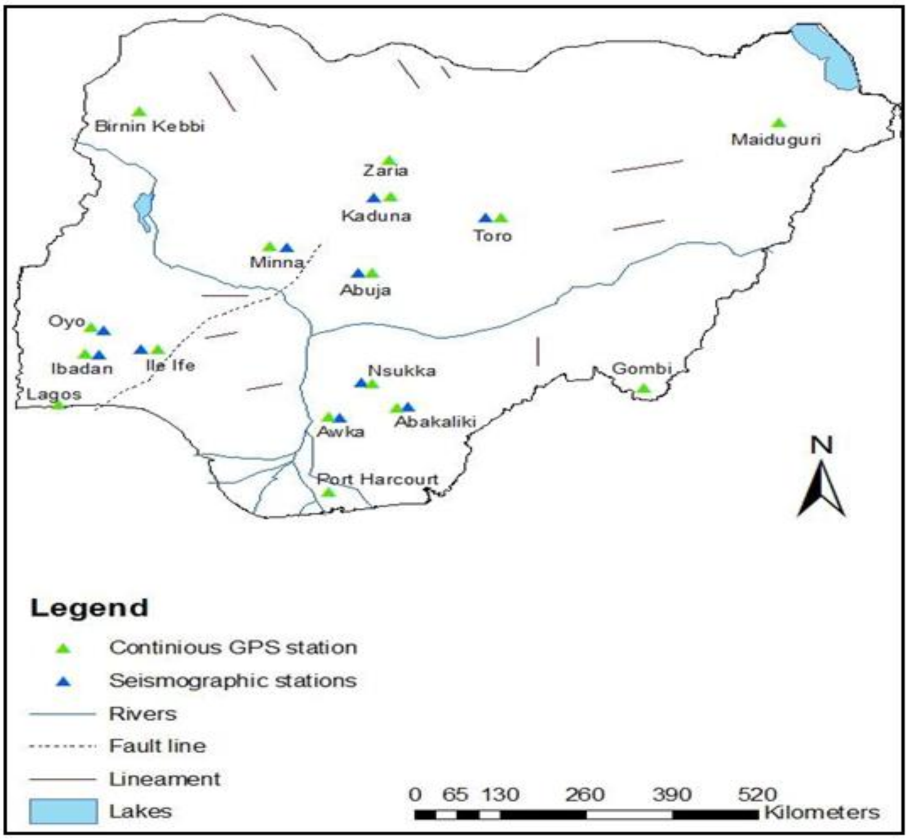

Figure. 7: Map of Nigeria showing the proposed locations for the instrumentation making up an Integrated Geo-hazard monitoring scheme (Sources: Afegbua et al., 2011)

II. Discussion And Conclusion

Previous researches revealed that Nigeria is free from Earthquakes, but historical instrumental records showed that Nigeria recorded some Earth tremors. However, it is believed that Nigeria is a stable continental crust that has experienced some degree of seismicity. The Earth tremors in Nigeria are distributed among the Basement Complex and sedimentary basins (Figure 5). They are concentrated along the south western and north eastern to north central parts of the country. The tremors lie in the SE-NW orientation. Any future occurrences of Earth tremors in the country are likely going to occur along these inferred fault lines. Possible mechanisms for these intraplate tremors have been examined to include regional stresses created by Nigeria's position between two cratons and zone of weakness resulting from magmatic intrusions and other tectonic activities in the sediments. CGG, Toro, is currently making arrangement to increase more seismic stations across the nation and also to collocate the network for effective monitoring (Afebgua et al., 2011).

Although, no active faults have been identified in Nigeria, a careful review of seismicity in the country by Osagie (2008), Akpan and Yakubu (2010) showed that Nigeria may not be as aseismic as has hitherto been believed. Historical evidence indicates that earth tremors have been felt in some parts of country. While a few of the felt earthquakes actually had their epicentres in Nigeria (Figure 1), some of the more widely felt ones actually originated outside Nigeria. There is also the Zungeru-Ifewera fault (Adepelumi et al., 2008; Anifowose et al., 2010); running from the Mid-Atlantic ridge across to North-Western Nigeria, But there is no confirmation that this fault is active at the moment.

Since past geology provides a clue to the future, we expect minor earthquakes to keep occurring in Nigeria in the future (Onuoha, 2010; Adepelumi, 2009). Therefore, there is need to carefully monitor those activities that have the potential to trigger earthquakes in Nigeria through the densification of seismic stations and integrated with spaced-based techniques for example, GPS (Afegbua et al., 2011).

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