Flooding in Nigeria: Surveying Approach to Mitigating the Risk and Disaster.

OBIANINULU Oduwegwu, DAVID Elegbede and PRISCILLA Vambe, Nigeria.

Abstract.

Flood is an unmanaged disaster in Nigeria. For a developing country, the welfare of its citizens must be on the priority list because they are the primary agencies that help to build up the country's economy.

The government and the surveyors should work together to either avert the recurrence of floods or effectively manage flood situations, so this research paper analyses the cause of floods, areas of Nigeria affected by the flood, What the government has done about the flood and what the government should do about the flood, then the role of a surveyor during the flood.

Questionnaires, interviews of people from affected areas, information from news stations and an extensive review of articles were the sources used for this research. The findings from this research have the potential to promote the welfare of the citizens and improve the economy of Nigeria.

Keywords: flood, economy, Surveyor.

1. STATISTICS FOR FLOODED AREAS

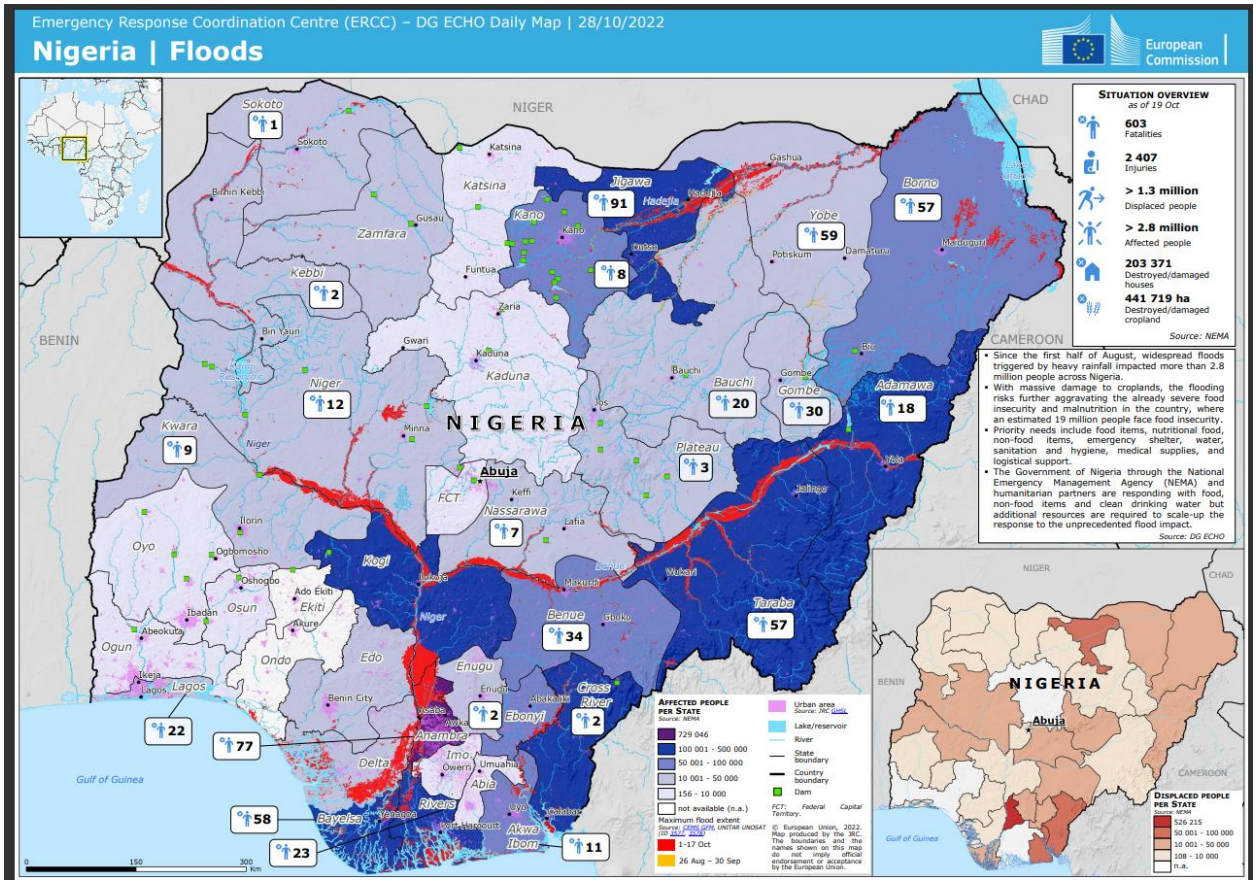
Nigeria is made up of 36 states, and flooding affected 33 of them (ACAPS, 2022) causing the displacement of 1.3 million people, while farmlands totaling more than 108,393 hectares have been destroyed nationwide. (Yusuf and Ekanem, 2022)

One of the worst-affected locations of the flooding is Lokoja, which is situated where the Benue and Niger rivers meet. (Wikipedia, 2022) flooded 130.46 km2 of land, of which 33.23 km2 were agricultural land. The extent of the damage in Lokoja resulted in the deaths of three people, the displacement of over 10,000 people, the damage of around 1110 buildings, and floods that submerged nearly 113.3 kilometers of roadways in Lokoja, Kogi State (ReliefWeb, 2022).

Bayelsa State was said to have been severely impacted, with about 700,000 people either displaced or affected. ("ACAPS, 2022) and about 300 communities and villages in the state have been completely or partially submerged in water. The two main entry points into the state by road from the Delta and River States are also impassable because the majority of the road has been washed away by water. (Yusuf and Ekanem)

76 individuals died in Anambra State on Friday, October 7, 2022, while attempting to flee severe floodwaters." (Dike and others) 526,000 people were displaced and 729,000 individuals

were affected throughout 13 of Anambra State's 21 LGAs. Over 120 people are believed to have died in the disaster, according to reports.



2. TYPES OF TERRAIN OF THE FLOODED AREAS

The 2022 flood occurrence in Nigeria is one that will not be forgotten in a very long while. A good understanding and knowledge of the terrain succors in the management of our environment and recuperates safety. The type of terrain of these areas is one factor contributing to makes states becoming flooded. According to NEST (1991), these geographical areas experience the hazard more than other parts in Nigeria:

A. Areas that are low-lying in the south where annual rainfall is very heavy.
B. The areas in the Niger Delta part of the nation
C. The floodplains of the larger rivers of Niger, Benue, lokoja, Anambra amongst other.
D. Flat low-lying areas around and to the south of lake Chad which may be flooded

Anambra is a state in the eastern part of Nigeria. The state is annually affected by flood dues to its position along Niger River basin and drains into the Atlantic Ocean. (Udo E.A. et al., 2021). Anambra is boarded by Delta State, Imo State, Enugu and Kogi State to the West, South, East and North respectively (Agbo et al., 2015). The state rests inside the humid tropical rainforest belt of the south eastern Nigeria. It has the climate periods, the rainy season that begins in April

and lasts September. The Dry season which begins in October and lasts in March (Chukwuma et al., 2021). The effect of climate change has greatly affected the beginning and end of the season. Now in Anambra, there is a yearly rainfall with range from 1400mm in the north to 2500mm in the south. (Fagbohun et al., 2017). The annual average temperature within the state ranges from 20.78ºC to 30.24ºC with humidity ranging from 34% yearly minimum in dry season to 89% maximum in rainy season (Chukwuma et al., 2021). The region encompasses two major land forms which are made up of high-lying regions situated in the south and low-lying regions located in the west, north and north-eastern part of Anambra. (Okoyeh et al., 2014). The state has a low-lying elevation ranging from 13 – 388m above sea-level making it a flood dominant issue. (Chukuma et al., 2021)

Bayelsa is made up of riverine and estuarine setting the many communities enclosed by water, therefore making them inaccessible by road (Wikipedia, 2021).). The annual rainfall of the state is not the same all year. The rains are characterized by heavy downpour. Bayelsa has a tropical region. The mean monthly temperature ranges from 25ºC to 31ºC, mean maximum monthly temperature ranges from 26ºC to 31ºC. Wikipedia 2021, describe Bayelsa ‘s common yearly problem to be flooding because it is situated close to the Atlantic Ocean. The state is borded by Delta State, Rivers State on the North and Eastern parts respectively then the Atlantic Ocean on the Western and Southern parts. The state is situated in the lower Delta plain which is believed to have been made during the Holocene of the Quaternary period by the buildup of sedimentary deposits. The state is made up of abandoned beach ridges due to many tributaries of the Nigeria River in this plain. The soil type within the state are acidic sulphate soils, shallow and poorly drained soils. (Nigerdeltabudget, 2023). Bayelsa is characterized by tidal flats, coastal beaches, beach ridge barriers, flood plains on a lowland State. The relief feature in the state are mostly cliffs and lagoons. It is a low-lying state which lies between the upper and lower Delta plain of Niger. The elevation decreases downstream. (Nigerdeltabudget, 2023).

Lokoja is made up Wooden Savanna region parted by Niger River and Benue River (Brtannica, 2023). The town is located in the tropical Wet and Dry savanna climate zone of Nigeria, and temperatures remain hot year-round. The region encompasses a dissected undulating plains on one hand, lofty hills masses and mesas. Lokoja lies at the confluence of River Niger and River Benue and has an annual rainfall of about 1150mm, which begins March, perker around June to September. The average temperature is 30ºC. Lokoja has a damp weather due to higher temperature sponsored by high humidity. The region is known for its yearly, flood occurance around July, peak in October and finishes in December (Department of Geography, Federal University of Lokoja, 2014).

3. EFFECTS OF FLOODING IN NIGERIA

Some of the effects of the flood are:

1. Loss of human life: Many of the families in the affected areas lost at least one member of their family as a result of the flood, and those that lost the breadwinner of the family have not been able to recover from poverty even now that the flood has dried up; they still don't have money enough to get a new apartment and food, so they are still at the facilities the government or religious organizations set-up for shelter during the flood. Children who lost contact with

their families during the flood still roam around society, trying hard to get food; some have resorted to stealing and various other vices to survive. Thereby increasing the crime rate and insecurities in the country.

2. Damage to infrastructure: The damage to infrastructure caused by the flood not only affects the education sector but also has a ripple effect on the economy, hindering development and progress in the affected areas. The lack of access to essential services like healthcare and banking facilities can lead to increased hardship and poverty among the affected population, thereby increasing the crime rate and insecurities in the country.

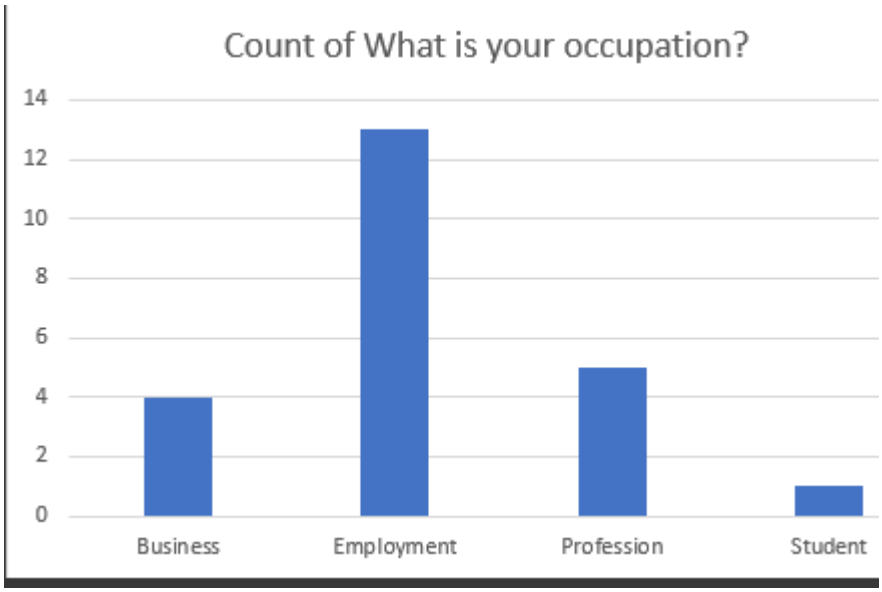
3. Displacement of people: A lot of people were forced out of their homes, which caused unrest in society because many of them ended up on the street in other communities because there was nowhere to go. Although some got help from friends and strangers, they lost everything to the flood and have to start over now that the flood has dried. The shortage of food was the biggest challenge for the people displaced, as some were seen begging on the streets.

4. Economic losses: The number of people rendered jobless by flooding is high, other states that were not covered by the flood also felt the effect because Nigeria's major mode of transportation is by road, and many of the access roads were covered so market product not be distributed across the nation. The flood also caused damage to farmlands, which led to a decrease in food production and an increase in food prices. This, coupled with the rise in fuel prices, made life unbearable for many Nigerians who struggled to afford necessities.

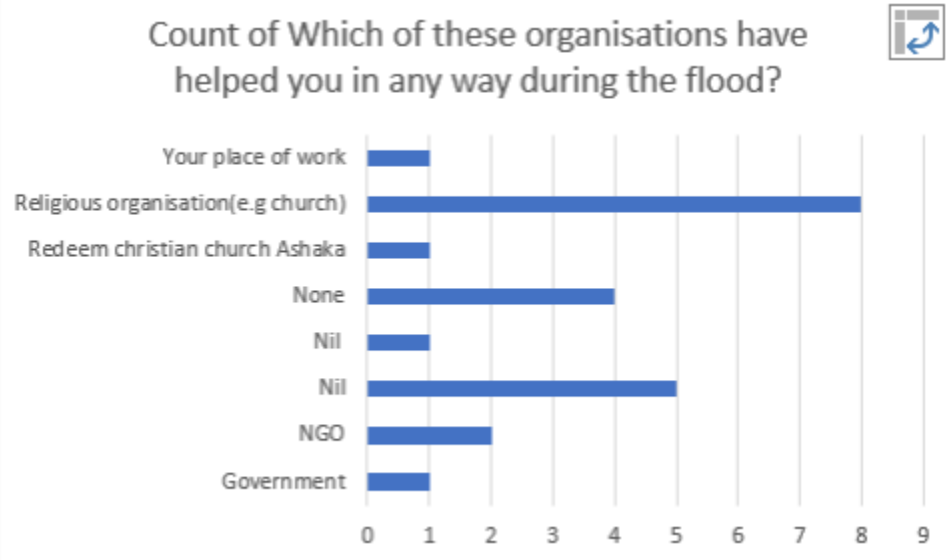
5. Environmental damage: The flood caused erosion, and those parts were no longer useful for agricultural and infrastructural development. Water pollution also promoted the spread of diseases.

6. Psychological effects: Continuous spread of diseases and unbearable hunger and many other situations led to trauma, depression, and anxiety in the country.

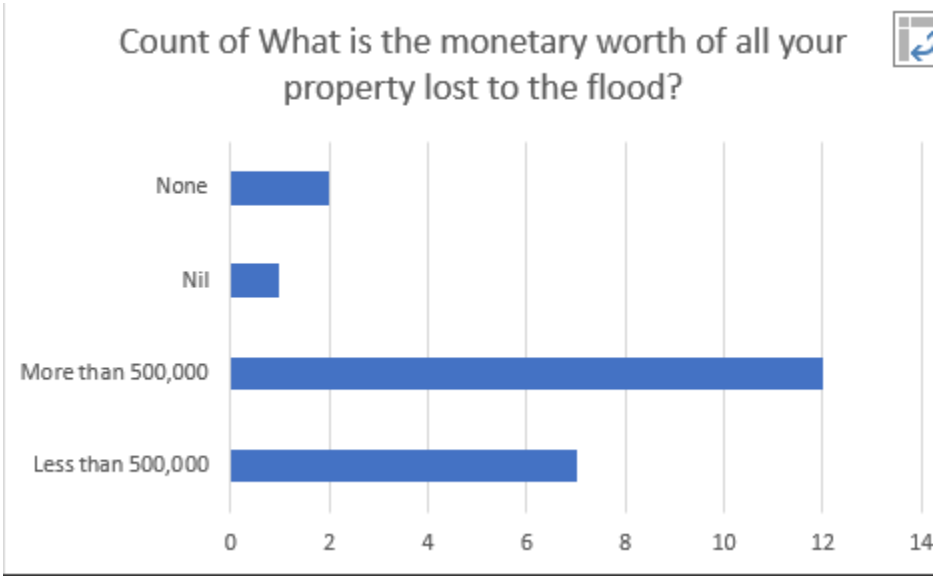
From the questionnaires sent out, we obtained some of the information below:



The flood affected more people who worked for others to get wages or salaries in return because they had to move to a different location from the organizations they were working for, and some of those organizations got destroyed by the flood.



From the data we gathered, we also discovered that more people got help from their religious organizations than the government. We noticed churches opened up their buildings as shelters for those affected, and there were free-will donations in honor of those affected.



People lost a lot of money to the flood, to the extent that they don't have enough to start over after the flooding.

4. WHAT GOVERNMENT HAS DONE ABOUT FLOODING

In the past, the flood occurrence was not pronounced because it was curtailed by the Nigerian government in collaboration with other western countries like Benin, Chad, Cameroon, Mali, Niger, Ivory Coast, Burkina Faso and Nigeria. This is the reason for the Formation of the Niger Basin Authority, to foster cooperation among member states in management of water resources. The Authority mission was for cooperative management of water resources in the Niger River (but not limited to Niger River) (Nijeholt et al 2001). Today in Nigeria, the government has really not maintained this role. This was one of the major causes of the 2022 flooding in Nigeria when the Cameroon Lagdo dam was released of its excess water. According to The Nation 2022, Cameroon and Nigeria were to build two dams, while the Cameroon Lagdo Dam was built in 1977 and completed in 1982. The Nigeria Dasin Hausa Dam was also to be built two and half the size of the Lagdo dam, which will supply electricity to the northern part of Cameroon and aid irrigation, was built but up till 2023, the dam is yet to be completed. So, the non-presence of dam in Nigeria which will hold the excess water from the Cameroon dam is completely absence and this has continued to cause serious danger to the lives of Nigerians.

The African News on Friday 14th of October, 2022 reported that Nigeria experienced its worst flood in ten years. The flood displayed 1.4 million persons out of their homes, destroying 70,000 hectares of farmland and killed more than 500 people. In Nigeria, the government response to flood is not quite clear and has remained dawdling, reason begin that, there seems to be no proactive strategy as to flood issues or management of disasters. (Ships & Ports, 2022)

The Nigerian government has been doing a lot not in the area of controlling these floods but mostly in giving relief materials to flood victims. One of such was the activity reported by the Federal Ministry of Humanitarian Affairs, 2022. The federal government in Nigeria distributes 12,000 metric tons of food and non-food items to flood affected victims in Nigeria.

Another of such is that the Federal government has developed a Flood Emergency Preparedness and Response Fund known as Flood Fund. The Flood Fund is meant to mitigate flood by giving out grants and loan.

These are some of the responses gotten from different parts of the flooded location when we asked them what they wanted the government to do for their communities.

What state in Nigeria do you live?	**What is the name of your town?**	**In what way has the government helped your community?**	**In what way would you prefer the government to help you and your community?**
Kwara	Ilorin	Government constructed road and drainage system.	Government should construct more better road and drainage systems.
Delta	Olomoro	No way	Send relieve materials and also help to establish my business back on track
Bayelsa	Azuzuama		
Delta	Aboh	Provided food and shelter to the affected ones.	Provide more accommodations
Delta	Kwale	Provision of IDP camps	Make our community inaccessible by flood
Delta	Sapele	No help from them as at this moment	Give out palliative to those affected
Enugu	Ituku Ozalla		
Delta	Ashaka	Nil	Let government open all the rivers that are covered with sand and open all water channels and give fund to assist the affected communities to start doing something.
Delta	Iwene-Ase	The government has not helped my community	The government should give my community road
Delta	Beneku	The government has not helped my community	The government should help to build dam in order to reduces the flood damage in the country Nigeria.
Delta	Umuti	No way	Giving us money for the flood had destroyed our properties and farms and provide dams to control and reduce the flood and its damage in my place and Nigeria as a whole.
Delta	Akarai Obodo	Nil	Government should build dam and Government should drain the Niger
Delta	Azagba	No way	By giving us money and food

Delta	Ashaka	No way	The government should help us by making sure that the dam is built to avoid water flooding the whole state.
Delta	Inyi	No way	By giving us money and food
Delta	Aboh	No help from the government	The government should dredge river Niger and also to build a dam for Nigeria people
Delta	Ashaka	They provided IDP camp	The government should dredge river Niger.
Delta	Ashaka	The government help the community by giving them food and water.	Government should build a dam to stop the flood, not to destroy the community.
Delta	Abbi	No way	By giving us money and food
Delta	Ashaka	I don't know	No way
Delta	Ashaka	Government helped us by giving them rice and other things	Government should help us to do something about this flood.
Delta	Kwale	Nil	They should build a dam in order to curb the damage being caused by the flood
Delta	Utagba-ogbe	Nil	I would prefer the government to render help to the flood victims in our community by giving out money or house properties to us.

5. FLOOD CONTROL AND MANAGEMENT

Flooding causes a lot of damage to the environment. Flooding experience over time has shown that if not properly managed can get worst. A lot of factors are responsible for the annual increase in the rate of flooding. Rainfall gives relief to human in terms of weather, power generation, agricultural activities, etc. however there need to always prepare for the event rainfall by ensuring they are being channel appropriately for advantageous use. Flooding is one of the most frequent natural disasters and endanger lives, results in loss of lives and affect economic growth.

Globally, it has become evident that averting flood challenges can be very expensive to conquer but it is worth the effort to ensure there are no disasters or chaos that will result to National emergency. Many countries hit by flooding in the past have deployed different approach to avert these challenges. Some of these approaches can actually be adopted in Nigeria to reduce the havoc.

Areas close to the coast like Lagos which is an urban area and other riverine part of the country such as Bayelsa, Delta, Kogi, etc. are usually prone to flooding because of the soil and slope of the terrain which aids water storm movement resulting into land slide and the likes. Some of

the approaches that have been deployed by different countries and the role of surveying profession to mitigate the challenges are further discussed in subsequent paragraph.

The construction of dams to collect the storm water is one of the best approaches that helps to reduce flooding. They are being complemented with a dyke to prevent embarkment collapse. Storm water only needs a path to flow through or channel to be able to discharge properly to the dam. Engineering input in getting these infrastructures in place is very key. The paving materials for the road construction depending on the soil structure are put into consideration during design.

Drainage and canals should be recommended for construction where necessary to serve as water channels within the cities or communities. Drainage is to be constructed around any developments like houses, malls, School, highways, etc. Drainage with good invert and kept clean would aid easy flow of water storm the reservoir. Creation of manhole and underground channel where water can easily escape from the road are also good measures to adopt.

6. THE ROLE OF SURVEYORS IN CONTROL AND MANAGEMENT OF FLOODING

Different professions have massive role to play in the control and management of flooding. These roles are dependent on which others expertise to be able to come up with a solution. To be able to have a reasonable solution that will reduce the risk of flooding, it is very important to rely on the input of this professionals. The soil structure needs to be understudied which will require the input of the Geologist/Geophysicist, the terrain configuration needs to be known and will require the input of a land surveyor or a geomatics engineer. All these inputs are put together to be able to take critical engineering decisions.

In slope or steep terrain, the effect of flood when there is heavy rainfall will be greatly felt. Determining the topography of the terrain is very critical so as to be able to determine what kindly of measure would be take that will not affect developments in the area. As-built and detail mapping of flood prone areas will also guide on how to properly channel the canals, drainage and gutters within the environment.

Regular dam monitoring is also very important. This helps to determine the volume of water intake and also helps to guide on when and how to discharge. During construction of infrastructural measure to prevent flooding, it is very important to have accurate and precise x, y and z data pre and post construction to ascertain the correctness of engineering design.

Map produced from topographical data such as digital terrain model (DTM) and vector maps helps to depict the terrain configuration and direction flow of water which would aid positioning of water channels. In a case where there are developing water fingers which can easily develop into gullies if not quickly dealt with can easily be identified.

The advent of surveying technology, it now very easy to monitor and predict ahead for quick measure environment hazard such as flooding. With the aid of remote sensing technology and real time satellite data, it is easy identify and prepare measures for flood prone areas.

Flooding is caused by rainfall whether light or heavy but in a case where water does not have a proper channel through which it can conveniently flow, flood disaster will sure occur in such environment. Flood can be curtained by an individual but society effort and Government involvement. Funding for averting flooding issues is mostly through Government and should be taken seriously into consideration as it causes a lot of damage to live and property and also affect economic growth.

Government through her agencies can also come up with educational program that will educate the citizen on why keeping our environment and water channel neat from refuse are very important. This will also reduce human factors that contribute to flooding within the society. Professional predictions and recommended measures should be taken seriously to avoid disaster. Funds used to acquire relief for affected persons or communities can be channeled into other aspect that will benefit the community and nation at large.

REFERENCE

- African News, En, (2022), "Nigeria's Ministry of Humanitarian Affairs Announced the Federal Government has started to distribute food and non- food disaster – stricken states..
- Agbo F.U., Arua R.N., Okonkwo E.A. (2015), "Effects of Climate Variability on the Choices of Livelihood among Farm Households in Anambra, Nigeria. Afr.j.Agric Res 10(44) 4134 – 4141.
- Aleem K. F., "The Roles Of Surveying And Mapping In Flood Management And Control". https://www.researchgate.net/publication/329059025_The_Roles_of_Surveying_and_Mapping_in_Flood_Management_and_Control
- Ayadiuno, R. N, and Ndulue, C. D., (2020), "Mapping the terrain and Land use types in Idemili south Local government Area of Anambra state, south Eastern Nigeria. PONTE, International Journal of Science and Research. Vol76/ No 9/1/Sep 2020 Doi;10.21506/j.ponte 2020.9.9.
- Chukwuma, E. C., Okonkwo C.C., Ojediran J.O., Anizoba D. C., Ubah J. I., and Nwachukwu C.P. (2021) "A GIS based Flood Vulnerability modelling of Anambra State using an Integrated IVFRN
- Consultant, CXA- Arquitectura e Engenharia Ltda., Salvador, Bahia, Brazil "Flood control and its management". http://dx.doi.org/10.24966/AES-8780/100005
- Dike, Afoma, et al. (2022) "Nigeria's Ongoing Flooding Crisis." The Republic, 12 Oct. 2022, republic.com.ng/august-september-2022/nigerias-ongoing-flooding-crisis.
- Editor, et al. "Reintegrating Anambra Flood Victims – THISDAYLIVE." Reintegrating Anambra Flood Victims – THISDAYLIVE, www.thisdaylive.com/index.php/2023/01/16/reintegrating-anambra-flood-victims. Accessed 12 Mar. 2023.
- Fagbohun, B. J., Olabode O.F., Olufemi A. and Akinluyi F. O. (2017) "GIS based basin scale identification of dominant run off processes for soil water management in Anambra area of Nigeria.

- Federal University of Lokoja, Department of Geography, (2014), " Lokoja at a Glance".
- Niger Delta Budget (2023) "Overview of Bayelsa State Nigeria". Nigerdeltabudget.org/overview-of-Bayelsa.
- ReliefWeb, (2022), ACAPS Briefing Note - Nigeria: Country-wide Flooding (21 October 2022) – Nigeria, Retrieved from reliefweb.int/report/nigeria/acaps-briefing-note-nigeria-country-wide-flooding-21-october-2022
- The Editors Encyclopedia, (2023), Britannica Kogi State Nigeria.
- "Nigeria: Synoptic View of the Flood Damage Extent in Lokoja as of 4-10-2022 - Nigeria." ReliefWeb, 11 Oct. 2022, reliefweb.int/map/nigeria/nigeria-synoptic-view-flood-damage-extent-lokoja-4-10-2022.
- Nijeholt R. L., Bie de S., Geerling C., Magha M., Kambou J.,Koudenoukpo J (2001) "Beyond Boundaries: Transboundary Natural Resource Management in West African" Biodiversity Support Program (BSP) Transboundary Project #108
- Okoyeh E.I., Akpan A.E., Egboka B.C.E. and Okoke H.I (2014) "An Assessment of the Influence of Surface and Subsurface water level Dynamics in the Development Gullies in Anambra state, Sothern Nigeria Earth Interact 18(4), 1 – 24.
- Punch News Paper (2022)
- Ships & Port (2022) "Are you Satisfied with Government's Response to flooding".
- Udo E.A., Ojinnaka O.C., Chukwuocha A.C., and Unchenna D. U., (2021) "Terrain Modelling and Analysis using Earth Observation System Based Data; A Case Study of Anambra State, Nigeria. Dio:10.4236/oalib.1107284. Scientific Research Academic Publisher.
- Wikipedia, (2022), "2022 Nigeria Floods - Wikipedia." en.wikipedia.org/wiki/2022_Nigeria_floods.
- Wikipedia, (2023) "Bayelsa State" https://en.wikipedia.org.
- Yusuf, Ayo, and Ima Ekanem. "2022 Flood: A Tragedy Foretold – Thisdaylive." 2022 Flood: A Tragedy Foretold – Thisdaylive, www.thisdaylive.com/index.php/2022/10/27/2022-flood-a-tragedy-foretold. Accessed 11 Mar. 2023.

Contacts details:

Obianinulu Oduwegwu,
University of Nigeria Nsukka,
+2347061325150,
obianinulu.oduwegwu.249816@unn.edu.ng

David Elegbede
GEOSYS Nigeria Limited,
13, Olaide Tomori,
Ikeja, Lagos
NIGERIA
Tel. +2348060498032
Email: dayveed05@gmail.com

Priscilla Sewuese Vambe.
Young Surveyors Network, member,
+2347063227278,
priscillavambe2@gmail.com