CHAPTER FIVE

SOCIO-ECONOMIC AND PHYSICAL FACTORS INCREASING VULNERABILITY TO FLOOD

5.0 Introduction

Different processes operating at both the local and national level may influence vulnerability and adaptive capacity at the local level. For example, at a national level, national economic policy can have a strong influence on the economic well-being of vulnerable groups, by determining the cost of basic needs such as food, education and healthcare, as well as market price of commodities that form the basis of the livelihoods of vulnerable groups (Adger, et al., 2004). In this chapter, socio-economic and physical factors increasing vulnerability of the local people (Shiroro communities) to floods are examined. The chronology of the flood events and perception of flood events along the Kaduna River at Shiroro LGA is captured and examined. Transects with the communities were conducted to examine the socio-economic activities of the people, diversity of the ecosystem and land-use types that exist.

5.1 Transect through Kuta and Galadima-Kogo

A transect through Kuta and Galadima-Kogo was conducted during the fieldwork (Plates 5.1 and 5.2). The transect through the communities captured the greatest diversity of ecosystem, land-use and other socio-economic activities. Three major land use systems were identified during the transect from south to north in Kuta and Galadima-Kogo. The land use types could be classified into: Group A, Group B, and Group C (Tables 5.1a, b & c). Group A is a highly built-up area with few gardens around homes. These are settlements found in the town. It is located over 20 km from the River Kaduna. The major economic activities here are tertiary (services) and secondary (processing) economic activities.

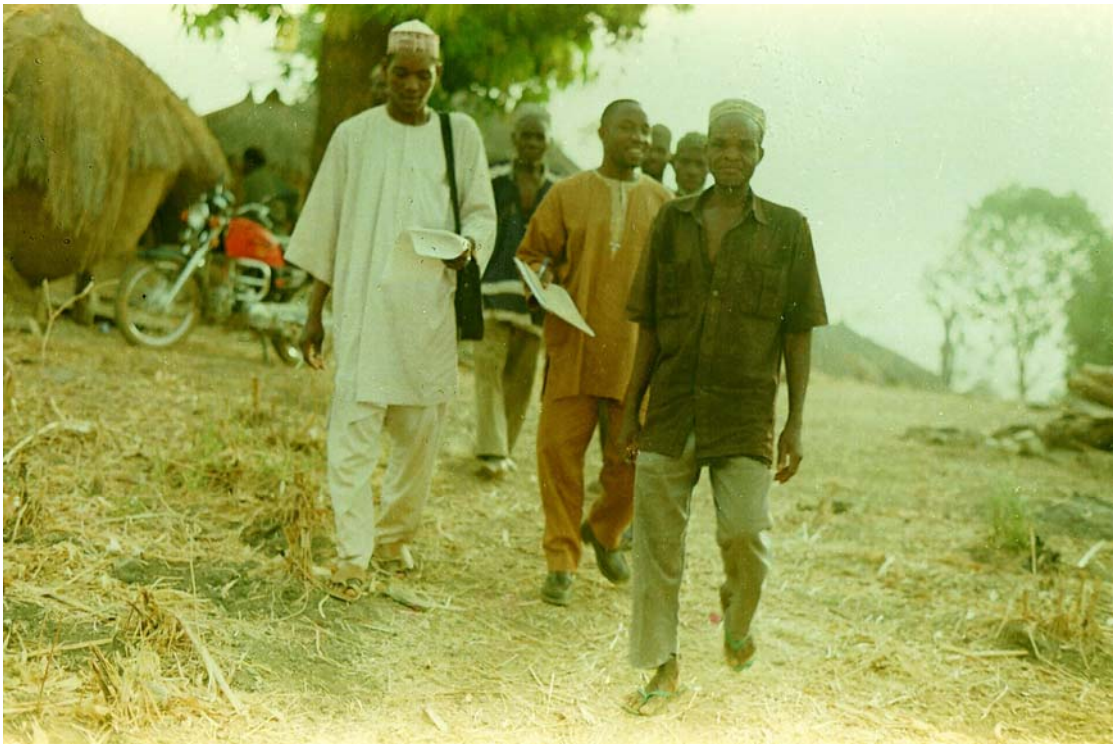

Plate 5.1: A transect through Kuta with some key members in the community.

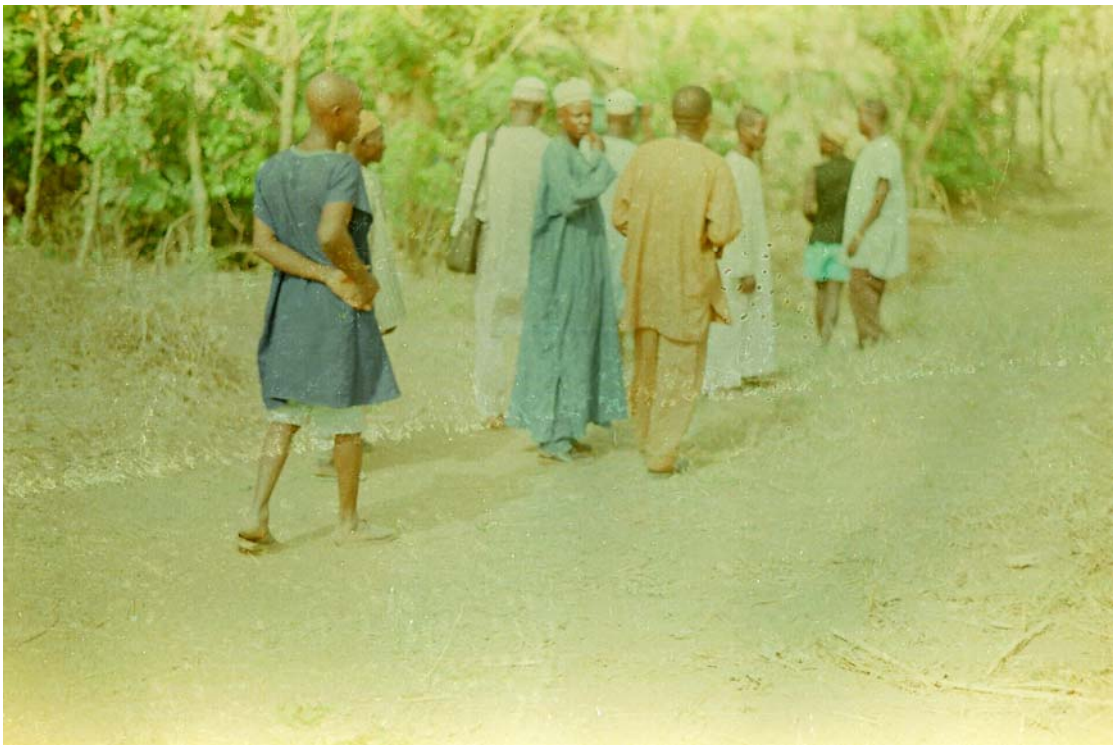

Plate 5.2: A transect through Galadima-Kogo with some key members in the community.

Table 5.1a: Transect through Kuta and Galadima-Kogo (Biophysical factors).

Land use types	Group A	Group B	Group C
Soil	High quality of clay soil with some rock out crops scattered over the area	Clay soil mixed with small quantity of sandy soil. Light ash in colour, rich in nutrients (water logged patches)	Sandy soil with rich alluvial deposits. Rocky along the watercourse with scattered rock-outcrop
Water	Most households use communal pipe-borne water, located at some strategic places. Some have them in their homes. Also, there are wells in various households. Rain harvesting is very common	Streams dry up during the dry season. Have some wells but also dry up during the dry season, especially from November to May. Have hand pumps provided but mainly out of order. Sometimes fetch water from the river Kaduna	River Kaduna (flows all-year round with high quantities of particles in suspension with very few wells that dry up during the dry season, which last for eight months
Vegetation	Most vegetation here consists of economic trees like mangoes, manila, and whistling pine. And also covering most places are mainly grasses. Farmlands dominates the human activities	Vegetations found are mainly grasses with some stunted acacia trees. Most land cover is farmlands intensively cultivated	Natural vegetation here consists of mainly grasses with scanty scrubs. Most land cover have been cleared for intensive farming
Forestry and agro-forestry	Forestry and agro-forestry with different species of tress.	Minimal tree planting but some trees like mango and Dogoyaro (Izadirach-indica)	Very few trees are found especially mango trees

Source: Fieldwork 2005.

The types of houses here are mainly made of cement walls with corrugated iron-roofs. Group B is a moderately built up area with large farmlands around homes. It is located

between Group A and C. The major economic activities in Group B are primary and secondary economic activities.

Table 5.1b: Transect through Kuta and Galadima-Kogo (socio-economic factors).

Social and economic indicators	Majority of the households earn their living from secondary and tertiary economic activities (manufacturing and services). Living in houses made of cement blocks with corrugated roofing sheet. Availability of electricity and good roads.	More than half of the households built their houses with mud-blocks and grasses, as materials for the roofing. The population depends mainly on both primary and secondary economic activities. Availability of electricity but no access to good roads	All the households depend wholly on farming and fishing along the River Kaduna. Houses are made up of mud walls and thatched roofs. No access to good roads. No school, electricity, and market
Food crops	Yam, maize, cassava sugar cane plantain, banana, Guinea corn, rice, millet and vegetables-like tomatoes, melon, spinach, onions	Yam, maize, cassava sugar cane plantain, banana, Guinea corn, rice, millet and vegetables-like tomatoes, melon, spinach, onions	Yam, maize, cassava sugar cane plantain, banana, Guinea corn, rice, millet and vegetables-like tomatoes, melon, spinach, onions
Cash crops	Cottons, groundnut, Beniseed and sugar cane	Cottons, groundnut, Beniseed and sugar cane	Cottons, groundnut, Beniseed and sugar cane
Achievements	Soil conservation, tree planting, water development projects, construction of roads and wells. Rain harvesting is common. Practice crop rotation and bush fallowing	Soil conservation, like bush fallowing, mulching, crop rotation, and use of fertilizers.	

Source: Fieldwork 2005.

Table 5.1c: Transect through Kuta and Galadima-Kogo (socio-economic factors continued).

Resource management	Use of fertilizers and manure, engages in bush fallowing, mulching and use of pesticides, build embankments to check erosion.	Very few farmers use fertilizers, but manure. People here also practice crop rotation and bush fallowing	Depend only on animal manure.
Problems	Experiences long dry season, which bring about drought. The inhabitants here do, however, experience flood occasionally (excess rainfall). Inadequate water, education and health facilities.	Inadequate education and health facilities. No access to good water and road. Experiences drought, but occasional flood due to excess rainfall	Flooding from the river Kaduna. No good drinking water, no electricity, no school and health facilities

Source: Fieldwork 2005.

Buildings in Group B are made of cement walls with corrugated iron-roofs and mud houses with thatched roofs. Group C is a clustered settlement with large farmland surrounding each settlement. These are settlement located on the floodplain. Houses here are made of mud wall with thatched roofs. Having examined the diversity of ecosystem, land-use, and some of the economic activities of the inhabitants in the study area, attention is now focused on the socio-economic status of the communities under study.

5.2 Socio-economic status

Data were collected from two communities of Kuta and Galadima-Kogo districts in Shiroro local government area, during transects and the household interviews. From the data collected and the reconnaissance survey carried out, the population living on the floodplain can be described as being predominantly subsistence farmers and fishermen (Table 5.3). The farm implements in use for farming here are traditional farm tools including, hoes, cutlasses, baskets, few wheelbarrows, and oxen. While the population living outside the flood plain especially at Kuta and Galadima-Kogo towns engage in other economic activities including trading, manufacturing and services. From the

population data collected as shown in figure 5.1 below, there are more females than males. The sixty households interviewed were made up of 480 members, of which males are 187 while females comprise 293 (Fig. 5.1).

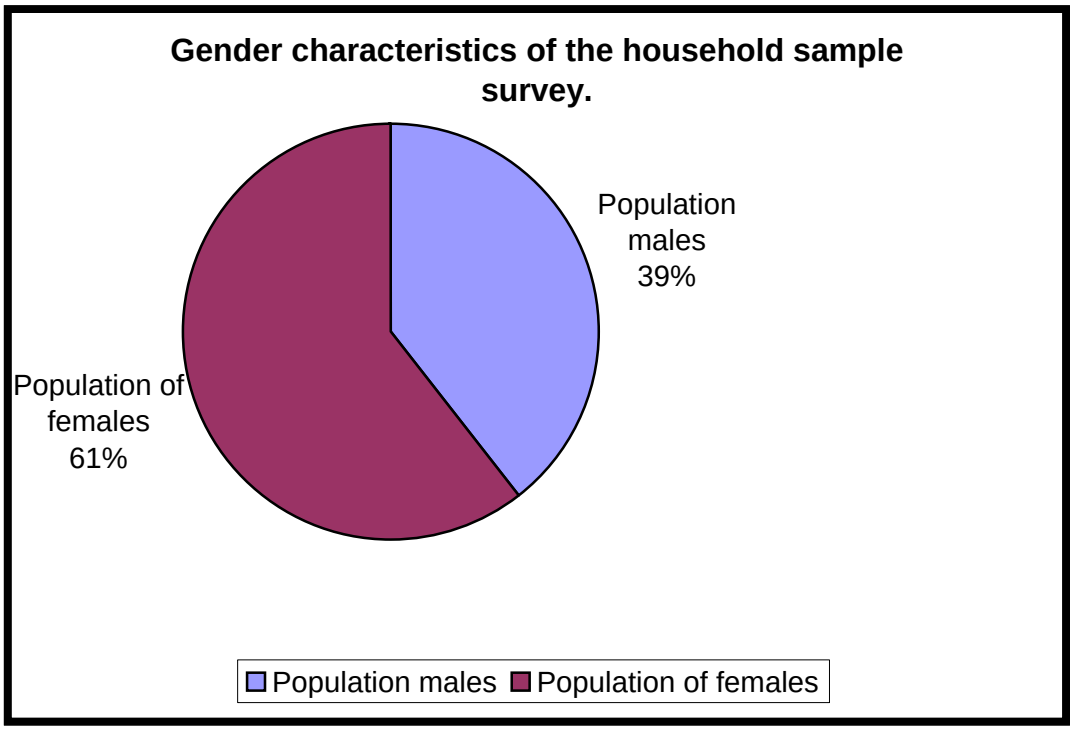

Figure 5.1: Population of household survey showing gender characteristics *(Source: Fieldwork 2005).*

The dominant age groups residing in these communities are the children below the age of 18 and adults from the age of 40yrs and above (Table 5.2). The information gathered from the Health Department at Kuta secretariat shows that HIV/AIDS is the major cause of mortality particularly for those aged from 19 to 59 years.

Table 5.2: Population characteristics of the sample survey.

Characteristics of Age groups	Number of Households (60)	Total sample population (%)
Age 0-18	256	53.3
Age 19-59	187	38.98
Age over 60	37	7.71

Source: Fieldwork 2005.

The dominant religion is Islam and traditional African religion. Nuclear families are uncommon. Every household is a polygamous family, with more than eight children per man.

The types of housing found are mainly made of mud-walls, thatched roofs, uncemmented floor, with small window openings made of wood, (Plate 5.3). Each household depends wholly on farm output. The majority of the population are not educated (never attended, formal school). The settlements outside the floodplain, however, are made of houses with cemented walls and corrugated roofing sheet. About 80% of the people interviewed within Kuta and Galadima-Kogo town are educated (may have obtained a primary education).

Plate 5.3: Traditional houses among people living along Kaduna River floodplain at Shiroro communities.

There is no official record of economic indicators for the community such as GDP. The data collected in the field (household data), however, were used as an estimate of the

communities' income and farm output. The data shows that there is a contraction in income and farm output of the villagers on the River Kaduna floodplain. This may in large part be the result of frequent flooding that has resulted in extensive farm losses.

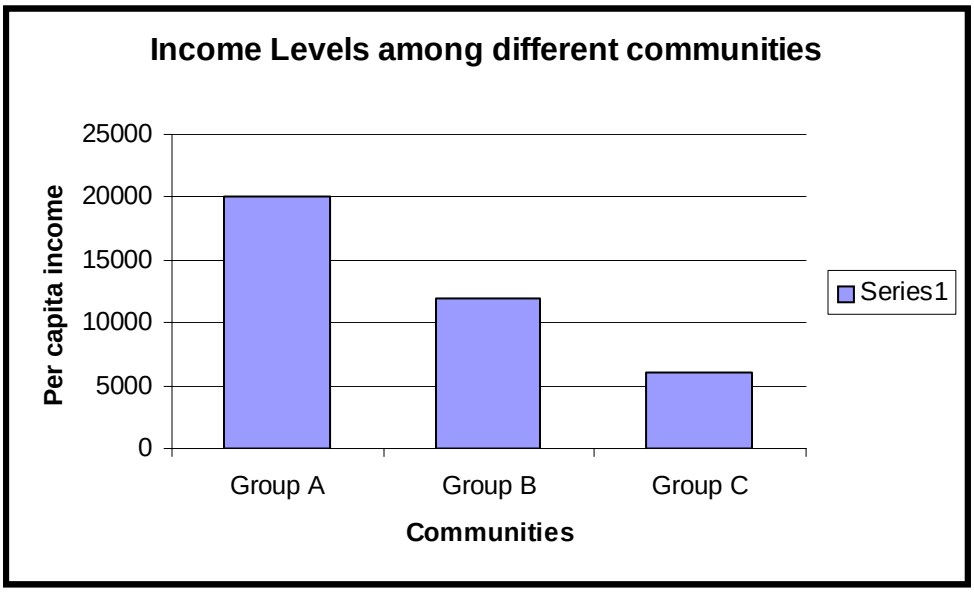

Figure 5.2: The income levels at different communities in Kuta and Galadima-Kogo (Source: Fieldwork, 2005).

Moreover, the household data show that the average income per household in Group C (those residing on the flood plain) is very low (less than 6000 Naira or 40 USD per month). Those in Group B (those residing between groups A and C) earn between 12, 000 Naira and 6,000 Naira per month, while those in Group A (those residing in Kuta town) earn more than 20, 000 Naira per month on average (Fig. 5.2). Having briefly examined some of the socio-economic status among the communities in the study area, attention is now focused on other socio-economic factors increasing vulnerability (such as, agriculture, water resources, human health, education, and transportation and communication).

5.3 Agriculture

The major source of income of these communities along the Kaduna River comes from agriculture. These communities have a very fertile soil made up of alluvial deposits, with extensive farmland but fragmented farm holdings within the floodplain. The size of farmland per household is a function of the number of male children in each home. Each household has plots of land scattered at different places. Lands are shared according to family inheritance. The major food and cash crops grown in this area are, yam, maize, guinea corn, cassava, sugar cane, millet, beniseed, groundnut, rice, banana, plantain and cotton. The farm management practices that are being undertaken by the farmers are: use of organic manure, pesticides, mulching, and rehabilitation of gullies, as shown in the transect work through Kuta and Galadima-Kogo (Table 5.1). Interviews conducted among some farmers show that there is a severe contraction in farm output since the 1980s. In the past, farmers were producing surplus food like, guinea corn, maize, banana, plantain, groundnut and yam for sale. For the past two decades, farmers hardly produced enough for family use, as a result of flooding that has converted most of their farmlands into river course (Plates 5.8, 5.10 and 5.11). The chief of Gussoro village indicated, that in the period between the year 1950s to 1980s he produced tones of grains and cereals in excess for sales, but since the late 1980s till the year 2004 farm harvest, his farm outputs have been decreasing progressively.

The community has traditional silos that are used for storing grains. They are made of local red earth (Plate 6.1). The major agricultural problem in these communities is flooding. Other problems include: the use of traditional farm implements, erosion, pest attacks and fragmented farm holdings, which make mechanized agriculture in the communities impossible. The livelihoods of these communities are linked to the river. For example, people have lived along the Kaduna River floodplain for many years.

Table 5.3: The list of settlements interviewed along River Kaduna floodplain.

S/NO	SETLEMENT	APPROXIMATE POPULATION SIZE	MAIN OCCUPATION	OTHERS
1	Gussoro	4753	Farming	Fishing
2	Baha	515	Farming	Fishing
3	Bussu	730	Farming	Fishing
4	Gbusudna	552	Farming	Fishing
5	Gniyi	626	Farming	Fishing
6	Kwataiyi	422	Farming	Fishing
7	Gijiwa	651	Farming	Fishing
8	Guwa	473	Farming	Fishing
9	Maikakaki	510	Farming	Fishing
10	Samaila	445	Farming	Fishing
11	Lawyi	519	Farming	Fishing
12	Kami	472	Farming	Fishing

Source: Fieldwork 2005.

The land along the Kaduna River was so fertile that every farmer produced excess for sales every year. Secondly, the Kaduna River was a good fishing area. Fish were caught in commercial quantities. The increasing flood frequency and its impacts on agriculture has, however, greatly reduced food production among the community dwellers. The most direct implications of climate variability, including periods of climate stress e.g. floods, for food security are through its impacts on food production worldwide (Devereux and Edwards, 2004). Therefore, changes in rainfall intensity and extreme weather events that increase the scale of flooding and soil erosion can seriously damage agricultural capacity (Lewsey *et al.,* 2004). Information gathered from the head of the Department of Agricultural of the Local Government Secretariat, shows that the 1999 and 2003 flood event impacted negatively on the agricultural output within the LGA. In the next section, water resources as one of the socio-economic factors increasing vulnerability of the communities in the study area is examined.

5.4 Water resources

The inhabitants of Kuta and Galadima-Kogo, residing along the river floodplain depend on the Kaduna River as the source of irrigation, and for their household water use and drinking. There are some wells but, they dry up during the dry season. The inhabitants travel only a maximum of 100 meters to fetch water from the river, which flows all year round (Plate 5.4). They fetch their drinking water from up-stream, but wash their clothes, kitchen utensils and use the river for personnel hygiene downstream of the Kaduna River (within the same communities)(Plate 5.5).

Plate 5.4: Villagers fetching water from the Kaduna River for drinking and other household uses.

All the twelve communities visited along the Kaduna River have no piped water. The chiefs of Baha and Gussoro villages stated that the major problems encountered in both villages regarding water access was that, water tends to be polluted during the rainy season that requires purifying the water before use.

Plate 5.5: Community making use of the river for various functions.

An elder-spokesman at Shiroro village, where the Dam is sited, further stated that the major problem encountered in their village was access to clean water and dangerous snakes found around the riverside. Water hyacinths have been found to occupy large parts of the Shiroro reservoir that pollutes the water and serves as a habitat for water snakes that kill their children who go to fetch water. By contrast to Shiroro village, those living in, Kuta and Galadima-Kogo towns located away from flood plain have access to pipe borne water. Most of the households in the town have tap water in their homes. Having examined water resources as one of the factors increasing vulnerability in the communities under study, human health is now examined in the next section.

5.5 Human health

The data collected shows that communities along the Kaduna River within Shiroro Local Government Area have health problems related to poor quality of water from the Kaduna River, which is the only source of water for household use. Climate-related extreme events may be harmful to health (Blood, 2004), for instance flooding. The social stress associated with adjustment to climate change reduces a community's capacity to deal with illness (Bloom, 2004). Health may be affected by changes in nutrition and access to water (Bloom, 2004). The most common diseases in these communities are mainly water-related diseases. For example, malaria, river blindness (caused by simulium-flies), typhoid, diarrhoea, bilharzias, scabies and spinal meningitis. A change in the physical and social environment has an effect on health and on the capacity of individuals and societies to cope with health problems (Bloom, 2004). This change in environment may also bring about changes in distribution of organisms and of animal vectors, resulting in the spread of malaria and other infectious diseases (Bloom, 2004), for example, Shiroro communities. Of the twelve villages interviewed along the River Kaduna, none has hospital or health facilities. The villagers have to travel for about 18 to 20 kilometres to Kuta town or Galadima-Kogo town before getting any hospital services, because of lack of health facilities and transportation system.

5.6 Transportation and communication

The principal modes of transportation are land and water transport. The villages do not have good road access. They carry their goods on their heads while going to buy or sell some of their agricultural products, since there is no accessible road to these villages. Women had to travel for about 20 kilometres before they get to the market (Plate 5.6). Conversely, Kuta town has access to telecommunication, markets and good roads linking them to other important towns, for instance Minna and Bida. But to travel from Kuta to Galadima-Kogo, water transport is the only means. It was found that the river is only navigable between November and April when the river flow is not irregular.

Plate 5.6: Village women going to sell their agricultural products in the market.

5.7 Education

Lack of good transport systems is a problem affecting the population of children enrolment in schools. Data collected show that there is no school in all the villages along the Kaduna River except one primary school at Gussoro. Most of the children do not go to school because of the distance they have to travel on foot. During flood periods the road are damaged. The heads of the families interviewed stated that most children were discouraged from going to school because they had to travel for over 20 kilometres before getting to school. There are many primary and secondary schools in Kuta and Galadima-Kogo towns, including a college of education in Kuta town. Having given some of the critical socio-economic context in which these communities live out their daily tasks and responsibilities, attention now turns to examine the flood, how people perceive and cope with floods in the next section.

5.8 Perception of flood by the communities

The data collected from the twelve villages on the floodplain show that inhabitants perceive flood in their community as a problem and a threat to life and property. It was pointed out that floods were formerly seen as a blessing because they served as a source of water for irrigation. The elders in Baha, Gussoro and Maikakaki villages attributed the increased magnitude of flood flow and flood frequency in the recent years as the anger of river gods. This was because in the past, whenever the river over flowed its bank to a certain level (reaching the houses), the males in the villages would line up at the riverbank to recite incantation (Plate 5.7). This prayer was done with the pestle used in pounding yam. It was believed that the flood flow did retreat immediately as a result of their prayers being accepted by the river gods.

Plate 5.7: The arena where the villagers perform incantations to appease river gods during flooding.

But in the recent times, flood flow appears not to be responding to the communities. Instead floods have destroyed their farmlands, lives and houses. Having briefly examined

how the communities on the floodplain perceive floods in their area, the impacts of flood on the livelihood and food security in Shiroro LGA is now discussed in the next section.

5.9 Impacts of flood on the livelihood and food security in Shiroro LGA

The persistent flooding of the farmlands along the Kaduna River has impacted negatively on the livelihood of the inhabitants on the floodplain. The Kaduna River attracted so many people along the river floodplain in the past, because of fertile land for agriculture and fishing. Since the 1990s, the floods became so destructive, that many people have migrated to other places in search of safer land for their farming and other activities, thereby reducing the population. In the past, most people have large farmland along the River Kaduna on the floodplain, but now those farmland have been eroded by the river action, which converted the farmland into river course (Plate 5.8).

Plate 5.8: Hectares of farmlands that have been converted to river course by flood actions.

Farmlands on the floodplain usually give very high agricultural outputs every year. Since the flood became more frequent and increased in magnitude, the outputs from the farms

have been very low. The in-depth interviews with the key members in the villages revealed that the Kaduna River floodplain used to be the "food basket" of the nation in the 1970s and 1980s, especially during the Sahelian drought that affected Northern Nigeria. It was also noted that farmers were getting more than N15, 000 (fifteen thousand Naira) per month from the sale of their agricultural produce in the 1970s and 1980s. Since the 1990s, however, the monthly income has been decreasing such that the farmers at the time of this research can no longer make approximately N6, 000 per month.

Floods therefore seem to be contributing to the reduction in annual income. According to an elderly statesman in Shiroro village, the 1999 and 2003 flood events have converted all his farmlands into a river course. Floods have affected all the members of the community directly or indirectly. Since so many plots of farmlands have been lost to flood, the agricultural outputs have decreased drastically. Plate 5.9, shows the re-generating plantain in a plantain farm after the year 2003 flood that destroyed the whole farm.

The interviews with the traders, youths and civil servants in Kuta and Galadima-Kogo town revealed that the cost of agricultural produce has been constantly rising because of increased demand on the few farm products from the farmers. This occurred because of losses of farmland to floods, resulting in deceased production. The flood impacts on the farmland along the Kaduna River have resulted in food insecurity in Shiroro LGA, which undoubtedly has increased pressure on food demands on the neighbouring local government areas. In the next section the impacts of the Shiroro dam on the communities under study is examined.

Plate 5.9: Plantain plantation destroyed by the 2003 flood event.

5.10 Impacts of Shiroro dam on the communities upstream and downstream of the dam

The Shiroro dam has impacted negatively on the lives of people living in the communities along the Kaduna River as well as the villagers located downstream and a few kilometres upstream. According to the respondents, water is usually released from the dam without proper notification from the dam management. The water released from the dam usually takes the inhabitants by surprise, hence causing damages to lives and property. Although, the respondents from the dam management stated that warning notices were being made through the media before water was released, the inhabitants have neither radio nor television. The inhabitants upstream stated that their vast agricultural farmlands located some distance away from the reservoir have been inundated on an annual basis (Plates 5.10 and 5.11).

Plate 5.10: Areas formally covered by farmland at Bussu.

Plate 5.11: Submerged groundnut farmland at Gussoro village.

The villagers make use of the draw down areas (areas exposed after water has receded) to cultivate crops. In most cases, however, the farmlands were usually submerged before the inhabitants could harvest their crops. These villages around the dam were found to be the largest producer of potatoes and tomatoes. Transporting the commodities outside the community for sale has, however, been so difficult especially during the peak months of rainy season. This was due to backwash from the Shiroro reservoir that cut the villages off from the rest of the communities. The data collected show that government has virtually done nothing, except in the year 2003, when the State government allocated land for some villages to be relocated, but there was no financial help to enable these affected communities build houses on the allocated areas. Having briefly discussed the impacts of floods and Shiroro hydroelectric power dam on the Shiroro communities, the chronology of the flood events is now examined.

5.11 Chronology of the flood events

The negative impacts of floods on the Shiroro communities appear to be a recent issue. Information gathered from the elder statesmen from the twelve villages interviewed, show that flood events in the community are as 'old as the river itself'. Floods have always been a regular occurrence, but have not been as destructive. Floods have been a blessing to the communities because they irrigated their farmlands and brought fertile soil to their farmlands. Floods appear to have become more destructive in the late 1980s. Since the 1990s the floods have become more frequent (Fig. 4.7) and appear to be more destructive than in the past. In the 1990s the floods occurred about seven times including in the 1994, 1998, 1999, 2000, 2001, 2003 and 2004.The worst floods were those of the years 1999 and 2003.

In addition, the meteorological and hydrological data on the flood events from, the Federal Ministry of Water and Resources Abuja shows that floods occurred in the 1988, 1994, 1998, 1999, 2000 and 2003 (Fig .4.5). Data from the Shiroro Dam Management, show flood events of the 1994, 1998, 1999 and 2003 (Fig. 4.8 and 4.9) and the Dartmouth flood Observatory recorded the floods of 1988, 1999 and 2003 (Tables 4.7, 4.8, and 4.9) along the Kaduna River. These data appear to show good correspondence to the derived

chronologies of flood events recalled by community members. The dam management did not record the year 1988 flood because it only came into operation in the year 1990. The communities along the River Kaduna, however, observed more flood events than the recorded data, that may be as a result of differences in what constitutes a flood disaster for such communities or their closeness to the river.

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A transect through the study area during the fieldwork, captured the greatest diversity of ecosystem, land-use and other socio-economic activities. Three major land use systems were identified during the transect classified as groups A, B, and C. Group A are settlements found in the town. This group is located some 20 km from the River Kaduna, with the major economic activities including tertiary (services) and secondary (processing) economic activities. Group B is a moderately built up area with large farmland around homes. It is located between the groups A and C. The major economic activities in Group B are primary and secondary economic activities. Buildings here are made of cement walls with corrugated iron-roofs and mud houses with thatched roofs. While Group C is clustered settlements located on the floodplain with large farmland surrounding each settlement. Houses in Group C are made of mud walls with thatched roofs.

Various socio-economic and physical factors in Shiroro communities have been identified as increasing household vulnerability to flood events. These factors include poverty, customs and culture, lack of social amenities and infrastructure, illiteracy and dependency on agriculture and poor management of Shiroro dam. The research report shows that the opening of the dam gate to release excess floodwater from the dam reservoir has aggravated inundations of large agricultural farmland. Many residential and public structures have been destroyed. Some secondary roads and footpaths have been submerged as a result of the flooding making transportation very difficult. The flood events have impacted negatively on the agricultural outputs of the communities on the floodplain and also converted most of the farmland to a river course.

The chronology of the flood events along the Kaduna River from the historical data and scientific data reveals that flood disasters appear to be more frequently in recent times. Floods occurred in the past but they never seemed to be viewed as a disaster to the communities. Rather the communities construed them as blessings since they served as irrigation to the farmlands. Interviews conducted with some farmers show that, there is a severe contraction in farm output since the 1980s. This contraction in farm outputs has led to household food insecurity among the villages on the floodplain. Agriculture in Shiroro communities on the floodplain is currently constrained by biophysical and socio-economic problems including flooding, poor infrastructure, lack of access to market, and information. As a result of these constraints over the past two decades, farmers hardly produce enough food for family use. Failures in harvest therefore, will certainly undermine household food security, hence increasing their vulnerability to malnutrition and reduces their coping capacity to other health problems. There were for example, reported cases of outbreaks of disease such as malaria, typhoid, diarrhoea and gastroenteritis in Shiroro communities on the floodplain. In the next section household vulnerability, adaptation strategies and adaptive capacity of the communities to floods will be assessed and the socio-economic interaction across all the three research sites (A-C) will be traced.