TABLE OF CONTENTS

FOREWARD

Flood incidents in Nigeria have been made more visible by Nigeria Hydrological Services Agency (NIHSA), through its yearly publication of the Annual Flood Outlook (AFO) since 2013, when its maiden edition was released to the public after the unprecedented 2012 flood devastation.

The Agency was established via the Establishment Act of 2010 Vol. 97 No. 100 to, amongst other functions, provide hydrological services in operational hydrology and water resources activities, and work with other relevant agencies to issue forecasts on flood, drought, saline water intrusions, etc., to the Nigerian populace has risen to accomplishing this mandate through its AFO.

In seven years of prediction of probability of flood events, the level of accuracy of the forecast has improved significantly. The flood level of 2018 was similar to that of 2012 based on the observed water level and discharge flow rate downstream the confluence of rivers Niger and Benue at Lokoja. However, improved monitoring and heightened awareness created by NIHSA reduced the devastation of the flooding. Twelve (12) states were most affected, namely; Adamawa, Anambra, Bayelsa, Benue, Delta, Edo, Kebbi, Kogi, Kwara, Taraba, Rivers and Niger. This informed the declaration of a National Disaster in nine (9) most affected states.

Our nation cannot afford to experience yet other monumental losses due to flood and should therefore, take appropriate steps to minimize the devastating effects of this hydrological event.

This 2019 edition of AFO should be accorded the required attention and everything done to adhere strictly to warnings by government, the general public and all stakeholders. If this is done, then the losses

experienced in previous years would be greatly reduced. Some proactive measures could be taken to ensure less devastating impacts of flood such as embarking on flood early warning and sensitization campaigns, attitudinal changes, and adopting the right measures to protect our water courses as well as our environment.

I therefore, recommend the 2019 AFO to the general public, relevant government agencies, research institutions, public and private sector and all stakeholders in the water sector as a guide for flood control and management.

Engr. Suleiman H. Adamu, FNSE, FNAH, FNAHS
Honourable Minister for Water Resources
April, 2019

ACKNOWLEDGEMENT

My appreciation goes to the Honourable Minister for Water Resources, Engr. Suleiman H. Adamu, FNSE, FNAH, FNAHS, for his unflinching moral and financial support to the Agency and inspiring the Agency to deliver on its mandate of providing reliable data and information for the sustainable management of the nation's water resources and development of sound water policies.

I am equally appreciative of the support of the Permanent Secretary, Federal Ministry of Water Resources, Mrs Ekaro Comfort Chukwumuebobo for encouraging the Agency's activities and publication of the 7th Edition of Annual Flood Outlook.

Let me also, express my profound gratitude to the technical experts, consultants and stakeholders for their invaluable contributions to the production of this year's edition of the Annual Flood Outlook. I equally appreciate other agencies such as National Space Research and Development Agency (NASRDA), National Water Resources Institute (NWRI), Nigerian Meteorological Agency (NiMet), Nigeria Integrated Water Resources Management Commission (NIWRMC), Office of the Surveyor General of the Federation (OSGOF), River Basin Development Authorities (RBDAs), etc. for their support and provision of relevant data and information for the production of this publication.

The intervention of the Nigeria Erosion and Watershed Management Project (NEWMAP) has improved Hydromet system and flood management in the Anambra-Imo and Cross River Basins. It boosts the Agency's hydrological activities within these basins and the nation in general.

I sincerely appreciate the management and staff of Nigeria Hydrological Services Agency (NIHSA) for the effort put into the production of this publication.

It is my hope that this 7th Edition of the AFO will serve the purpose of providing information on flood early warning towards mitigating flood risks for the general public, especially those living on the flood prone areas of the country.

Engr. Clement Onyeaso Nze
Director General (NIHSA)
April, 2019

EXECUTIVE SUMMARY

The Annual Flood Outlook (AFO) by the Nigeria Hydrological Services Agency is in line with its' statutory mandate which amongst other functions is to issue forecasts on flood, sensitize Nigerians on flood management towards mainstreaming disaster reduction efforts for sustainable socio-economic development. This is intended to sensitize the general public particularly those living in the coastal states like Lagos and the South – South States; including the low-lying cities like Makurdi and others along the trans-boundary Rivers Niger and Benue and other major river systems that are at high risk of flooding.

This year's AFO is derived from the application of two reliable models, viz; Geospatial Stream Flow Model (GeoSFM) and the Soil and Water Assessment Tool (SWAT). These models utilize hydrological and hydrogeological data, disaggregated Seasonal Rainfall Prediction (SRP), satellite rainfall data, Digital Elevation Model (DEM), topographical and soil/water index balance data amongst others. This AFO contains useful information on the areas that are likely to be flooded and the severity of the expected flooding in 2019.

The AFO was first published in 2013 after the 2012 devastating flood in Nigeria with the primary intent of creating awareness and proffering mitigation measures. The current edition tagged "2019 AFO" is presented in this document. Furthermore, it offers clear measures to take before, during and after flooding.

These initiatives are necessary for the implementation of appropriate counter-measures to alleviate the persistent threats of water related disasters.

It will also be important to mention that, the sensitization exercise embarked upon by NIHSA across the Country and the efforts of the Stakeholders on mitigation also reduced and prevented flooding in some areas predicted in the previous years. In its effort to address the challenges posed by perennial flooding in Nigeria, the current administration, through the unrelenting efforts of the Honourable Minister for Water Resources, *Engr. Suleiman H. Adamu*, has consistently advanced steps at mitigating the effects of flooding across the nation.

It is pertinent to state that series of erosion control and various urban infrastructural development projects have been undertaken, early warning and sensitization on flood risk areas and efforts of the stakeholders on mitigation have also reduced and prevented flooding in some areas predicted in the country. The need to carry out aggressive sensitization and awareness campaign cannot be over-emphasized. Similarly, consistent dredging of our water ways and maintenance of hydraulic structures such as dams and reservoirs are very essential as this will ensure free flow of runoff into the provided drainages. Stakeholders, decision and policy makers, relevant states and federal government departments and agencies should take note of the information contained in the 2019 AFO and prepare in advance.

CHAPTER ONE

1.0 INTRODUCTION

1.1 PREAMBLE

Hydrologists generally believe that "No one should be surprised by flood". However, it is also true conception that natural hazards such as flood and droughts cannot be eradicated, but a timely and accurate prediction of hydrometeorological extremes help societies to prepare for and mitigate disasters and to reduce damages to infrastructure and productive activities.

Flood is the most devastating natural disaster affecting many regions of the world every year. According to the World Meteorological Organization (WMO), there has been an exponential increase in the damages caused by flood during the past decades mostly as a consequence of the effects of climate change. Nigeria is not an exception to this trend and has experienced several flood disasters since its existence. The most notable incidences are 2012 and 2018 devastating floods in which many lives were lost, property damaged and general disruption of livelihood with attendant adverse socio-economic consequences.

The Nigeria Hydrological Services Agency (NIHSA), a parastatal of the Federal Ministry of Water Resources, is saddled with the responsibility amongst others, to advice the federal and state governments on all aspects of hydrology. NIHSA in fulfillment of its mandate over the past years has steadily continued to inform the Nigeria public on the flood outlook with an improvement on the quality and quantity of data as well as the models used in producing the AFO's. This has led to improved flood forecast leading to reduction in the harmful effects of flood on the communities that have heeded the warnings and carried out remediation actions contained in the past AFOs.

The 2019 AFO is derived from the application of two reliable models, viz; Geospatial Stream Flow Model (GeoSFM) and the Soil and Water Assessment Tool (SWAT). The input parameters for these models include hydrological and hydrogeological data, disaggregated Seasonal Rainfall Prediction (SRP), satellite rainfall data, Digital Elevation Models (DEM), topographical and soil/water index balance data amongst others. The model runs within a GIS environment (ESRI Arcview) for data input and visualization of output.

In line with the earlier publications, this year's AFO contains useful information on the areas that are likely to be flooded and the severity of the expected flood. Furthermore, clear advice on measures to take before, during and after flooding are enshrined herein. These important initiatives should continue to be deployed to implement appropriate counter-measures (structural and non-structural) to alleviate the persistent threats of water related disasters.

The Annual Flood Outlook serves as an important guide in reducing flood risks and vulnerabilities, thereby contributing to national sustainable development.

1.2 THE PHYSICAL SETTING

Location and Spatial Extent: Nigeria is located within the western coast of Africa, slightly north of the Equator. The Atlantic Ocean washes its entire southern part while the fast encroaching arid zone south of the Sahara Desert borders its northern part. It lies approximately between latitudes 4°N and 14°N and between longitudes 3°E and 15°E, encompassing a vast geographical area of contrasting landforms, climatic conditions and vegetation belts.

The surface area of the country is approximately 923,800 sq. km and, with about 200 million people. It is bordered by the Republic of Cameroun to the east, Niger Republic to the north and Benin Republic to the west. The southern boundary is

formed by the 800 km Atlantic coastline, which includes the eastern sector of the Gulf of Guinea.

Nigeria is naturally divided into three regions, the north, west and east, by the valleys of its two principal rivers, the Niger and the Benue.

The three regions consist of distinctive relief features including highlands and plateaux, uplands and plains, escarpments and valleys, and coastal wetlands and delta (Figure 1). Thus, the north has the Jos Plateau located in its eastern central area. It also has the Adamawa Mountains along the eastern border, north of the Benue valley. The west has the uplands and plains studded with inselbergs, while the eastern region has the escarpments and the Eastern Borderlands plateau and highlands (Bamenda Mountains and the Mambilla Plateau). The mountains, plateaux and highlands are made of igneous and metamorphic rocks. In general, the uplands and plains are denudation surfaces derived from the long-term denudation of crystalline rocks mainly of the Precambrian Basement Complex suite (granite, gneiss, quartzite, amphibolite and schist). In the central north, the plains are called the High Plains of Hausa land, and they, along with the Jos Plateau, form a major headwater zone from where rivers radiate forming a radial drainage pattern. The Eastern Borderlands constitute headwaters for some of the tributaries of River Benue, Lake Chad and River Cross. In western Nigeria, the uplands comprise the Yoruba Hills and Ranges and its extension, the Kukuruku Hills. The ranges and hills constitute a major drainage divide separating the rivers running southwards into the Gulf of Guinea from those running eastwards and northwards into the River Niger. Most of these rivers run parallel to each other and the drainage pattern is trellised where it is structurally controlled or otherwise dendritic.

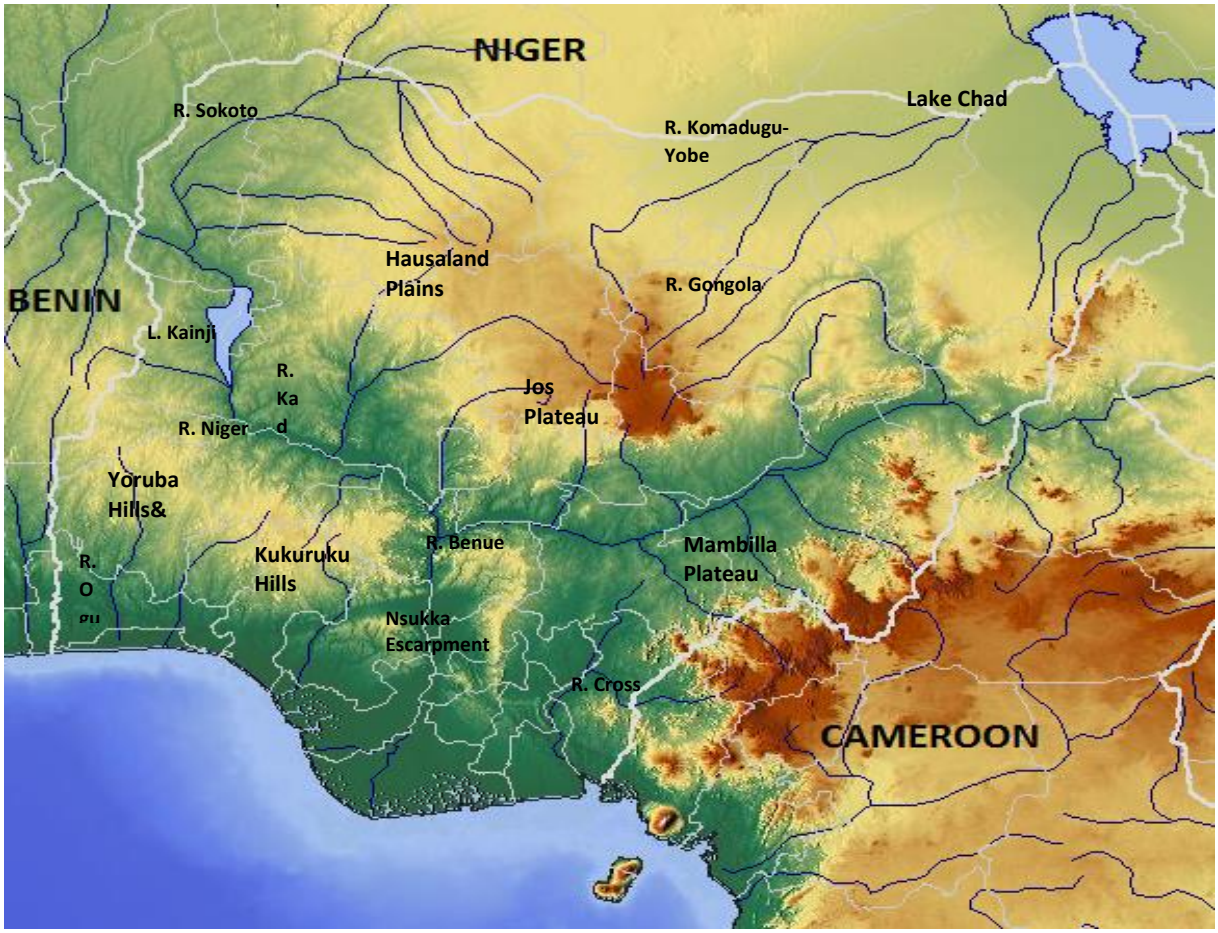

Fig. 1: Generalized relief map of Nigeria

Another category of plains consists of aggradations land surfaces and are found in areas bordering the denudation land surfaces. The Sokoto Plain (in the northwest), and the Kerri–Kerri and the Gombe Hills (to the east of the Jos Plateau) belong to this category. They are composed of Cretaceous to Tertiary age sedimentary rocks. The Kerri–Kerri merges to the north with the Quaternary plains of the Chad Basin. The drainage pattern on these plains is centripetal with a focus on the Lake Chad in the east, and the Sokoto valley in the west (Figure 1). Similar aggradation surfaces extend over the areas bordering the southern and eastern margins of the Yoruba/Kukuruku Hills and Ranges. These extend to the coast where they form coastal plains associated with barrier islands, and fresh water, brackish water and marine wetlands. The plains also extend eastwards across the

Niger valley into eastern Nigeria where they constitute the Anambra and the Cross River plains. In central eastern Nigeria, the plains are composed of resistant rocks that form the Awka–Orlu, and the Nsukka–Okigwe escarpments. These latter constitute drainage divides separating rivers draining into the Niger (e.g. River Anambra) and the River Imo from those draining into the River Kwa Ibo and River Cross.

The coastal zone consists of four contiguous physiographic types, each terminating landward at the southern boundary of the Coastal Plains. These are the Barrier Beach–Lagoon complex, Transgressive mud coast and associated wetlands and intertidal flats, Niger delta and its distributary system, characterized by barrier islands separated by tidal channels and backed by extensive mangrove swamps, Strand coast–estuary complex consisting of narrow sandy beaches backed by coastal plains and rather limited wetlands.

The climate at any location in Nigeria is directly related to the distance from the Atlantic coast (Figure 2), except where coastal upwelling on the one hand, and inland orographic effects on the other, provide counteracting influences. The climate type within 100 km of the coast is the Koppen'sA_f humid tropical type, with mean rainfall ranging from 1800mm at Lagos in the west, to amounts in excess of 4000 mm in the area proximate to the River Cross estuary (Eket, Akwa Ibom). Landward, at distances exceeding 200 km from the coast in western Nigeria, and 250 km in the east, the Koppen's A_{w1} wet and dry climate type prevails. The rainy season extends from April to October with mean annual rainfall in excess of 1200 mm**.** This is the zone referred to as the Guinea Savanna given its diagnostic floral composition. Between the Guinea Savanna and the Humid Tropical A_f climate or rain Forest zone is an area described as Derived Savanna, an anthropogenic derivative from the Rain Forest but with characteristics similar to those of the Guinea Savanna (Figure 2). The northern boundary of the

Koppen'sA$_{w1}$ region follows a line extending from the northern end of the Lake Kainji to the northern foreland of the Jos plateau, after which it dips southwards towards the Mambilla plateau. Northward of this region, the prevailing climate is the Koppen's A$_{w2}$ Tropical Wet and Dry (Sudan type). The Koppen'sBshw (Sahel type) prevails in the extreme northeast of Nigeria. Mean annual rainfall in these two climatic zones varies from less than 400 mm in the distal northeast to approximately 1000 mm in the southwest, along the boundary with the Koppen's A$_{w1}$ zone. The length of the rainy season varies from three months in the northeast (July – September) to six months (in the south) (May –October). The dry season lasts variously from October to May, during which, cold and dry Harmattan winds prevail, particularly between November and February. The rainfall and number of rain–days both decrease rapidly northwards (Ogunkoya, 2017).

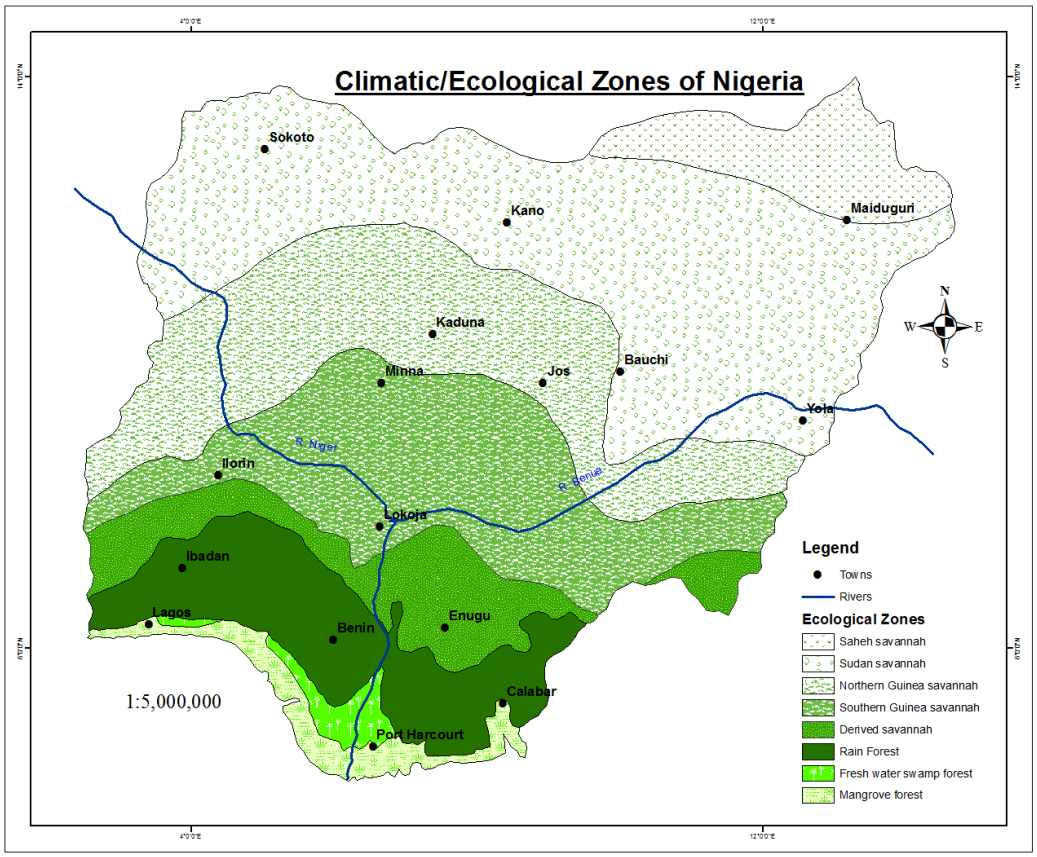

Fig. 1.2: Climatic/Ecological Zones of Nigeria

1.3 THE RIVER SYSTEMS OF NIGERIA

The large number of high order rivers and the well–drained nature of the country present a picture of inexhaustible water resources (Figure 3). However, the climate over Nigeria imposes a regime on many of the rivers such that there is a rainy season of high water and a dry season of little or no water within the average year. The rivers in Nigeria can be grouped into five drainage systems:

- Niger (i.e. the Niger and its tributaries apart from the Benue)
- Benue (the Benue and its tributaries)
- Chad (Lake Chad and all its tributaries)
- Cross River/Imo/Kwa Ibo and all the short rivers draining the eastern littoral zone

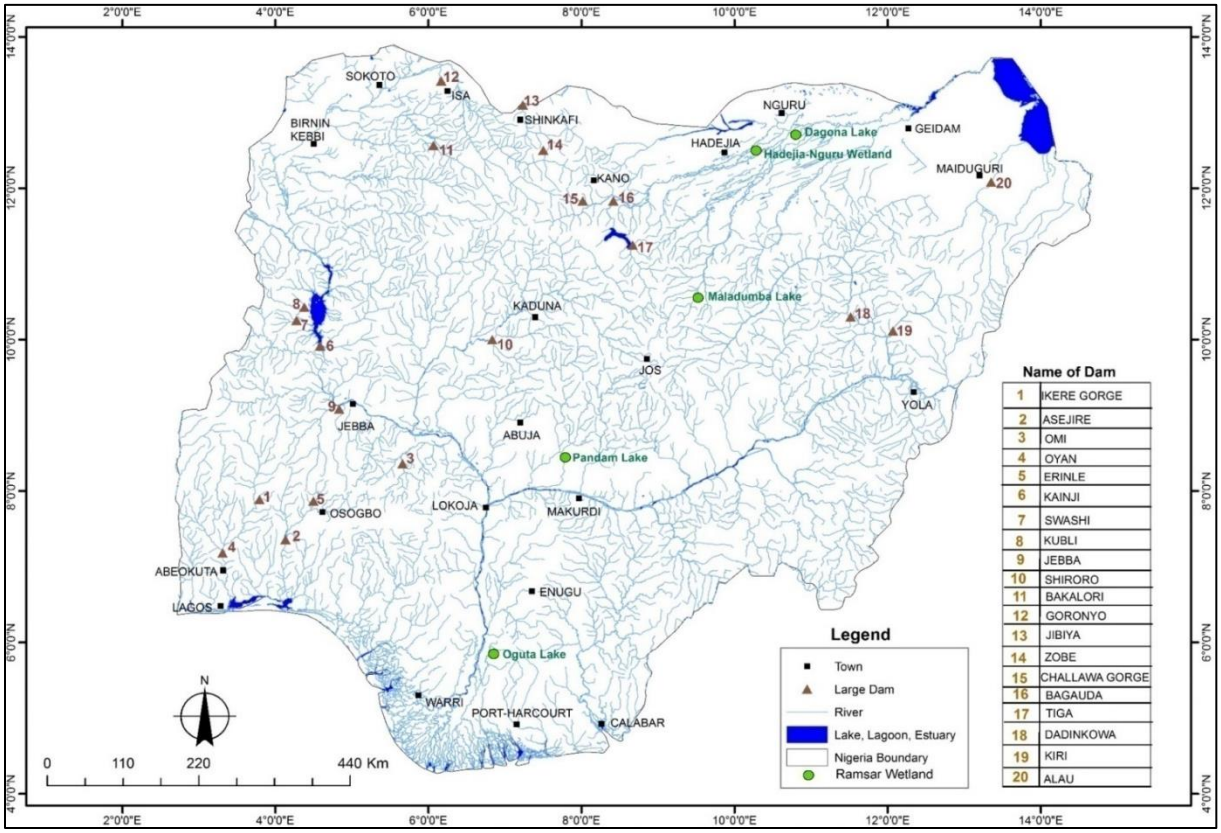

Fig. 1.3: Map of Nigeria Showing Drainage System

- Western littoral rivers (the rivers of western Nigeria that follow more or less regular courses in the N – S direction.

The division of these rivers into the five groups is not based on any peculiar characteristic but that of proximity and similarity in the direction of flow. Except for the Chad drainage system, which is an endorheic drainage system, all the other drainage systems ultimately drain into the Gulf of Guinea. The rivers flowing into Lake Chad from Nigeria (mainly River Komadugu–Yobe, River Ngadda and River Yedseram) provides 10% inflows into the lake. The other tributaries of the Lake Chad originate from Cameroon, Chad and Central African Republic (including Chari and Logone), which provides 80% of the inflow, while precipitation provides the remainder 10%.

The five river systems have been divided into eight Hydrological or Basin Areas (Figure 4 and Table 1):

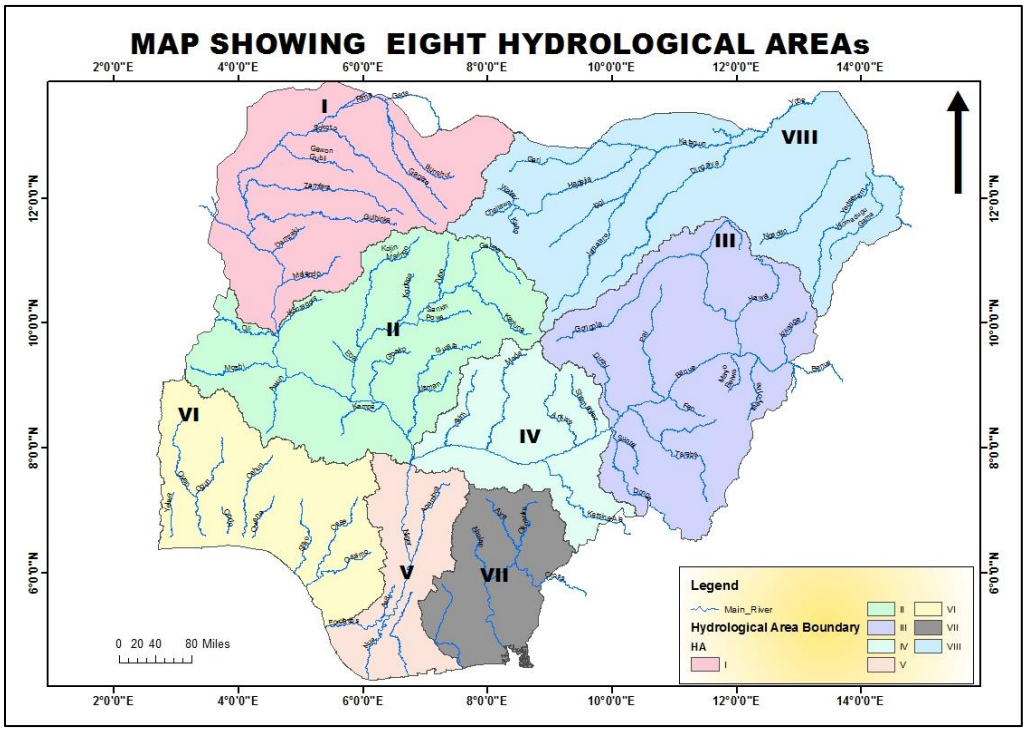

Fig. 1.4: Hydrological or Basin Areas of Nigeria

Table 1: The Eight (8) Hydrological Areas

HYDROLOGICAL AREA	DRAINAGE AREA (KM^2)	DESCRIPTION
HA I: Niger North	131600	Consists mainly of the Sokoto–Rima drainage basin and some relatively small drainage basins in the northwestern zone of the country. All the rivers drain directly or otherwise into the River Niger.
HA II: Niger Central	158100	Consists mainly of the Kontagora, Kaduna, Gbako, Gurara, Moshi, Oyi–Kampe and some smaller drainage basins discharging into the middle section of the River Niger (Kainji Dam–Lokoja).
HA III: Upper Benue	158900	Mainly the Gongola, Donga and Taraba drainage basins though it includes numerous but small rivers draining directly into the Benue.
HA IV: Lower Benue	73000	Rivers Mada, Ankwe, Shemankar, Katsina Ala and many others that drain into the Benue from the north and south between the confluence with the Niger and some distance east of Makurdi.
HA V: Niger South	53900	Consists of tributaries such as the Mimi, Orle, and the Anambra discharging into the main trunk of the Niger, and the Ase, Orashi and

		Sombreiro, which drain into the Upper Niger Delta.
HA VI: West Littoral	100500	All the north–south flowing rivers in the southwestern zone of the country.
HA VII: East Littoral	59800	Consists of the rivers draining eastern Nigeria, including Cross River and River Kwa Ibo, which drain into the Gulf of Guinea.
HA VIII: Lake Chad	188000	Consists of the rivers draining into the Lake Chad. The principal rivers are the Hadejia, Gana-Komadugu–Yobe, Ngadda and Yedseram.

1.4 CAUSES OF FLOODING IN NIGERIA

The soil moisture regime of the lower lying plains during the peak rainy season months, the prevailing extreme weather conditions presumed to be associated with an incipient climate change, dam operations particularly outside the nation's borders, and topography have promoted significant flooding in recent times. Floods have since become annual, ubiquitous rainy season phenomena not only within floodplains in Nigeria, but also in her urban and semi-urban areas.

Large parts of Nigeria were subject to massive flooding and long-term inundation (> 2months) between June and October 2012. They were the consequence of extreme rainfall events that marked the rainy season of the year, river channel inadequacy, and dam operations, particularly, of the Lagdo dam on the River Benue in neighbouring Republic of Cameroun, and secondarily of the River Niger dams (Kainji and Jebba). But there was also urban flooding linked to incapacities of urban culverts and bridges that had become too small for current discharges given city expansion, the use of river channels as waste repositories,

and thus clogging of channels, and poor compliance with or non-existence of land use zoning/building codes, and environmental management. Further, urbanization that was hitherto confined to higher elevations and levees encroached into lower areas including the flood basins. The encroachment was prompted by the long–term drought that prevailed mainly in the Niger and Chad basins between 1968 and 1998, and its effects on the maximum flood stages attained during that period.

Coastal areas of Nigeria are not spared from flooding. A cause could be the continuing global warming and associated extreme events (IPCC, 2007). Rising temperatures cause glaciers to retreat and ice caps to melt promoting sea level rise by the added water from melting ice and the expansion of sea water as it warms. Sea level rise and extreme rainfall events are expected to promote storm surges. The flooding is always more invidious during high tides when coastal drainage is occluded.

Fig. 1.5: Flooding in Koton-Karfe, Kogi State (2018)

Fig. 1.6: Flooding in Abeokuta Township, Ogun state (2018)

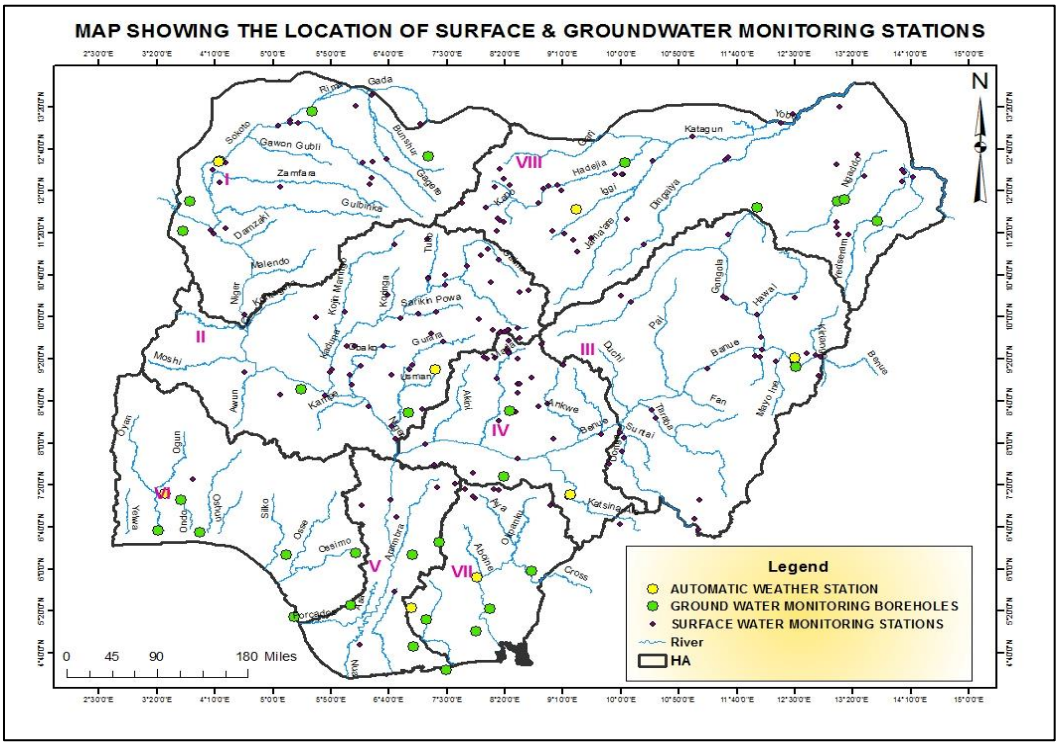

Fig. 1.7: Map showing Network of Groundwater and Weather Stations

2.0 EVALUATION OF THE 2018 ANNUAL FLOOD OUTLOOK (AFO)

2.1 INTRODUCTION

This chapter takes a look at the 2018 AFO predictions in relation to the actual flood occurrence in the country. It is worthy to note that the Nigeria Hydrological Services Agency (NIHSA), commenced the Annual Flood Outlook in 2013 following the devastating flood events of 2012 that affected about twenty-seven states of the Federation, causing the deaths of over four hundred persons and displacing about two million people from their homes. The total amount of losses according to NEMA (2012) was estimated to be approximately ₦2.29 trillion in damaged properties, oil production platforms, and agricultural produce amongst others.

The Agency so far, has successfully produced six (6) editions of the AFO prediction (2013-2018), recording a remarkable success in mitigating the effects of flood within the country through its awareness campaigns of the consequential effects of human activities on drainage systems, such as dumping of refuse, erecting of structures on flood plains and other indiscriminate actions that interfere with the free flow of water.

Fig. 2.1: Flood Occurrence at Jibiya, Katsina, State (2018)

The Agency uses two (2) models, Geospatial Stream Flow Model (GeoSFM) and Soil Water Assessment Tool (SWAT) to simulate flood level for forecast in the eight (8) Hydrological Areas (HAs) of the country on the basis of the Local

Government Areas. It should also be noted that the 2012 flood scenarios have been used as a reference point (benchmark) for flood assessment. The analysis of the model performance is at table 2.1 and figure 9 below. The analysis shows that the 2 models used have performed above average.

Table 2.1: Performance of NIHSA Models from 2013 - 2018

S/No.	YEAR	PERFORMANCE	REMARK
1.	2013	70%	Maiden edition
2.	2014	63%	Decreasing trend
3.	2015	55%	Decreasing trend
4.	2016	53%	Decreasing trend
5.	2017	53%	Decreasing trend
6.	2018	53%	

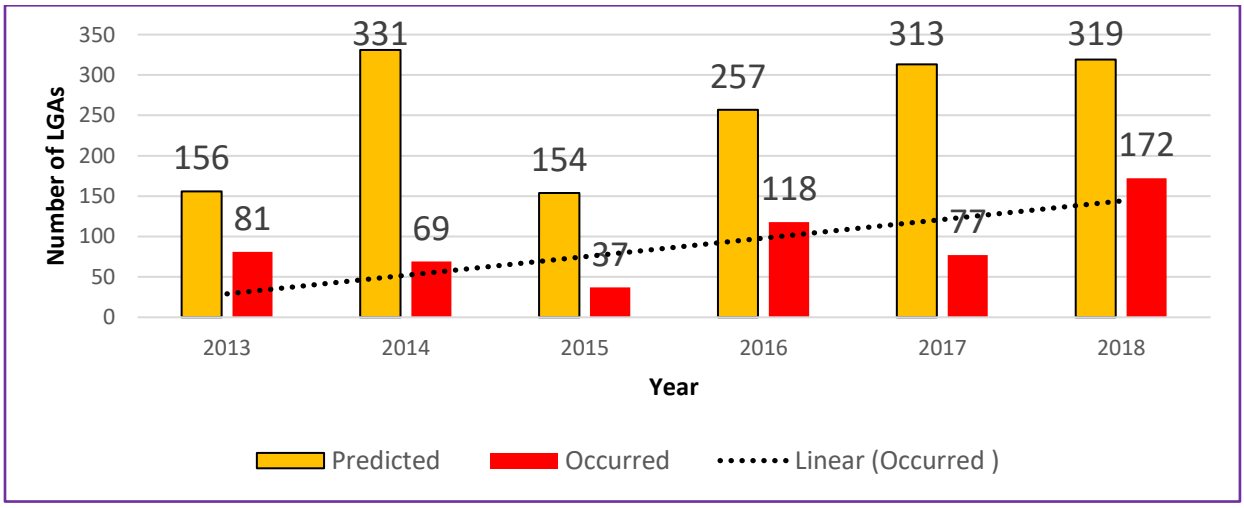

Fig. 2.2: Graph Showing the Trend of NIHSA model prediction and occurrence from 2013- 2018

2.2 Evaluation of the 2018 AFO

In 2018, a total of 1,921,026 people were affected by the flood; 210,206 were internally displaced, 156,672 hectares of agricultural land destroyed while 82,376 houses submerged.

Fig. 2.3: Flood Occurrence at Jibiya, Katsina, State

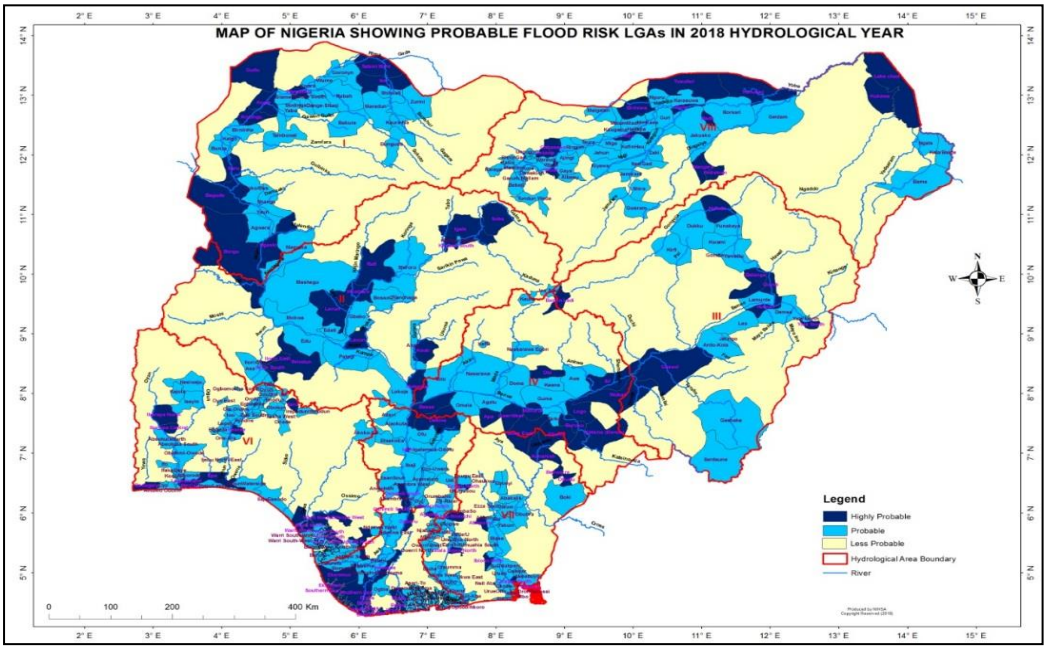

Fig. 2.3: Map of Nigeria Showing Probable Flood Risk LGAs in 2018.

The flood forecast for 2018 was classified into three (3) categories namely Highly Probable, Probable and Less Probable Risk Areas using two scientific Models (figure 11). The models allow simulation of stream flow across the drainage network covering the eight (8) Hydrological Areas in the analysis of flow for the

prediction. The models have proved to be effective and reliable over the years. The predicted and actual flood incidents for 2018 is as summarized in table 2.2 below.

Table 2.2: Comparative Analysis of 2018 Flood Occurrence

Serial	Flood Scenarios	Number of Affected Local Government Areas
1.	Predicted	319
2.	Actual	172
3.	Occurred Not Predicted	75
4.	Predicted Not Occurred	222
5.	Predicted Occurred	97

Source: *Compiled by NIHSA Staff from Field assessment, Daily News Papers and NEMA situation reports*

Table 2.3: Effect of 2018 floods in Nigeria

1.	Affected Population	1,921,026
2.	Number of Deaths	204
3.	Number of Internally Displaced Persons	210,206
4.	Houses Destroyed	82,376
5	Hectares of Agricultural Land Destroyed	156,672
6.	Number of Roads Damaged	321

Source: NIHSA Field Assessment NEMA situation report Vol 4.

From table 2.2 above, a total of 319 LGAs in 35 states were predicted in 2018, while 172 flood occurrences were recorded in 27 States (*see Appendix 1 attached*). Furthermore, flood occurred in 75 LGA which were not predicted by NIHSA. The reason for this could be attributed to anthropogenic activities (human activities). The models only capture the locations along the major river channels. In Katsina State (Jibiya) flood was not predicted but occurred as flash flood. Lastly, structural management measures taken by most state governments may have been responsible for no flooding in some of the predicted areas.

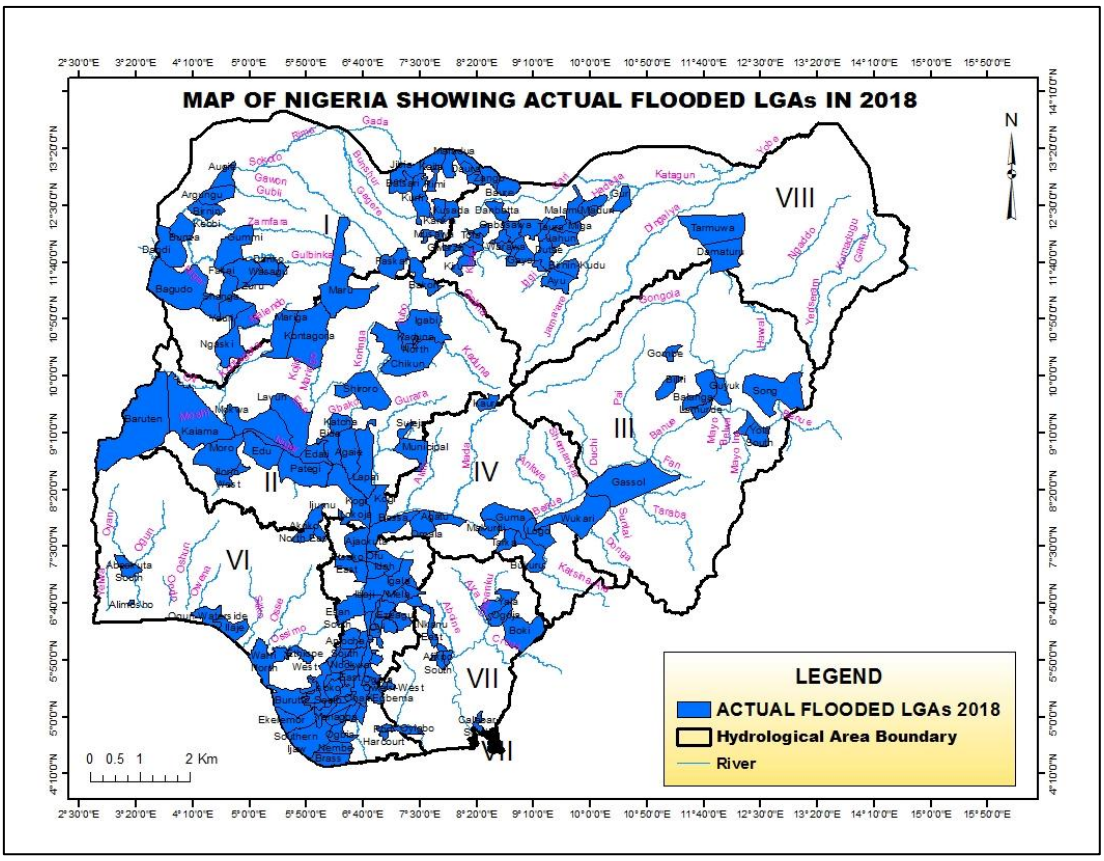

Fig. 2.4: Map of Nigeria Showing Actual Flooded LGAs in 2018.

Comparing the discharge at Lokoja as of 20th Sept. 2018 which was 26,318m^3/s (11.40m) to that of 2012 which rose to 31,540m^3/s (12.84m) as at 29th Sept. 2012 depicted in figure 13 below. The level of water as at 20th Sept 2018 could have worsened the situation if there were releases upstream from Lagdo dam on River Benue.

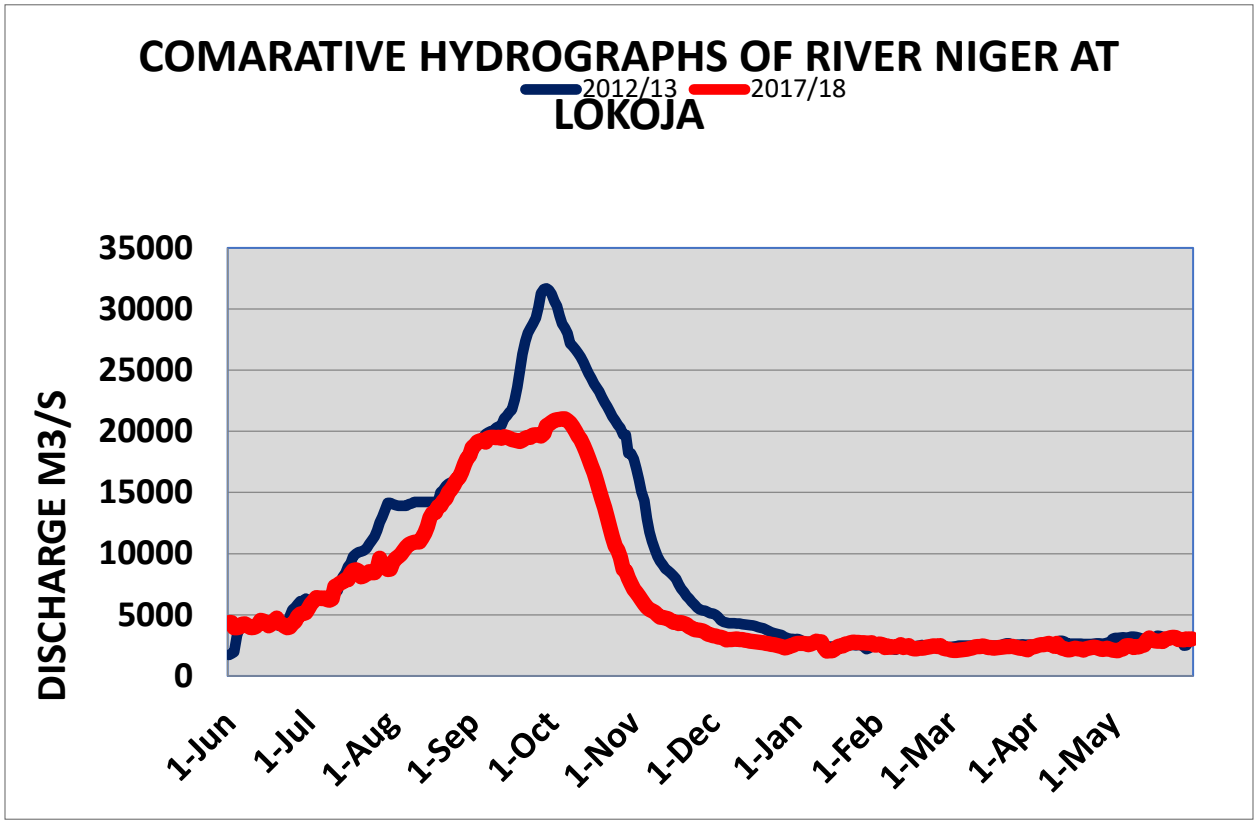

Fig. 2.5: Graph Showing the Comparative Hydrographs of Lokoja

It is imperative to note that, accuracy of flood forecast and its adoption by the public who were sensitized on the high flood risk LGAs has led to a reduction in the devastating effect of flood on the communities that have heeded the warning and carried out remediation action contained in the previous AFOs.

CHAPTER THREE

3.0 2019 ANNUAL FLOOD OUTLOOK

3.1 Preamble

The Geospatial Stream Flow Model (GeoSFM) and the Soil and Water Assessment Tool (SWAT) have been effective in the previous editions of AFO and hence were retained for 2019 AFO. Nonetheless, NIHSA is currently exploring other models for a more robust analysis.

The GeoSFM is a semi distributed, physical based, catchment–scale, hydrologic modeling system developed by the United States Geological Survey Centre for Earth Resources Observation and Science (USGS/EROS). The model provides a tool for monitoring wide area hydrologic events. It is used to identify and map the status of stream flow and soil water condition. The SWAT on the other hand, is a river-basin based model developed by the Texas Water Resources Institute, Texas A & M University System. The model is used to predict runoff and sediment yield in large complex basins. It is a physically based, semi–distributed and continuous simulation model with Geographic Information System (GIS) interface.

To predict the Annual Flood Outlook for 2019, the two models were successfully applied to each of the eight (8) Hydrological Areas of Nigeria in the form of

Hydrographs converted to areal flood extent based on the affected LGAs across the drainage network of the country.

For the 2019 Annual Flood Outlook, calibration of the GeoSFM model at each Hydrological Area (HA) was based on the discharge record at the various stations with the respective HAs. Flows were simulated from the period 1981 – 2018 at 0.05^0 resolution in line with the 2019 Seasonal Rainfall Prediction (SRP) from NiMet based on the Climate Hazards Group InfraRed Precipitation with Stations (CHIRPS) dataset, Digital Elevation Model (DEM)and soil characteristics. The probable flood zones were determined based on the statistical analysis of the simulated flows and DEM using GIS package. The impact of trans-boundary inflow to HA I and HA III were assessed based on the 50^{th} and 90^{th} percentile as the extreme inflow scenarios.

These models were selected based on their wide application in various parts of the world from arid to semi-arid regions giving satisfactory results. Besides having simplified application, they utilize relevant data and are capable of simulating flood flows much more reliably and they also utilize geologic and catchment factors in their operations.

3.2 DATA USED AND SOURCES

- Daily flow records (stage and discharge) from stations at Afikpo, Ikom, Okitipupa, Siluko, Katsina-Ala, Abeokuta, Shiroro, Baro, Umaisha, Wuya, Ebba, Kurawa, Zungeru, Malabu, Otuocha, Onitsha, Makurdi, Geidam, Kainji, Kende, Dadinkowa, Ologbo, Ogun, Chokocho, Tiga, and Lokoja on the Niger and Benue Rivers System and other hydrological stations in the eight (8) Hydrological Areas of the country.

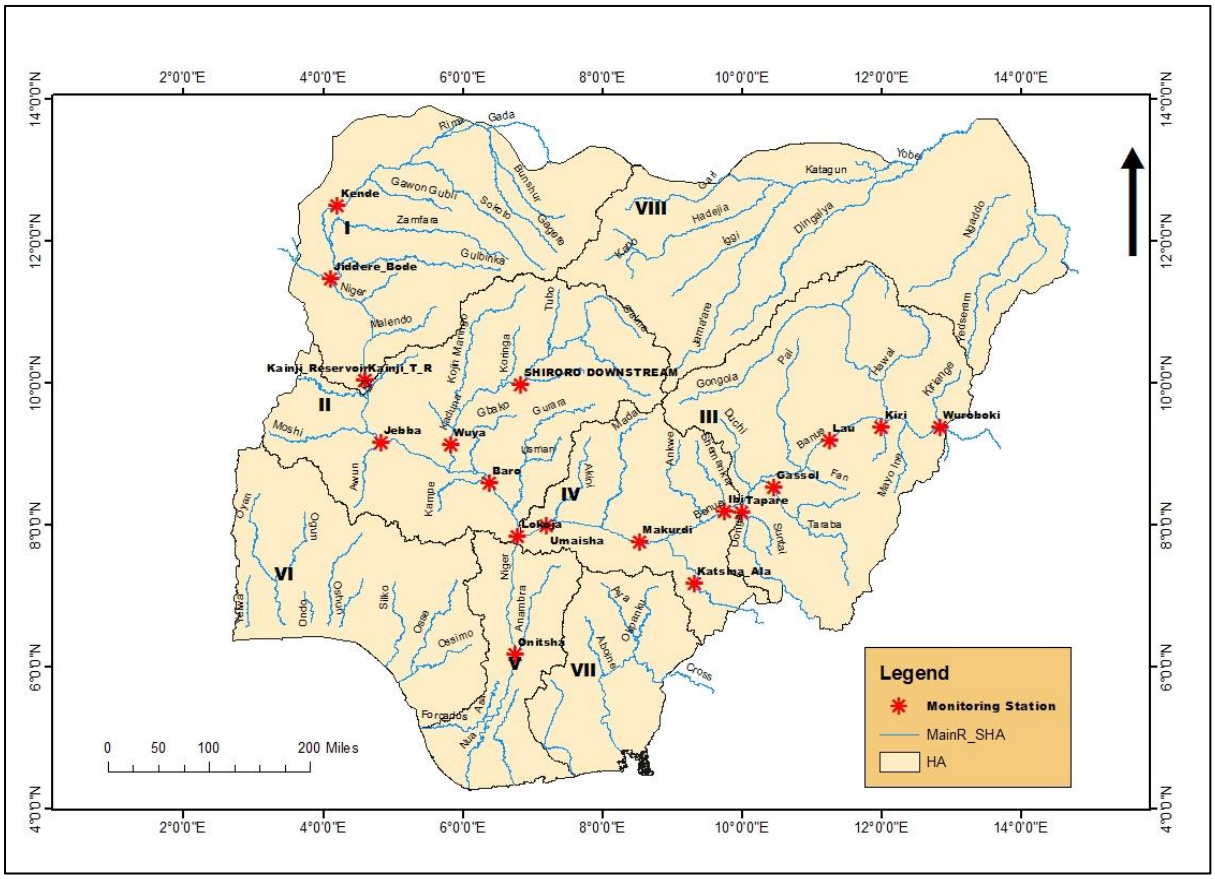

Fig. 3.1: Map Showing the Location of Data Collection Platforms (DCPs) along the two major rivers in Nigeria

- Daily, monthly and yearly rainfall records
- The gridded satellite daily rainfall data available: the Climate Hazards Group Infra–Red Precipitation with Stations (CHIRPS) data archive available from 1981 to 2017 at 0.05^{o} resolution.
- The daily potential evapotranspiration (PET) based on the data produced by the Famine Early Warning Systems Network (FEWSNET).
- Seasonal Rainfall Prediction (SRP)
- The soil characteristics, topography (Shuttle Radar Topography Mission (SRTM) data with a vertical accuracy specification of +/- 5 metres, and available in resolutions of 3 arc–second (90m) data around Nigeria from the USGS website), land use and land cover data.

3.3 Highlights of 2019 Annual Flood Outlook

The eight Hydrological Areas and their well–defined hydrogeological features which have been articulated in the flood prediction are discussed below.

3.3.1 Hydrological Area I (Niger North)

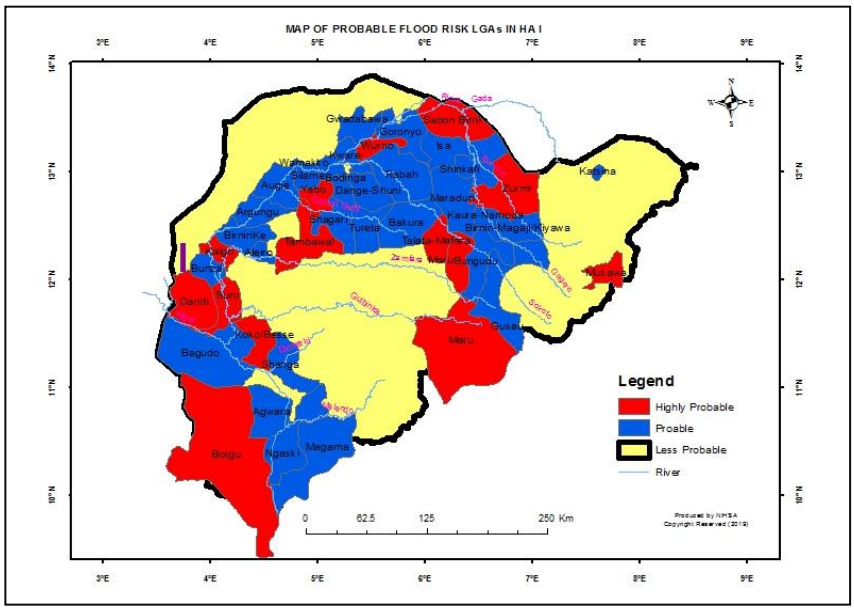

Fig. 3.2: Probable Flood Risk LGAs in HA I

Hydrological Area I comprises Kebbi, Zamfara, Sokoto, and parts of Niger and Katsina States and is drained mainly by the Rivers Niger, Sokoto and Rima. It has two distinct geological features, mainly the Precambrian Crystalline Basement which covers 30% of the area and Sedimentary terrain which covers 70%.

The Highly Probable and Probable flood risk areas in Hydrological Area I are shown in Tables 3.1 and 3.2 as well as Figure 3.2.

Table 3.1: Highly Probable Flood Risk LGAs in HA I

S/N	State	LGAs
1	Katsina	Musawa
2	Kebbi	Dandi, Kalgo, Koko/Besse, Suru
4	Niger	Borgu
5	Sokoto	Sabon Birni, Tambuwal, Wurno,Yabo
6	Zamfara	Maru, Talata-Mafara, Zurmi.

Table 3.2: Probable Flood Risk LGAs in HA I

S/N	State	LGAs
1	Katsina	Katsina
2	Kebbi	Aliero, Argungu, Augie, Bagudo, Birnin–Kebbi, Bunza, Ngaski, Shanga
3	Niger	Agwara, Magama
4	Sokoto	Gwadabawa, Goronyo, Isa, Kware, Rabah, Shagari Bodinga, Tureta, Silame, Dange–Shuni,, Wurno, Yabo, Wamako,
	Zamfara	Birnin-Magaji/ Kiyawa, Bakura, Bungudu Shinkafi, Gusau, Kaura–Namoda, Maradun.

3.3.2 **Hydrological Area II** (Niger Central)

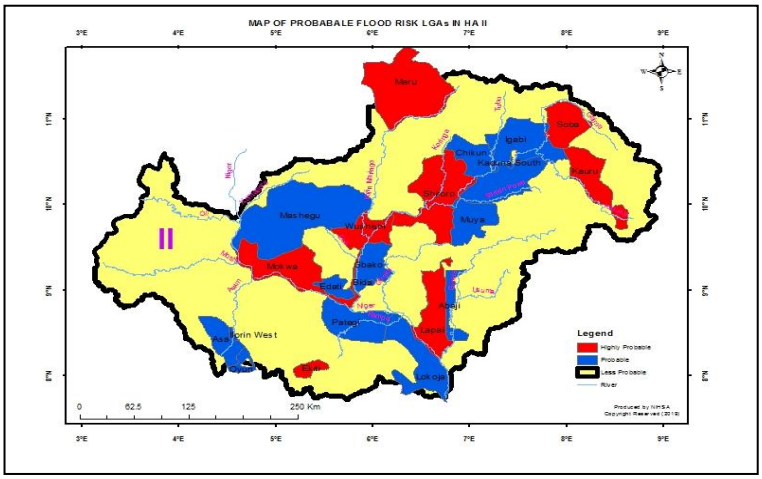

Fig. 3.3: Probable Flood Risk LGAs in HA II

Hydrological Area II covers Niger, Kwara, Kaduna, Kogi States and the FCT. The geology of the Hydrological area comprises of about 20% Sedimentary rocks and 80% Basement complex rocks. The main rivers in the area are: Niger, Kaduna, Gurara, Usuma, Kampe and Awun.

The Highly Probable and Probable flood risk areas in Hydrological Area II are shown in Tables 3.3 and 3.4 as well as Figure 3.3.

Table 3.3: Highly Probable Flood Risk LGAs in HA II

S/N	State	LGAs
1	Kaduna	Kauru, Soba
2	Kwara	Ekiti
3	Niger	Lapai, Mokwa, Shiroro, Wushishi
4	Zamafara	Maru

Table 3.4: Probable Flood Risk LGAs in HA II

S/N	State	LGAs
1	Kaduna	Chikun, Igabi, Kaduna South
2	Kogi	Lokoja
3	Kwara	Asa, Ilorin West, Oyun, Pategi

4	FCT	Abaji
5	Niger	Bida, Edati, Gbako, Mashegu, Munya,

3.3.3 **Hydrological Area III** (Upper Benue)

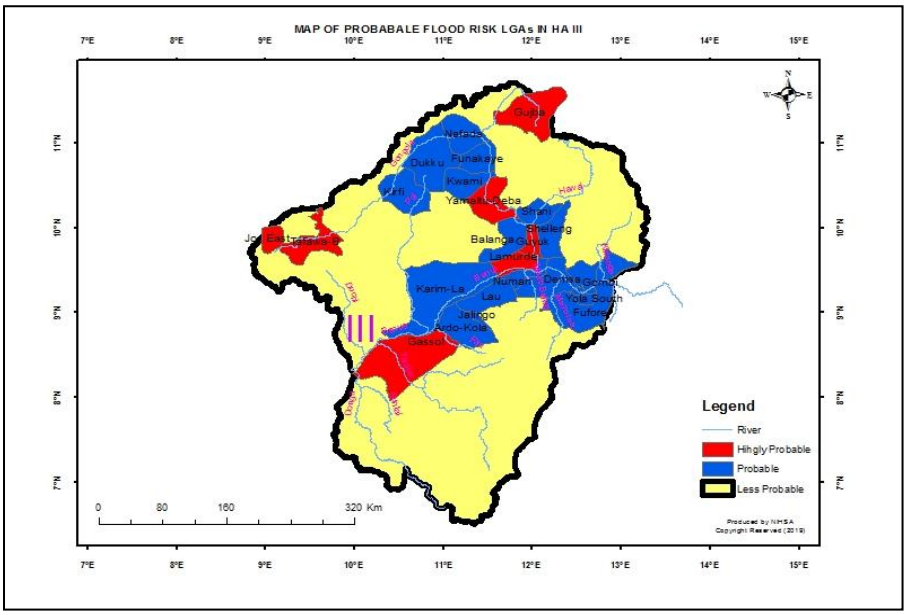

Fig. 3.4: Probable Flood Risk LGAs in HA III

Hydrological Area III comprises Adamawa, Taraba, Gombe, Bauchi and part of Borno State. It is made up of about 70% Sedimentary and 30% basement. The major rivers are Benue, Gongola, Taraba, Donga, Faro, and Mayo-Kebbi.

The Highly Probable and Probable flood risk areas in Hydrological Area III are shown in Tables 3.5 and 3.6 as well as Figure 3.4.

Table 3.5: Highly Probable Flood Risk LGAs in HA III

S/N	**State**	**LGAs**
1	Adamawa	Guyuk, Lamurde
2	Bauchi	Tafawa-Balewa
3	Gombe	Balanga
4	Plateau	Jos East
5	Taraba	Gassol
6	Yobe	Gujba

Table 3.6: Probable Flood Risk LGAs in HA III

S/N	State	LGAs
1	Adamawa	Demsa, Fufore, Gombi, Numan, Shelleng, Yola North, Yola South
2	Bauchi	Kirfi
3	Borno	Shani
4	Gombe	Balanga, Dukku, Funakaye, Gombe, Kwami, Nafada.
5	Taraba	Ardo-Kola, Karim Lamido, Jalingo, Lau

3.3.4 **Hydrological Area IV** (Lower Benue)

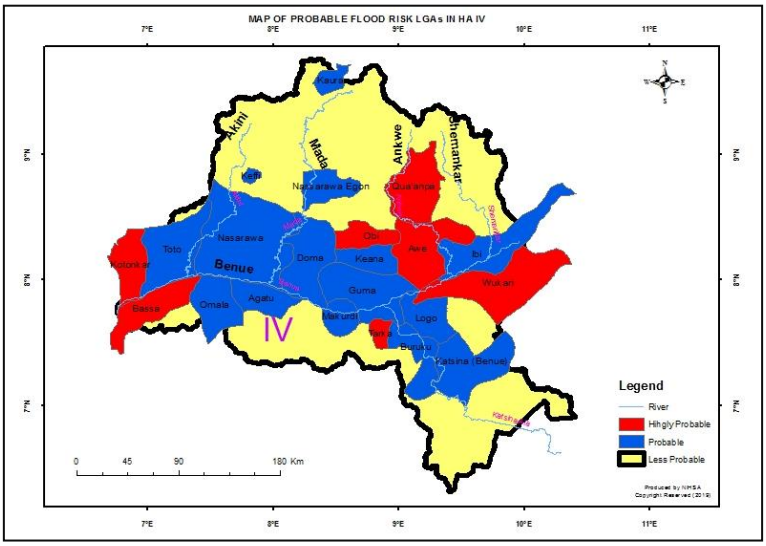

Fig. 3.5: Probable Flood Risk LGAs in HA IV

Hydrological Area IV covers Plateau, Nasarawa, Benue and part of Kogi States. The area is covered by 50% Sedimentary and 50% Basement and is drained mainly by Rivers Benue, Katsina–Ala, Dep and Mada.

The Highly Probable and Probable flood risk areas in Hydrological Area IV are shown in Tables 3.7 and 3.8 as well as Figure 3.5.

Table 3.7: Highly Probable Flood Risk LGAs in HA IV

S/N	State	LGAs
1	Benue	Tarka
2	Kogi	Bassa, Koton-Karfe
3	Nasarawa	Awe, Obi
4	Plateau	Qua'an Pan
5	Taraba	Wukari

Table 3.8: Probable Flood Risk LGAs in HA IV

S/N	State	LGAs
1	Benue	Buruku, Guma, Agatu, Tarka
2	Kaduna	Kaura
3	Kogi	Omala
4	Nasarawa	Keffi, Nassarawa–Eggon, Keana, Doma, Toto, Nassarawa
5	Taraba	Ibi.

3.3.5 **Hydrological Area V** (Niger South):

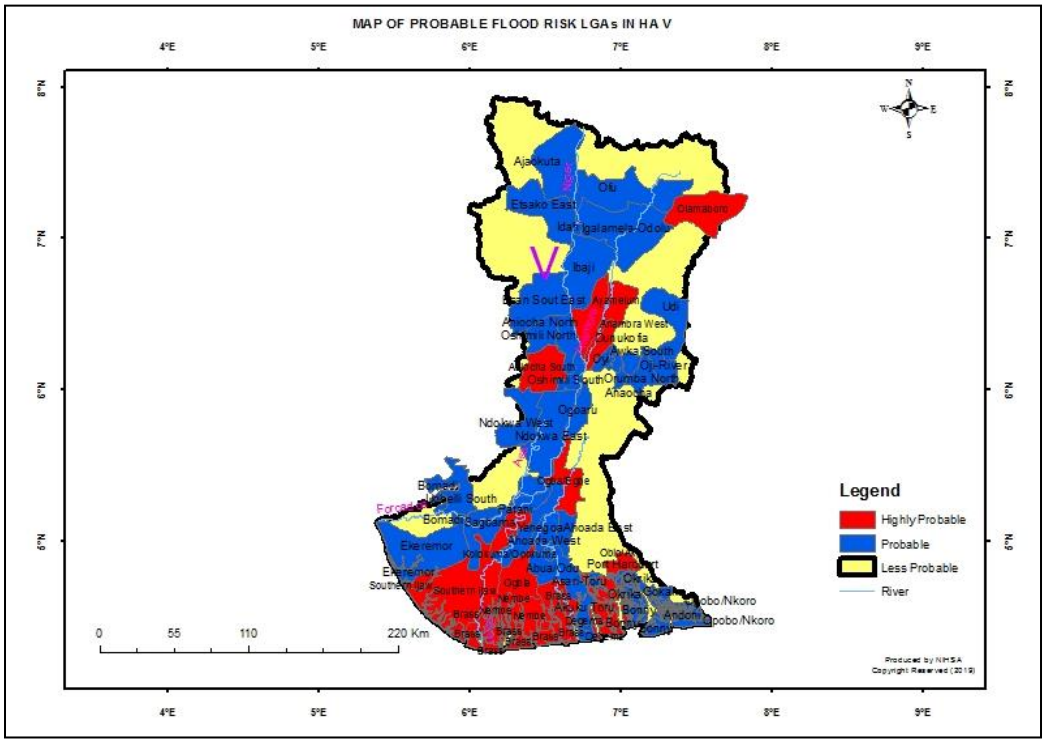

Fig. 3.6: Probable Flood Risk LGAs in HA V

Hydrological Area V includes: Bayelsa, Delta, Edo, Anambra and parts of Kogi, Imo, Enugu and Rivers States. The geology is 90% Sedimentary and 10% Basement. The major Rivers are: Niger, Anambra, Ase, Orashi, Nun and Forcados.

The Highly Probable and Probable flood risk areas in Hydrological Area V are shown in Tables 3.9 and 3.10 as well as Figure 3.6:

Table 3.9: Highly Probable Flood Risk LGAs in HA V

S/N	State	LGAs
1	Anambra	Ayamelum, Anambra East, Anambra West,
2	Delta	Ughelli North, Oshimili South, Oshimili North
3	Bayelsa	Brass, Kolokuma/Opokuma, Nembe, Southern Ijaw, Ogbia
4	Delta	Aniocha South
5	Kogi	Olamaboro
6	River	Degema, Obio/Akpor, Ogba/Egbaema/Ndoni

Table 3.10: Probable Flood Risk LGAs in HA V

S/N	State	LGAs
1	Anambra	Anaocha, Awka South, Dunukofia, Njikoka, Ogbaru, Orumba North, Oyi
2	Bayelsa	Ekeremor, Sagbama, Yenegoa.
3	Delta	Aniocha North, Bomadi, Ndokwa East, Ndokwa West, Oshimili North, Oshimili South, Patani, Ughelli South,
4	Edo	Esan South East, Etsako East
5	Enugu	Oji-River, Udi
6	Rivers	Abua/Odual, Ahoada East, Ahoada West, Akuku-Toru, Andoni, Asari-Toru, Bonny, Gokana, Ogu/Bolo, Okrika, Opobo/Nkoro, Port-Harcourt

3.3.6 **Hydrological Area VI** (Western Littoral):

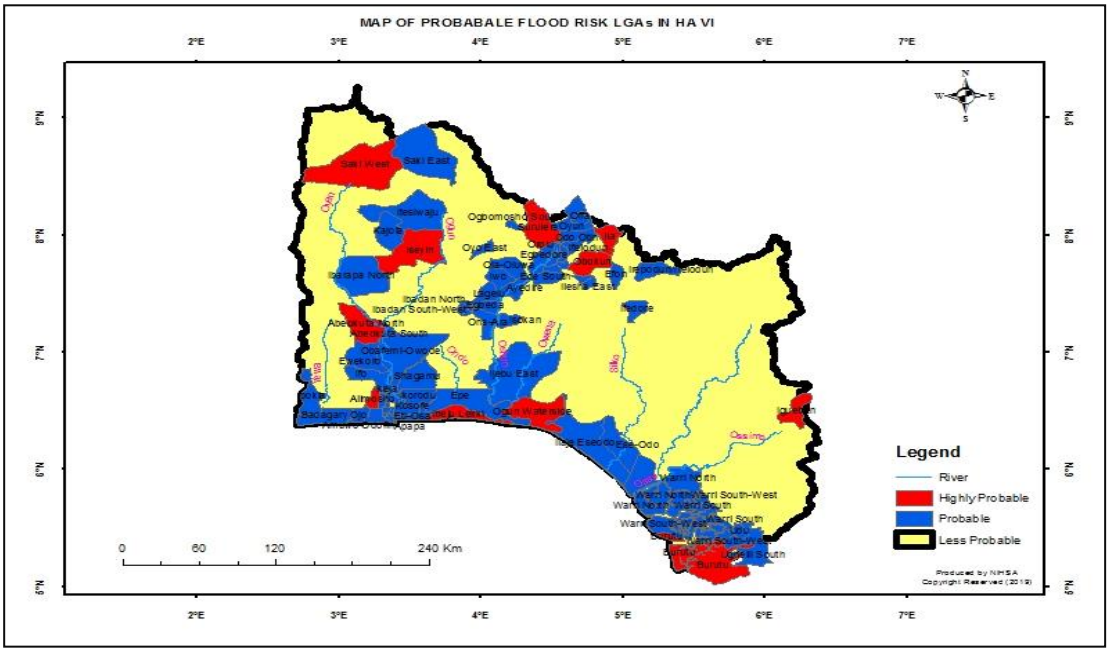

Fig. 3.7: Probable Flood Risk LGAs in HA VI

Hydrological Area VI comprises of the following States: Lagos, Ogun, Oyo, Osun, Ondo, Edo, Delta and Ekiti. The Area is 60% Basement and 40% Sedimentary and is drained by Rivers: Yewa, Ogun, Osun, Shasha, Omi, Owena, Osse,and Ossiomo

The Highly Probable and Probable flood risk areas in Hydrological Area VI are shown in Tables 3.11 and 3.12 as well as Figure 3.7:

Table 3.11: Highly Probable Flood Risk LGAs in HA VI

S/N	State	LGAs
1	Delta	Burutu
2	Edo	Igueben
3	Lagos	Alimosho, Ibeju Lekki
4	Ogun	Abeokuta North, Ogun Waterside
3	Osun	Ila, Obokun
	Oyo	Iseyin, Saki West, Surulere.

Table 3.12: Probable Flood Risk LGAs in HA VI

S/N	State	LGAs
1	Delta	Udu, Ughelli South, Warri North, Warri South-West, Warri South
2	Ekiti	Efon, Irepodun/Ifelodun
	Kwara	Offa, Oyun
3	Lagos	Agege, Ajeromi/Ifelodun, Amuwo Odofin, Apapa, Badagry, Epe, Eti-Osa, Ikeja, Ifako/Ijaye, Ikorodu, Kosofe, Lagos Island, Mainland, Mushin, Ojo, Oshodi-Isolo, Surulere
4	Ogun	Abeokuta South, Ewekoro, Ifo, Ijebu East, Ipokia, Obafemi-Owode, Shagamu
5	Ondo	Ese-Odo, Ifedore, Ilaje Ese-Odo
6	Osun	Ayedire, Ede North, Ede South, Egbedore, Ifelodun, Ilesha East, Ilesha West, Irepodun, Isokan, Iwo, Odo Otin, Ola–Oluwa, Olorunda, Orolu, Osogbo
7	Oyo	Ibadan North–East, Ibadan North–West, Ibadan North, Ibadan South–East, Ibadan South–West, Ibarapa North, Itesiwaju, Kajola, Lagelu, Ogbomosho South, Ona Ara, Oyo East, Saki East,

3.3.7 **Hydrological Area VII** (Eastern Littoral)

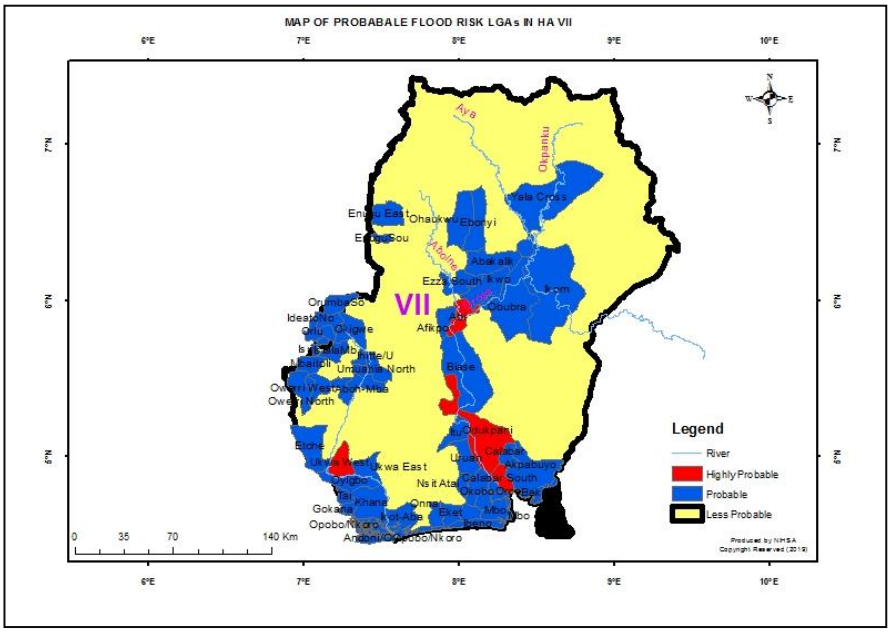

Fig. 3.8: Probable Flood Risk LGAs in HA VII

The Hydrological Area VII comprises of Abia, Anambra, Imo, Enugu, Ebonyi, Cross–River, Akwa–Ibom and Rivers States. The area is covered by 90% Sedimentary and 10% Basement and drained by Imo, Qua–Iboe, Calabar, Ivo, Asu, Cross River and Ebonyi Rivers.

The Highly Probable and Probable flood risk areas in Hydrological Area VII are shown in Tables 3.13 and 3.14 as well as Figure 3.8.

Table 3.13: Highly Probable Flood Risk LGAs in HA VII

S/N	State	LGAs
1	Abia	Awka West,
2	Cross River	Abi, Calabar South, Odukpani

Table 3.14: Probable Flood Risk LGAs in HA VII

S/N	State	LGAs
1	Abia	Ukwa East, Umuahia North, Umuahia South
2	Akwa - Ibom	Eastern Obolo, Eket, Esit Eket, Ibeno, Ikot–Abasi, Itu, Mbo, Nsit Atai, Okobo, Oron, Udung Uko, Uruan, Urue Offong/Oruka
3	Anambra	Orumba South,
4	Cross River	Akpabuyo, Bakasi, Biase, Calabar, Ikom, Obubra, Yalla
5	Ebonyi	Abakaliki, Afikpo North, Ebonyi, Ezza North, Ikwo, Ohaukwu
6	Enugu	Enugu East, Enugu South
7	Imo	Aboh-Mbaise, Ezinihite, Ideato South, Ideato North, Ihitte/Uboma, Isiala Mbaitoli, Isu, Mbaitoli, Nkwerre, Obowo, Okigwe, Orlu, Owerri Municipal, Owerri North, Owerri West, Unuimo
8	Rivers	Andoni, Etche, Gokhana, Opobo/Nkoro, Oyigbo, Tai

3.3.8 **Hydrological Area VIII** (Chad Basin):

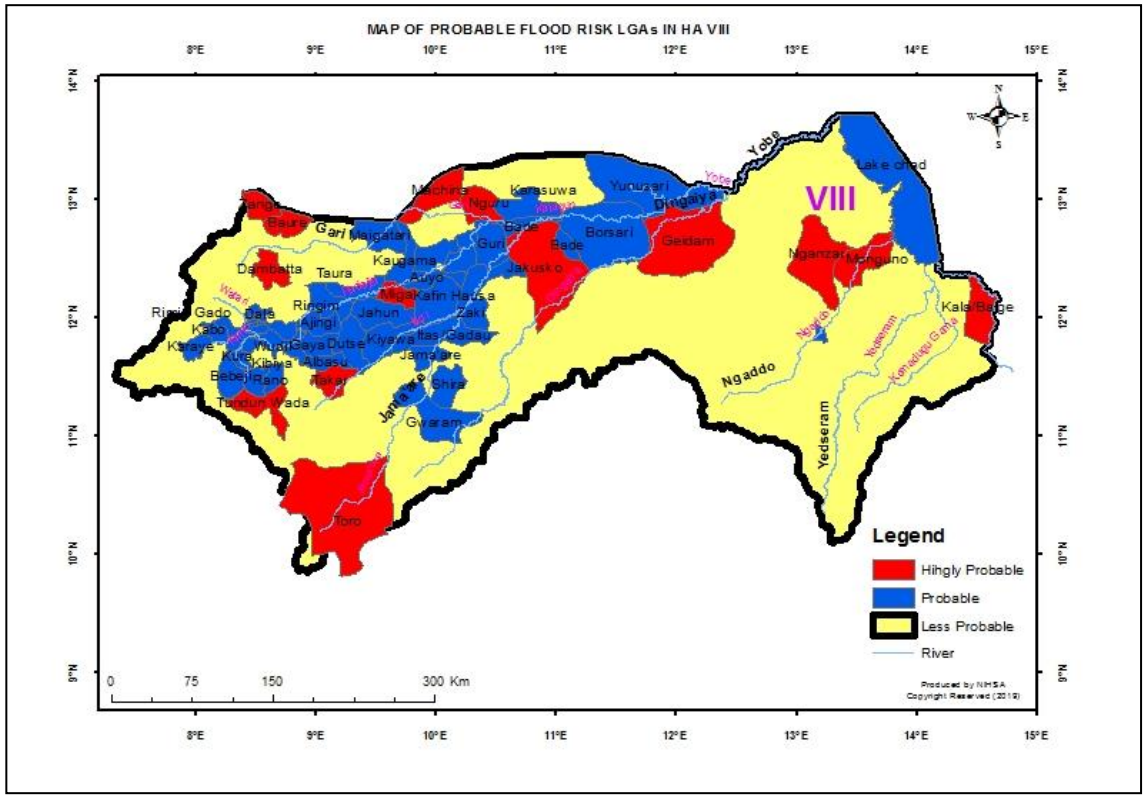

Fig. 3.9: Probable Flood Risk LGAs in HA VIII

The Hydrological Area VIII comprises Kano, Jigawa, Yobe, Borno States and parts of Bauchi, Plateau and Adamawa States. The geology is made up of 80% Sedimentary and 20% Basement rocks. Major rivers in the area are: Hadejia, Jama'are, Komadugu–Yobe, Yedseram, Ngadda and Dingaiya.

The Highly Probable and Probable flood risk areas in Hydrological Area VIII are shown in Tables 3.15 and 3.16 as well as Figure 3.9:

Table 3.15: Highly Probable Flood Risk LGAs in HA VIII

S/N	State	LGAs
1	Bauchi	Toro
2	Borno	Kala-Balge, Monguno, Nganzai,
3	Jigawa	Miga, Auyo, Birniwa
4	Kano	Danbatta, Kakai, Tudun Wada,
5	Katsina	Baure, Zango
6	Yobe	Geidam, Jakusko, Machina,

Table 3.16: Probable Flood Risk LGAs in HA VIII

S/N	State	LGAs
1	Bauchi	Shira, Zaki, Itas/Gadau, Jama'are
2	Borno	Maiduguri, Baga
3	Jigawa	Dutse, Auyo, Guri, Gwaram, Jahun, Kafin Hausa, Kaugama, Kirikasamma, Kiyawa, Maigatari, MalamMadori, Ringim, Taura
4	Kano	Albasu, Ajingi, Bebeji, Dala, Garum Dawakin Kudu, Fagge, Garun Mallam, Gaya, Gwale, Kabo, Kano, Karaye, Kumbotso, Kura, Madobi, Nasarawa, RiminGado, Tudun Wada, Dawakin Tofa, Warawa, Kibiya, Kumbotso, Rano, Tarauni, Ungogo, Wudil
5	Yobe	Bade, Busari, Geidam, Jakusko, Yunusari

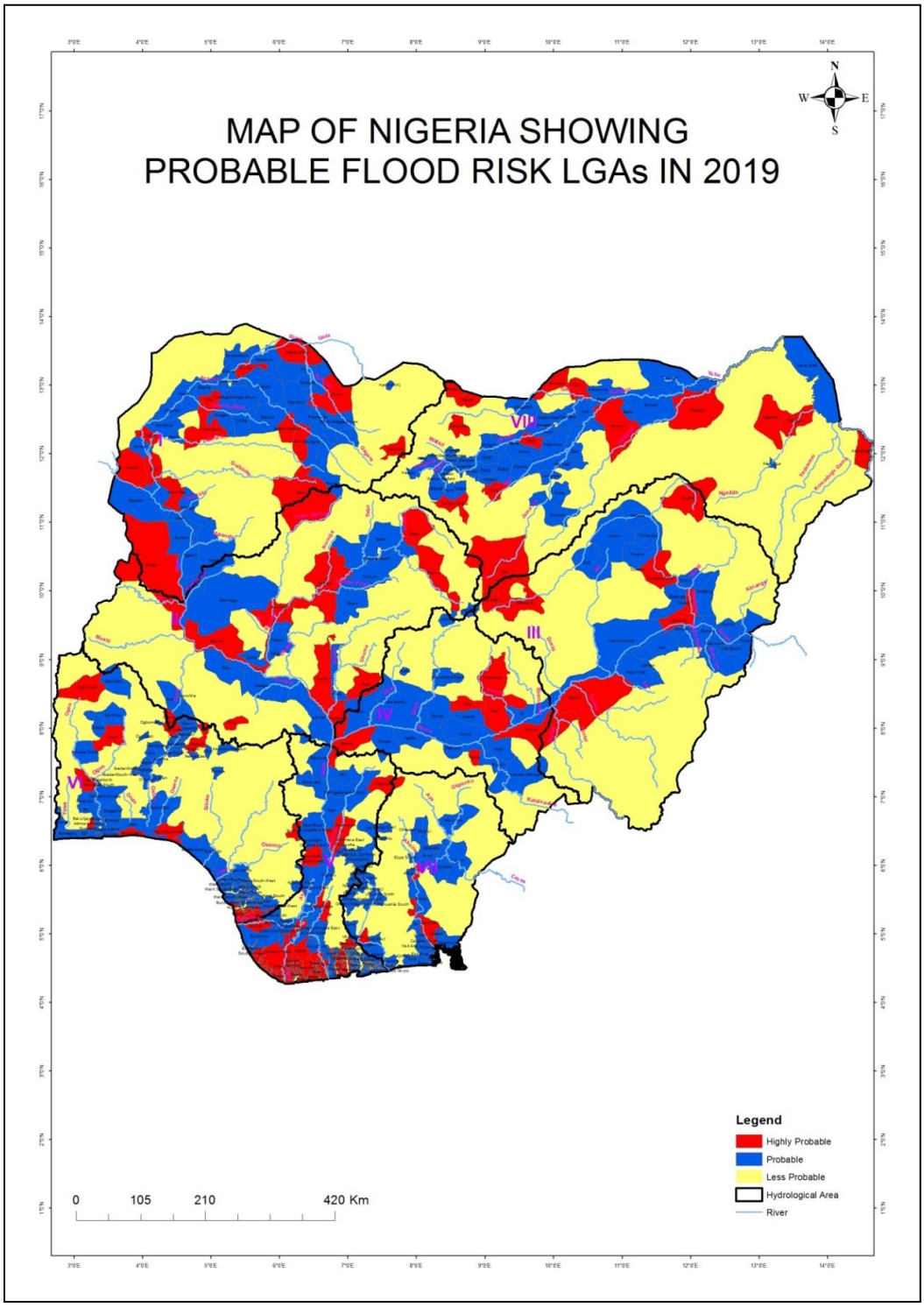

Fig. 3.10 Map of Probable Flood risk LGAs in 2019

The expected areas for river flooding in 2019 are located in the following drainage basins: Benue, Niger, Anambra–Imo, Niger Delta, Sokoto–Rima, Komadougu–Yobe, Ogun–Osun, Cross River and other sub–basins of the country. The predicted probable flood areal coverage in 2019 is expected to be lower than that of 2018 (Figure 3.10).

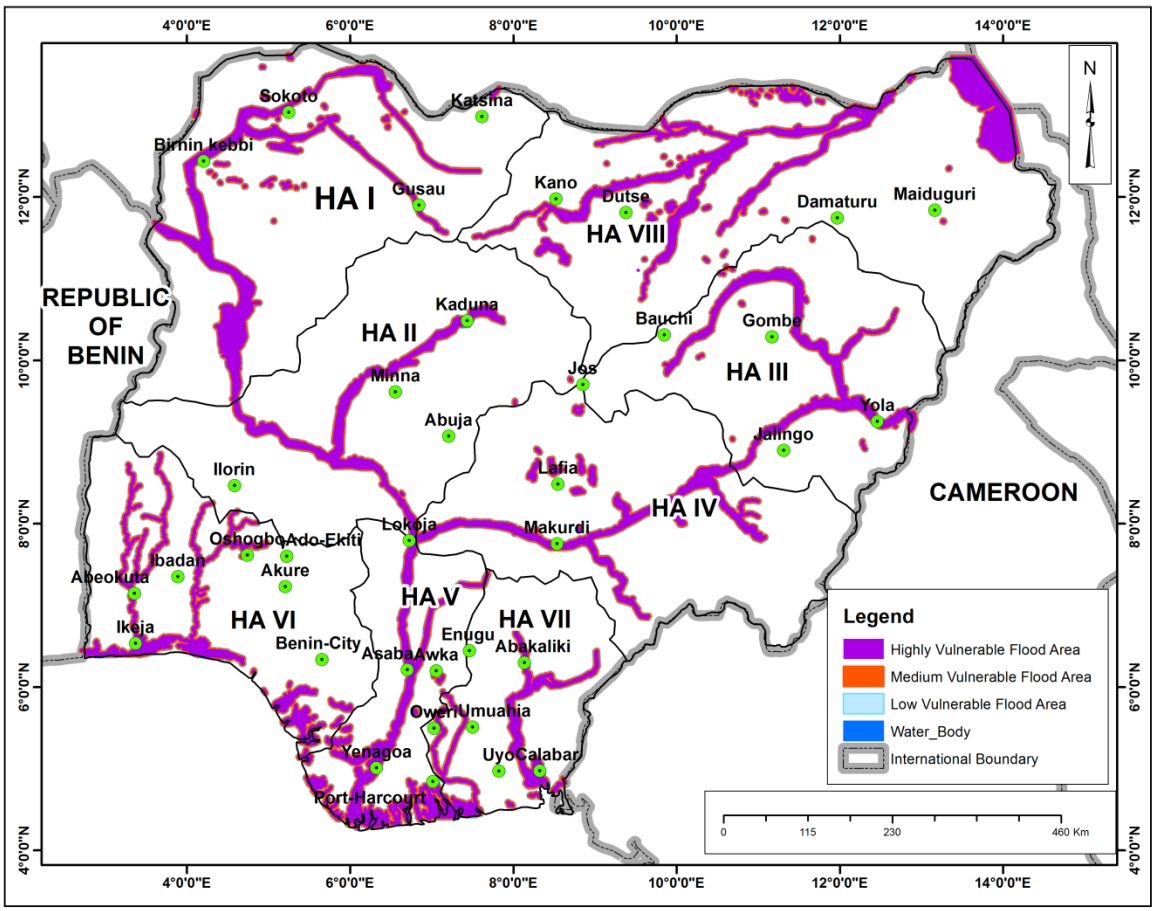

Fig. 3.11: 2019 Flood Zone Vulnerability Map

Taken into consideration, the saturated geological conditions, the areas along the major river channels within a radius of 1km, 2km, and 3km are vulnerable to high, medium and low degree of flooding respectively.

3.4 Highly Probable Flood Risk Areas

The expected high flood risk basins are: Sokoto–Rima (HA I), Niger (HA II), Adamawa (HA III), Benue (HA IV), Anambra–Imo (HA V), Niger–Delta (HA V), lower fringes of Ogun–Osun (HA VI) part of Cross River (HA VII) and Komadougu–Yobe (HA VIII). Appendix 2

3.5 Probable Flood Risk Areas

In this category, some of the LGAs likely to be affected are: HA I: Augie, Goronyo, and Katsina, HA II: Masehegu, Kaduna South and Pategi; HA III: Lau, Yola South, Kirfi and Gombe; HA IV: Omala, Makurdi, Doma and Ibi; HA V: Ekeremor, Kolokuma/Opokuma, Ajaokuta, Ibaji; HA VI: Ughelli South, Ojo, Abeokuta South and Ibadan South; HA VII: Ukwa East, Oron, Oyigbo, Calabar Municipal, Owerri West, Afikpo North; HA VIII: Itas/Gadau, Maiduguri, Guri, Wudil and Borsari. Detail list in Appendix 3

3.6 Coastal Flooding

Some coastal States, Bayelsa (HA V), Cross River (HA VII), Delta (HA V), Lagos (HA VI) Ondo (HA VI), and Rivers (HA V) are expected to experience coastal flooding due to rise in sea level and tidal surge which would impact on fishing, habitation and coastal transportation.

3.7 Flash and Urban Flooding

Flash and Urban Flood are also expected to occur in some locations such as HA I: Sokoto, Birnin–Kebbi; HA II: Kaduna, Ilorin, Suleja Jibya; HA III: Yola Gombe, HA IV: Abuja, Lafia, Makurdi; HA V: Port Harcourt, Lokoja, Yenagoa; HA VI: Lagos, Abeokuta, Sapele, Oshogbo, Ado-Ekiti Ibadan; HA VII: Awka, Nsukka,

Onitsha Calabar, Owerri; HA VIII: Maiduguri, Kano, and major cities with poor drainage systems.

3.8 Simulated Hydrographs at selected stations

The simulated hydrographs of gauging stations at Tiga, Kainji, Ologbo, Kende, Geidam, Ikom, Lokoja, Malabu, Okitipupa, Onitsha, Siluko, Zungeru, Abeokuta, Dadin Kowa, Hadejia, Kafin Gana, Katsina-Ala, Makurdi, Shiroro, Afikpo, Ebba, Gassol, Baro, Kurawa, Umaishia, Otuocha, Wuya, Donga, Chokocho, and Ogun, are shown in Figures 25 – 60 for both SWAT and GeoSFM models.

The peak flood flow for the year 2019 is expected to be significantly lower than that of year 2012 (reference flood events at all stations).

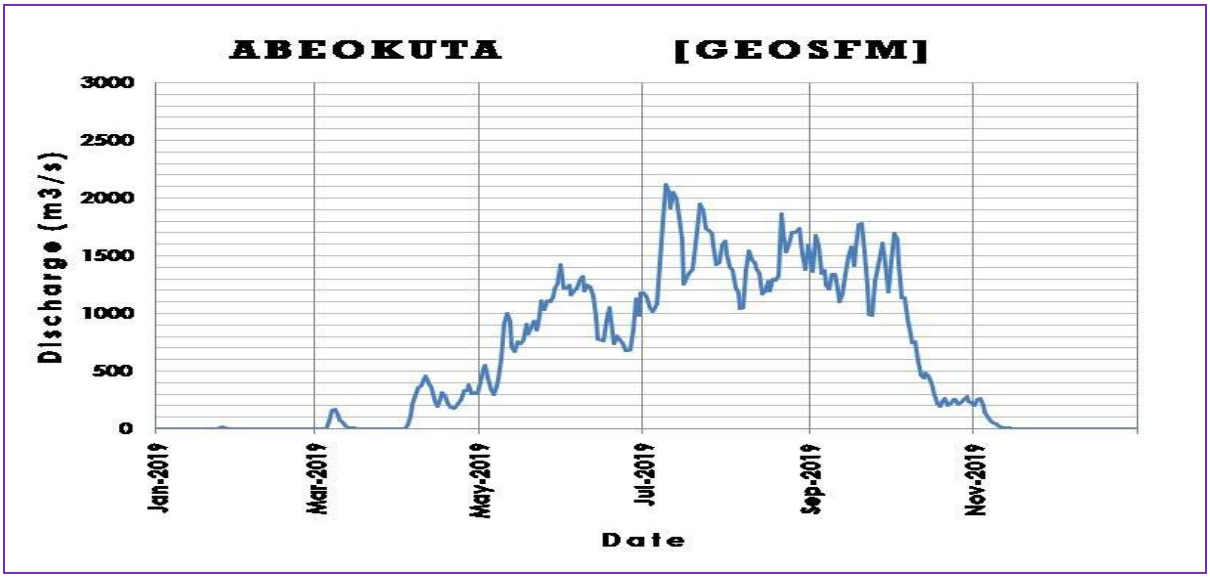

Fig. 3.12: Simulated Flows at Abeokuta, River Ogun

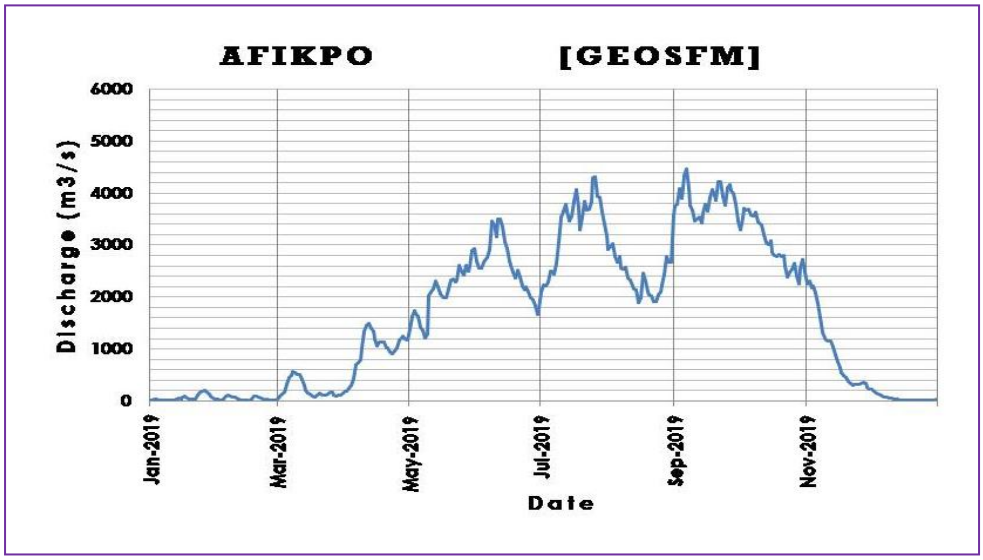

Fig.3.13: Simulated Flows at Afikpo, Cross-River

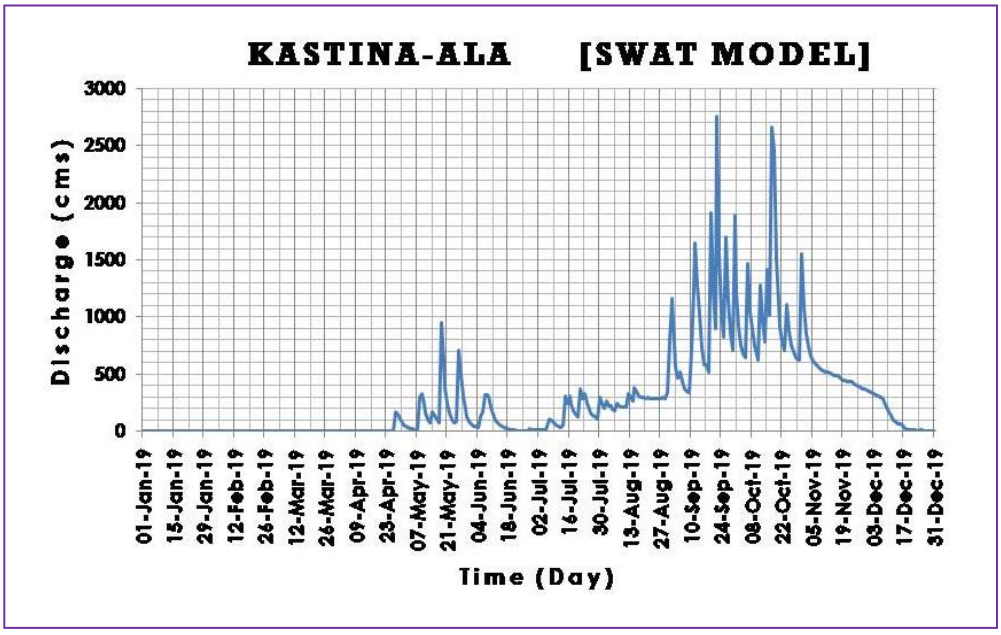

Fig. 3.14: Simulated Flows at Katsina-Ala, River Katsina-Ala

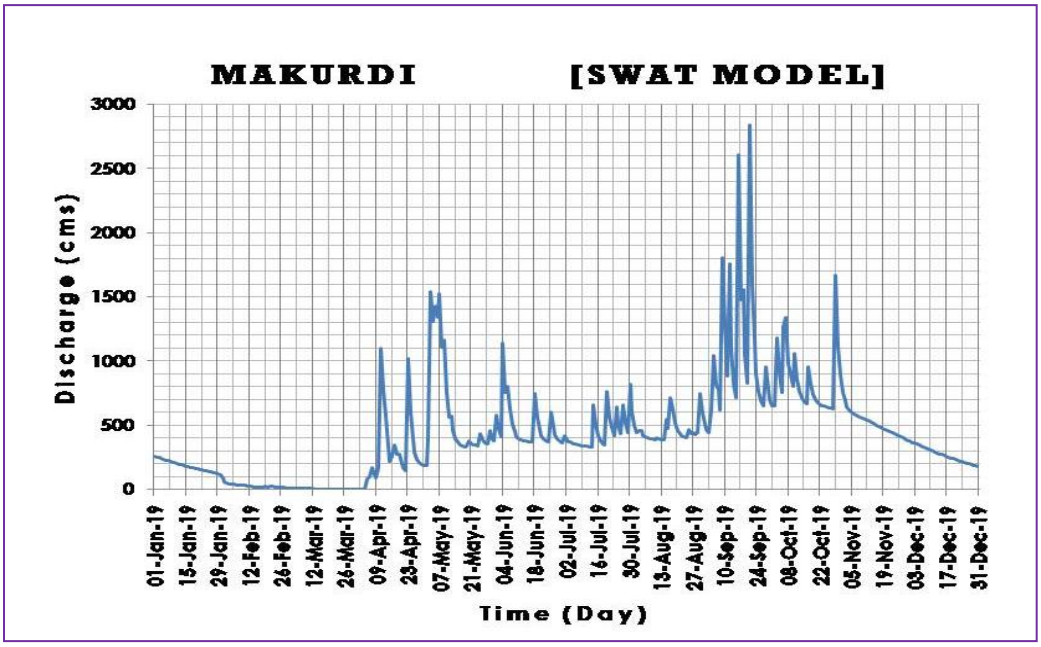

Fig. 3.15: Simulated Flows at Makurdi, River Benue

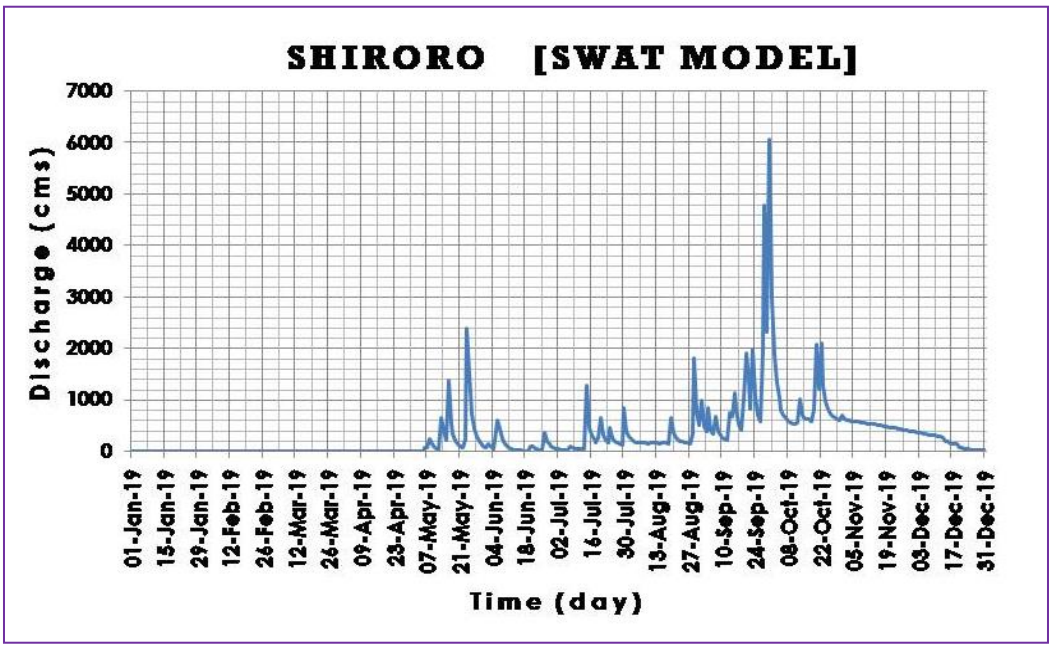

Fig. 3.16: Simulated Flows at Shiroro, River Kaduna

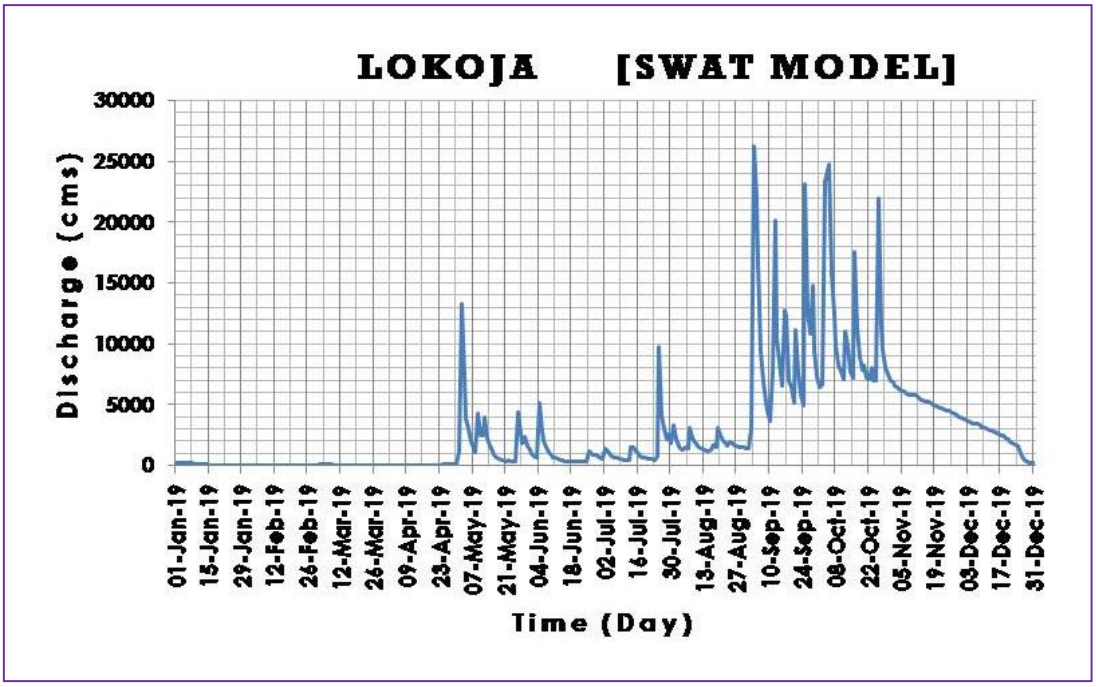

Fig. 3.17: Simulated Flows at Lokoja, River Niger

Fig. 3.18: Simulated Flows at Onitsha, River Niger

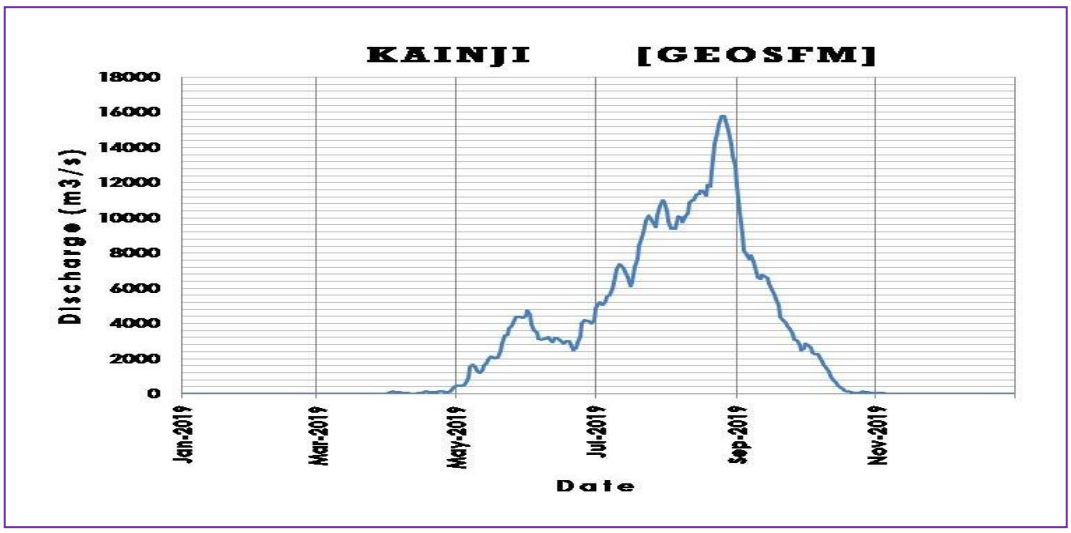

Fig. 3.19: Simulated Flows at Kainji, Niger-River

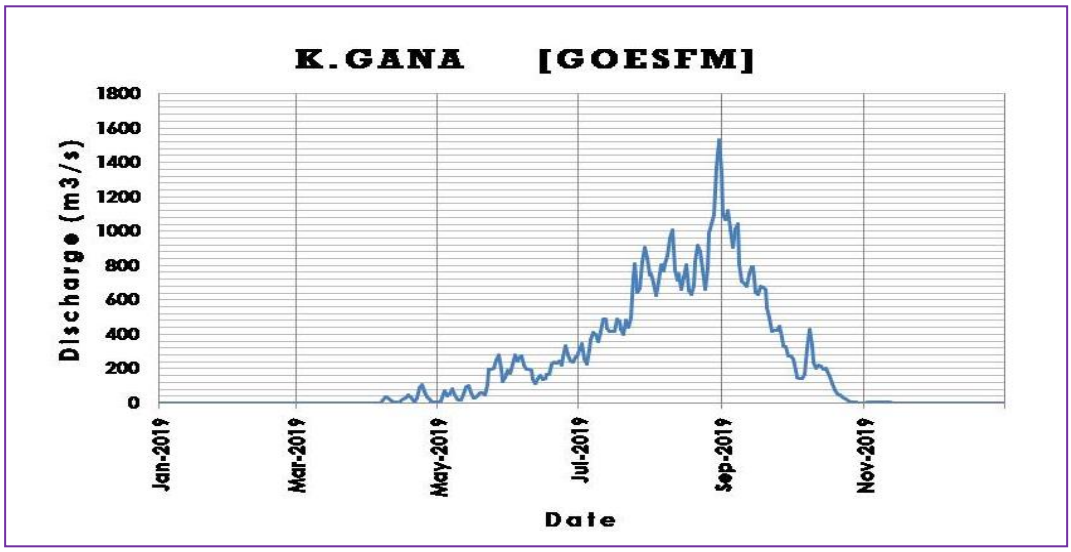

Fig. 3.20: Simulated Flows at Kafin Gana, River Komadugu Yobe

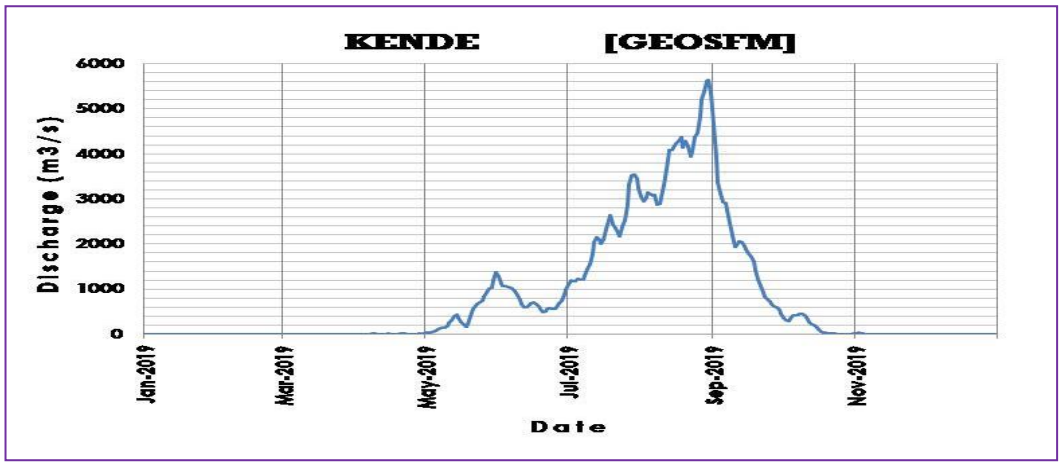

Fig. 3.21: Simulated Flows at Kende, River Rima

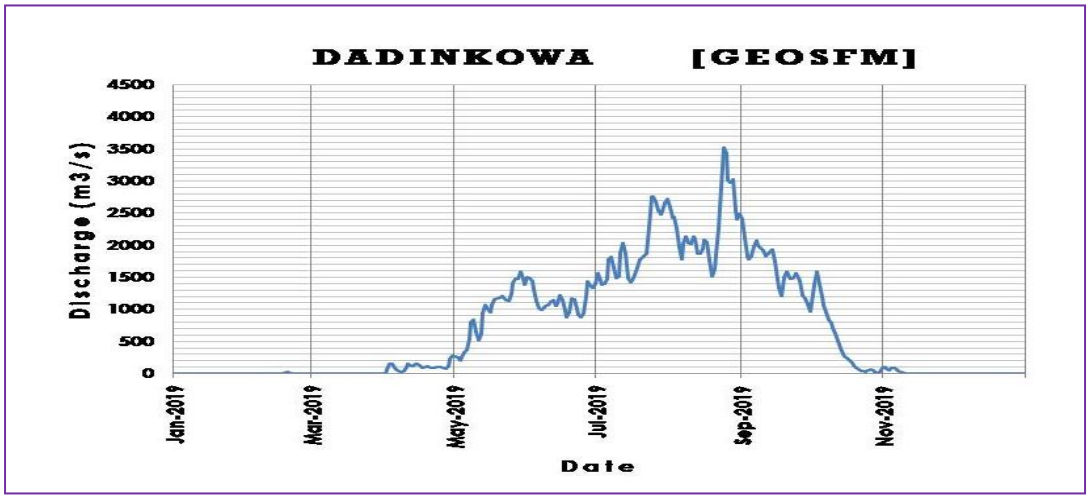

Fig. 3.22: Simulated Flows at Dadinkowa, River Gongola

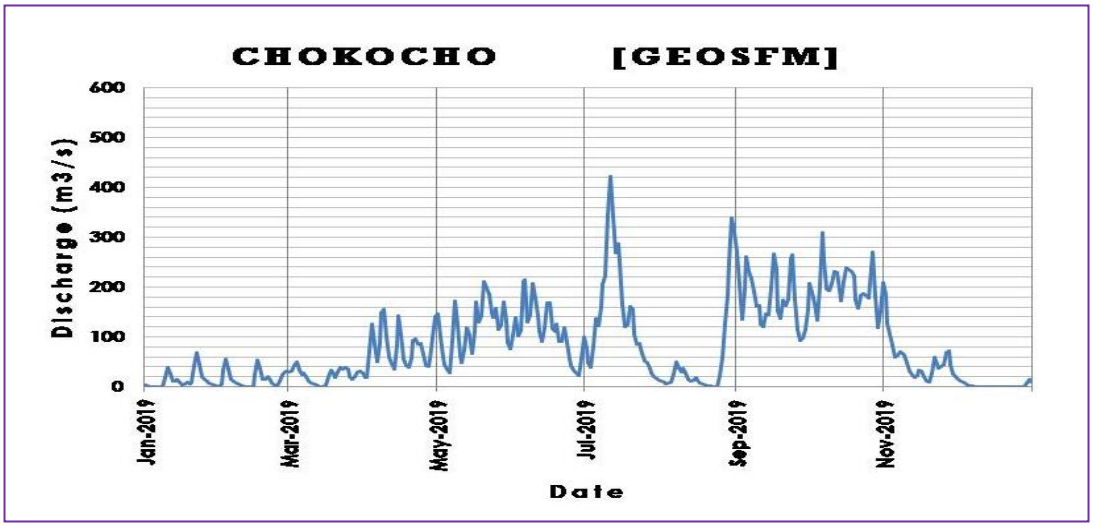

Fig. 3.23: Simulated Flows at Chokocho, River Otamiri

Fig. 3.24: Simulated Flows at Tiga, Kano River

Fig. 3.25: Simulated Flows at Ogun, River Ogun

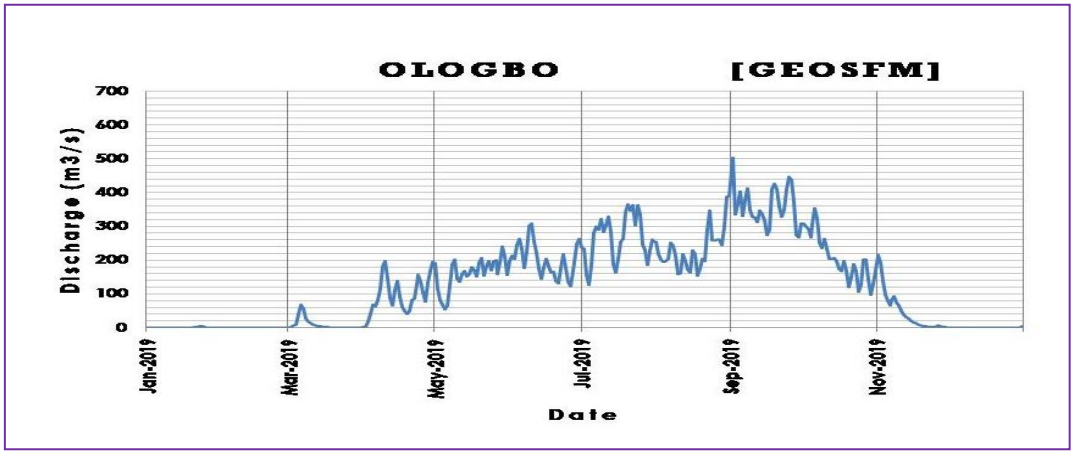

Fig. 3.26: Simulated Flows at Ologbo, River Ossiomo

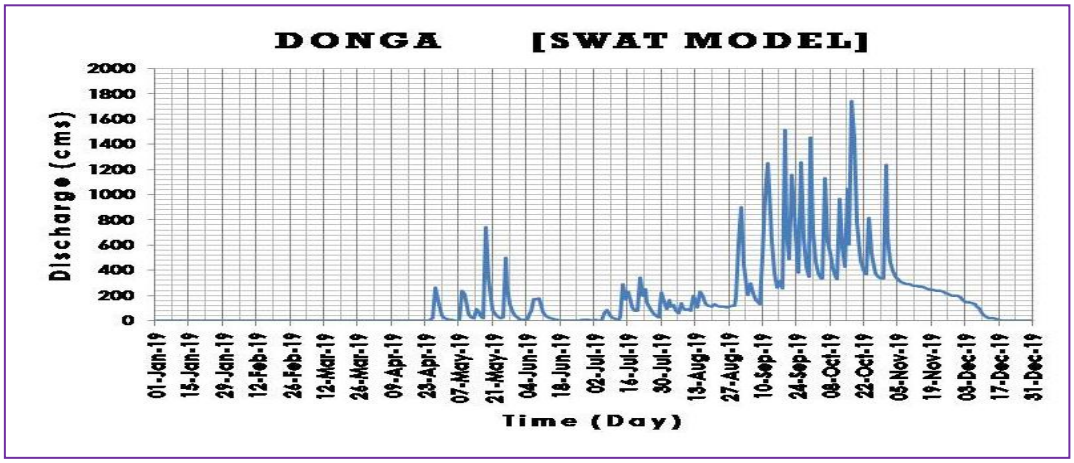

Fig. 3.27: Simulated Flows at Donga, River Donga

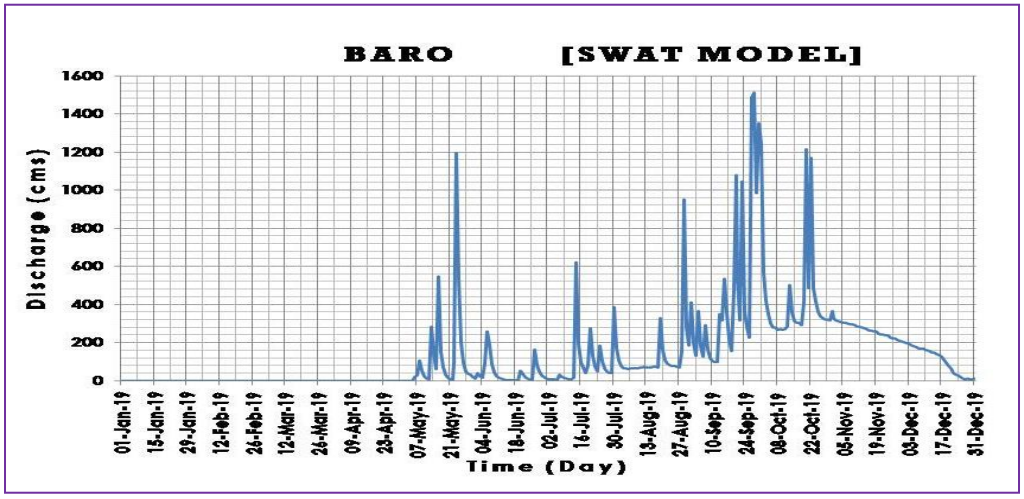

Fig. 3.28: Simulated Flows at Baro, River Niger

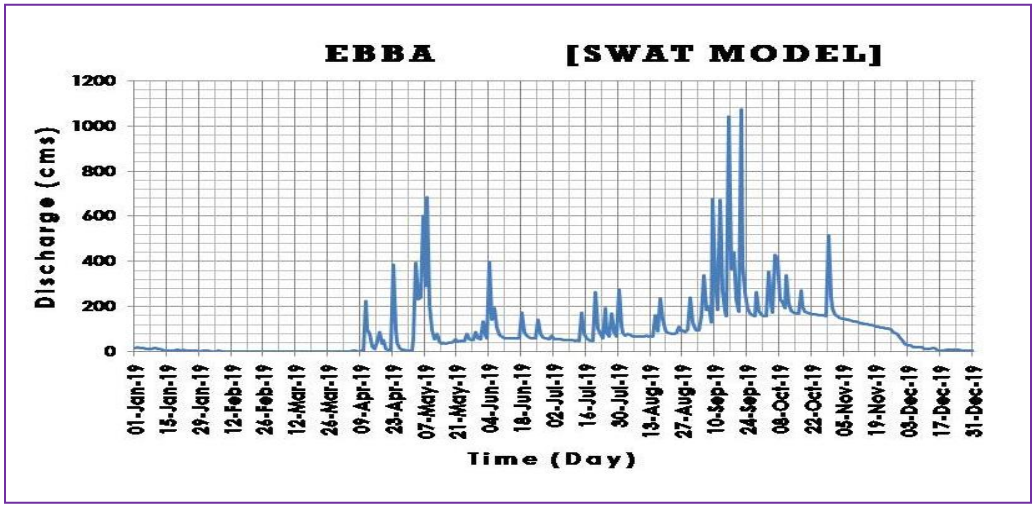

Fig. 3.29: Simulated Flows at Ebba, River Gbako

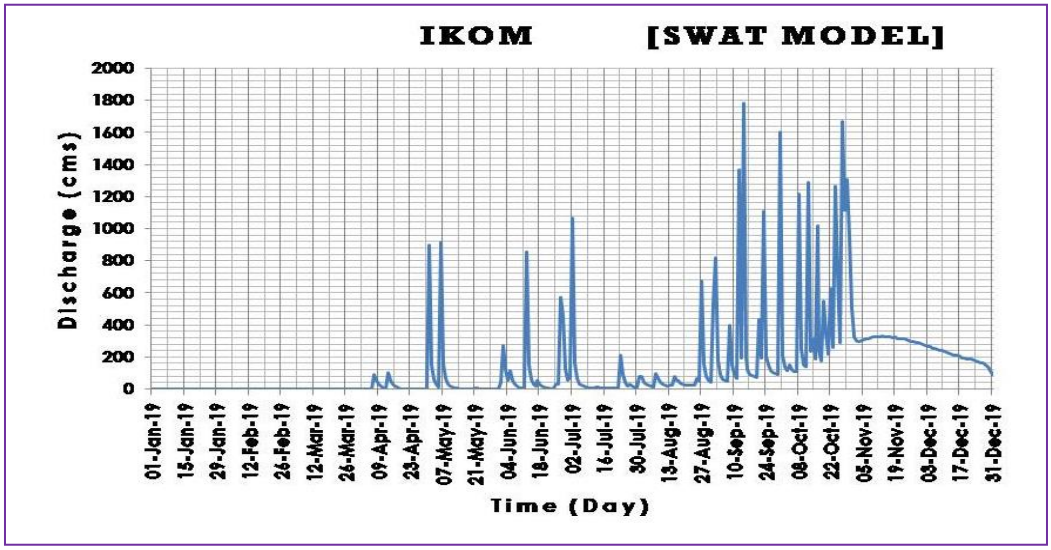

Fig. 3.30: Simulated Flows at Ikom, Cross River

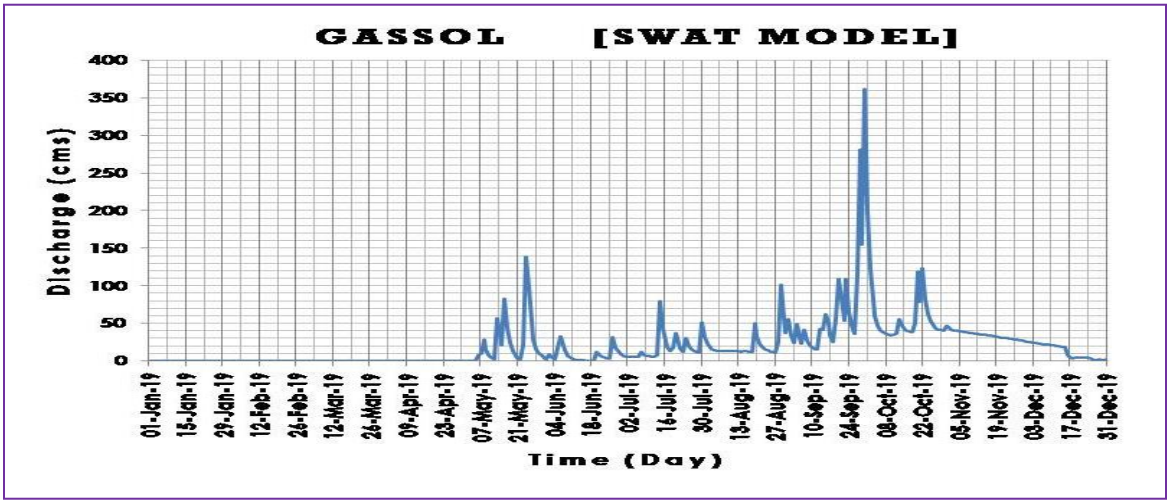

Fig. 3.31: Simulated Flows at Gassol, River Taraba

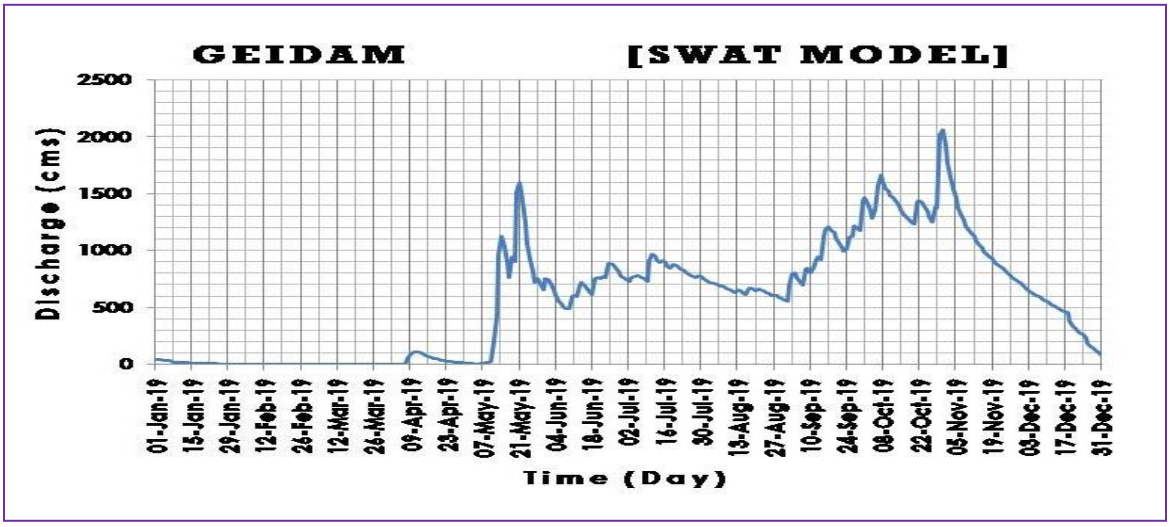

Fig. 3.32: Simulated Flows at Geidam, River Hadejia

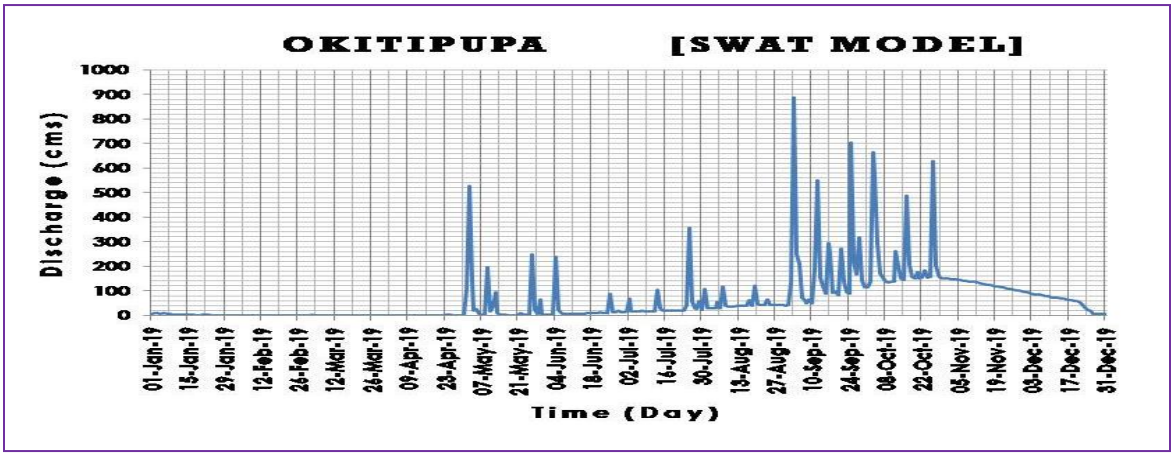

Fig. 3.33: Simulated Flows at Okitipupa, River Omi Nla

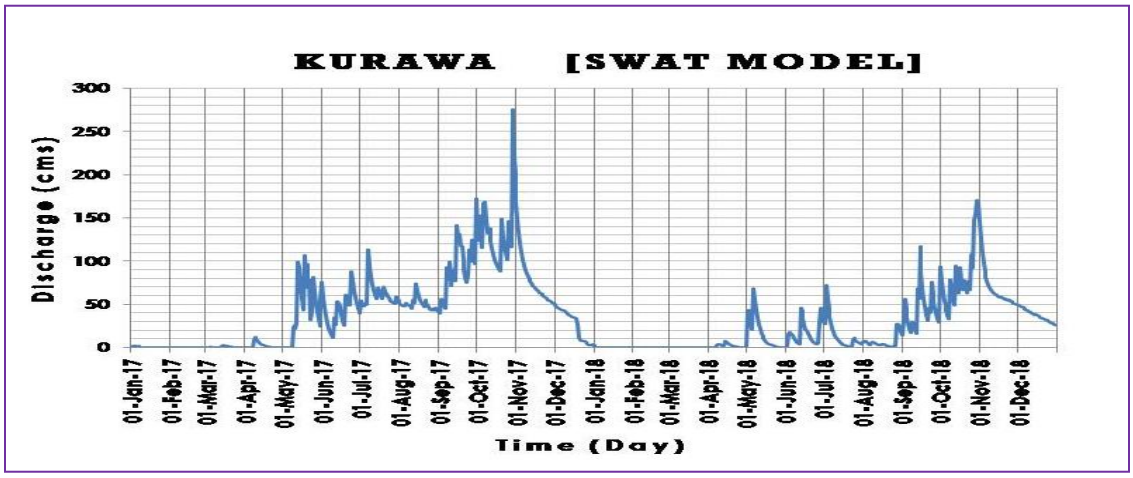

Fig. 3.34: Simulated Flows at Kurawa, River Bunsuru

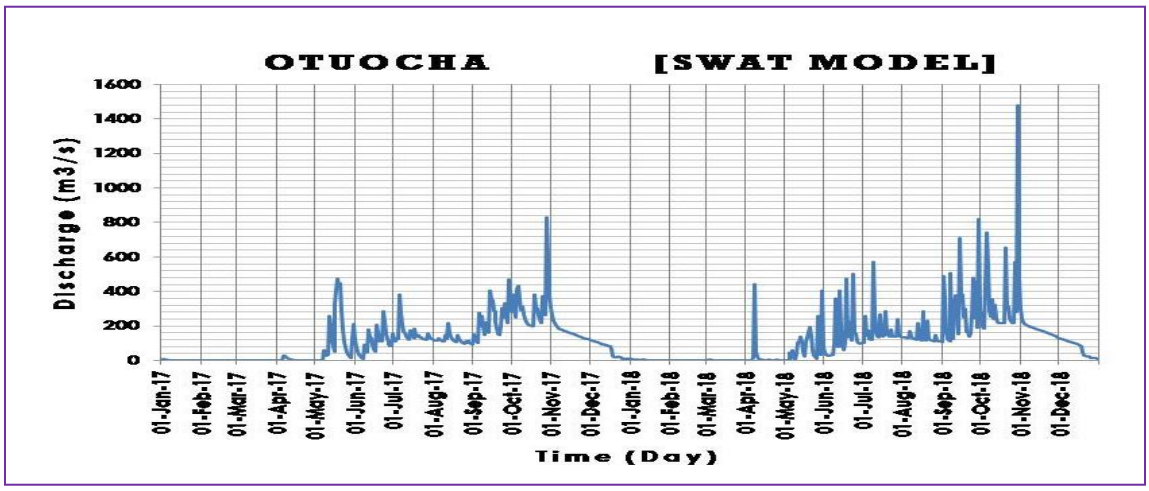

Fig. 3.35: Simulated Flows at Otuocha, River Niger

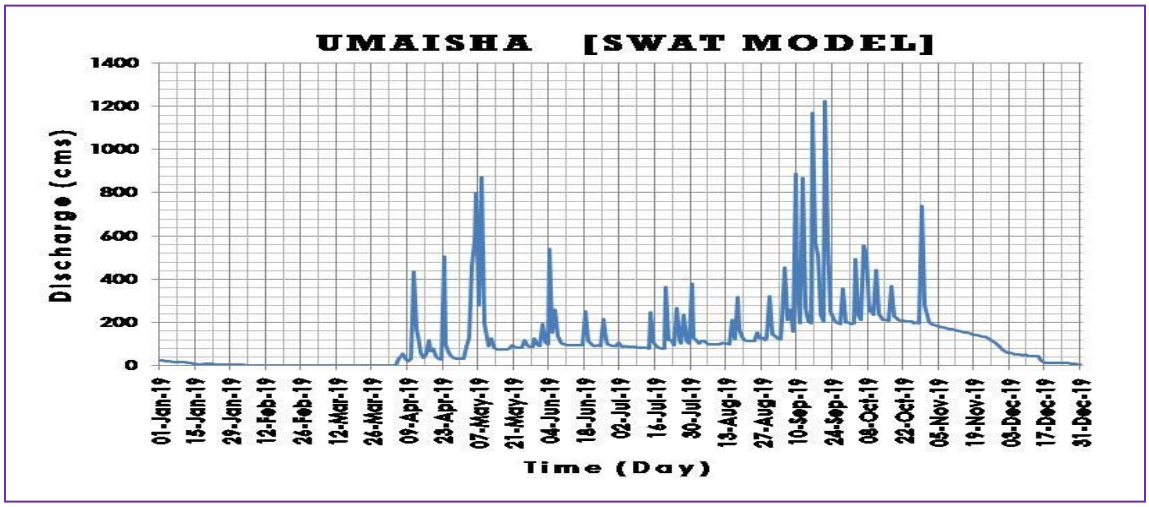

Fig. 3.36: Simulated Flows at Umaisha, River Niger

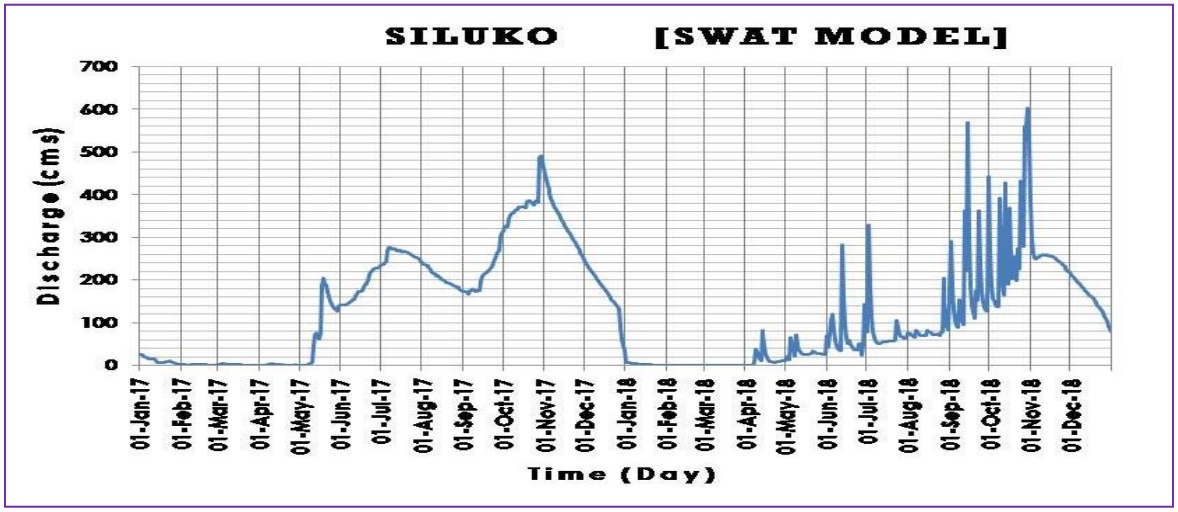

Fig. 3.37: Simulated Flows at Siluko, River Owena

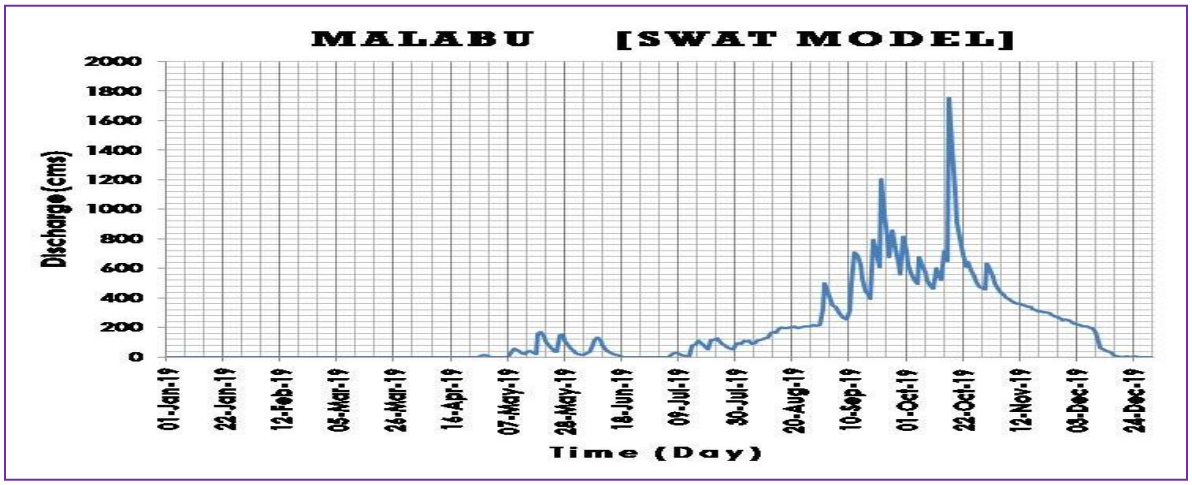

Fig. 3.38: Simulated Flows at Malabu, River Adamawa

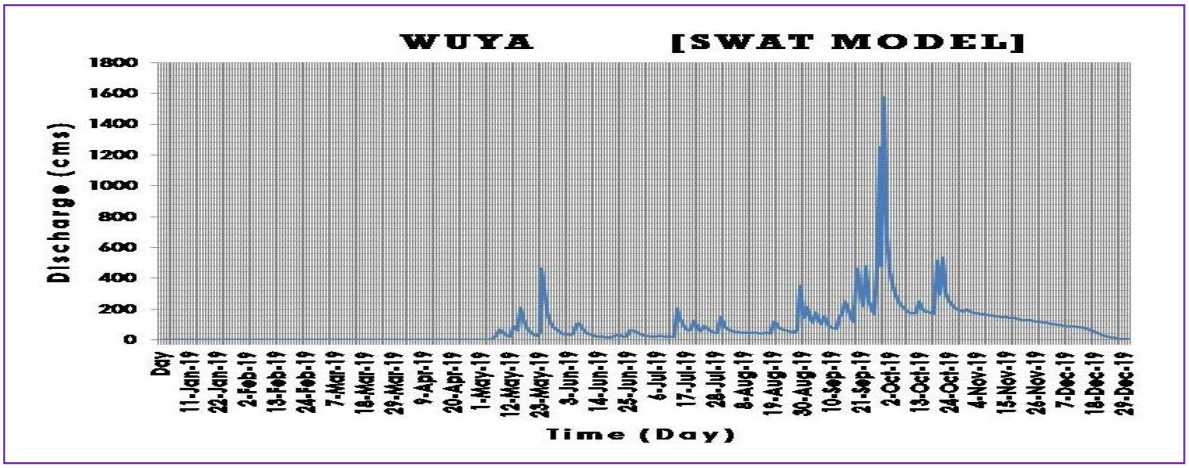

Fig. 3.39: Simulated Flows at Wuya, River Kaduna

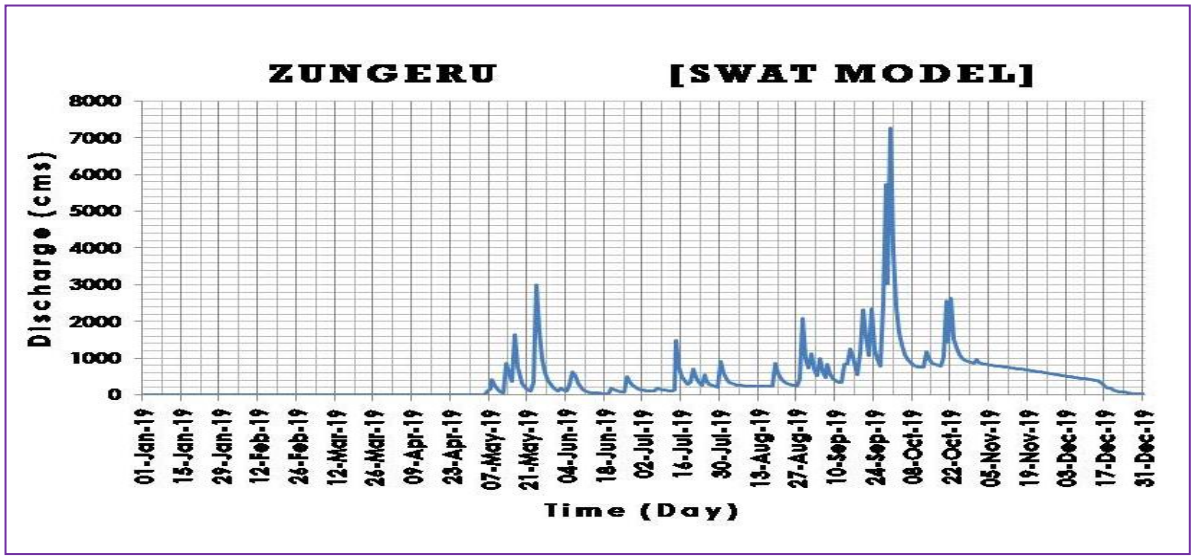

Fig. 3.40: Simulated Flows at Zungeru, River Niger

From the hydrographs as seen in figures '3.12 – 3.40", a steady rise in discharge rate and water level is expected from May, June to July and a Peak flow between September and October along the nation's Major river channels.

4.0 CONCLUSION AND RECOMMENDATION.

Flooding is multi- dimensional in causes and effects; it is a global phenomenon that has increased in frequency over years. Impending climate change and anthropogenic activities exacerbate flooding.

In predicting flood occurrence and mitigation of flood hazards understanding the hydro-meteorological and catchment processes is essential. Imaginative and innovation management approaches should be encouraged and applied in the planning and management of flood. The most sustainable approach in dealing with flooding are to put in place measures to manage the hazards and eventually adapt and learn to live with floods.

Hydrologic modeling and simulation are indispensable tools in water resources management and should continue to be adopted and applied in flood forecasting and risk management. Beginning from the maiden edition of the publication of the AFO two modeling tools have been appreciatively effective (SWAT and GeoSFM).

The concept of AFO should feature prominently in planning and development processes of critical sectors of the economy namely: Agriculture, Aviation, Water Resources, Power, Health, Environment and Education amongst others.

The synergy between Nigeria Hydrological Services Agency, stakeholders and other collaborative agencies should be encouraged. The effective management of flood risk should be a collective responsibility of all stake holders from individual, Local, State and Federal levels.

Furthermore, there should be in place, programmes to: enhance resilience (insurance; compensation, economic empowerment, education and awareness) flood forecasting and warning, floodplain mapping and catchment management plans, innovative building and construction schemes, enactment and enforcement of planning laws.

Governments at various levels should also put in place measures for better town planning, effective flood disaster management in the changing environment, improved biodiversity and ecosystem management for the enhancement of rapid and sustainable development in the country.

The States should create retention basins for harvesting flood waters downstream of major rivers where there is scarcity of groundwater thereby using this flood waters for possible groundwater recharge and other uses. By so doing the fresh flood waters will not be lost to the sea to become saline water.

Finally, it's advised that the predictions of flood for 2019 AFO be adhered to and all recommendations heeded. From the prediction, Thirty-Six States including F.C.T are expected to experience different levels of flooding. Out of the 774 local

government areas of the country, seventy-four (74) are predicted to be highly probable while two hundred and seventy-nine (279) local government areas are probable areas of flood and four hundred and twenty-one, (421) are predicted to be less probable.

Glossary

5.1 Annual rainfall amount – This is the total amount of rainfall observed and recorded in the year under reference.

5.2 Anthropogenic - It describes changes in nature made by people. If your town has rerouted water from the river for drinking water, that is an anthropogenic activity.

5.3 Basin - It is an area of land that is lower at the centre than at the edges, especially one from which water runs down into a river. It is also large, bowl-shaped depression in the surface of the land or ocean floor.

5.4 Catchment - A structure, such as a basin or reservoir, used for collecting or draining water.

5.5 Climate change – It is a non-random change in climate that is measured over several decades or longer, which may be due to natural or human-induced causes.

5.6 Coastal inundation – A type of flooding which occurs when water is driven onto land from an adjacent body of water such as the sea or ocean.

5.7 Discharge - It is the volume rate of water flow per unit time, including any suspended solids (e.g. sediment), solute, and/or biological material (e.g. diatoms), which is transported by the water.

5.8 Flash flood - It is a rapid flooding of geomorphic low-lying areas: washes, rivers, dry lakes and basins. It may be caused by heavy rainassociated with a severe thunderstorm, hurricane, tropical storm, or melt water from ice or snow flowing over ice sheets or snowfields.

5.9 Flood - A flood is an event where the river channel becomes inadequate to contain the flow, leading to overtopping of banks and the inundation of parts of the environment. The term has been extended to situations where, due to high imperviousity and relative low-lying nature of an area, overland flow stagnates in, and inundates such zones. Flooding associated with high-magnitude storm events, overtopping of river banks, high surface imperviousity, low elevation areas, and unrestrained/sustained inundation of communities.

5.10 Floodplains -. A floodplain is the strip of very low relative relief alluvial plain that borders a river channel and is usually bounded on the channel side by levees – discontinuous, wedge-shaped ridges around active and abandoned channels, and on the landward side by bluffs and uplands. It is subject to periodic inundation particularly during seasonal floods, and comprises river channels, ox-bow lakes, levees, and terraces (Bridge 2003).

5.11 Global warming – An overall increase in the world temperatures, which may be caused by additional heat being trapped by greenhouse gases mostly as a result of human activities.

5.12 Hydrology- Hydrology is the study of the occurrence, circulation and distribution of fresh water (i.e. water with total solute load less than 1000 mg L^{-1}) on the surface of the earth. It also investigates the physical and chemical properties of the water and its interactions with man and his environment. A practitioner of hydrology is a hydrologist, working within the fields of earth or environmental science, physical geography, geology or civil and environmental engineering.

5.13 Inundation - It is the covering of the land by water as a result of flood or construction of a dam across a river.

5.14 Meteorology - It is the interdisciplinary scientific study of the atmosphere. Meteorological phenomena are observable weather events which illuminate, and are explained by the science of meteorology. Those events are bound by the variables that exist in Earth's atmosphere; temperature, air pressure, water vapor, and the gradients and interactions of each variable, and how they change in time. Different spatial scales are studied to determine how systems on local, regional, and global levels impact weather and climatology.

5.15 Morphology - It is a scientific study of form and structure, usually without regard to function.

5.16 Permeability – It is a process whereby water percolates into the ground through the interconnected pores and spaces in a rock.

5.17 Precipitation - as any product of the condensation of atmospheric water vapour that falls to the earth under gravity. The main forms of precipitation include drizzle, rain, sleet, snow and hail. Precipitation occurs when a local portion of the atmosphere becomes saturated with water vapour, so that the water condenses and precipitates.

5.18 Surface Runoff – **Surface runoff** (also known as **overland flow**) is the flow of water that occurs when excess storm water, melt water, or other sources flows over the earth's surface. This might occur because soil is saturated to full capacity. It can also occur because rain arrives more quickly than soil can absorb it.

5.19 Telemetric - It is a technology that involves the automatic measurement and transmission of data from remote sources.

5.20 Topography - This is a detailed map of the surface features of land. It includes the mountains, hills, creeks, and other physical features on the earth's surface.

5.21 Transboundary Aquifer Systems (TAS) - It can also be referred to as Internationally Shared Aquifer Systems. This is a situation where water bearing rock formations (aquifers) underlie two or more countries

ACRONYMS

- **ACMAD** : African Centre for Meteorological Application for Development
- **AFO**: Annual Flood Outlook
- **AGRHYMET** : Agro–meteorology and Operational Hydrology and their Applications
- **AMESD** : African Monitoring of Environment for Sustainable Development
- **ArcGIS** : Arc Geographic Information System
- **CHIRPS** : Climate Hazards Group Infra-Red Precipitation with Stations
- **DAR** : Deviation of Length of Rainy Season
- **DCP** : Data Collection Platform
- **DEM** : Digital Elevation Model
- **FEWSNET** : Famine Early Warning System Network
- **FME** : Federal Ministry of Environment
- **FMWR** : Federal Ministry of Water Resources
- **GeoSFM**: Geospatial Flow Model
- **HA** : Hydrological Area
- **HKYTF** : Hadejia Komadugu Yobe Trust Fund

- **JICA** : Japanese International Cooperation Agency
- **NASA** : National Aeronautic and Space Agency
- **NASRDA** : National Space Research and Development Agency
- **NBA** : Niger Basin Authority
- **NEMA** : National Emergency Management Agency
- **NIHSA** : Nigeria Hydrological Services Agency
- **NiMet** : Nigeria Meteorological Agency
- **NIWA** : National Inland Waterways Authority
- **NIWRMC** : Nigeria Integrated Water Resources Management Commission
- **NWRI** : National Water Resources Institute
- **OSGOF** : Office of the Surveyor General of the Federation
- **PET** : Potential Evapotranpiration
- **RBDAs** : River Basin Development Authorities
- **SRP** : Seasonal Rainfall Prediction
- **SRTM** : Shuttle Radar Topography Mission
- **SWAT** : Soil and Water Assessment tool
- **WFP** : World Food Programme
- **USGS** : United State Geological Survey

REFERENCES

Association American of Geographers 1969. *Perspectives on geomorphic processes*. Commission on College Geography Resource Paper No. 3. AAG, Washington D.C. 56p

Bridge J.S. 2003. *Rivers and floodplains: forms, processes and sedimentary record*. Blackwell Publishing Co. Oxford. 491p

IPCC - Intergovernmental Panel on Climate Change (2007). ***Fourth Assessment Report (AR4)*** *Climate Change 2007*: *The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.) Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 996 pp

Ogunkoya O.O. (2017) Physiography of Nigeria. *TheNigerian Field* 82 (2017)

APPENDIX 1

LIST OF FLOODED LGAs IN 2018 FLOODED LGAs IN 2018

S/N	State	LGA	Source
1	Adamawa	Guyuk	Vanguard 18th Aug
2	Adamawa	Lamurde	Vanguard 18th Aug
3	Adamawa	Song	Vanguard 18th Aug
4	Adamawa	Yola North	Vanguard 18th Aug
5	Adamawa	Yola South	Vanguard 18th Aug
6	Anambra	Aghamelum	Vanguard 19th Sept
7	Anambra	Anambra East	Vanguard 19th Sept
8	Anambra	Anambra West	Vanguard 19th Sept
9	Anambra	Awka North	Vanguard 19th Sept
10	Anambra	Ekwusigo	Vanguard 19th Sept
11	Anambra	Idemili South	Vanguard 19th Sept
12	Anambra	Ihiala	Vanguard 19th Sept
13	Anambra	Ogbaru	Vanguard 19th Sept
14	Anambra	Onitsha North	Vanguard 19th Sept
15	Anambra	Onitsha South	Vanguard 19th Sept
16	Anambra	Oyi	Vanguard 19th Sept
17	Bayelsa	Brass	Vanguard 28th Sept
18	Bayelsa	Ekeremor	Vanguard 28th Sept
19	Bayelsa	Kolokuma/Opokuma	Vanguard 28th Sept
20	Bayelsa	Nembe	Vanguard 28th Sept
21	Bayelsa	Ogbia	Vanguard 28th Sept
22	Bayelsa	Sagbama	Vanguard 28th Sept
23	Bayelsa	Southern Ijaw	Vanguard 28th Sept
24	Bayelsa	Yenagoa	Vanguard 28th Sept
25	Benue	Agatu	Vanguard 19th Sept
26	Benue	Bukuru	Vanguard 19th Sept
27	Benue	Guma	Vanguard 19th Sept
28	Benue	Logo	Vanguard 19th Sept
29	Benue	Makurdi	Vanguard 19th Sept
30	Benue	Tarka	Vanguard 19th Sept
31	Cross River	Boki	Vanguard 11th Aug
32	Cross River	Calabar Municipality	Premium Times 13Sept
33	Cross River	Calabar South	Vanguard 11 Aug
34	Cross River	Ogoja	Premium Times 13Sept
35	Cross River	Yala	Vanguard 11Aug
36	Delta	Aniocha South	Vanguard 5th Sept, Guardian 25 sept
37	Delta	Bomadi	Vanguard 5th Sept, Guardian 25 sept
38	Delta	Burutu	Vanguard 5th Sept, Guardian 25 sept
39	Delta	Ethiope West	Vanguard 5th Sept, Guardian 25 sept

40	Delta	Isoko North	**Vanguard 5 Sept, Guardian 25** sept
41	Delta	Isoko South	Vanguard 5th Sept, Guardian 25th sept
42	Delta	Ndokwa East	Vanguard 5th Sept, Guardian 25th sept
43	Delta	Ndokwa West	Vanguard 5th Sept, Guardian 25th sept
44	Delta	Oshimili South	Vanguard 5th Sept, Guardian 25th sept
45	Delta	Patani	Vanguard 5th Sept, Guardian 25th sept
46	Delta	Ughelli North	Vanguard 5th Sept, Guardian 25th sept
47	Delta	Ughelli South	Vanguard 5th Sept, Guardian 25th 25th sept
48	Delta	Ukwuani	Vanguard 5th Sept, Guardian 25th sept
49	Delta	Warri North	Vanguard 5th Sept, Guardian 25th sept
50	Ebonyi	Afikpo North	Blueprint 31st July
51	Ebonyi	Afikpo South	Blueprint 31st July
52	Ebonyi	Ohaozara	Blueprint 31st July
53	Edo	Esan South	Thisday 17th Sept, Leadership 9th Nov
54	Edo	Etsako East	Thisday 17th Sept, Leadership 9th Nov
55	Enugu	Enugu East	Eagle online 21st Sept
56	Enugu	Ezeagu	Eagle online 21st Sept
57	Enugu	Igbo-Etiti	Eagle online 21st Sept
58	Enugu	Igbo-Eze South	Eagle online 21st Sept
59	Enugu	Nkanu East	Eagle online 21st Sept
60	Enugu	Nsukka	Eagle online 21st Sept
61	Enugu	Uzo-Uwani	Eagle online 21st Sept
62	FCT	Municipal	Thisday 15th Oct
63	Gombe	Balanga	Vanguard 31st March, PremiumTimes 13th Sept
64	Gombe	Billri	Vanguard 31st March, PremiumTimes 13th Sept
65	Gombe	Gombe	Vanguard 31st March, PremiumTimes 13th Sept
66	Imo	Oguta	Thisday 15th Oct
67	Imo	Ohaji/Egbema	Thisday 15th Oct
68	Imo	Owerri	Thisday 15th Oct
69	Imo	Owerri-West	Thisday 15th Oct
70	Jigawa	Ayu	The Sun, 6th Sept
71	Jigawa	Birnin-Kudu	The Sun, 6th Sept
72	Jigawa	Dutse	The Sun, 6th Sept
73	Jigawa	Guri	The Sun, 6th Sept

74	Jigawa	Hadejia	The Sun, 6th Sept
75	Jigawa	Jahun	The Sun, 6th Sept
76	Jigawa	Kaugama	The Sun, 6th Sept
77	Jigawa	Malam-Maduri	The Sun, 6th Sept
78	Jigawa	Miga	The Sun, 6th Sept
79	Jigawa	Ringim	The Sun, 6th Sept
80	Jigawa	Taura	The Sun, 6th Sept
81	Kaduna	Chikun	Vanguard 24th Aug, The Nation 15th Sept
82	Kaduna	Igabi	Vanguard 24th Aug, The Nation 15th Sept
83	Kaduna	Kaduna North	Vanguard 24th Aug, The Nation 15th Sept
84	Kaduna	Kaduna South	Vanguard 24th Aug, The Nation 15th Sept
85	Kaduna	Kaura	Vanguard 24th Aug, The Nation 15th Sept
86	Kano	Danbatta	Daily Trust 17th Sept, Leadership 09th Sept
87	Kano	Dawakin Tofa	Daily Trust 17th Sept, Leadership 09th Sept
88	Kano	Gabasawa	Daily Trust 17 Sept, Leadership 09 Sept
89	Kano	Gaya	Daily Trust 17 Sept, Leadership 09 Sept
90	Kano	Gezawa	Daily Trust 17th Sept, Leadership 09th Sept
91	Kano	Gwarzo	Daily Trust 17th Sept, Leadership 09th Sept
92	Kano	Kabo	Daily Trust 17th Sept, Leadership 09th Sept
93	Kano	Kiru	Daily Trust 17th Sept, Leadership 09th Sept
94	Kano	Nassarawa	Daily Trust 17th Sept, Leadership 09th Sept
95	Kano	Rimin Gado	Daily Trust 17th Sept, Leadership 09th Sept
96	Kano	Tofa	Daily Trust 17th Sept, Leadership 09th Sept
97	Kano	Warawa	Daily Trust 17th Sept, Leadership 09th Sept
98	Kano	Wudil	Daily Trust 17th Sept, Leadership 09th Sept
99	Katsina	Bakori	Thisday 17th July, Guardian 14th Sept
100	Katsina	Batsari	Thisday 17th , Guardian 14th Sept
101	Katsina	Baure	Thisday 17th , **Guardian 14th Sept**
102	Katsina	Daura	**Thisday 17th July, Guardian 14 Sept**

103	Katsina	Dutsinma	Thisday 17th July, Guardian 14 Sept
104	Katsina	Faskari	Thisday 17th July, Guardian 14 Sept
105	Katsina	Jibia	Thisday 17th July, Guardian 14 Sept
106	Katsina	Kaita	Thisday 17th, Guardian 14th Sept
107	Katsina	Kankia	Thisday 17th July, Guardian 14th Sept
108	Katsina	Kurfi	Thisday 17th July, Guardian 14th Sept
109	Katsina	Kusada	Thisday 17th July, , Guardian 14th Sept
110	Katsina	Maiadua	Thisday 17th July, Guardian 14th Sept
111	Katsina	Mashi	Thisday 17th July, Guardian 14th Sept
112	Katsina	Musawa	Thisday 17th July, Guardian 14th Sept
113	Katsina	Rimi	Thisday 17th July, Guardian 14th Sept
114	Katsina	Sandamu	Thisday 17th July, Guardian 14th Sept
115	Katsina	Zango	Thisday 17th July, Guardian 14th Sept
116	Kebbi	Argungu	Vanguard Aug, 16th
117	Kebbi	Augie	Vanguard Aug, 16th
118	Kebbi	Bagudo	Vanguard Aug, 16th
119	Kebbi	Birnin Kebbi	Vanguard Aug, 16th
120	Kebbi	Bunza	Vanguard Aug, 16th
121	Kebbi	Dandi	Vanguard Aug, 16th
122	Kebbi	Danko Wasagu	Vanguard Aug, 16th
123	Kebbi	Fakai	Vanguard Aug, 16th
124	Kebbi	Ngaski	Vanguard Aug, 16th
125	Kebbi	Shanga	Vanguard Aug, 16th
126	Kebbi	Yauri	Vanguard Aug, 16th
127	Kebbi	Zuru	Vanguard Aug, 16th
128	Kogi	Ajaokuta	Vanguard Sept, 1st
129	Kogi	Bassa	Vanguard Sept, 1st
130	Kogi	Ibaji	Vanguard Sept, 1st
131	Kogi	Idah	Vanguard Sept, 1st
132	Kogi	Igala Mela	Vanguard Sept, 1st
133	Kogi	Ijumu	Vanguard Sept, 1st
134	Kogi	Kogi	Vanguard Sept, 1st
135	Kogi	Kogi Lokoja	Vanguard Sept, 1st
136	Kogi	Ofu	Vanguard Sept, 1st
137	Kogi	Omala	Vanguard Sept, 1st

138	Kwara	Baruten	Thisday 28th Oct, Punch 17th Sept
139	Kwara	Edu	Thisday 28th Oct, Punch 17th Sept
140	Kwara	Ilorin West	Thisday 28th Oct, Punch 17th Sept
141	Kwara	Kaiama	Thisday 28th Oct, Punch 17th Sept
142	Kwara	Moro	Thisday 28th Oct, Punch 17th Sept
143	Kwara	Pategi	Thisday 28th Oct, Punch 17th Sept
144	Lagos	Alimosho	PM News Oct, 29th
145	Niger	Agaie	Premium Time Sept 15th
146	Niger	Bida	Premium Time Sept 15th
147	Niger	Edati	Premium Time Sept 15th
148	Niger	Katcha	Premium Time Sept 15th
149	Niger	Kontagora	Premium Time Sept 15th
150	Niger	Lapai	Premium Time Sept 15th
151	Niger	Lavun	Premium Time Sept 15th
152	Niger	Mariga	Premium Time Sept 15th
153	Niger	Mokwa	Premium Time Sept 15th
154	Niger	Shiroro	Premium Time Sept 15th
155	Niger	Suleja	Premium Time Sept 15th
156	Ogun	Abeokuta North	Presidential Committee on Flood July, 13th
157	Ogun	Abeokuta South	Presidential Committee on Flood July, 13th
158	Ogun	Ogun-Waterside	Presidential Committee on Flood July , 13th
159	Ondo	Akoko North East	Punch July 27th
160	Ondo	Ilaje	The Cable July 18th
161	Rivers	Ahoada East	Vanguard Sept, 25th
162	Rivers	Ahoada West	Vanguard Sept, 25th
163	Rivers	Obio/Akpor	Vanguard Sept, 25th
164	Rivers	Ogba/Egbema/Ndoni	Vanguard Sept, 25th
165	Rivers	Oyigbo	Vanguard Sept, 25th
166	Rivers	Port Harcourt	Vanguard Sept, 25th
167	Taraba	Gassol	Punch Sept, 26th
168	Taraba	Wukari	The Eagle Net Online Sept, 19th
169	Yobe	Damaturu	The Nation July, 18th
170	Yobe	Tarmuwa	Premium Times Nigeria July, 25th
171	Zamfara	Gummi	The Sun Sept, Sept, 16th
172	Zamfara	Maru	Leadership July, 26th

(Other Sources are: On-Field Assessment by NIHSA Staff, United Nations Institute for Training and Research Imagery, Acaps brief note I & II reports 2018, NEMA Situation Report No. 4 NE0C)

APPENDIX 2

LIST OF HIGHLY PROBABLE FLOOD RISK AREAS IN 2019

S/N	STATE	LGAs
1	Abia	Ukwa West
2	Adamawa	Guyuk, Lamurde, Anambra East, Anambra West
3	Anambra	Ayamelum
4	Bauchi	Tafawa-B, Toro
5	Bayelsa	Brass, Kolokuma/Opokuma, Nembe, Ogbia, Southern Ijaw
6	Benue	Tarka
7	Borno	Kala/Balge, Monguno, Nganzai
8	Cross River	Abi, Calabar South, Odukpani
9	Delta	Aniocha South, Burutu
10	Edo	Igueben
11	Federal Capital Territory	Kuje
12	Gombe	Yamaltu-Deba
13	Jigawa	Miga
14	Kaduna	Kauru, Soba
15	Kano	Dambatta, Takai, Tundun Wada
16	Katsina	Baure, Musawa, Zango
17	Kebbi	Dandi, Kalgo, Koko/Besse, Suru
18	Kogi	Bassa, Koton karfi, Olamabor
19	Kwara	Ekiti
20	Lagos	Alimosho, Ibeju/Lekki
21	Nassarawa	Awe, Obi
22	Niger	Borgu, Lapai, Mokwa, Shiroro, Wushishi
23	Ogun	AbeokutaNorth, OgunWaterside
24	Osun	Ila, Obokun
25	Oyo	Iseyin, Saki West, Surulere
26	Plateau	Jos East, Qua'anpa
27	Rivers	Degema, Obio/Akp, Ogba/Egbe
28	Sokoto	Sabon Birni, Tambawal, Wurno, Yabo
29	Taraba	Gassol, Wukari
30	Yobe	Geidam, Nguru, Gujba, Jakusko, Machina.

APPENDIX 3

LIST OF PROBABLE FLOOD RISK LGAs in 2019

S/N	STATE	LGAs
1	Abia	Ukwa East, Umuahia South, Umuahia North
2	Adamawa	Demsa, Yola South, Fufore, Gombi, Numan, Shelleng, Yola North
3	Akwa Ibom	Eastern Obolo, UrueOffo, Uruan, Udung Uko, Oron, Onna, Okobo, Nsit Atai, Mbo, Itu, Ikot-Aba, Ibeno, Esit Eket, Eket
4	Anambra	Anaocha, Oyi, Orumba South, Orumba North, Ogbaru, Njikoka, Dunukofia, Awka South
5	Bauchi	Itas/Gad, Shira, Kirfi, Jama'are, Zaki
6	Bayelsa	Ekeremor, Yenegoa, Sagbama
7	Benue	Agatu, Makurdi, Logo, Katsina Ala, Guma, Buruku
8	Borno	Maiduguri, Shani, Lake chad
9	Cross River	Akpabuyo, Yala, Obubra, Ikom, Biase, Bakassi
10	Delta	Aniocha North, Bomadi, Ndokwa East, Ndokwa West, Oshimili North, Oshimili South, Patani, Udu, Ughelli South, Warri South, Warri South-West, Warri North
11	Ebonyi	Abakaliki, Ohaukwu, Ikwo, Ezza South, Ebonyi, Afikpo
12	Edo	Esan South, Etsako East
13	Ekiti	Efon, Irepodun/Ifelodun
14	Enugu	Enugu East, Udi, Oji-River, Enugu South
15	Federal Capital Territory	Abaji
16	Gombe	Balanga, Nafada, Kwami, Gombe, Funakaye, Dukku
17	Imo	Aboh-Mba, Unuimo, Owerri West, Owerri North, Owerri Municipal, Orlu, Okigwe, Obowo, Nkwerre, Njaba, Mbaitoli, Isu, Isiala Mbano, Ihitte/Uboma, Ideato North, Ideato South, Ezinihit
18	Jigawa	Auyo, Taura, Ringim, Malam Maduri, Maigatari, Kiyawa, KiriKasa, Kaugama, Kafin Hausa, Jahun, Gwaram, Guri, Dutse
19	Kaduna	Chikun, Kaura, Igabi, Kaduna South
20	Kano	Ajingi, Karaye, Kano, Kabo, Gwale, Gaya, Garum Mallam, Fagge, Dawakin Kowa, Dala, Bebeji, Albasu, Kibiya, Kumbotso, Kura, Madobi, Nassaraw, Rano, Rimin Gadu, Tarauni, Wudil, Warawa, Ungogo
21	Katsina	Katsina
22	Kebbi	Aleiro, Ngaski, Bunza, Birnin Kebbi, Bagudo, Augie, Argungu, Yauri, Shanga
23	Kogi	Ajaokuta, Lokoja, Igalamela-Odolu, Idah, Ibaji, Omala, Ofu
24	Kwara	Asa, Pategi, Oyun, Offa, Ilorin West, Edu
25	Lagos	Agege, Amuwo Odofin, Ajeromi/Ifelodun, Apapa, Badagary,

		Epe, Eti-Osa, Ifako/Ijaye, Ikeja, Ikorodu, Kosofe, Lagos Island, Mainland, Mushin, Ojo, Oshodi/Isolo, Surulere
26	Nassarawa	Doma, Toto, Nassarawa Egon, Nasarawa, Keffi, Keana
27	Niger	Agwara, Muya, Mashegu, Magama, Gbako, Edati, Bida
28	Ogun	Abeokuta South, Shagamu, Obafemi-Owode, Ipokia, Ijebu East, Ifo, Ewekoro
29	Ondo	Ese-Odo, Ilaje Eseodo, Ifedore
30	Osun	Ayedire, Osogbo, Orolu, Olorunda, Ola-Oluwa, Odo Otin, Isokan ,Iwo, Irepodun, Ilesha West, Ilesha East, Ifelodun, Egbedore, Ede South, Ede North
31	Oyo	Egbeda, Saki East, Oyo East, Ona Ara, Ogbomosho South, Lagelu, Kajola, Itesiwaju, Ibarapa North, IbadanSouth-West, Ibadan South-East, Ibadan South-East, Ibadan North, Ibadan North-West, Ibadan North-East
32	Plateau	Jos South
33	Rivers	Abua Odu, Tai, Oyigbo, Opobo Nkoro, Okrika, Ogu Bolo, Khana, Gokana, Etche, Bonny, Asari Toru, Andoni, Akuku toru, Ahoada West, Ahoada East, Port Harcourt
34	Sokoto	Bodinga, Wamakko, Tureta, Silame, Shagari, Rabah, Kware, Isa, Gwadabawa, Goronyo, Dange-Shuni
35	Taraba	Ardo-Kola, Lau, Karim Lamido, Jalingo, Ibi
36	Yobe	Bade, Yunusari, Karasuwa, Borsari
37	Zamfara	Bakura, Gusau, Bungudu, Birnin-Magaji/Kiyaw, Kaura-Namoda.