THE IMPACT OF FLOOD FREQUENCY OF RIVER KADUNA AT GBARA, NIGER STATE

BY

NDALAZHI HANNAH	AS/12/60268
ALIYU MARYAM	AS/12/60262
IBRAHIM AGNES	AS/12/60223
SADIQ A. GARBA	AS/12/60266
YAKUBU AHAMED	AS/12/61503

A PROJECT SUBMITTED TO THE
DEPARTMENT OF GEOGRAPHY
NIGER STATE COLLEGE OF EDUCATION, MINNA

SEPTEMBER, 2015.

THE IMPACT OF FLOOD FREQUENCY OF RIVER KADUNA AT GBARA, NIGER STATE

BY

NDALAZHI HANNAH	AS/12/60268
ALIYU MARYAM	AS/12/60262
IBRAHIM AGNES	AS/12/60223
SADIQ .A. GARBA	AS/12/60266
YAKUBU AHAMED	AS/12/61503

PROJECT SUBMITTED TO THE GEOGRAPHY DEPARTMENT IN PARTIAL FULFILLMENT OF REQUIREMENT FOR THE AWARD OF N.C.E IN GEOGRAPHY

SEPTEMBER, 2015

CERTIFICATION

We certify this project has been read and approved by the under-sign on behalf of the Department of Geography, Niger State College of education Minna.

Project Supervisor
Mr Joseph Ahmadu Gunni

15/10/2015
Date

Project Coordinator
Mallam Ndako Nma

15/10/15
Date

H.O.D of Geography Department
Mr Sakoma Joash Kaura

15/10/15
Date

DEDICATION

This project is dedicated to the Lord Almighty and to our Lovely Parents, Brothers and sisters.

ACKNOWLEDGEMENT

We wish to first express our gratitude to Almighty God for sparing our lives and giving us good health, strength and effort which enabled us to complete this phase of our academic endeavor.

Our sincere appreciation goes to our supervisor Mr Joseph Ahmadu Gunni for His constructive, Criticizing with this write up and providing guidance that led us to improvement, both in academic and research work.

We thank our families for bearing with our absence and also their unflinching moral support throughout the project our appreciation goes to our lovely parents, Brothers and sisters.

Our appreciation goes to our Head of Geography Department in Person of Mr Sakoma Joash Kaura and other lecturers in geography Department.

We finally register our appreciation to our friends and well wishers, whose inspirations and support spurred us into action.

ABSTRACT

The purpose of this work is to examine the impact of flood and it frequency and some of the ways to ameliorate the effect of frequency in the areas. The research methodology used include questionnaires, oral interviews, time series analysis and cumulative frequency distribution of annual rainfall. The result of the analysis indicated the statistical analysis of rainfall, time series of annual rainfall and flow hydrograph as well as bar graphy. The following recommendations were made: run off can be detained in the headwater by planting ground cover on the slopes. Building terraces to increase soil infiltration and prevent soil erosion.

TABLE OF CONTENTS

CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

CHAPTER ONE

1.0 Introduction

1.1 Background

Flood, inundation of land by the rise and over flow of a body of water. Floods occurs most commonly when water from heavy rainfall, from melting ice and snow, or from a combination of these exceeds the carrying capacity of the river system, lake or the like into which it runs. Usually the combined flow of several water-swollen tributaries causes flooding along a river bank or shoreline. Accounts of floods that destroyed nearly all life are found in the mythology of many peoples.

Not all floods are destructive, however, the annual flood waters of the river Kaduna and some other larger rivers historically deposited fertile soil along the surrounding flood plain, which is used extensively for agriculture. The damming of the river Kaduna (Shiroro) and other rivers in modern times, however, often has greatly reduced this deposition.

The rise and fall of the water level in a river is called the flood wave. Its highest point a crest travel progressively downstream. In the upstream portions of a river the flood crest passes quickly. Furthermore, downstream, the greater volume of water causes slower passage of flood crest resulting in floods of longer duration. In most time annual floods of Kaduna river follow the thaws and rains of spring; and is also may occur because of narrower and shallower parts of a river.

Sudden torrential flows, called flash floods following a brief, intense rainstorm or the bursting of a natural or constructed dam or level. In addition to the duration and quality of rainfall, the nature of the soil (permeability; state of saturation) of an area affects the frequency of flood, (Columbia electronic encyclopedia 2012).

1.2 Statement of Problem

The Kaduna River is subject to great seasonal fluctuations and during the flood it create health hazards by way of pollute the environment due to deposition of debris. The destruction of farmlands which requires considerable skilled labour for controlling flood water, for irrigation and drainage, and for leveling the land and building banks around the fields to keep in the water for cultivation. For the light of this, the project will try to look into the problem of flood along Kaduna river channel especially at gbara.

1. Causes of flood in Kaduna river
2. The impact of its frequency and magnitude
3. Preventive measure.

1.3 Aim and Objective

The aim of this project is to insight the impact of flood frequency along the Kaduna river bank.

i. To find out the causes of flood at gbara.

ii. To estimate flood frequency of river Kaduna at gbara.

iii. To find out the extent by which flood affects the gbara peoples.

iv. To establish preventive measures to reduce the level of damages.

1.4 Significant of the Study

The significant of the study cannot be over emphasize, as it sort to shoe case the impact as well as suggesting an acceptable of insuring control option so as to avoid flood. The study will therefore, focus on the impact of flood frequency of inhabited portion of a river so as to serve as a basis of the planning in the flood prone areas.

Which is going to be great benefit to student's teachers, geographers, climatologist, and geologist and even to develop an infestation index map to determine control option so as to reduce flooding.

1.5 Research Hypothesis

To guide this study the following research hypothesis has been posed VIZ:-.

i. The shallowness of river channel causes flood?

ii. The human activities along the river bank causes flood?

iii. The bursting of river banks by excessive rainfall causes flood?

1.6 Scope and Limitation

The scope of this study is confined to the impact of flood frequency making use of Gbara and suggesting possible solution to the impact therefore the study is limited to the Gbara flood prone areas.

1.7 Definition of Terms

Impact: According to oxford dictionary; is the action for one object coming forcible into contact with another or have a strong effect on someone or something.

Flood: the European union (EU) flood directive, defines a flood as a covering by water of land not normally covered by water which may result from the volume of water within a body of water such as a river or lake, which over flows or breaks levees, with the result that some of the water escape its usually boundaries or may be due to accumulation of river water on Saturated ground in a area flood.

Frequency: is the rate at which something occurs is repeated over a particular period of time or in an given sample.

CHAPTER TWO

2.1 Literature Review

In a nutshell, this chapter will be devoted to look into some existing literature that has relevance to the topic of research. Therefore it is the review of some works written by various scholars base on the issues of flooding around the world.

Water flowing in a channel is being pulled by gravity, the gravitational force of the weight having a down hill or forward component. The stream gradient is thus as an essential factor (Dunne and Leopold 1978). Wisher and Brater (1959) have stated that floods are primarily due to surface run-off. Any drainage basin with soil so pervious that its infiltration capacity is never exceeded is rarely subject to floods. Many floods result from intense rainfall, melting of accumulation snow or melting snow combined with rain.

Abubakar (1994) has estimated the mean monthly water discharge at Kaduna river to be highest between the month of July to September, while the lowest volume to be between the month of January to April. He observed that floods are unique events in the sense that even identical flood generating mechanism may result in different floods from one catchment to another or indeed within a given catchment from time to time.

Abubakar (1994), also forecast flood along river Kaduna using time series analysis. The discharge was found to be at its peak in august and September, which implies that flood activities are concentrated between the months of august and September.

2.2 Review of Flood Disasters

Historically, notable floods across the globe a flood of the tiber was recorded in 413 B.C. records of floods on the Danube date from A.D-1000. In China some of the worlds most disastrous floods have been caused by the unstable huangla He (Yellow River). The river, which flows at or above the level of the bordering lands, is contained in part by levees; however, because its channel has gradually become filled with deposited sediment, any appreciable increase in its volume causes the river to overflow and flood the surrounding area. The neither lands dependent on its dikes for protection from inundation, has suffered many disastrous floods from the sea and the Rhine and Meuse rivers. In 1970, 1988 and 1991, hundreds of thousand of people in Bangladesh were killed when the combination of high tides and a tropical cyclone (hurricane) storm surge caused widespread flooding of the low-lying delta of the Ganges and Brahmaputra rivers.

In the united states the Johnstown, Pai flood of 1989 in which thousands of lives were lost, was caused by the breaking of an earth dam above the city. Even greater loss of life occurred (1900) in Galveston, Tex, when tide and storm surges

engulfed the city after a hurricane. The hurricane of 1938 on the New England along is coasts and Hurricane Donna in 1960 along the Atlantic coast from Florida to the long island sound was also followed by storm surges. In June, 1972, extremely heavy rainfall associated with a tropical storm inundated the basins of the Chemung and Susquehanna rivers of new York and Pennsylvania causing severely damaging floods in corning and Elmira, N,Y; and Wilkes-Barre and Harrisburg, pa. In July, 1979, Hurricane Claudette deposited a vs. record of 43 in (109cm) of rain in Aluin, Tex in 24 hours. Hurricane Katrina in August; 2005, led to extensive and devastating storm-surge flooding along the Louisiana and Mississippi coasts, and the Failure of several levees in the new Orleans area resulted in hundreds of deaths. The worst in the United States from river overflow were in 1913 on the Miami River (a tributary of the Ohio) which claimed about 300 lives. In 1993 major and or record flooding occurred across North Dakota, Nebraska, Kansasa, Minnesota, Lowa, Misouri, Wisconsin and Illinois, fifty flood deaths occurred, and damaged approached and 15billion hundred of levees failed along the Mississippi and Missouri Rivers. Ten thousands of people were evacuated, some never to return to their homes. At least 10,000 homes were totally destroyed, hundreds of downs totally and completely under flood waters, at least 15 million acres of farm land were inundated, some of which may not be useable for years to come.

Transportation was sevely impact, Barge traffic on the Missouri and Mississippi river was stopped for nearly 2 months bridges were out or not accessible on the Mississippi river from davenport, Lowa, downstream Tost. Lovis Missouri. On the Missouri river, bridges were out from Kansas City, down stream to ST. Charles, Missouri numerous inter state high ways and other roads were closed the ten commercial airports were flooded. All railroad traffic in the mid west was halted. Numerous sewage treatment and water treatment plants were destroyed (Larson 1993).

In Nigeria, the story is not different, in 1978 Ogunpa floods, (Ibadan) Oladipo records in his paper resulted in damages to properly worth over ₦2 million and 30 deaths. Two years later, the Ogunpa again flooded it's heavily built-up banks killing 3000, rendering 50,000 homeless and destroying properties worth ₦300 millions. In august 1988, Bagauda Dam, near Kano collapsed, worsening the rainfall induced floods in the state which, according to Oladipo claimed 146 lives destroyed 18,000 houses and displaced over 200,000 people and damages residences worth the sum of ₦650 million (new swatch, 1990).

Not with standing, we cannot forget, the great flood disaster of 2012 in Nigeria which causes much havoc to many Nigerians that trail of tragedies, hardships across Nigeria from the North to south, east to west, the advance effects are very glaring that everyone feel the impact. The flood has brought untold

hardship on millions of Nigeria's; while various roads, bridges, houses, churches, mosques, culverts e.t.c were destroyed.

In Bayelsa the country home of the Governor Bayelsa state, Seriak Dickson in Sagbama local government Area was among many other houses taken over by the flood that hit Bayelsa states. No fewer than 700 indigenes of the community including farmlands were also over-run by the flood.

(Vanguard 2012) reported that at least39 people were killed due to flooding in the central Nigeria Plateau state. Heavy rainfall caused the Lamingo Dam to over flow near Jos sweeping across a number of neighborhoods in Jos and approximately 200 home were submerged or destroyed. In addition, at least 35 people were missing and left 300 people homeless.

There is also a report that about178 houses have been submerged by flood in Kaduna state following several days of rain in the state. The areas affected included, Abubakar Kigo road, Rafin Guza, Nasarawa rimi G.R.A which a close to the river Kaduna.

Executive secretary of SEMA, Ishaku Dogo Makam Said, After our assessment of these areas with the National emergency management Agency NEMA, and Red cross, we confirmed that 178homes were submerged, but we have not heard of any reported death or injury.

2. **Poor Farming:** some farming practices can damage the vegetation cover, so the soil will be washed into the river easily and can filled the river channels thereby leading to river to over flow its banks.

ii. **Overgrazing:** people want more food and money. They graze too many animals on the land and the pasture is eaten away quickly. Less vegetation cover results in soil washed into the river easily.

iii. **Over cultivation:** when a piece of land has been used for farming for along period of time, the soil may become so infertile that no vegetation can grow on it. The land is less fertile than before so the soil washed into the rivers more easily.

3. **Poor Water Management:** when the dams are poorly constructed or maintained they can easily collapse and this results in flooding. In China, many lakes along the major rivers have been heavily silted and reclaimed.

4. **Population Pressure:** because of large amounts of people, everything's needs more, like wood, land and foods e.t.c, soil erosion happens more often and increases the risk of flooding. Large numbers of people live in areas with high risk f flooding in China. They cause the problems of overgrazing and over cultivation.

The destruction of forest, drainage blockage the ploughing of major land areas and growing urbanization all serve to break up the natural environmental in general

and in particular, reduce the infiltration properties of solid. These activities increase the maximum run-off and the duration of floods moreover, errors in the design and running of hydraulic-engineering structences sometimes endower the safety of dam (would water, 1989).

CHAPTER THREE

3.0 Data and Computational Method

3.1 Method of Data Collection

The meteorological data consist of rainfall were supplied by Nigeria metrological (NIMET) Minna Airport Niger State i.e Annual rainfall record of Minna.

3.2 Description of Data Set

Annual totals of rainfall usually a normal frequency distribution at a place is expressed in term of the arithmetic mean.

The years are arranged along the horizontal line while the rainfall figures in cm^3 are arranged along the vertical line. The graph is then plotted annual rainfall values against the percentage of all events and maximum points of each year are joined together to give a line graph. This value is obtaining by ranking "n" annual precipitation values according to their size.

3.2.1 Summary of Data	
Data Types	Period
Rainfall Amount	2009-2014

Source: Day Seconddry school Gbara

3.3 Method of Data Analysis

3.3,1 Statistical Analysis

3.3.2 Cumulative Frequency Distribution

Value of annual rainfall from (2009-2014) are plotted against the percentage of all events. This obtained by ranking the annual rainfall value according to their size.

The percentage frequency of past event is taken and it may likely to occur in present and of future events.

3.3.3 Time Series

Time series is a list of values of variables according to time. The variable classified by time in which the values of the variable are functions of the time period

CHAPTER FOUR

4.1 Data Analysis, Result and Discuss

This chapter discusses the statistical analysis of rainfall, time series of annual ainfall and flow hydrograph were all carried out.

The values of rain in a year

mount (mm)	Percentage (%)
076.7	7.9
1254.1	15.8
1284	23.7
1344	31.6
1401	39.5
1465.2	47.4

Sources: field word, 2015

Column 1 shows the annual rainfall of period of six (6) years by ranking the annual rainfall according to their size. In column 2show the percentage of events less than or equal to each annual rainfall.

The time Series of Annual Rainfall from 2009-2014

Years	Annual Rainfall
2009	1401

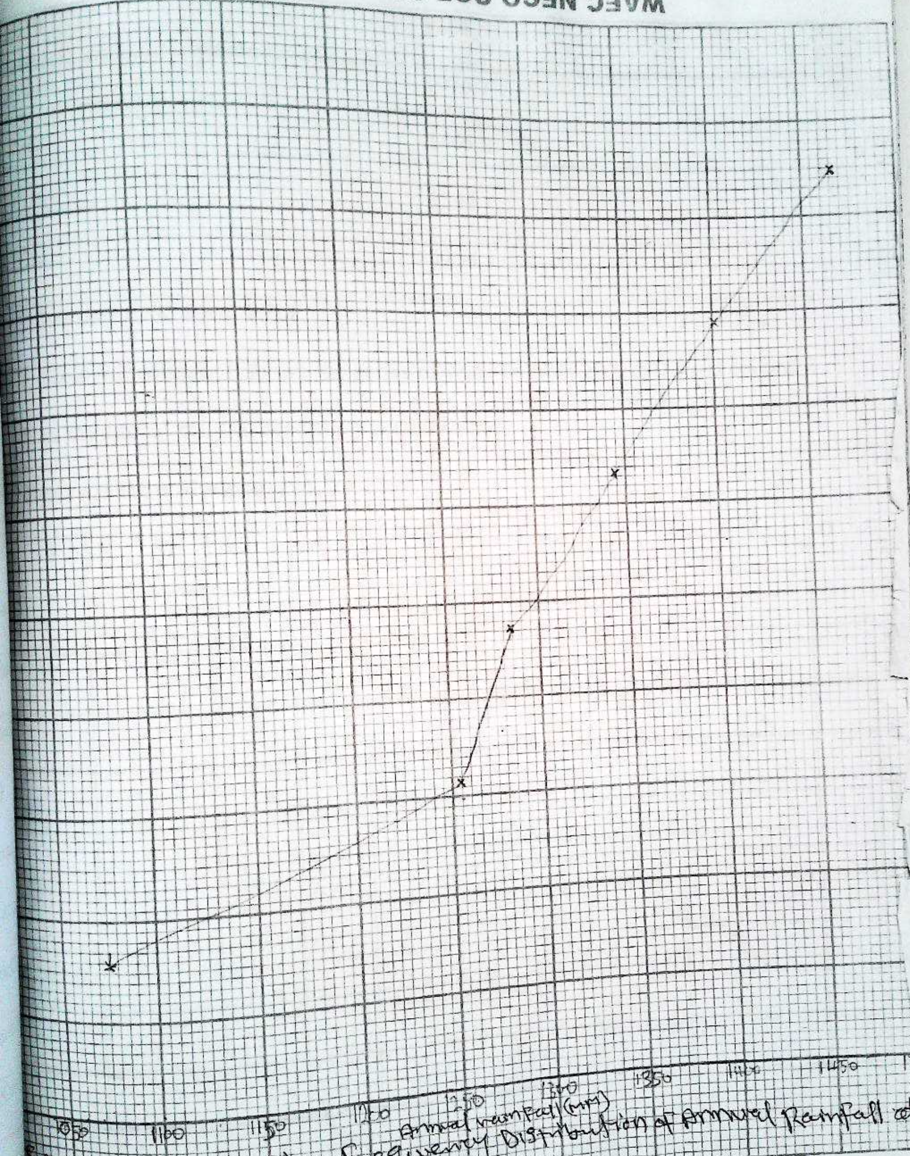


Fig 4.1 The Cumulative frequency Distribution of Annual Rainfall at Niger State.

2010	1284
2011	1076.7
2012	1465.2
2013	1344
2014	1254.1

Sources: field word, 2015

Table 4.2 column 1 shows the series of years i.e from 2009-2014 and column 2 shoes the annual rainfall according to their years.

Table 4.3 Flow Hydrograph for 2009

	J	F	M	A	M	J	J	A	S	O	N	D
							5.11		15.03			
					0.81							

)10	1284
)11	1076.7
)12	1465.2
)13	1344
)14	1254.1

Sources: field word, 2015

Table 4.2 column 1 shows the series of years i.e from 2009-2014 and column 2 oes the annual rainfall according to their years.

able 4.3 Flow Hydrograph for 2009

J	F	M	A	M	J	J	A	S	O	N	D
						5.11		15.03			
				0.81							

1.3

11.01

6.05

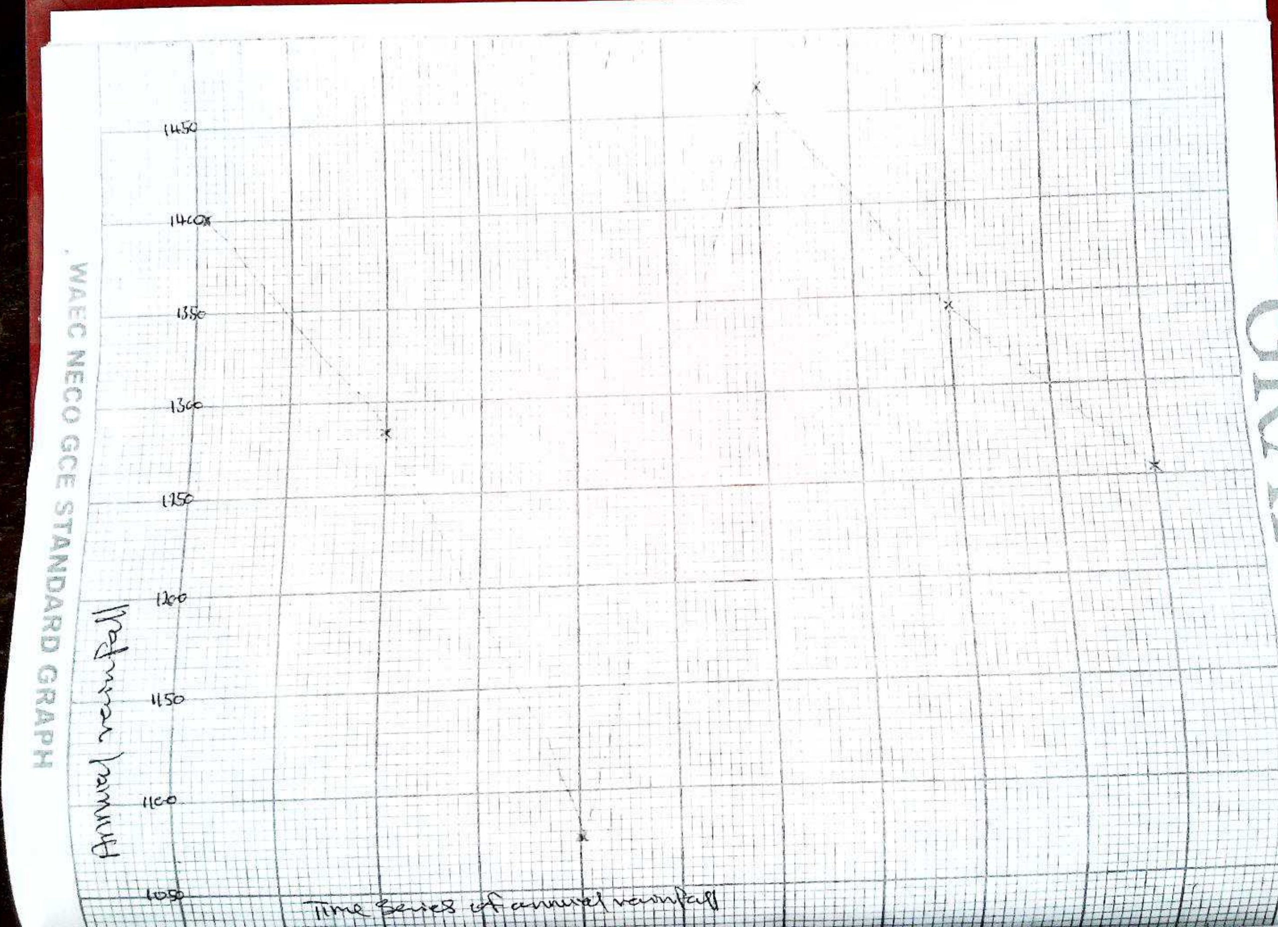
3.3

0.19

1.9

2.84

14.5



WAEC NECO GCE STANDARD GRAPH
GRAPH
Annual rainfall
1450
1400
1350
1300
1250
1200
1150
1100
1050
Time series of annual rainfall

			0.31			8.90					
							17.9			
			0.5	2.71	4.14	14.01	32.4	29.34	6.05	
			0.25	1.4	2.07	7.005	16.2	14.67	6.05	$=\frac{47.65}{12}$ $=3.90m^3$ sec

Table 4.3shows the discharge measurement (mm^3/sec) of river Kaduna for the year 2009. For we to achieve flow hydrograph, flow index (k) have to be determined, by given equation.

$Km = \frac{Qm}{Qy}$ monthly coefficient of flow index.

Where QM = mean of monthly discharge

Qy = mean of annual discharge and to determine k

$$\overline{K} = 1/m \frac{\Sigma KM}{M}$$

Where M =12 (month of the year).

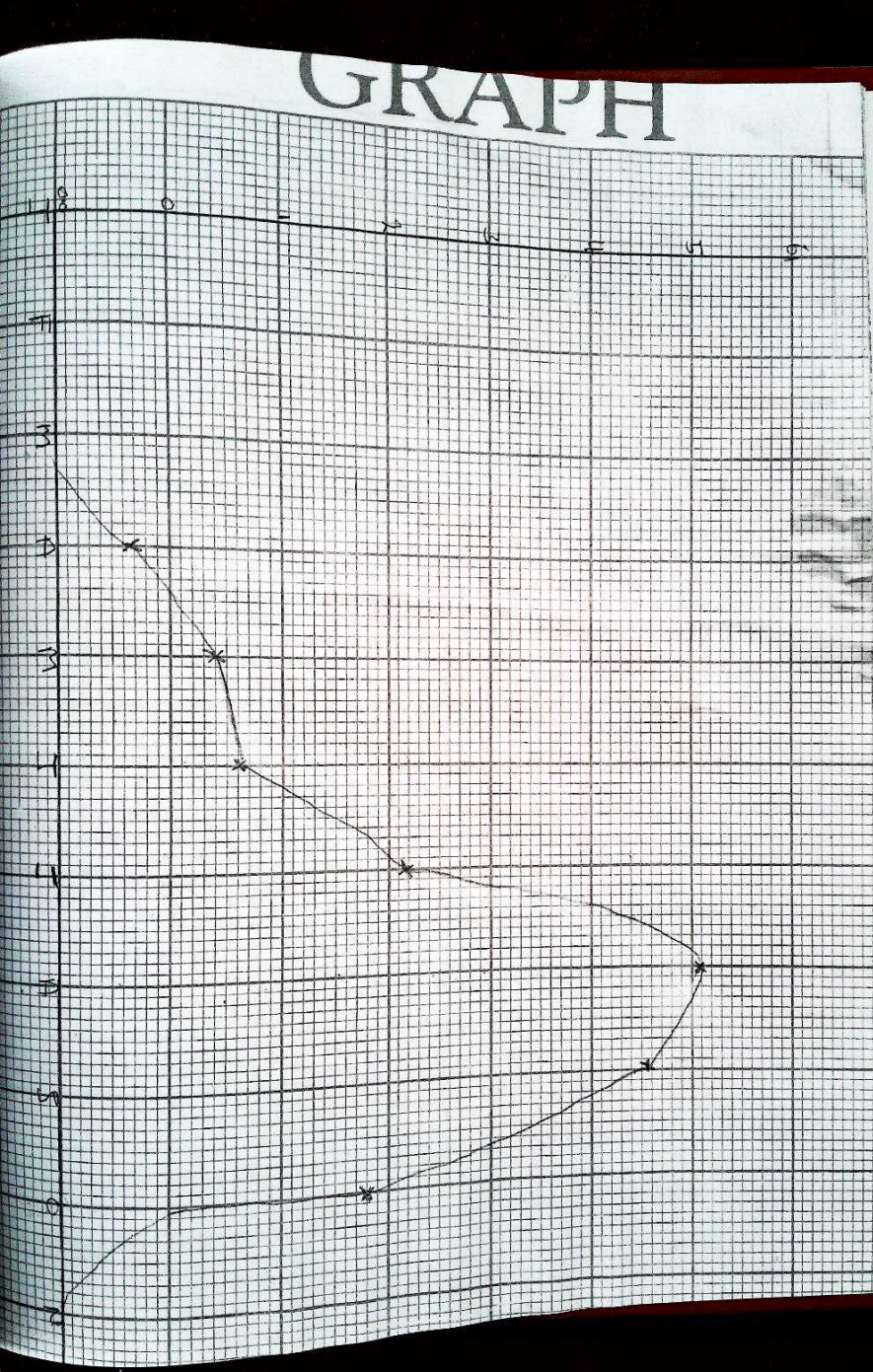
The mean annual discharge $= \frac{47.65}{12} = 3.10m^3/sec$

$$Km = \frac{Qm}{Qy}$$

For the month of April $\frac{0.25}{3.10} = 0.08m^3/sec$

For the month of May $\frac{1.4}{3.10} = 0.5m^3/sec$

GRAPH



For month of June $\frac{2.07}{3.10} = 0.7m^3/sec$

For month of July $\frac{7.005}{3.10} = 2.3m^3/sec$

For month of August $\frac{16.2}{3.10} = 5.2m^3/sec$

For the month of September $\frac{14.67}{3.10} = 4.7m^3/sec$

For the month of October $\frac{6.05}{3.10} = 1.9m^3/sec$

$Km = 15.4m^3/sec$

To determine $\overline{K} = \frac{1}{M}\Sigma KM = \frac{15.4}{12} = 1.3m^3/sec$

4.2 Discussion of Result

4.2.1 The Values of Rain in a Year

Column 1 table 4.1 shows the annual rainfall of period of six years by ranking the annual rainfall according to their size. While in column 2 shows the percentage of events less than or equal to each annual rainfall.

Fig 4.1 show cumulative frequency distribution of mean annual rainfall plotted on x-axis against the percent of annual rainfall for which that magnitudes is available plotted on y-axis, this give a sequential information regarding the annual rainfall that are available.

The annual mean rainfall has been estimated to be1304.2mm per amum. The highest amount of rainfall was recorded in 2012 which is about 1465.2mm which mark the high discharge of flooding; occurred in the riverine areas; while the

lowest recorded in 2011 because of inadequate rainfall or short-dry spell in that year.

4.2.2 Time Series of Annual Rainfall

The table 4.2 column 1 shoes the time series of the years from 2009-2014 and in column 2 shows the annual rainfall according to their years.

The fig 4.2 shows the time series of annual rainfall of Niger state south; the yearly annual rainfall was plotted on y-axis and the numbers of the years that are available plotted on the x-axis, on the line graph does not indicate clearly any trends patterns in the rainfall due to variation in each year.

There was a high rainfall, the year 2009 and decrease in 2010 and continue sharp decline occurred in 2011 which has the lowest rainfall than, 1,100mm, and a sharp increase occurred in 2012 which has the highest rainfall that more than1400mm; while the decline occurred between 2013 and 2014 respectively.

Base on the observation by the time series the flood frequency of river Kaduna at Gbara may likely give the gap of interval of two years and the third year the flood may likely to occur base on our observation from the graph. Probably there will be flood in the next year.

4.2.3 Flow Hydrograph

Fig 4.3shows the peak level of Kaduna river in each year, the flow hydrograph has values of flow index (K) plotted against months.

There was a gradual rising up between the month of April-June and sharp rising toward July and reached its peak in August and sharp falling in September due to ceases of rainfall.

4.3 The Impact of Flood Frequency

Flood can be have devastating consequences and can have effects on the economy, environment and people.

1. **Economy**: during floods, roads, bridges, farms, houses and automobiles are destroyed. People become homeless. As we can see from our fig 4.2 above, the 2009 and 2012 flood has cause a great havoc to many Nigerians which affect the economy because heavy cost to people and of course the government. It usually takes years for affected communities to be re-building and business to come back to normally.
2. **Environment:** the environment also suffers when floods happen. Chemical and other hazardous substances end up in the water and eventually contaminate the water bodies that floods end up in the case of 2012 flood as we can find it in fig 4.2above.

Additionally, flooding causes kills animals, and others insects are introduced to affected areas, destroying the natural balance of the ecosystem.

3. **People:** many people are killed in flash floods many more are injured and others made homeless, water supply and electricity are disrupted and people struggle and suffer as a result.

   In addition to this, flood brings a lot of diseases and infections including military fever, pneumonic plague, determatopathia and dysentery. Sometimes insects and snakes makes their ways to the area and cause a lot of havoc.

4. **Agriculture:** there is also something good about floods especially those that occur in floods plains and farm field. Flood waters carry a lots of nutrient (Alluvia fertile soil) that are deposited in the plains. Farmers love such soils, as they are perfect for cultivating some kinds of crops. This happen in 2013 that give birth to a bumber harvest of agricultural produce which followed the2012 flood as we can see in fig4.2.

CHAPTER FIVE

5.1 Summary

The study was carried out to appraise the impact of flood frequency of river Kaduna at Gbara and the work have shown the statistical picture of the rainfall variations flow hydrograph and the level of flood frequencies as well as causes of flood especially that of 2012flooding of river Kaduna at Gabra.

5.2 Conclusion

The work was to investigate the magnitude of flood and possible ways of providing the solution to the destructive effects of flood and the sometime when even the flood has been occurred it provide alluvial fertile soil for agriculture.

Actually, data on flood flow characteristics are insufficient and therefore, the level of the frequencies of flood in Kaduna river were extremely difficult, but the results of the analysis were not hundred percent accurate but it provides the following information's:

1. From the result, it could be concluded that 2009 and 2012 flood could be intense rainfall that led to bursting of a natural or constructed dam or levees.
2. From the results, one can concluded that in 2010 there is a b/umber harvest due to minimum rainfall that follow the 2009 flood that provide alluvial fertile soil for the2010 and the same happen in 2012 that give rise to heavy flooding which provide the alluvial fertile soil for 2013 agriculture produce.

3. One can also said that, river Kaduna flood is occur due to narrower and shallowness of some parts its river channel.

5.3 Recommendations

For the reduction of frequency level of flood damages in Kaduna river. Generally, flood control measures along Kaduna river are attempted at both its, headwaters and its low-lying flood plains.

1. Run off can be detained in the headwaters by planting ground cover on the slopes.
2. Building terraces to increase soil in filtration and prevent soil erosion.
3. Building small check dams or retaining ponds to reduce the flow of water.
4. Flood control on the lower flood plains involves building levees to contain the flow.
5. Straightening or dredging the channel to improve flood characteristics.

Finally, concern over the effects of channelization on rivers in flood plains has led to the development of flood-control approaches that attempt to combine the way flood plains naturally handle.

Floodwaters with traditional methods that restrict those water greater spread such an approach might involve increasing the distance of leaves from a rivers channel along with the creation of wetlands to absorb flood waters.

References

Abubakar SN, T.HChiew, J. Hanapi (1997) *Rainfall Run off Models and Flood Frequency Analysis. British Hydrological* Society

Ajayi Ola (2012): Nigeria Flood Sacks *Ibadan Residents. All Africa* Retrieved.

Dune T and Leopold L.B (1978): Water in Environmental Planning. *San Francisco, Calif, W.H Freemen,* 257-258p.

Kearney Laila (2014): Flash Floods, *New York Reuters, Retrieved.*

Mischaknight (2012): *Discharge and its Factors Affecting* Drainage Basin.

O.A Iwena (2008): *Essential Geography* Tonad Publishers Limited.

The Columbia Electronic Encyclopedia (2012): *Flood Characteristics and control* 6thed.

Tim Schoon (2013): *Flood Preparations Begin*, University of Iowa.

Vanguard (2012): *Flood Sacks 178 Homes in Kaduna on Septembers* 13, 2012.

Wisler C.O and Brater E.F (1959): *An Introduction to Coastal Engineering and Erosion Protection Wiley Publisher Inded* New York PP. 409.