

https://dspace.org/

Vulnerability and adaptation to climate variability and extremes: A case study of flooding in Niger state, Nigeria

Eze, Jude Nwafor

2006-10-31T09:09:49Z
http://hdl.handle.net/10539/1517

Downloaded from a DSpace repository. https://dspace.org/

CHAPTER THREE

BACKGROUND TO THE STUDY AND METHODS

3.0 Introduction

The description of the geographical background of the study area in this chapter, takes into consideration the location/position of Nigeria, the relief and various environmental problems of the Niger State, the Kaduna River, and Shiroro local government area. Greater attention, however, is given to the Shiroro local government area in Niger State including a focus on biophysical and socio-economic vulnerability to flood events along the Kaduna River. In this chapter, the methods used in data collection, analysis and problems encountered in the field are also discussed.

3.1 Location/position of Nigeria

Nigeria is situated entirely within the tropical zone and is located between latitudes 4° and 14° north of the Equator and longitudes 3°and 15° east (Fig. 3.1). It is bounded on the west by the Republic of Benin, to the north by the Republic of Niger, to the east by the republic of Cameroon and to the south by Atlantic Ocean, (Udo, 1970). Nigeria has a total landmass of about 924,000sq km and a population of approximately 120.9 million (UNDP, 2004).

3.2 Relief of Nigeria

The topography of Nigeria consists of plains in the north and south. Plateaus and hills in the centre of the country interrupt it (Iloeje, 1982). The Sokoto Plains are in the north-western corner of the country, while the Borno Plains in the north-eastern corner surround the Lake Chad region. Soft, geologically young sedimentary rocks underlie the Lake Chad basin and the coastal areas, including the Niger River delta and the western parts of the Sokoto region in the far northwest (Iloeje, 1982). Gently undulating plains, which become waterlogged during the rainy season, are found in these areas. Some of these plains lie below sea-level forming floodplains that constitute environmental

problems, for example, the floodplain of the River Kaduna at Shiroro LGA in Niger State (Iloeje, 1982).

MAP OF NIGERIA



Figure 3.1: map of Nigeria showing its location and position. The rectangular shape at the western part shows the study area (Shiroro Local Government Area) (http://www.infoplease.com/atlas/country/nigeria.html).

3.3 Environmental Problems in Nigeria

The most common natural hazards in Nigeria are periodic droughts and flooding (Adekolu-John, 1983). The African Network for Environment and Economic Justice (ANEEJ), in their report stated that, the current critical environmental issues in the country are soil degradation, rapid deforestation, urban air and water pollution, desertification, *flooding of coastline and riversides*, oil pollution, of which water, air and soil have suffered serious damages from oil spills, loss of arable land and rapid urbanization (ANEEJ, 2003). Flooding of coastal areas is thus one of the most noted areas of concern in the country, especially flooding along the River Niger and Kaduna in Niger State.

3.4 Niger State

The flooding of the River Kaduna floodplain in Niger State in Nigerian is common. Niger State is one of the 36 states that make up Nigeria as a country. Niger is a state in the west-central part of Nigeria. Niger State is bounded to the south by the Niger River. It is also bounded by the states of Kebbi and Sokoto to the north, Kaduna to the north and northeast, Kogi to the southeast, and Kwara to the south. The Abuja Federal Capital Territory is on Niger state's eastern border, and the Republic of Benin is its western border. The landscape consists mostly of wooded savannas and includes the floodplains of the Kaduna River (Iloeje, 1982). Niger State has an area of 29,484 square miles (76,363 square km) and a population of 2,775,526 (UNDP, 2004). Slave raiding by the Fulani armies of the Kontagora and Nupe emirates in the 19th century severely depopulated Niger State (SLG, 1999). In addition, the presence of the tsetse fly (which transmits trypanosomiasis or sleeping sickness) has hindered resettlement (SLG, 1999).

Niger province was created by the British in 1908 and called Nupe province from 1918 to 1926; it included the Abuja, Agaie, Bida, Kontagora, and Lapai emirates, the Gwari, Kamuku, and Wushishi chiefdoms, and the Zuru federation (SLG, 1999). In 1967 Niger province became the southern part of North-Western state, and in 1976 it became Niger state (excluding the newly created Abuja Federal Capital Territory). In 1991, part of northwestern Kwara state, lying between the Niger River and the Republic of Benin, was

added to Niger state (SLG, 1999). Niger state is populated mainly by the Nupe people in the south, the Gwari in the east, the Busa in the west, and Kamberi, Hausa, Fulani, Kamuku, and Dakarki in the north (Iloeje, 1982). Islam is the predominant religion. Most of the inhabitants are engaged in farming. Cotton, sheanuts, yams, and peanuts (groundnuts) are cultivated both for export and for domestic consumption. Sorghum, millet, cowpeas, corn (maize), tobacco, palm oil and kernels, kola nuts, sugarcane, and fish are also important in local trade (Iloeje, 1982). Paddy rice is widely grown as a cash crop in the floodplains of the Niger and Kaduna rivers, especially in the area around Bida and Shiroro. Cattle, goats, sheep, chickens, and guinea fowl are raised for meat. Pigs are raised around Minna for sale to southern Nigeria (SLG, 1999).

Gold, tin, iron, and quartz (used by the glass artisans in Bida) are mined mainly for local craftsmen. Pottery, brass work, glass manufactures, raffia articles, and locally dyed cloth are significant exports (SLG, 1999). Marble is quarried at Kwakuti, near Minna, the state capital; and Minna has a brick-making factory. Niger state has a share in all three dams of the Niger Dams Project, including one at Shiroro Gorge on the Kaduna River and one at Jebba (in Kwara state), the reservoir of which lies partly in Niger State. The Kainji Dam (1969) and part of its reservoir, the Kainji Lake, also lie in the state. Besides generating hydroelectric power, these dams sustain irrigation projects, and fishing has developed as an industry on their reservoirs. Most of the Kainji Lake National Park (formerly Borgu Game Reserve) is in Niger state (SLG, 1999).

3.5 River Kaduna

Niger state has two main rivers that run across the state, namely, the Rivers Niger and Kaduna. River Kaduna is the main tributary of the Niger River, in central Nigeria (Plate 3.1). It rises on the Jos Plateau 18 miles (29 km) southwest of Jos town near Vom and flows in a north-westerly direction to a bend 22 miles (35 km) northeast of Kaduna town (Iloeje, 1982). It then adopts a south-westerly and southerly course before completing its 340-mile (550-kilometre) flow to the Niger at Mureji (opposite Pategi).



Plate 3.1: River Kaduna.

Most of its course passes through open savannah woodland, but its lower section has cut several gorges (including the 2-mile [3-kilometre] granite ravine at Shiroro) above its entrance into the extensive Niger floodplains (Iloeje, 1982).

The Kaduna River (Plate 3.1) (meaning “crocodiles” in the Hausa language) is subject to great seasonal fluctuations and is navigable below Zungeru from July to October for light craft. It is used for fishing and for transport of local produce (GEC, 2004). Gwari people have utilized the Kaduna's upper floodplains for swamp rice cultivation, and in the southern plains, in Nupe tribal territory, rice and sugarcane production has become a major economic activity (SLG, 1999). Near Bida, the Edozhigi and Badeggi natural irrigation projects are major rice-growing ventures, whereas the floodplain in Shiroro LGA, yam, guinea corn, cassava and sugar cane are the major crops cultivated (SLG, 1999).

3.6 Shiroro Local Government Area.

Shiroro Local Government Area was created in May 1989. It was formally part of Chanchaga local government area. Kuta, the headquarters of Shiroro Local Government also served as a one-time headquarters of Chanchaga Local Government Area, in 1976. The local government is made up of six districts (Fig. 3.2) namely, Kuta, Galadima-Kogo, Manta, Gurmana, Allawa and Kushaka districts (SLG, 1999). Shiroro local government, which covers an area of 48,000 square kilometres, has a climate, which is tropical and belongs to the tropical wet and dry (AW) of the Koppen system of climatic classification, with rainfall varying between 1100mm in the north to 1600mm in the southern part of the area (Garnier, 1967).

Shiroro Local Government has an estimated population of 300,000. Gwari language is the major language spoken while other indigenous tribes such as Bassa, and Gurmana are also predominant. Other tribes representing the diverse socio-cultural groups are equally found in this area, e.g. the Hausa, Fulani, and Igbo (SLG, 1999). Because of the rich fertile land of the area, the predominant occupation of the people is farming while other inhabitants earn their living through fishing due to the presence of the Shiroro dam along the Kaduna River (SLG, 1999). The area is blessed with all the desirable resources of mother earth and lots of human resources. The occurrence of commercially viable mineral resources like gold, columbite and diamond have been proved, while it also ranked as a major producer of rice, yam, maize, cottons, beniseed, groundnut, millet and guinea corn in the state (SLG, 1999).

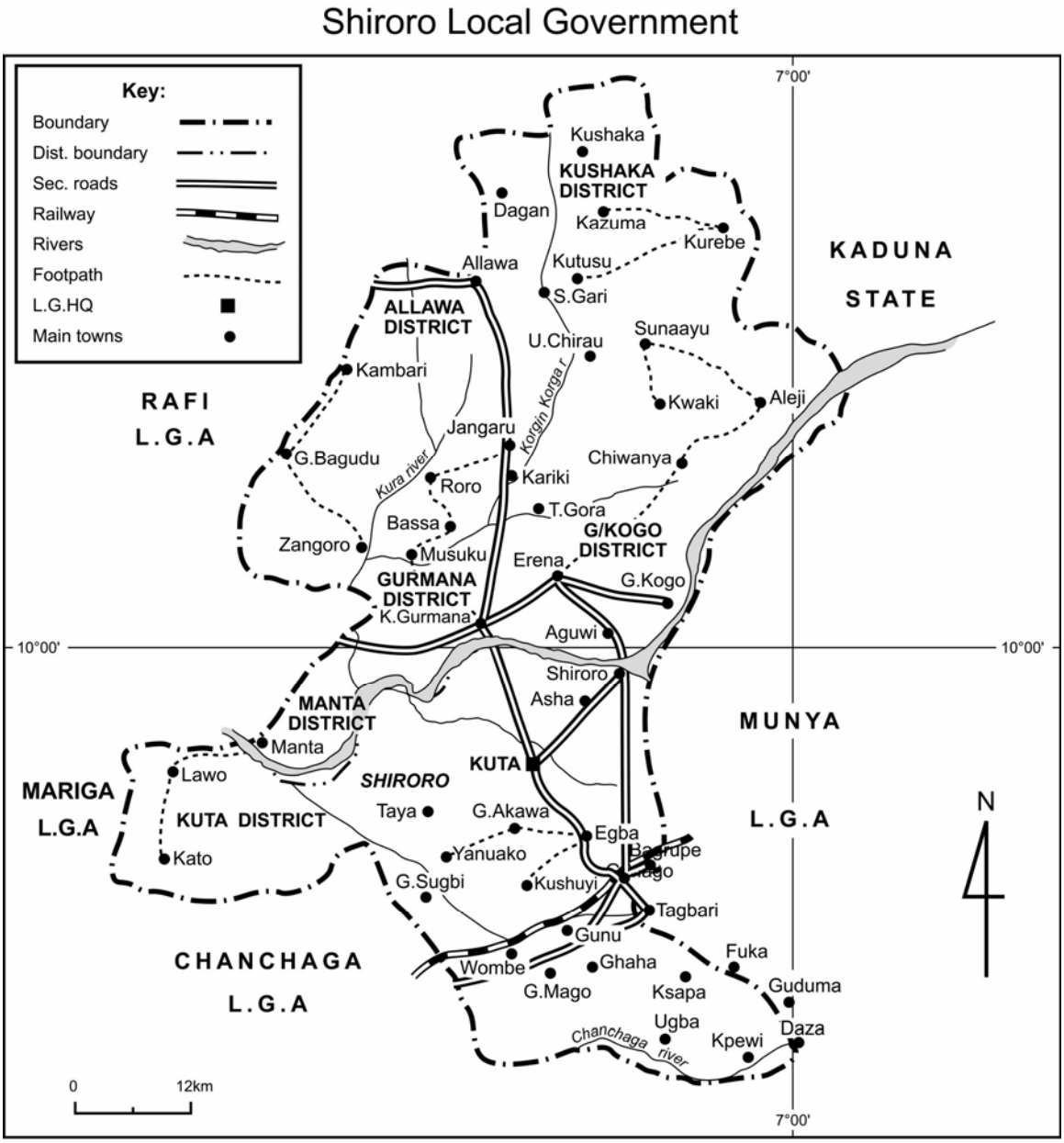


Figure 3.2: Map of Shiroro Local Government Area, showing the six districts, with the villages along the Kaduna River (adapted from Shiroro local government secretariat: 2005).

In Shiroro LGA, there is a dam (Shiroro dam) that is situated on the Kaduna River at the confluence of Dinya and Kaduna Rivers at Shiroro village. The lake is located on latitude 9° 58N and latitude 6° 51E. River Kaduna is the major river feeding the lake in which the dam is built (GEC, 2004).

There are about 15 tributaries of the Kaduna River within the Shiroro watershed, the major among them being rivers Dinya, Sarkin Pawa, Guni, Erena, and Muyi (Jimo, *et al.*, 1992). The tributaries flow in the north south direction and few in the northwest to southeast direction. Some surface hydrology has the problem of low base of rivers (Jimo, *et al.*, 1992). The storage areas do not sustain the river during extended dry season. This explains the seasonality characteristics of these rivers, since they depend on rainfall. It is obvious therefore, that the volume of the rivers swell in volume with ranging torrent while in the dry season they dwindle to dry up (Jimo, *et al.,* 1992). Having given some essential biophysical and socio-economic background to the study, attention now turns to outline and describe the methodology used in the study.

3.10 METHODOLOGY

This research examines vulnerability and adaptation to flood occurrences among the communities living along the River Kaduna basin in Niger State, from the north-eastern part of Shiroro local government area, to the south-western part, where the river enters Mariga Local Government Area (Fig. 3.2). In this research, different methodological approaches were employed to explore the fundamental aspect of human vulnerability and adaptation to climate variability. Both qualitative and quantitative methods of data collection were used.

3.11 Study Design

The methodology used in data collection included a qualitative cross-sectional study with a number of qualitative methods involved. These included participatory questionnaire methods and in-depth interviews administered by the researcher. Flood episodes were identified; using data on the frequency of flooding, the chronology of the flood events (informed both from the community in the form of historical data as well as meteorological data). Factors contributing to vulnerability to flood, including the socio-economic life of the people living in Shiroro Local Government Area, in Niger State of Nigeria, and the adaptive capacity of these people, were also assessed using participatory questionnaire methods and in-depth interviews.

3.12 Reconnaissance survey

The Shiroro Local Government Secretariat Kuta was visited for authorization from the chairman. Information on the affected communities and villages was obtained from the personnel department after getting authorization from the local council chairman. Further authorization was obtained from the two community leaders selected for the study. A reconnaissance survey was carried out with the help of staff from the Local Government Secretariat Kuta. A transect through Kuta and Galadima-Kogo was conducted with a few household heads and stakeholders in the two communities. Identification of these stakeholders was made possible through the help of Agricultural department at the local government secretariat.

3.13 Sampling

Sampling frames both random and systematic were employed to generate the sample of villages and households interviewed. Firstly, two communities in Shiroro Local Government Area were randomly selected. The first community was chosen from the communities located on the floodplain, but closest to the river. The second community was chosen among the communities situated some distance away from the river, but located within the floodplain. This was used as a comparison between these communities, facilitating understanding of the flood impact on the livelihood, perceptions of flood events and their specific determinants of adaptive capacity. Secondly, random sampling was used in selecting twelve villages interviewed from the two communities selected above. Six villages were selected from each community. This sampling frame was employed because of the scattered nature of the villages. Some villages are separated by large hectares of farmland while some are cut-off by river action (e.g. erosion). Thirdly, systematic sampling was employed in selecting sixty household units interviewed from the twelve villages selected for the study. This involved the selection of every 5^{th} household unit, but the order along each street could not be maintained due to the clustered nature of the settlement. Thirty household units in each community were selected for the study.

3.14 Data Collection

Sixty household heads, and the twelve key decision makers in the communities (such as, local government counsellors, community chiefs, head of department at the secretariat etc), others included, some elders, religious leaders, farmers, youths etc were targeted in the study, to provide information on the flood occurrences and its impacts on the life of people in the communities. The chiefs from the ten villages visited, were interviewed to get their perception about the flood occurrences and what benefits and problems it has brought to their villages. The management at Shiroro dam, the executive chairman, information officer, the personal manager, and the head of department of agriculture in Shiroro local government council were also interviewed. Participatory Rural Appraisal was used as a method to obtain an understanding of the community's perceptions on the flood occurrences and their implications on the life of the villagers. This method of data collection has been chosen because it gives more insight into the way the participants think and why they feel that way. It also allows for more in-depth views and comments to be given by respondents. A number of questions, by way of themes, were set to guide the researcher to conduct the participatory rural appraisal.

The heads of the household units selected from the above sampling were approached for the interview, using participatory questionnaire methods, e.g. transect walks was used. This is because the heads of the household units were in a better position to give information on the flood events and the impacts of flooding on their livelihood in the community. A questionnaire was used to generate baseline socio-economic, adaptive capacity and demographic data. The in-depth interviews were used in generating greater detail the chronology of the flood events, impact of flooding on the people's socio-economic life and their specific determinants of adaptive capacity.

The chronology of the flood events was collected from the Nigerian Meteorological station at Oshiodi in Lagos and from Federal Ministry of Water Resources at Abuja. These data were used as additional information to supplement the historical data on chronology of the flood events, collected from the communities. The population figures were collected from the Population Commission at Minna but there was no record of the

Gross Domestic Products of the two communities under study. Finally, data on the positive and negative impact of Shiroro dam were collected from the communities. This information helps to facilitate understanding of what derive the flood occurrences in the communities.

Primary and secondary sources were used to collect data. Primary sources could be defined as data collected by researchers themselves during the course of their field work while secondary sources are those consisting of 'data that already exists' (Haralambos and Holborn 1995). These data collection techniques were chosen in order to increase the response rate and also to ensure that respondents understand the questions asked, and the researcher is able to obtain the information that the research seeks to determine. Secondary sources that were used include journals, published books, government reports, videotape, science data (climatological data e.g., rainfall, river discharge, gauge heights and temperature), unpublished reports and newsletters, the Internet as well as research reports of past students. The research made use of a case study (which is Shiroro local government area in Niger State of Nigeria). The study does not, however, seek to generalize but in fact it hopes to get a clear picture of the socio-economic impacts of flooding on the communities along River Kaduna in Shiroro Local Government Area and their adaptive capacity to floods.

3.15 Problems encountered in the field.

An interpreter was used during the interview since the communities under study comprise a variety of different ethnic groups with different languages[1]. The assistance of an interpreter, however, was only used in two villages at Kami and Guwa out of 12 villages interviewed. The other 10 villages speak Hausa, as a common language that is spoken widely in the middle-belt and Northern Nigeria, which the researcher also speaks.

The issue of local culture is particularly important as was highlighted in this study. According to the custom, a stranger is not allowed into a man's house immediately, unless a cordial relationship is established, during the course of his stay in the

[1] I, Jude Nwafor Eze the principal investigator am a Nigerian. I speak Igbo and Hausa fluently.

community, which takes longer time. As a result of this constraint, some of the interviews were conducted in groups under a tree or a village square, which may have limited some individual's freedom of expression (Plate 3.2).



Plate 3.2: Group household interview at Baha village. The principal investigator is the second on the row from the left.

The household interviews conducted were recoded with each household's head. Due to time constraints, only a small sample was selected from each village. Each community is made up of villages, and each village consists of different hamlets and each hamlet is separated from each other by vast hectares of farmland. The major problem faced was accessibility, since there is no accessible road linking each village. Although the findings may not be representative of the whole population, a lot of effort was taken in the selection of respondents to ensure that there was some level of representativeness.

Consequently, as in most research studies, there are limiting factors in data collection. They include non-availability of GDP for the villages under study, incomplete records of rainfall data, gauge height and discharge flow of the Kaduna River, non-availability of

maps and population showing the villages under study, which were not made available to the researcher at the time of this study. These factors undoubtedly have introduced limitations into the results.

3.16 Method of data analysis:

Most of the meteorological data collected (e.g. rainfall) spanned a long period of between 18 to 21 years. In some cases only absolute daily values were available. They have been grouped as a form of reduction of voluminous data for meaningful understanding and interpretation. Some of the statistically derived methods used in carrying out data analysis are the mean and frequency distribution. The mean daily and monthly rainfall, daily and monthly water levels, daily, monthly and annual inflows into and outflow from Shiroro reservoir and many other variables used in this study were computed.

Microsoft Excel was used to analyse some of the data derived from the above statistical methods. Frequency and univariate analysis are displayed graphically to facilitate understanding of the socio-economic life of the people. In-depth interviews were analysed in themes (e.g. water resources, food security, natural resource management and biodiversity, human health, settlement and infrastructure, and adaptation strategies and vulnerability etc) to help understand the impact of flooding and the adaptive capacity of the people.

****

Nigeria is a country situated entirely within the tropical zone and is located between latitudes 4^o and 14^o north of the equator and longitudes 3^o and 15^o east. Flooding of coastal areas is thus one of the most noted areas of concern in the country, especially along the River Kaduna floodplain in Shiroro communities of Niger State. The indigenous people of Shiroro LGA live in an environment in which their culture and traditions appear to be well adapted to agricultural activities. Agriculture is their only source of livelihood. They inhabit isolated rural environments of low-lying areas on the floodplain that provides fertile soil for farming. Shiroro communities, however, are exposed to both biophysical and socio-economic problems.

In order to examine these biophysical and socio-economic problems, Participatory Rural Appraisal methods were used in data collection in the study area. The method used enabled several key issues to be identified including physical, socio-environmental factors and the complex, interaction of, various 'human dimensions'. As in all social surveys, the results cannot hope to reflect reality adequately. The problems encountered in the field and the adjustments made to the research procedure and method, ensured that the subsequent detailed investigation would, however, capture flood impacts in as comprehensive and reliable as manner as possible. The next chapter outlines the biophysical context of flood in Shiroro communities of Niger State.