SOCIO-ECONOMIC IMPLICATION OF FLOOD INCIDENCES IN ABAJI AREA COUNCIL OF FEDERAL CAPITAL TERRITORY (FCT) ABUJA-NIGERIA

BY

ANAIHO TIMOTHY TERKURA
NSUK/SS/MSC/ERM/022/15/16.

BEING A MASTER OF SCIENCE DEGREE IN ENVIRONMENTAL RESOURCE MANAGEMENT, NASSARAWA STATE UNIVERISTY, KEFFI, NASARAWA STATE, NIGERIA.

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN ENVIRONMENTAL RESOURCE MANAGEMENT OF THE SCHOOL OF POSTGRADUATE STUDIES OF NASARAWA STATE UNIVERSITY, KEFFI.

MAY 2018

DECLARATION

I, ANAIHO TIMOTHY TERKURA do hereby declare that this dissertation "**socio-economic implication of Flood Incidences In Abaji Area Council OF FEDERAL CAPITAL TERRITORY(FCT) Abuja Nigeria"** has been written by me and it is a report of my research work. It has not been presented in any previous application for the Award of Masters of Science Degree. All Quotations are indicated and sources of information specifically acknowledged by means of references.

ANAIHO TIMOTHY TERKURA

Certification

This dissertation the socio-economic implication of Flood Incidences in Abaji Area Council of FCT Abuja Nigeria meets the regulation governing the Award of Master of Science Degree (Environment Resource Management) Faculty of Social Sciences of Nasarawa State University Keffi.

_____ _____

(**SUPERVISOR**) Date
PROF. NASIRU .M. IDRIS

_____ _____

(Head of Department) Date
PROF. NASIRU .M. IDRIS

_____ _____

(Internal Examiner) Date
(DR. ALKALI)

_____ _____

(External Examiner) Date
PROF. A.S. ABUBAKAR

_____ _____

DEAN SCHOOL OF POSTGRADUTE Date
(PROF. S.A.S ARUWA)

Dedication

I dedicate this dissertation to Almighty God the Creator of the universe through Christ Jesus my Lord and Personal Saviour.

MY loving and caring parents Late Mr. and Mrs. Stephen Anaiho Mtswen and Woo Cecilia Anaiho Mtswen. For their character's of self-reliance courage in times of adversities which I have inherited during their lifetimes, their continues interest, encouragement in my educational background, progressed and other human endeavour, morally and financially respectively when they were alive.

Acknowledgement

It is my good pleasure to acknowledge with profound gratitude for the co-operation and valuable assistance received from the following during the execution of the research work and course of studies.

My project/ dissertation supervisor Prof. Nasiru .M. Idris and Prof. A.C. EZAISHI. for sparing their time to go through this manuscripts despite there tight schedules there continues assistance and useful suggestion and cooperation on fundamental issues through the research writing.

My special appreciation went to Mr. Tom .T. Edward, Mr. Nyam .M. Mark of FCT emergency management Agency for their assistance and co-operation.

Gratitude goes to all my lecturers of Dept of geography NSUK. Late Dr. Kasim Abayomi, Dr. Mahmud A, Dr. A.T Ogah, Late Dr. Labaris. and Dr Alkali My gratitude also to my wife Mrs. Dorathy .A. Anaiho, and my son Master Tordue Mark Anaiho for their support most especially during the course of these studies.

To all my Brother's and Sister's my Sister Margret Tarfa the Husband, My brother Rev. Fr. Anaiho Terngu Godwin for their moral and financial support. also the FCT Administration that have given me the approval and opportunity to undergo this programme.

Abstract

Flood disaster has become a recurring decimal in the last ten years in yaba community of Abaji area council of FCT. It has become an annual event with it attendant devastating effect on the socio-economic lives of the people in the area. In 2012 about 5000 people were affected, 300 people displaced 52 household were destroyed also about 300 hecters of farmlands made up of rice, maize, millets, guinea-corn and groundnuts crops were wash away by the flood as the result of excessive and prolong rainfall in the area leading to over-flow of gurara river banks. It has been observed that the accumulation of sediments or debris over the years had also reduce the river channels.

In view of the above, it have make it necessary to write this research work on this topic to examing and assess the socio-economic implication of this flood incidences on the livelihood of the people. A descriptive and investigative research designed is adopted the process is achieved through collection of data using reconnaissance survey, interview as well as personal observation was carried out to achieved the aim and objectives of the research work, however, to facilitate the analysis and presentation of data in understanding as regards to data collected, a descriptive and inferential statistic such as spear-man rank correlation co-efficient, measure of central tendency,frequency tables, bar-chart, pie-chart as well as chi-square are adopted to determines the relationship between variables. Chi-square value is use to test the null and alternative hypothesis.

Emphasis is place on the identification of the causes of flood and the analysis of socio-economic implication of flood on lives of the people in the area, one of the major strategic measures recommended to reduce or control this menance is by non-engineering and engineering approaches by strengthening and raising public awareness of flood disaster at the community level so as to reduce their vulnerability and risk. Community knowledge as well as improving of river gurara channel drainage basin is very significant to improved on preparedness and mitigation so as to reduce or prevent continues flood disaster in the area.

Table of Contents

ITEM	PAGE NO
Title Page - - - - - - - - - -	i
Declaration - - - - - - - - - -	ii
Certification - - - - - - - - - -	iii
Certification - - - - - - - - - -	iv
Dedication - - - - - - - - - -	v
Acknowledgment - - - - - - - - - -	vi
Abstract - - - - - - - - - -	vii
Table of Content - - - - - - - - - -	viii
List of Tables - - - - - - - - - -	x
List of Figures - - - - - - - - - -	xi
List of Appendices - - - - - - - - - -	xii

CHAPTER ONE

1.0	Introduction - - - - - - - - - -	1
1.1	Background of the Study - - - - - - - -	1
1.2	Global Inventory of Flood Events, Causes and Effects - -	1
1.2.1	Natural Climatological Factors and Human or Anthropogenic Factors	2
1.2.2	Climatological Factors - - - - - - - -	2
1.2.3	Human Anthropogenic Factors - - - - - - -	3
1.3	Statement of the Problem - - - - - - - -	6
1.4	Research Question - - - - - - - -	7
1.5	Aims and Objectives of the Study - - - - -	7
1.5.1	Aims - - - - - - - - - -	7
1.5.2	Objective - - - - - - - - - -	11
1.6	Significance of the Study - - - - - -	8

1.7 Scope and Limitation of the study - - - - - 8
1.8 Research Hypothesis - - - - - - - 9

CHAPTER TWO

2.0 Conceptual Framework and Literature Review - - - 10
2.1 Introduction - - - - - - - - - - 10
2.2 conceptual Frame Work - - - - - - - 10
2.3 Hazard - - - - - - - - - 11
2.4 Vulnerability - - - - - - - - 11
2.5 Capacity - - - - - - - - - 11
2.6 Potential Harzad/ vulnerability/capacity - - - - 11

2.7 Literature review - - - - - - - - 12
2.8 Income or Livelihood Recovery- - - - - - 14
2.9 Individual Protection - - - - - - - 14
2.10 Community Protection - - - - - - - 14
2.11 community Resurces - - - - - - - 15
2.12 Flooding and it Impact on the world Environment - - - 15
2.14 Flooding and Impact on Nigerian Environment- - - - 16
2.13 Creation of Sustainable cities - - - - - - 19
2.14 World view on flood event - - - - - - 19
2.14 Various Sectors of the Economy that are vulnerable to
Flood hazards- - - - - - - - - - - - - - 24
2.15 Advantages of flood - - - - - - - - - - - - 25

2.15 Socio-economic implication of floods in Nigerian Cities/Town- - 26

CHAPTER THREE

The Study Area and Research Methodology

3.0 The study Area - - - - - - - - 31

3.1 Emergency Creation of Fct - - - - - - 33

3.2 Geology and Relief - - - - - - - 33

3.3 Topography and Drainage - - - - - - 33

3.4 Climate - - - - - - - - - 34

3.5 Soil and Vegetation - - - - - - - 34

3.6 Settlement and Land Use - - - - - - 35

3.7 Industry - - - - - - - - - 35

3.8 Research Methodology - - - - - - - 36

3.9 Introduction - - - - - - - - - 36

3.10 Data - - - - - - - - - - 36

3.11 Types and Sources of Data - - - - - - 36

3.12 Primary Data - - - - - - - - 36

3.13 Secondary Data - - - - - - - - 37

3.14 Population Study - - - - - - - - 37

3.15 Sample Techniques - - - - - - - 37

3.16 Research methodology/computational techniques - - - 37

3.17 Method of Data Analysis and Presentation - - - - 38

CHAPTER FOUR

PRESENTATION AND DICUSSION OF RESULT

4.00 INTRODUCTION - - - - - - - - - - - - - 39

4.1.1 Testing of Hypothesis - - - - - - - 39

4.2.0 Analysis and Findings - - - - - - - 57

4.2.1 Analysis of socio-economic implication of Flooding on the livelihood of the people in the Study Area - - - - 65

4.2.2 The Negative Impacts - - - - - - - 58

4.2.3 The Positive Impact of Flooding in the Study area - - - 60

4.2.4 Analysis and interpretation Profile of socio-economic and climatic Variables Affected by 2014 Flood in Yaba Community of Abaji area council - - - - - - - - - 61

CHAPTER FIVE

Summary, conclusion and recommendation.

5.1 Summary of findings - - - - - - - 83

5.2 Conclusion - - - - - - - - - 84

5.3 Recommendation - - - - - - - - 85

5.4 Improvement of institutional capacity and adequate coordination of disaster management in fct - - - - - - - 85

5.4 Recommended Strategy for flood disaster risk reduction Measures- 86

5.5 Engineering/ structural flood disaster risk reduction strategies - 87

5.7 Non-Engineering/ non-Structural flood disaster risk reduction - 87

5.8 Future Research Direction (Optional) - - - - - 88

5.9 recommendation for future research - - - - - 88

References - - - - - - - - - - 89-94

List of abbrevations - - - - - - - - - 95

Glossary of items - - - - - - - - - - 96-98

List of appendice - - - - - - - - - - 99-106

LIST OF TABLE

TABLE	TITLE	PAGE
1.10	Typical Causes of Flood - - - - -	4
2.10	Flood distructions and Associated Impact in Selected Cities/Town in Nigeria - - -	29
2.2.0	Selected Flood Parameters in particular Locations in Nigeria - - - - -	30
4.1.0	Sample Survey data to test the correlation between Amount of Rainfall and Floor Magnititude in the area	87
4.1.1	Observed Frequency Table	40
4.1.2	Expected Frequency Table - - - -	40
4.1.3	Difference between Observed and Expected Frequency Table - - - - - -	
4.1.4	Square the Results Divide by expected Frequency -	41
4.2.1	Summary of house type affected by 2014 Yaba Floods-	
4.2.2	employment opportunities Affected during - - - - - 2014 flood in Yaba Community- - - -	61 63
4.2.3	persons or age-group Affected during 2014 flood year-	64
4.2.4	crops and it owners destroyed during 2014 flood year-	66
4.2.5	fishing tools destroyed during 2014 flood year- -	68
4.3.0	Present Annual Sediment Yield for River Gurara Over the past 20years. - - - - -	80
4.3.1	frequency distribution table - - - -	81
4.3.2	Frequency Distribution Table - - - -	83
4.3.3	Annual sediment yield for river gurara- - -	85
4.3.4	Present the magnitude of flooding and the degree of destruction of crop yield - - - - -	87

4.3.5 spear-man rank correlation coefficient - - - 88
4.3.6 Relationship between Temperature and Rainfall - 92

LIST OF FIGURE

FIGURE	TITLE	PAGE
1.10	Incorporating exposure and coping capacity into Risk Management - - - - - -	5
2.1.0	Phase of the Hazard Impact Risk and Vulnerability model using the study area - - - -	12
2.1.1	Flood Generating Process - - - -	23
3.1.0	Map of FCT Abuja showing River Gurara Drainage Channel and it tributaries passing through Yaba Community - - - - - - -	32
3.2.0	Maps of Nigeria showing all States and FCT Abuja-	32
4.2.1	Pie-chart of house type affected by floods in 2014- -	62
4.2.2	Bar-chart of occupational/ livelihood of people affected by flood in 2014 - - - - - - - - -	63
4.2.3	Pie-chart of age-group affected - - - -	65
4.2.4	Pie-chart of crops destroyed by flood - - -	67
4.2.5	Pie-chart of fishing tools affected - - -	69

LIST OF PLATES

NO	Title	Pages
1-5	Flooding in Glisten International Academy in Jahi District Abuja - - - - -	44-48
6-8	Showing Flooding Incidence in Gwagwalada Area Council - - - - -	49-51
1-6	showing flood incidencs in yaba community in Abaji Area council the study area - -	52-57

	LIST OF SYMBOLS	PAGES
∑	**summation**	**82**
x^2	**chi-square**	**87**
∑ (x-x)	**mean**	**86**
Õ	**standard deviation**	**88**
rx		

LIST OF ABBREVIATION

NEMA	National Emergency Management Agency
NSUK	Nasarawa State University, Keffi
ISDR	International Strategy for Disaster Reduction
DPC	Disaster Preparedness Centre
FEMA	FCT Emergency Management Agency
IFRCS	International Federation of Red Cross Society
GIS	Geographic Information System
NIMET	Nigeria Metrological Agency
UNDRO	United Nations Disaster Relief Organization
UN-ISDR	United Nations International Strategy for Disaster Reduction
NGO	Non-Governmental Organization
AMAC	Abuja Municipal Area Council
EM	Emergency Management
UNEP	United Nation Environment Programme
MSC	Master of Science
ERM	Environmental Resource Management
SS	Social Science
WSWS	World Socialist Website
FCT	Federal Capital Territory

GLOSSARY OF TERMS

NO	TITLE	PAGES
1	Adaptive capacity	
2	Anticipatory planning	
3	Coping capacity	
4	Command and control floodplain managements	
5	Critical mass.	
6	Cross-scale linkages/interaction	
7	Exposure	
8	Frequency	
9	Hazards	
10	Integrated risk management	
11	Inundation	
12	Magnitude	
13	Mitigation	
14	Probability	
15	Resilience	
16	Resilience Community	
17	Resistance	
18	Risk	
19	Risk transference	
20	Social amplification of risk	
21	Social capital	
22	Vulnerability	

LIST OF APPENDICES

APPENDIX	TITLE	PAGES
A	Table showing annual sediment accumulation in gurara River in 20years - - - - - -	83
B	Frequency distribution table(group data) Showing annual sediment Accumulations in river gurara -	99
C	Frequency distribution graphical chart. Showing Sediment Accumulations in river gurara(mm) in 20years - - - - - - -	100
E	Spear-man rank coefficient correlation Table showing Positive Rank Correlation, between Flood Magnitude and Crop Yields Destroyed in Eleven Farmlands in the Study Area - - - -	101
E	Graph showing the perfect positive rank correlation between Flood magnitude and cucumber crop yield destroyed in eleven farmlands in the study area -	102
F	Spear-man Rank Coefficient Correlation Table between Rainfall and Temperature in the Study Area. - -	104
D	Formula for calculation	
G	Person consulted for information	
H	Tables of house type affected by flood- - -	62

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

"Flood disaster do causes perilous experience; the experience are what we term as (flood) tragedy" (Wolf Dombrowsky, 1995), the above extract conveys a point that, disaster is a product of an event that brings liability to environment. Thus, it implies that there is a need to study the causes and it effect. (Morris town 2010) defined flood as a spill over of water onto normally dry land, In the same vein, Flood Disaster According to (WHO, 2002) flood disaster is an occurrence that regularly causes harm including interruption to road, rail-lines, airports, electricity supply, systems, water supply and dirt disposal systems.

1.2 GLOBAL INVENTORY OF FLOOD EVENTS, CAUSES, AND EFFECTS.

Natural disasters are widespread in our time in today's world. According to UN-water (2011) They are product of abrupt change in state of natural element due to natural factors. Most of the natural changes that lead to disasters are outside control of human beings and cannot be predicted perfectly when it occurs. foremost natural disasters like flood when it happens. It end result in endangering of human life, loss of properties; impinge on road and rail network, farming and surroundings.

According to (UN-water 2011), there is a swift growth in the number of persons killed and properties shattered as the result of grave impact by flood disasters. Across the world, the study discloses that more than one billion people representing one third of the world's population have been subjected to natural disasters in the last ten years with flood and drought recording about 86 percent of all such catastrophic, even if earthquake, volcanic eruption and landslides maybe more remarkable and take an incredibly high toil on human lives. earth socialist website (WSWA 2011), flood is extensive in flood plain, alongside rivers and coastal, area, where such areas are not settle by man, it even attract little or no attention however, where such areas are settle with large population such as the Gages in Bangladesh, Mississipi in USA, River Nile in Egypt, the Rhine in Germany and the Vulnerability of flood disaster in this pacific regions. It affect both economic and

social stability of this countries according to (WSWA. 2011), many occurrence of flood in china, the worst flood in china is in 1998, it affected 223 million people, 3004 were said to be dead, 15 million were made without homes and economics loss of over 23billion US Dollars destroyed for that year. Due to heavy flood in Cambodia and Vietnam during year 2000, 428 people died and estimated economic loss of 250 million dollars destroyed, in 1991 it affected 25millions lives.

(United nations, 2003) for the last 10years due to recurrent of flood other areas like India, Pakistan, Korea, and bangledesh, in 19th century, chaotic rainfall actions in Europe have increased occurrence of flood. Flood in the European macro region during 1985-2004 caused 252 disasters, according to (Hoyois and Guha-sapir 2005). The worst flood event occurred in chec Republic 2002, France 1977 and 2003, Germany 1993 and 2002, Italy 1970,1994 and 2000, Netherlands, Belgium, Poland 1997, Spain 1982, Sweden 1977,1985 and 1994 and UK 2000 and 2004 have affected many human life and environment, (savenije, 1996) in the study of the cause of flood in Europe there was a serious debate on whether the flood were cause due to human role, climatic change or normal incidence. The past climatic data used for outlook projections of flood expectedness in Western Europe shows that floods will probably be on increased.

This chapter examine the courses, and natures of Flooding the Impact on the environment, Advocating for responses at both local, National, and International Levels. Flood are perhaps the most common experience Catastrophic ecological hazards according to (NOTT, 2006) it is normally a devastating over flow of water from lake or other bodies of water as a result of extreme rainfall; its does not differentiate amid the industrialised and the unindustrialised or under-developed countries. Flood are regularly caused by two factors:-

1.2.1 NATURAL CLIMATOLOGICAL FACTORS AND ANTHROPOGENIC FACTORS.

1.2.2 Climatological Factors; the most common worldwide causes of Flood, according to is course by rainfall which is heavy, excessively prolong or both, however, a smaller amount of rainfall may also create flooding on ground that is already drenched with water, these actions are habitually linked with numerous days, seven days or month of

continues precipitation, this expected phenomenon as a fraction of the soil Bio-physical processes becomes overwhelming to the people and environment. Other types of flooding that is climatologically, partly or indirectely related are: reverse of river flow by mounting tides, mainly for the duration of spring tide formation, Rivers and tributaries transporting water flows extremely to a large extent of their carrying ability due to contraction of run-off, Main rivers support up water in their tributary ,Peak floods taking place at the equal time in a major river and its tributaries. serious rainfall synchronizing with spills of rivers, deficient and bungling drainage of low lying coast by exceptionally high tides associated with storm surge effects.

1.2.2 Human anthropogenic Factors: such activities like clearing of flora, intrusion in normal Drainage Lines, reduction of forest and unending possession of wet land in the shield zones of river bank, in some cases flood happens when Dams Fail thus releasing huge and unrestrained volume of water, floods are act of God but flood losses are largely acts of man. Human Impact on river catchment influence flood behavior, Land utilization changes in particular have a direct impact on the magnitude and behavior of floods Deforestation results in increase run-off and often decreases in channel capacity due to increase sedimentation rate. Flooding can be cause by storms,according to(IFRC 2003) world disaster report, Geneva. on 29 August, 2005 the deadliest storm, Hurricane Katrina hit the United States and causes flooding that shattered much of new Orleans, Louisiana, and the Coastal Cities of Mississipi and Alabama. The storm destroyed about 1,300 people, making it the third deadliest in U.S. history, the hurricane that struck Galveston, Taxas in 1900, killed an estimated 8,000 people. The second deadliest hurricane to hit the United State of America was the great Okeechobee hurricane of 1928 which strike Florida and kill amid 2,500 to 3,000 persons. Floods waters affected, 80% of new Orleans one of American most fable cities for the most part of the new Orlean take a pew beneath sea level and broad system of stone levees and concrete wall had been constructed to maintain the water out till a tidal flow of 6 to 8mm (20 to 25ft) rolled in from the bay.

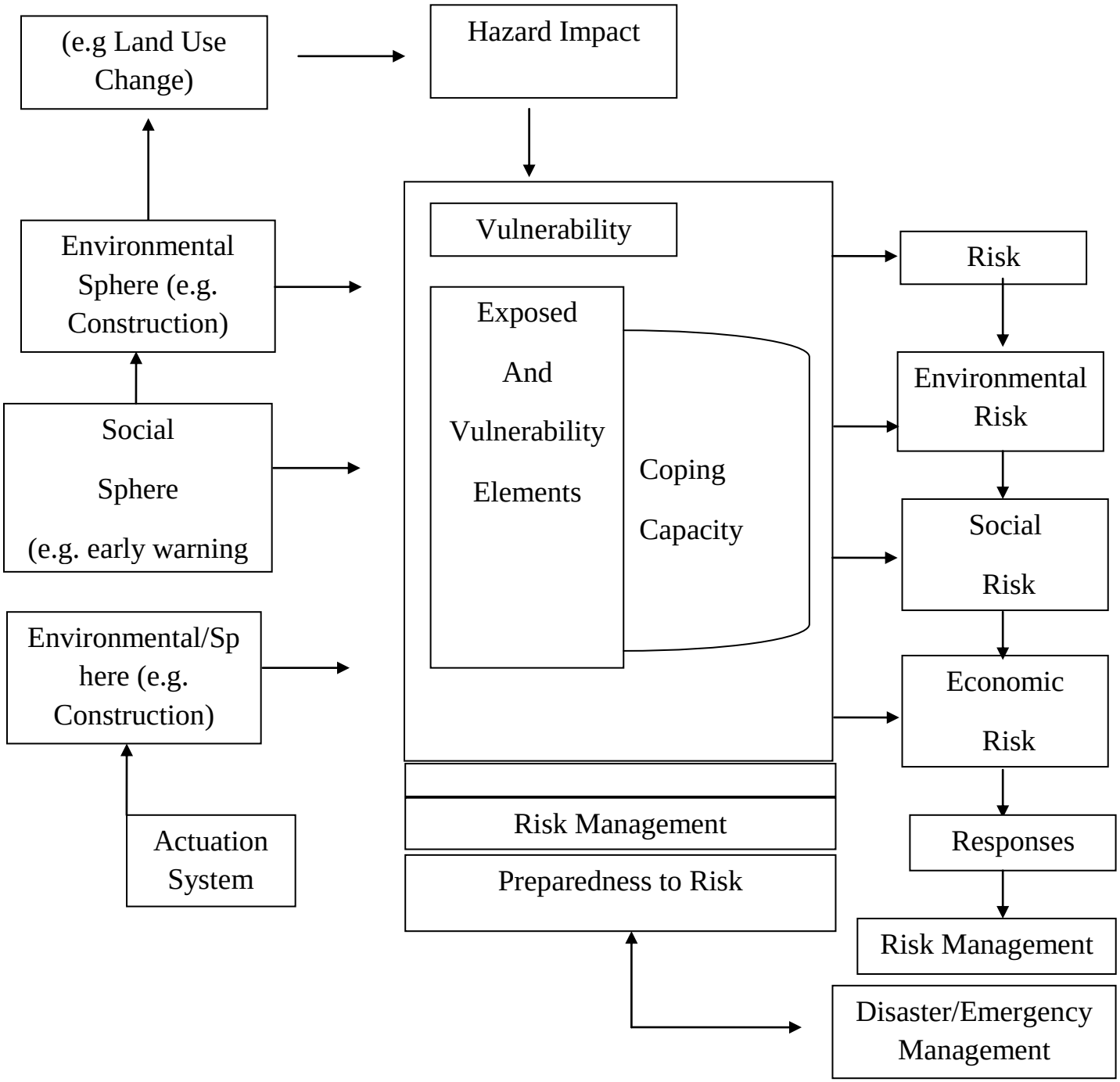
Table 1:1,0 TYPICAL SOURCES OF FLOODS IN NIGERIA

S/N	SOUURCES	NO OF RESPONDENT	% PROPORTION
1	heavy Rain	1492	74.20
2	pedestal Water surge	126	5.90
3	pounce Water course	120	5.60
4	Car-wash business	89	4.50
5	tering vegetation	69	3.50
6	packed/Silted/filthy Drainage Channels	1853	97.25
7	societal Cultural Activities	1222	60.70
8	Ocean/Lagoon flow	1195	59.35
9	illicit Channelization of Drains	1221	60.65
10	building and rebuilding	1585	73.85
11	log jam of Canals	1951	97.65
12	poor Drainage Channel	1896	94.40
13	negation to Regulation	1639	81.55
14	prohibited structure on drainage channels	1899	99.05
15	intrusion/land reclamation	1828	91.00
16	Poor heading to forecast	73	36.10
17	Poor physical development /planlessness	1884	98.80
18	Global warning & climate change	1153	57.75
19	control Policies and Programmes	1538	76.50
20	abandon	1187	56.95
21	warped Bridges/Curvets	185	8.85
22	cultivation along flood plains	1091	54.60
23	Nature of topography	795	34.35

24	Others (unSpecified)	69	3.50

Source:(Aderogba K.A. 2011)

Figure 1.1 : Intergrating vulnerability and Coping ability into threat Management.



Source: Bogardi et al, 2005

1.3.0 STATEMENT OF THE PROBLEM

There are positive and negative impact posed to the environment and the people as a result of flood disaster. this is cause by natural or product of human development. These impact are often unintended and unplanned people most of the times does not care about this changes and there implications (i.e environmental changes) government at times does not have environmental data to assessed the implication of this disaster events on environment and it people. Like any other state in Nigeria, FCT has it fare share of disaster occurances, notably flood, in the past FCT experience both Natural and Human made disaster in the past seven years FCT was among the states that suffered in 2012 National Flood disaster that affect many states in Nigeria.

Flood disaster has become a recurring decimal in the last ten years. Issues of flooding in Kubwa Area of AMAC, part of Bwari, Gwagwalada and Yaba an area in Abaji Area Council. it has become an annual event with it attendant devastating effects In the last ten years, many lives were impoverish in the Area with serious destruction of Houses and other properties farm crops like rice,maize,groundnut, cassava e.tc were wash away about 5,000 populations were affected in 2012, it mostly occure between month of august and October when the area experience excessive rainfall resulting in overflow of Gurara River channel and it tributaries carrying water flows beyond their transporting capacities due to contraction of it run-off. with no drainage network community been sacked by flood water causing series of relocations and resettlement of the people yearly by the Fct adminstration.

United nations and host of world bodies considered the huges losses associated with flood disasters throughout the world encouraged a concerted effort by national and intergovernmental agencies to develop pragmatic measures to deal with flood disasters. One of this approaches approved by united nations is the use of space technologies for disaster reduction and management. Over the years two dominant approaches have been use in flood management which I had recommend in this work which includes structural and non-structural flood management approach the structural approach entails the construction of dams, embankment,

drainage channels and regular evacuation of the waterways including dredging of the riverbeds however, the recent flooding events have shown the inadequacy of these techniques to tame the surge of flooding in the rich and poor communities the non-structural approach to flood management includes but not limited to the following; flood plain management, flood plain zoning, flood forecasting,flood disaster preparedness plan, flood proofing and flood insurance.

1.4.0 RESEARCH QUESTIONS

To strategically reduce the carnage of floods in Yaba Community in Abaji Area Council. This study will seek to provide the following Research Question:-

i. To identify and analyse the underlying Causes of vulnerability of the area to flooding ?
ii. To establish the brunt which flood have on the livelihood of the Resident of Yaba Community in abaji area council.
iii. To establish the vulnerable groups that Are affected, and if there are loss of lives and properties due to flooding in the study area?
iv. To identify the coping mechanism employed by the people or residents in mitigating flood incidences in the study area
v. To establish the Perception of residents to flood incidences in the community

1.5.0 AIM AND OBJECTIVES OF THE STUDY.

1.5.1 AIM

To examine and analyse the socio-economic implication of flooding on the livelihood of the people of Yaba Community in particular and FCT in general.

1.5.2 OBJECTIVES.

The aim of this study will be achieved through the following specific objectives;

i. To identify and analyses the underlaying causes of floods on the vulnerable people in the Community

ii. To examine the impact and implication of Flood on the socio-economic lives of the people in the community

iii. To identify the coping mechanism adopted by the residents in mitigating or combating flood menace in the Area

iv. To establish the vulnerable groups that are most affected by flood incidences.

1.6.0 SIGNIFICANCE OF THE STUDY

There are little or no attention given to the flood plain or flood prone areas in FCT by the FCT Administration, hazard maps are not yet produce or developed to monitor this areas, therefore this provide the call for for this study. The study is needed in order to highlight the causes and socio-economic implication of this flood on the people, and provide useful information about it nature, frequency and magnitude for decision making and management purposes. This will help in programs for project designed by geographers, geologists, environmental managers, town planners and policy makers for good policy implementation to enhance sustainable development.

The findings of this study will give an insight into land use pattern that are detrimental to the environment those that promote environmental flood disaster and proffers solutions to the problem, These could equally provide useful information to research institutions and emergency management agencies such as National Institute for Oceanography and Marine Research, (NIOMAR) International Institute of Tropical Agriculture FEMA, NEMA etc.

1.7.0 SCOPE AND LIMITATION OF THE STUDY

The scope of this study is limited to Yaba Community of Abaji Area Council of FCT. Emphasis will be place on the Causes of Flooding, impact on Social Economic life of the people in the study area. It also examines the Impact of Flood and evaluation of strategic management techniques to Control the menance in the area. One of the limitation of this work is the problem of obtaining data from the managing agencies, the financial constraints, also the time factor drastically limit the extent to which this study could be conducted, because of the tight office

schedule which make impossible for me to go beyond expectation to get more facts concerning this project work. However, the accuracy of this study result depend on what was obtain from FCT emergency management Agency and references within the available resources, also the ability of the researcher to present and analyse this acquire data effectively. These limitations occur at various stages of this research work.

Other Flood prone area in FCT include Abaji, Kwali, Bwari, Mabushi, Kukwaba, Guzape, Karu, Kuje, Kurudu and Lugbe Glisteen international academy Jahi district. all in the FCT.

1.8.0 RESEARCH HYPOTHESIS

A. NULL HYPOTHESIS (H0): There is no relationship between excess Rainfall and River Water Flooding in the study area.

ALTERNATIVE HYPOTHHESIS (H1): There is a relationship between excess Rainfall and River Water Flooding in the study area.

B. STATISTICAL OR EXPERIMENTAL HYPOTHESIS: using chi-square test to determine the null hypothesis which state that there is no relationship between excess rainfall and water flooding the observed frequency data table and the expected frequency data table. Explained in chapter four of this research work. Frequency distribution table showing the amount of sediment accumulations in gurara river channel over the past 20 years that narrow the river gurara channel that lead to more flooding in the study area.due to excess rainfall, spear-man rank coefficient correlation table use to determine the magnitude of flood in the area and the cucumber yield destroyed over a eleven farm-land in the study area. Express in statistical and measurable terms in chapter four of this research work.

CHAPTER TWO

2.0.0 CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1.0 INTRODUCTION

2.2.0 CONCEPTUAL FRAME WORK

worldwide, disaster management has voice a conceptional shift from being "reactional and relief centric approach to becoming a "preparedness and mitigation approach" as lessons are drawn from UN-ISDR. A Second Paradigm shift is in progress, motivated by climate-change consciousness and sustainability concerns in disaster management (Gupta et al, 2009) this has resulted in a wider reception of the 'Disaster Risk Reduction 'as a model over 'Disaster Management' and giving acknowledgment to the green approach that includes disaster risk reduction and management which is now of a primary concern in disaster management strategies globally. In the view of the above; proof that preparedness and obedience to warnings are the key concept before and during flood events. Accordance to the account in the Holy Bible in chapter 6:1-26. only those who were prepared and obey the warnings of the flood were saved. God proffers both structural and non-structural solutions to the impending flood that was to come. The non-structural strategy was the flood awareness campaign and warning that was made known to the people and the structural strategy was the constructions of an Ark that was to House all members of Noah families and pairs of animals species. Monitoring and observation of environmental factors that indicate the inception of Hazard are essential to early warning systems. Environmental monitoring and assessment play a vital role in generating pertinent information that assists in identifying risk, vulnerabilities and opportunities to encourage community resilience (UNEP-UNISDR-PEDRR, 2010).

According to Tierney et al. (2001), the brunt of flooding on any area is reliant on the vulnerability of the place. Vulnerability to disaster is a product of Natural actions on the built environment. There is no area, in this world that is immune from disaster, though vulnerability to disaster varies, thus hazard that strike in area

with low vulnerability are not considered, a disaster as is the case of uninhabited regions. There is no disaster without vulnerability to natural or human – induce hazard, disaster only occurs when peoples vulnerability expose them to a hazard.according to (UN-ISDR, 2010) flood disaster is as a result of the combination of hazard and vulnerability and insufficient capacity , A flood disaster happens when a hazard impacts on the vulnerable population and cause harm, causalities and interruption. Thus flood disaster occurs only when Hazard and vulnerability meet. But it is also to be noted that with greater capacity of individual community and environment to these flood disasters. The impact of hazard reduces, therefore we need to understand the three major components name above with example base on this study area.

2.3 HAZARD: is defined as a perilous state, that threaten or had the probability of causing injury to life and damage to properties.

2.4` VULNERABILITY:- it defined the scope to which a neighbourhood, formation, services or geographic area is likely to be hurt by the Impact of particular hazard on the report of their nature, closeness to Hazard terrain .

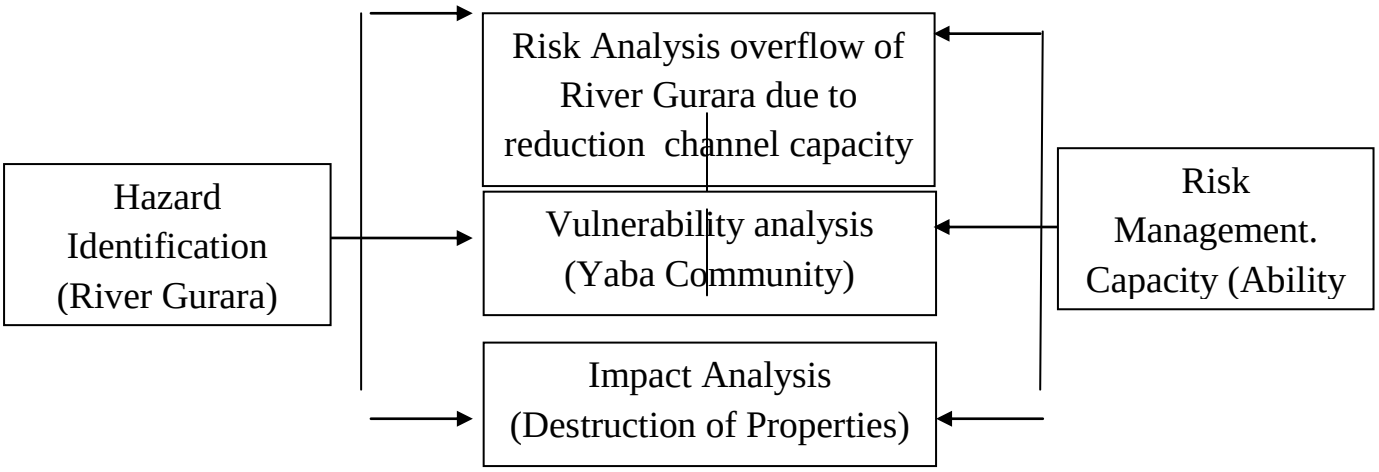
2.2.3 CAPACITY: is defined as income and ability which exist in household which enables them to deal with , with stand, prepare for, prevent, mitigate or rapidly recuperate from a disaster as a result of these Flood disaster are complex events and hence there is need for proper management.

2.2.4 POTENTIAL HAZARD: in this case is River Gurara Drainage basin and it tributaries that overflows it bank annually due to main river and it tributeries carrying water flows very much in excess of their transporting capacities due to contraction of run-off and channel saiting due to increased in sedimentation rate in channels basin, overflows the study area.

2.2.5 VULNERABILITY: is the Yaba Community study area that River Gurara passes through it.

2.2.6 CAPACITY: are the people of this community the ability or strength to cope with this flood event that occures in the area yearly.

Fig2.1.0 STAGE OF THE HAZARD AND VULNERABLE IMPACT, RISK AND MODEL USING THE STUDY AREA.



(**Source: PEARCE 2003)**

2.3 LITERATURE REVIEW

Globally, man and its surroundings are usually the prey of floods disaster, each time it happens, as it is yearly, affects man more than any other natural disaster. frequent floods and erstwhile disaster have been recognized as a grave risk to sustainable progress. Flooding causes about one third of all fatality, one third of all injuries and one third of all harm from natural disaster the trend in the frequency and intensity of flood disaster locally, Nationally and Internationally is due to unpredictable climate change, according to (Action Aid 2006) El-NINO – a cosmic Natural Climatic event that can bring sturdy floods and drought in several parts of the globe is becoming more common as a result of a global warming and could further exaggerate Health Problems in many part of the world, undue flooding is for example a prime cause of cholera and other water-borne and food-borne infections to which children are principally prone while heavy rains will become more regular in some part of the world, this include the study area (yaba) which

had being experiencing heavy rainfall in the last ten years, meanwhile there will be more periods of draught and increase spreading of the deserts in other part of the globe.

According to (Action Aid International 2006) flood hazard are phenomena, but damages and losses from flood are the consequence of Human action. Flash flooding/urban flooding destroys agricultural produce e.g. Crops like, Rice paddy, Fruits tree and Vegetable etc. thereby posing the risk to food security, to those who engage in subsistence farming at commercial scale even to nations great loss. (Kolawole et al. 2011) with the rising number of urban dwellers worldwide, the number of people at risk or vulnerable to flood hazard is expected to increase, for any raise flood disaster whether large or small will threaten development gains and hinder the implementation of millennium development goals (UN – ISDR 2003) as well as sustainable development goal.(SDGs).

According to(UN-ISDR,2003) flood disaster poses serious challenge to the economy of Nation it must be noted that the economic environment of a nations consists of its financial systems, social welfare, power sector, transportation, investment, commerce, manufacturing, construction, banking among others, disaster when they occur usually result in pains and huge losses to the economy and in most cases; it is always difficult to quantify the actual cost of damages and recovery. (Kotte, 2003) in addition, it is the poor people that are more vulnerable to disaster just as in the case of yaba community. incessant and rising incidence of devastating disaster events such as urban Flooding often poses substantive threat to the achievement of both sustainable development and poverty reduction initiative (UN-ISDR. 2009). The issue of disaster reduction and risk management is swiftly being adopted into the policy plan of affected government as well as multilateral and bilateral agencies and NGOs. The International strategy for Disaster Reduction (ISDR) through the Resolution UN General Assembly 54/219 aim to mobilize Government, UN-Agencies, Regional bodies, private sector and civil society to join efforts in building resilient societies by developing a culture of anticipation and awareness.

However,(UN-ISDR,2009) a study conducted on privacy, vulnerability on the impact of flooding in the Limpopo province in South Africa argues that while disaster may Affect everyone and play an important role in increasing vulnerability, poor people are made more vulnerable from the web of the situation that make them prone to the effects of disaster just like people of yaba community of Abaji area council of fct (Khandihela, and May 2006). They established that the varying Impact of floods on house hold and the community at large showed that vulnerability to the effect of a flood disaster is indeed an outcome of the interaction between Socio-economic and political process as relate to what is happening in yaba community of fct.(Adamson 1983) also observed that extreme events such as floods over Southern Africa have resulted in loss of life. Massive damage to property, crops, livestock's and communication system, though lives had not being lost in this study area but properties and agricultural farmlands were destroyed as the result of flooding in this study area.

2.3.1 INCOME OR LIVELIHOOD RECOVERY: is an evaluation of the capability of an individual and/or their household to cope with or recover from the outcome of a given danger and to reinstate their earning or livelihood pattern. This may include their probable sustained employment echelon of saving, loss of profitable benefits, loss or injury of reliable family members, hazard dent to their normal livelihood activity (example in floods this might means harm to agricultural land by sediment deposits, sea-water invasion, toxic or sewage blemish, loss of place of abode e.t.c).

2.3.2 INDIVIDUAL PROTECTION INSTINCTS: this is the capacity or motivation (inclination) of an individual or household (with a level of awareness of perceptible risks) to afford themselves with ample safeguard to be able to avoid living or working in hazardous place. This could be influence by the level of awareness of physical method and the capacity of people to execute them.

2.3.3 COMMUNITY PROTECTION: the capability or eagerness of social and political structures at political or social levels above the individual or house hood to provide protection (particularly structural and scientific preparations) from

meticulous hazard. This may include Local Government, State and National Government, relevant organizations (e.g Fire Department, Civil Defence, NEMA, NGOs) or Community-based Initiatives.

2.3.4 COMMUNITY RESOURCE: involves the malleable security provided by group or community capacities to enhance (or ease) an individual resilience. This include the degree of cohesion or rivalry that might affect rescue and recovery. There are diverse forms of social capital that may enhance or hinder recovery such as support network (belong to a church or other group) some of which may offer mutual aid in times of adversity according to the World Bank Development Report, while no part of the world is entirely safe, inability to reduce the Impact of hazard remain a major yoke for developing countries (World Bank, 2004).

Vulnerable Group amid the urban inhabitants who occupies the flimsy ecosystem are often face with attendant environmental problems such as Flooding (Gurenko 2004) the destruction cause by the flood is a reflection of the lack of disaster preparedness nationwide just as in the study area. Most of the risk to urban population is connected with the incapacity of local government to ensure provision for infrastructure and for disaster risk reduction and disaster preparedness and general lack of proper planning in the urban area. The consequence of inaccurate planning in most urban centres of developing countries like Nigeria are of interest to different stakeholder including those involved in research studies and policy making process.

2.3.5 FLOODING AND ITS IMPACT ON THE GLOBAL ENVIRONMENT

According to (UN-ISDR 2011) The flood in Pakistan in 2010 caused terrible damage to 25% of the country homes, business, crops and lives were lost. An estimated 1,600 people were killed while more than 20 million people (nearly 12 percent of the population) suffered. more than 160,000 square kilometers or 20 percent of the Pakistan land mass were inundated. A million homes were destroyed or damage also. About 10 million acres of the 50 million acres of cultivated land withstanding crops mainly cotton and sugarcane were destroyed or severely damaged. Ten million men, women and children lacked the food and water and

water they needed to stay alive. Pakistan in the last 30 years has witnessed more than fifty floods. In each of these calamities, those whose lives were devastated never recovered to the state where they were before the flood disaster. Those who suffer were always the same people. The overwhelming majority of the victims are the poor and oppressed working masses of Pakistan. (World social website wsws 2011) The flood in South western Haiti in 2010 cause great devastation so great in fact that the authorities stopped counting the dead. Bodies were piled up in common graves 10 feet wide 10 feet long and 20 feet deep. The estimate shows more than 3000 deaths in Haiti. Asian countries like Indian, China, Japan, Philippine, Thailand, Korea, Indonesian Bri-lanka, Pakistan, Afghanistan, Ubezkhstan, Mongolia, Nepal, Katakhstans, Bangladesh etc. were hit by already flood disaster. The CNN reported that the flood disaster across South East Asian in 2011 led to the death of more than 139,580 people. Flooding in Asia is a result of the combination of growing risk of global warming and climate changes together with rapid and massive urbanization without proper infrastructure. (USEP 2011) Report.

2.3.6 FLOODING AND IMPACT ON NIGERIAN ENVIRONMENT.

According to (Babanyara et al, 2010 and, etuonovbe 20011) The Nigeria cities of today face numerous problems which include rapid urbanization dwindling environment, urban decay, un-cleared refuse, flooding, erosion and pollution etc (Aderogba K. 2012), the initial flood strike Ibadan, (now the capital of Oyo state) was in 1948. afterwards, severe flood disasters have occur in Ibadan in 1963, 1978, April 30, 1980, 1985, 1987 and 1990 damaging many precious things, Lagos metropolis recorded the first flood in early 1870s and till date, flood (Both river and coastal floods) have become perennial event in the state most recently about 700 people along the river Ogun in Lagos state were displaced to refugee/relief after a shocking flood that plagued the area around October 12, 2010. The overwhelming flood disaster that happens on the 26th of August, 2011 cause a lot of havocs to people around the Eleyele wetlands in Ibadan, South-West Nigeria damaging lives and properties in Apete, Idi-ishin, Apata, Odo-Ona Elewe, Oke-Ayo Ologuneru and university of Ibadan where the University Library and

Zoological Garden were badly affected. The dilapidation of the Eleyele wetland is seen as a major cause compounded by human impact and the emerging reality of climate change. The extraordinary rate of flooding in recent years implicates increasing rain storms due to the 0n-going global warning and climate change, low-lying coastal areas such as Lagos, Niger and other areas such as Ibadan and Abeokuta where the flood-plain have been violented due to hazard, physical development, unlawful erection of building and other structure and the unhealthy tradition of dumping refuse and other solid wastes in the usually span channel drainage system, while flood hazard is a natural, human influence or urban alteration and adaptation in the urban space can aggravate the problem, while the disastrous consequences are dependent on the degree of human activities and occupation of vulnerable areas (Ogba and Utang 2008; 2007). According to (Adelekan,2000) the construction of infrastructure. Such as highway road and bridges in the flood plain frequently increase the magnitude of flood which increases the damage to properties and life, large impervious surfaces and concentration of Building which disrupt natural drainage channels had increase speed run off. In many instance, the blueprint of urban form and buildings in Nigeria do not take current and future hazard into account, resulting in increase scales and level of risk from floods. However in Nigeria, floods occur in three main forms: Coastal Flooding, River Flooding and Urban Flooding (Oriola 1994: Okoduwa, 1999: Folorunsho and Awosika 2001, Ologunorisa 2004). Floods have posed tremendous danger to people's lives and properties Moreso about 20% of Nigerian population is at risk of flooding as concluded by (Etuonoube 2011) who also acknowledges flooding as a peremial problem in Nigeria which consistently causes death and displacement of communities. In 2010 lives were lost as about 1,555 people were killed and 258,000 more displaced while properties worth Billions of Naira were destroyed. Flooding is a recurring phenomenon in most cities of Nigeria. On the 26th of August 2011 the flooding disaster which occurs in Ibadan metropolis caused monumental destruction in the city. The continues construction of structure on flood plain, indiscriminate dumping of refuse, excessive rainfall and deforestation were identified as the causative factors which help render the town vulnerable. (Khandihela and May 2006) the National

Emergency Management Agency (2012) reported that the 2012 flood in Nigeria was declared a national disaster as it affect over 7.7million and displaced 2.3 million people and killed over 363 people. Some Nigeria cities were swept off by the flood and affect 34 out of 36 states of Federation including Anambra State which was rank as the worst hit. According to NEMA (2012), at least 68 people were killed in Plateau state in Central Nigeria and also 25 bodies found in Benue River after the flood while properties were also lost to floods. These include the cost of damage to goods and possession, loss of income or services in the floods aftermath and clean-up costs. Some impacts of floods are intangible and are hard to place a monetary figure on. Intangible losses also include increased level of physical emotional and psychological health problem suffered by flood affected people. Due to flood topography, unpredictable climate hazards, uncontrolled cross-boundary, flood water, subsistence agro-based livelihood and poor economic conditions, it is highly needed to follow community level adaptation practices and preparedness compare to large-scale structural measures. It is a truism that there is a considerable reduction or alteration in water quality in the event of extreme floods. The poor quality of water may be due to huge amount of man-made and natural contaminant and erosion. Man has altered low lying areas to farmlands by considerable removal of flood plain vegetation and wetland regions which serve as sediment intercept, hydraulic sponge, natural stilling ponds and erosion protection. the floods have led to loss of human life, destruction of social and economic infrastructure and degradation of already fragile ecosystem. The study indicate that social impact include changes in people's way of life, their culture, community, political system, environment, health and wellbeing of personal and property rights and their fears and aspirations. The study undertaken in Scotland suggests that social impacts are link to the level of well being of individual's communities and society. It include flood losses are devastating as many never get recovered after the flood recedes vulnerable communities suffer great losses in event of flood. Especially when the flood causes unprecedental hunger, farmine, diseases and epidemic outbreak are usually resultant impact of flood. (Mmom and Alfesehi 2013).

2.3.7 CREATION OF SUSTAINABLE CITIES

Nigeria now the African largest economy and it apparition to be among the first apex twenty nations with foremost financial system by the year 2020 may not be feasible, if life and properties are not protected from the regular incidence of flood disaster in the countryside. According to (Action Aid 2006) flood is one of the key factors that is preventing Africans indeed humanity from eluding poverty level. Flood not only affects the sufferer, but also has a enormous gross consequence on the state economy of the country where poverty levels rises due to the occurrence. (Halley, 2001) identifies the major causes of flood in African to be lack of or poor planning and management/control system. On the divergent view, the major causes of flood in Nigeria has been identified to be extreme rainfall (Wetch, 1977, Taiwo, 2008, Akanin and Bilesanmi 2011; Aderogba 2012a and 2012b). mean while, flood frequently occurs when there is a incessant down pour of rain for a long period, while resulting to excess water having capacity beyond what existing drainage can simply convey, due to it shortfall or obstruction of this drainage.

2.3.8 WORLD VIEW ON FLOOD EVENT

There are three schools of notion regarding the prevalence of floods all over the world particularly in the tropics the first idea is of the view that there is global warning and climate change that is directly or indirectly escalating the amount of rain and ice melting that is mounting the amount of run-off in this case. The only supply of water that results in great floods in West Africa and certainly South Western Nigeria is rain water.

The second school of thinking is of the view that there have been a lot of abuses heaped on the physical environment of man and that the environment is only responding to the Abuses heaped on it by man. The abuses include but limited to poor planning of physical environment, poor management of wastes, inadequate drainage system for the built up areas and others.

The third world view or school of notion has it that it is the amalgamation of global warming, climate change and the abuses of man on the environment that

causes prolong and pouring showers of rain and the consequential run off that lead to devastating floods in America, Europe, Asia and Africa including Nigeria, (Dowand Dowing, 2006 and Simon 2005).In related development, Yaba community of Abaji Area Council of FCT, the study area, have been affected by flood due to prolong and excessive torrential showers of rains which lead to increase in the volume of water in river gurara channel leading to overflowing of it banks, in 2012 the release of water from Lagdon Dams that increase the volume of water in Benue and Niger River, causes increase in volume of water in River Gurara, which is one of the tributaries flowing into River Niger that pass through yaba community; another reason for flooding the area is due to ineffective waste management that blocks the few drains in the area; the erection of structures on water ways, over-stretched or non-existing sanitary drainage system, forest degradation i.e. removal of green cover, alleviation of flood disaster can be triumphant only when comprehensive information is obtained about the likely rate of recurrence, disposition and degree of hazardous event in an area as well as the exposure of the people building, infrastructure and economic activities in a potential precarious area (Van Western and Hoststee 2000) unfortunately, Efatimehin et al (2009), Ishaya et al (2008a), Ishaya et al (2008b) and Ifatimehin and Uguah (2006) reported that this comprehensive awareness is always deficient in most urban/rural centers of the developing world especially Nigeria. According to(Gwary,2008) and (Adeotic,2010) flooding in cities/communities can infect water provisions and deepen the spread of enpidemic diseases, like diarrhoea, typhoid, scabies, malaria, dysentery and other water borne diseases, which Yaba Community is not an exception

Siemens (2010) stated that redesigning and reconstruction of unplanned settlements or cities in Nigeria could absolutely power up to 70% of human ecological foot prints. Mean while, challenges of functional cities or settlement can excellently be explicit within the context of infrastructural amenities that can alter the Socio-economic performance of the society, good control and sustainable

livelihoods. Thus, roles of Nigerian cities seems to obtain an added urgency partly due to unmanaged urbanization. Most settlement/cities are faced with mounting demand for services and infrastructure towards enhanced livelihoods of citizens and facilitate economic development. sketchy population growth and poor governance act as multiplier and significantly exacerbate negative impact of climate change, particularly flooding. The suggestion worth mentioning is that unguided urbanization and poor management forces development to take place in dangerous areas. Lack of economic potency and low level of preparedness in Nigeria increases the level of vulnerability, by restraining the capability to diminish and adopt to the impacts of climate related hazards.

additionally, Nigerian settlement habitually need risk management plans, monitoring observations and premature signs. Local government does not have the faculty to respond punctually to natural disasters. Due to insufficient enforcement and meagre human and financial empowerment, active legislaations or strategy for disaster response are in most cities/towns are rendered unproductive.

(Vulnerability) exposure to tragedies of flood can be correlated to the following:

i. Lack of adequate land-use planning
ii. Weak structural defense mechanisms
iii. Neglects of construction codes
iv. Unregulated development of disaster prone areas
v. Unethical behavior of professionals in allege of formulating and controlling sustainable and vigorous cities/towns
vi. Substandard housing and physical structure.

(Nelson,1994) asserted the rapid development and the preponderance of unplanned and poorly serviced environment in Nigerian cities/towns have certain negative consequences leading to flooding. This is because in-terms of physical development pressure arising from population influx and high demand for housing

and infrastructure which result into illegal, congested and haphazard development without planning in an area thereby causing flooding.

This explained why Yaba the study area is so devastating, the socio-economic life of the people is badly affected, farmlands/crops are destroyed thereby causing threat to FCT food security, hence the area is inhabited by predominately local farmers and fishermen.

The assertions of Stephen (2011) and Lutz et al (2008) seens to be accepted because in developing countries, there are absences of efficient zoning system. Flood emergency response plans to infrastructure and early dectection systems. Bangladesh is a growing country and one of the most inclined countries to flood disasters in the world, up to 30% of the country has been sheltered with flood waters in 1991, additional 200,000 lives were lost due to flood in Bangladesh (Stephen 2011). The poor in developing Nations usually dwell where the value of land is economical, like river banks which are flood prone areas, thus risking their lives to flooding, worldwide in the modern time flood event had been associated to lengthen heavy rainfall.

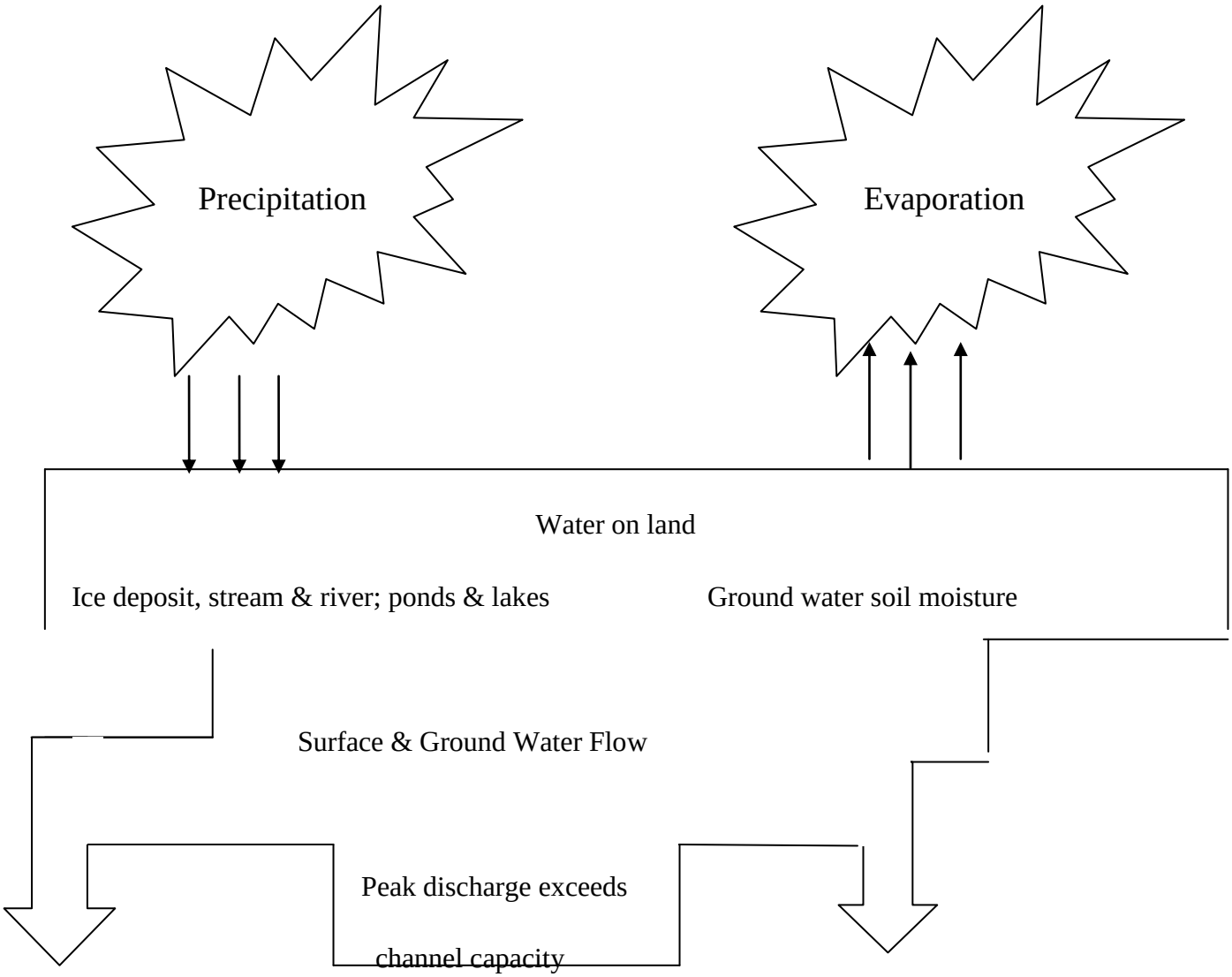


Fig 2.1 Flood Generating procedure (Source N.J. Bello 2015.).

2.4.5 VARIOUS SECTORS OF THE ECONOMY THAT ARE VULNERABLE TO FLOOD HAZARDS.

The various sectors of the economy that have suffered from flood in Nigeria include:- (Anaiho 2017)

Agriculture

- Food and cash production and sale
- Animals husbandry and processing into meat
- Fisheries and agriculture activities
- Forestry and plantation agriculture
- Commerce and trade and industry
- Transportation (Road, rail and water)
- Periodic and daily market activities
- Artisan work (mechanical, welding and art work)
- Logging and saw milling

Education

- Closure of Educational Institutions at all Levels Leading to some set back in learning
- Academic Session were disrupted and students could not graduate at the right time.

Health Sector

- Drinking water was contaminated and this lead to incidence of water borne diseases such as cholera, dysentery, diarrhea in a number of communities.
- There were cases of snake bite in fishing communities around flood plain.

Works and Services

- Building and construction industries suffer a great deal when there is flood
- Acquisition and movement of material become problematic.

- Procurement earth material for, cement production block making and granite for concrete structures were badly affected.

Oil and Mining Industries

- Crude oil exploration including sand, quarry and other earth mineral

Manufacturing and Battling including Canning Industries.

- Access to and transportation of raw material and distribution finished products to whole sellers and retailer was problematic during flooding.
- Planning for urban and rural social infrastructure could adversely affected

2.4.6 ADVANTAGE OF FLOOD

The effect of flood is not totally harmful as pointed by numerous researchers it have it helpful impact. even if flooding usually, is a nuisance to most people, floods can be pretty favourable. really environment profit extra from natural floods than from not having it at all.

(Abowei and Sikoki 2005). Those obsession that makes natural floods a disaster is when flood waters take place in areas inhabited by humans plus in areas of important human growth if not when left in its natural condition, the benefit of flood overshadow the bad effect (Bradshaw etal,2007) the advanced the flood waters from the river, it improved it harvest for that year (Bariweni etal 2012). The advantageous result of flood is when the river overflows and the flood waters covers the banks, sand, silt and debris are deposited into the adjoining land. After the water goes down and go back to its normal flow, the deposited fabric will aid to make the land wealthier or more productive. The untreated matter and minerals drop by the rivers water make the soil fertile and productive (ABowei and Sikoki 2005) flooding adds a lot of nutrients to lake and leads to enhanced fisheries for a few years, also because of the fitness of a flood plain for spawning (little predation and a lot of nutrient) fish like the weather fish also birds profit from the improve in production cause by flooding (Bariweni etal 2012).

Studies were revealing the beneficial effects of flood for instance according to (Langbe in 1978) noted that it is perhaps secure to feature the increase and expansion of the early civilization to the incidence of flood. evolution here is use freely to refer to the period when people settle and embarked on cultivation of Agriculture. logically these early settlement thrived along the valley and flood plain of the Nile River in Egypt, Mississippi river in USA, the Ganges in Bangladesh, the Rhine in Germany, Thramas river in Britain, the Kalimatan in Indonisia and Nigeria along the rivers like Niger, Benue and the rivers in around the Niger Delta.

Flood plains also giving rise to early civilization around West Africa empire of Ghana, Mali and Songhai whose largely important custody were the flood plain form by the anatomization of the river round the section of present day Bamako the NOK Cultures also urbanization on the flood plain of the Nigeria. today the Ganges Delta, Niger Delta and the Hwang Ho, flood plain among the most densely populated part of the world. Tarhule (1990) observed that some farmers along the lower zone of flood plain have adopted their crops pattern to annual overflow and that they would be disappointed if flooding were to fail these are reasons why floods not only of benefit, but necessary for survival of life. However river Nile and it valley can be regarded as the best example of benefit of flood plains. Nile has given rise to such popular saying “No Nile, No Egypt” and the Nile gives life to the Egyptian desert (TARHULE 1990).

2.4.7 SOCIO-ECONOMIC IMPLICATION OF FLOODS ON NIGERIAN CITIES/TOWNS

Flood have been known to cause damage to lives, properties, traffic, drains and surface and underground water (ward 1967) the negative effect of flooding can be multi-dimensional and inflicting long term “injuries” on lives, property and means of livelihood,(Oyo State Government 2011) on September 13, 2010 not less than 50 villages were ravage by floods in Sokoto, while more than 130,000 persons were displace out of the 50 villages affected, 20 were completely submerged, while some bridges linking the Sokoto metropolis and Usman danfadio university

this led to the closure of the university for about 3 months (Sokoto State diary of events 2010).

nevertheless, destructions associated with flood disaster in Nigeria have important effect on the people and city infrastructure as well as urban government. In modern moment most city residents feel the impact of flood directly or indirectly and the pitiable stories were confirm by diverse newspapers Headlines in Nigeria which also discover that flood has turn out to be a major problem in Nigeria Cities/towns as the first flood strike Ibadan, (now the capital of Oyo state).

afterwards, service of grave incidences of floods have take place in Ibadan and other parts of the country between 1963-2015 show plates from swamped area in parts of Lagos in 2011. Ibadan flood clear away 2,105 building (the punch 24th 2011 pg. 14) Floods kills 8 in Kastina and 100 families rendered homeless, five hour down pour aggravate panic in Ibadan. Boy dead, dad sister hospitalized in schools fence crumple. Flood of rage in cities, Lagos calls for calm Lagos ask pupil to stay away from school (the nation newspaper July 11th 2011) 10 dead in Lagos floods. Lagos/Abeokuta road cracks (the National Newspaper July 12th 2011) 10 buildings collapse. How Doctor, three kids died, Senator condoles with families of wounded (the Nation August 30th 2011) Ibadan floods: six residents still lost as death toll hits 32. Lagos law makers seek fed Govt. involvement on flooding (the Nation Newspaper 30th August 2011) 4 waitresses, baby dies on wet night. (the punch July 12th 2011) where do I start my life from? asked Ganiyat Hussein, Revenue collector who lost all (the Nation Sept 3rd 2011) floods resident count losses a canoe operators rake money (the punch October 7th 2010) flood Sokoto Council evacuate 6,000 resident (daily times August 26th 2011) I thank God I lost my business and all, but not my life.

The Guardian August 2nd 2011) Government distributes relief materials to victims. Oyo can, Senator mourn. Flood thereafter Oyo resident (the Nation August 29th 2011) how we save 102yr old, woman and 15 kids, Ibadan flood death toll up as more bodies recovered from the waters, man loss 8 children. Another losses 4 kids father pathetic newspaper headlines on flood in Nigeria. Flood experience in

Nigeria had ripped more damage without any perception of benefit from the report of National Emergency Management agency. In 2012 between June-September 2012, over 364 lives were lost and about 1.2 million, Nigeria were relocate, the report asserted that over one million Nigerian may die due to the effect of flood before 2020 if no preventative measures are not taken. (Etuonoube,2011) In Nigeria, the Coastal states such as Lagos, Ondo, Rivers, Bayelsa, Delta and Akwa Ibom etc. are example of where flood plain development has be engaged . In Lagos state of Nigeria, place like Lekki, Victoria Island, Ikoyi, Ajegunle, Apapa etc. have witnessed incredible construction of Building. The buildings occupy land space reclaimed from River and Ocean. Sand filling of Flood Plain land for Construction similarly decreases the volume available to stream water and this further aggravates the situation, Nigeria has a rainy season and suffers from seasonal flash floods. These flash floods are sometimes lethal, especially in the rural areas or congested slums where drainage is poor or does not exist at all. On 2nd July, 2012 many Nigeria coastal and inland cities had heavy rainfall and residents of Lagos were puffed for breath due to the flooding. In addition, there was a congestion on major high-ways causing people to call off or put off meeting they intend to have in mid July, 2012 flooding, in the Ibadan Metropolis of Oyo State, Nigeria make some inhabitants in difficult areas, Oke Ayo, Eleyele to run away from their dwellings and save their lives. In late July 2012 at least 39 people were killed due to flooding in Lamingo dam near Jos, Plateau State in Ado Ekiti state. Nigeria, flooding has become a chronic event annually from 2010 to date and it has overwhelmed and cause untold adversity on the residents of Basiri, Ajilosun, Olorunda, Afao road by making some homeless and disrupting economic activities.

TABLE FLOOD DISTRUCTIONS AND RELATED IMPACT IN SELECTED CITIES/TOWNS/SETTIEMENT IN NIGERIA.(2001—2016)

STATE	TRAGEDY	ASSOCIATED IMPACT	CASUALTIES RECORDED	YEAR
Abia	Rainstorm	Dwellings	600 people	2001
Adamawa	Flood	Homes and farmland Destroyed	600 people	2001
Akwa Ibom	Flood and rainstorm	367 houses wash away	5000 people	2002
Bayelsa	Flood	dwellings, school, market and farmland submerged	2/3 of the population	1999, 2001, 2012, 2014
Delta	Flood and rainstorm	Houses, school, market and farmland submerged	Half of the population	1999, 2001, 2012, 2014
Edo	Flood and rainstorm	560 houses destroyed	820 people	2001
Kano	Flood and windstorm	Schools, houses, farmland	300,000 people affected	1998, 2001, 2012
Lagos	Floods	Building collapse markets submerged properties destroyed	300,000 people affected	1970's 2011
Oyo	Flood	600 homes demolished properties destroyed and bridges collapse	50,000 affected	1967, 1980, 1985, 1987, 1990, 2011
Taraba	Flood	85 homes totally swept 410 houses extensively destroyed	Over 50,000 displaced	2005
Zamfara	Flood	Building submerged farmlands destroyed properties damaged	12, 398 people affected	2001, 2011, 2012, 2014

Source (Anaiho fieldwork 2016)

TABLE 2:2 SELECTED FLOOD PARAMETERS IN PARTICULAR LOCATIONS IN NIGERIA

LOCATION	MEAN WIDTH (meters)	MEAN EXPERIENCE HEIGHT(meters)	MEAN FREQUENCY (per annum)	MEAN LONGEST DURATION(DAYS)
ASABA	125.00	7.99	7	11
ABUJA	164.00	6.30	6	5
ABEOKUTA	116.05	7.33	7	9
ABA	236.00	7.55	6	16
IBADAN	522.45	9.21	4	8
OWERRI	125.04	8.22	6	8
WARRI	222.25	7.29	7	17
BENNI CITY	199.00	8.91	9	13
JALINGO	116.00	7.38	5	6
ENUGU	148.72	7.36	6	7
LAGOS CITY	748.00	11.89	11	26
KANO	111.00	9.73	4	9
KADUNA	129.00	9.54	6	13
KATSINA	123.00	6.26	5	12
SOKOTO	114.25	7.03	7	5
P-HARCOURT	122.21	8.13	5	19
ONDO	125.75	7.81	9	12
OGBOMOSHO	119.00	9.56	4	13
OSOGBO	112.00	9.74	9	13
ONITSHA	129.00	7.66	5	5
CALABAR	214.00	7.54	9	12
MAKURDI	229.73	8.79	8	13
MAIDUGURI	118.00	6.74	9	8
ILORIN	226.25	6.56	9	13
GOMBE	127.30	8.41	9	12

Source: (Aderogba K.A 2011)

CHAPTER THREE

3.0.0 THE STUDY AREA AND RESEARCH METHODOLOGY

3.1.0 THE STUDY AREA

Yaba is located west of Abuja town, about 70km from Abuja city. Yaba is a development area in Abaji area council of the FCT. It is a rural community made up of predominantly peasant farmers, Yaba and its surrounding have an estimated population of about 30,000 people surrounded by Niger state northwest and kogi state southwest Abuja-Lokoja road.

Abaji is a local government area of the Federal Capital Territory (Nigeria) its headquarters are in the town of Abaji, it has an area of 992km^2 and a population of 85,837 at the 2006 census the postal code of the area is 905101.

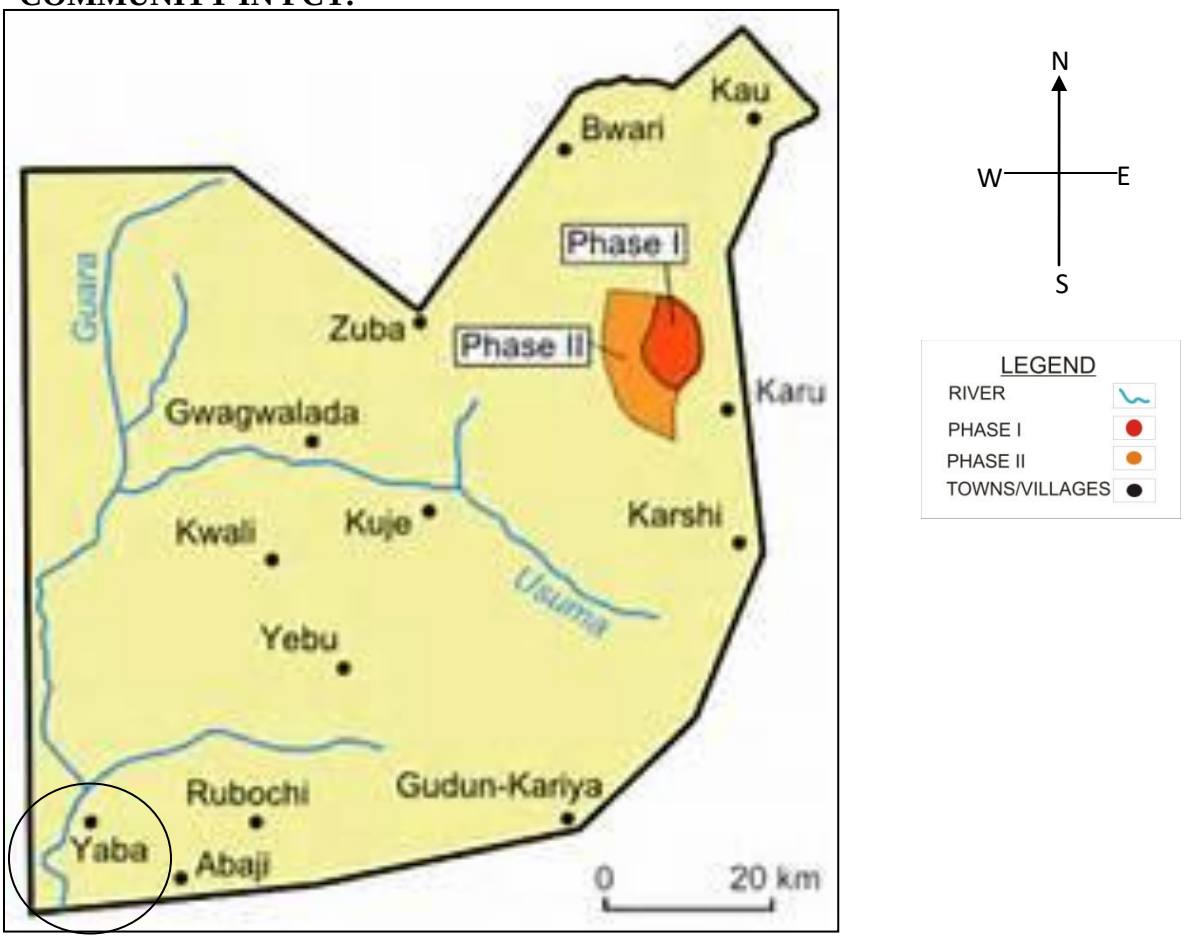
Abaji is situated between longitude 6,9500(657”0.000E) and on latitude 8,4667(828”012”N) the altitude of 152m.

Abuja the Federal Capita Territory (FCT) is positioned flanked by longitude $5^0$45’E and $7^0$39’E and latitude 7 25”N and 9 20 north of equator situated in the center of Nigeria covers a total land area of 8,000 square kilometer, surrounded by four states; to the North is Kaduna state to the east and Kogi state is on the south west it has a total inhabitants of 4 million according to 2010 population census.

FIG. 3.2 MAP OF NIGERIA SHOWING ALL STATES AND FCT ABUJA



FIGURE 3:1 MAP OF FCT ABUJA SHOWING RIVERS DRAINAGE FLOW INCLUDING RIVER GURARA THAT PASS THROUGH YABA COMMUNITY IN FCT.



EMERGENCE CREATION;

Abuja becames the capital territory of Nigeria formally on the 12th of December 1991 when the capital was move from Lagos to Abuja. The FCT was move to Abuja because it is sited in the geographical hub of the country and also there was too much pressure on the infrastructural amenities that existed in Lagos then (Moore 1984) the master plan for Abuja the new Federal Capital of Nigeria is planned by International Planning Associates (IPA) and executed by the federal military government in 1979 justified the motive for moving the federal capital from Lagos to Abuja as insufficient land space for advance coastal flooding uneven representation of Nigeria's ethnicity (as it was dominated by one ethnic group) insecurity due to the decentralized nature of Lagos among others. (IPA 1979) the pressure led to various economic and social problems among which were over population, high cost of living (rents in particular) traffic jam, existence of slums, poor hygiene, high mortality rate, social vices, insecurity among others hence, the necessity to move to a new federal capital.

3.1.1 GEOLOGY AND RELIEF

Yaba community lies on a sloppy land in Abaji area council of FCT with elevation of the area at about 500-760m above the sea level. However, Yaba falls within the middle Niger-Gurara Valley. Abuja is characterized by igneous and metamorphic rock, the topography is rugged. According to FCDA (2009) the rocks of the area can be grouped into five major classifications namely: Magmatic complex, intrisine-granite-coarse, grained granite, metamorphosed supra-costal (Exogenesis) rocks minor intrusion and other formation. The relief is high the highest part of the territory is in the north-west (Yaba) where there are peaks over 760m above sea level.

3.1.2 TOPOGRAPHY AND DRAINAGE

The topography of Yaba community in Abaji area council and its surrounding settlement are within the Gurara River Basin and the Niger valley and can be described as flat and undulating plain which is drained by Gurara Lower Usman river Kaduna river from the northwest. Yaba community is situated on the southern bank of river Gurara that feeds river Niger. Yaba community site is on southwest

of the river extending west ward and northward of FCT the Gurara inter-basin water transfer scheme, situated between latitude $8^0 11^0$N and longitude $7^0 3^0$'-8E covers Federal Capital territory of Nigeria. Offodile (1991). Yaba community been part of this area.

3.1.3 CLIMATE

Yaba community of Abaji area council falls within the tropical type of climate, basically has two separate seasons in a year damp and arid seasons the rainy periods starts around April and ends around October with day time temperature ranging from 27^0 to 33^0c whereas the desiccated season starts from October and ends approximately March with day time 29^0 to 33^0c this made blanket effect of cloud over the region harmattan wind a arid grimy north trade storm from the Sahara control the region between November and February each year (Bimbol et al 2007)

3.1.4 SOIL AND VEGETABLE:

The major soils are of the region are the loamy, clay and sandy soil derived mainly from the basement complex formation and other sedimentary rocks the area is situated within the southern Guinea savanna belt the rain and erstwhile ecological factors sustain the natural flora made up open forest dominated by trees and giant grasses with some scrub the liberal establishment of orange and cashew orchards and forest reserved support the natural flora cultivated areas have become distorted into sub-Sudan vegetation with more spotted trees and shrubs as well as grasses (LYAM 2000) tropical woodland savanna vegetation is found in Yaba community, tenacity clearance of flora for arable agriculture, cutting down of trees for timber and custom of bush fallowing had led to the expansion of re-growth foliage at various levels of development the vegetation is noticeable by dotted matured trees and brushwood of economic worth, such as locust beans, African Iron trees, shear butter trees, mahogany and cashew tree.

3.1.5 SETTLEMENT AND LAND USE:

The major dominant tribes in this area are Igbiras igbagi"s, Nupe, among others, the English and Hausa is widely spoken language in the study area.

In Yaba, Abaji area council there are two major types of land use Agricultural and residential, commercial services are not so pronounce animals rearing form part of activities and use system in this area, grazing, deforestation for construction and agricultural activities modify the character of this area this involve the removal of vegetation and building of houses etc. the major livelihood of the people of this area is agriculture and fishing. husbandry forms the backbone of the economy of this area in particular and Nigeria in general engaging more than 90% of its working population of the area. The area is endowed with large expense of fertile land both hinterland and along the streams valleys. As such the people are known with substantial cultivation of seasonal crops like cassava maize, groundnuts, beans and rice. However, livestock and fish production also play a very significant role in the physical and socio-economic well being of the growing population.

3.1.6 INDUSTRY

Abuja has a very a small number of factories which are mostly involved in agro-allied processing and small range manufacturing majority of these factories are food connected such as bakeries, confectioneries and plastic making companies the businesses in Abuja are mostly little.

Small and average scale businesses which provide retail and trading services to the resident there are also a lot of construction companies working with the federal government to developed infrastructure and properties hotels and hospitality services are very common but Abuja is still a civil service city to a large degree with the government services being the main stay also the occupants delight in land and property business.

3.2.0 RESEARCH METHODOLOGY

3.2.1 INTRODUCTION

The study seeks to assess and examine the causes, and socio-economic implication of flooding on livelihood of the people in Yaba community of Abaji area council of FCT. Thus the permutation of descriptive and investigative research design is adopted. A comprehensive process is use to achieved this through collection of data using reconnaissance survey, interviews as well as personal observations.

3.3.0 DATA

3.3.1 TYPES AND SOURCES OF DATA

Data to be use for this study are fundamentally primary and secondary sources.

PRIMARY DATA INCLUDE:

1. **RECONNAISSANCE SURVEY**

A reconnaissance survey is carried out by identify flood plains, in the study area, and to established the magnitude, severity and frequency of floods. This have also provide opportunity to interact with some of the residents and other relevant stakeholders.

2. **OBSERVATION**

Personal observation of procedures and photographs will be use to collect data for the study, interviews was conducted with some of the enlighten resident and indigenes. However questionnaires are not use hence many residents of the areas are peasant farmers who do not know how to read and write. Interviews has being conducted with the technical staff of FCT emergency management agency, non-governmental organizations(NGOs), churches,society leaders and practitioners, local establishment. FCT emergency management agency are the main stakeholders and had been managing and coordinating the flood problem in this study area.

SECONDARY DATA INCLUDES:

The secondary data comprise of existing publication such as textbooks, journals, articles, previous research FCT, reports of the ministerial committee on Yaba flood disaster 23rd August 2014 adopted for implementation by the FCT administration is used, other's are internet and other related literature, some of the maps, tables and chart are obtained from relevant organization, establishment and department.

3.4.0 POPULATION STUDY

Yaba community had a population of about 30,000 people in Abaji area council. The estimated total population of Abaji area council is about 85,440 according to 2006 population census. The ethnic groups in this area are the Igbagi, Nupe and Igbira among others, English and Hausa are widely spoken in the area.

3.5.0 SAMPLE TECHNIQUES

Having established the population of this study area systematic sampling techniques had being adopted for the study, first the flood prone settlement along the flood plain identified, secondly random selection of households and respondent in each household. An eligible respondent were be the household head who is resident in Yaba community, selected.

Sampling will be preceded by counting the number of houses settlement along the flood plain depending on the number of household found along the flood plain. And within the community

3.6.0 RESEARCH METHODOLOGY

Primary and secondary data vital for the study is carried out using the following methods.

(a) **OBSERVATION:** the primary data had been collected direct from the field, personal observations, using photographs and field interviews with household respondents. While Secondary Data is collected using textbooks, internet, maps, newspapers, seminars papers, journals, technical report on Yaba flooding August

23rd, 2014 from FCT Emergency Management Agency, Rainfall Data of FCT FOR the period OF 5 to 20 years 1996-2016 from Nigerian Metrological Agency (NIMET).

(b) **INTERVIEWS/PHONE CALLS:** Personal interviews and phone calls were made with technical officials of FCT Emergency Management Agency for this study.

3.7.0 METHODS OF DATA ANALYSIS AND PRESENTATION

To facilitate the analysis in understanding as regards to nature of Data collected, descriptive and inferential statistics such as correlation co-efficient (spear man ranks, person moment correlation co-efficient) measure of central tendency, frequency tables, bar-charts, pie-charts Chi-square are adopted to determined the relationship between variable. Chi-square value is use to test the Null hypothesis that said there is no association or relationship between rainfall and flooding in the area or alternative proposition which state that there is a connection between increase in Rainfall and flooding in the study area.

CHAPTER FOUR

4.0.0 METHOD OF DATA PRESENTATION AND DISCUSSION OF RESULT

4.1.0 INTRODUCTION.

This chapter closely analyse the environmental changes, socio-economic implication on livelihood of people, includes the house type, farmlands, fishing tools, employment opportunities, age groups etc, variation in amount of rainfall and the flood volume or magnitude during the periods by analyzing monthly 2014 annual rainfall between June to September of the study area. Chi-squared test a non-parametric test is use to compare the observed distribution frequency variable with an expected theoretical distribution or to compare the distribution of two related variables to an expected theoretical distribution.

4.1.1 TESTING OF HYPOTHESIS

From the data obtained, we analyse if there is a correlation between the amount of rainfall in the area and flood magnitude/volume, consequently the chi-square analysis is used to compare the observed distribution frequency of data, amount of rainfall the area with a theoretical or expected distribution data which would occure, if the flood magnitude/volume had no correlation on the amount of rainfall in the study area.

In order, to carry out the test, it is first necessary to formulate a null hypothesis, which states that there is no correlation of one variable on the distribution of the second. The result of the chi-square test determines whether we are able to reject the Null hypothesis and accept instead, the Alternative Research proposition, that one variable has correlation over the distribution of a second. Working in negative phrases in this fashion may appear to be rather confusing but the formulation of Null proposition to be tested will become familiar with practice. In my example the Null hypothesis have state that there is no correlation between amount of rainfall and floor magnitude/volume in the study area.

A sample survey have produce the following Data. TABLE 4:10

Table 4.1.1 Observed Frequency

Volume or Magnitude of Floor

Amount of rainfall (mm)2014	**<400**	**400-599**	**600-1000**	**1000+**	**Total**
June	10.0	15	42	51	118
July	29	22	10	7	68
August	21	26	35	41	123
September	19	12	17	6	48
Total	79	75	98	105	357

(Source fct water board 2014)

Null Hypothesis: there is no correlation or association between Rainfall in the study area and the magnitude/volume of River flooding in the study area. Data presented in the figure 4:2 below

Step 1: calculate the expected value for each cell using the method outline above.

Method

Table 4.1.2 Observed Frequency

2014	**<400**	**400-599**	**600-1000**	**1000+**	**Total**
June	10	15	42	51	118
July	29	22	10	7	68
August	21	26	35	41	123
Sept	19	12	11	6	48
Total	**79**	**75**	**98**	**105**	**357**

(source fct water board 2014)

$$\text{Expected Frequency} = \frac{79 \times 118}{357} = 26.11$$

Above formula used to obtained the next Table

Example

Table 4.1.3 expected frequency Table

Year 2014	**<400**	**400-599**	**600-1000**	**1000+**
June	26.11	24.79	32.29	34.71
July	15.05	14.29	18.67	20.00
August	27.22	28.34	33.76	36.18
Sept	10.62	10.08	13.18	14.12

Step 2: find the difference between the observed and expected frequency from each cell (O-E)

Observed minus expected frequency

26.11 --- -16.11 = 9.94

To obtained the next Table

Table 4.1.4

Year 2014	**<400**	**400-599**	**600-1000**	**1000+**
June	-16.11	-9.79	9.61	16.29
July	13.95	7.71	-8.67	-13.00
August	-6.22	-2.84	1.24	4.82
Sept	8.38	1.92	-2.18	-8.12

Step 3: Square the results of step 2 and divide by the expected frequency

$$\mathbf{X2} = \frac{\sum (\text{O-E})^2}{\mathbf{E}}$$

Table 4.1.5

2014	**<400**	**400-599**	**600-1000**	**1000+**
June	9.94	3.87	2.85	7.65
July	12.95	7.71	-8.67	-13.00
August	-6.22	-2.84	1.24	4.82
Sept	8.38	1.92	-2.18	-8.12

Step 4: sum the individual value obtain in step 3

The formula for chi-square is below

$$X^2 = \frac{\sum (O-E)^2}{E} = (9.94 + 3.87 + 2.85 + 7.65 + 12.93 + 4.16 + 4.03 + 8.45 + 1.42 + 0.001 + 0.05 + 0.64 + 6.61 + 0.37 + 0.36 + 4.67)$$

Chi-Square X^2 = 68.00

Step 5: Consult the graph of significant value of X2 the degree of Freedom are equal to the number of Rows Minus one Multiplied by the number of Columns Minus one.

Degree of Freedom = df = (J-1) (K-1)

Where J – Number of Columns

And K = Number of rows

J = 4

K = 4

∴ **df = (4-1) (4-1)**

= 3 x 3

df = 9

Answers

The chi-square X2 value of 68.0 exceeds the value of significant at the 0.1% level (or 99.9%) with 9 degrees of freedom. therefore, the Null proposition is rejected and the Alternative Research proposition that there is an association/relationship between sum of rainfall in the area and the volume/magnitude of River Flooding in the area is accepted.

The scene Plate 1-5 Showing flooding in glisten international Academy in Jahi district Abuja in 2014 flood season.

Scene Plate 6-8 Showing flooding incidences in Gwagwalada area council of Fct 2015 flood year.

Scene Plate 1-6 Showing flood incidencies in Yaba Community the study area of Abaji area council Fct 2014 flood season.



Plate 1. Adminstrative block of glisten international academy under-water during 2015 seasonal flooding in jahi district Abuja.



Plate 2; collapsed fence of glisten international academy and the environs in jahi district Abuja



Plate 3 Glisteen international academy entire school premises submerged by flood water during 2015 heavy downpour



Plate 4 local stream that pass behind the glisten international academy that over-flows by heavy downpour in jahi district during 2015 seasonal floods



Plate 5 Inside the administrative block of glisten international academy during the 2014 flood events



Plate 6. One of the area in Gwagwalada area council submerged by flood during 2014 seasonal flood in Fct



Plate 7 A market in Gwagwalada area council submerged by flood during 2014 heavy downpour in Fct



Plate 8: A stream that pass through Gwagwalada metropolis over-flows it banks that flooded the area



Plate 1. Agricultural farmlands destroyed by flood in the study area of yaba community Abaji area council Fct.



Plate 2: Residential house flooded by 2014 flood in yaba the study area in Abaji area council Fct.



Plate 3: Young woman with a child stranded 2014 flood in yaba community of Abaji area council Fct.



Plate 4: Agricultural farmland with rice, palmtrees and maize destroyed by 2014 flood year in yaba community the study area.



Plate 5: houses along floodplain with the owners under-water during 2014 flood year.



Plate 6: Houses constructed along floodplain almost submerged by flood during 2014 flood year in yaba community Abaji area council Fct.

4.2.0 ANALYSIS AND FINDINGS

4.2.1 ANALYSIS OF SOCIO-ECONOMIC IMPLICATION OF FLOODING ON THE LIVELIHOOD OF THE PEOPLE IN THE STUDY AREA

An exhaustive check list of Physical, Biological and Social-economic Impact which flooding have on the people of this study area was employed in this study, field Data Collected include summary of members of the Community that were Affected by the Flood disaster in Yaba, crops variety destroyed, houses/buildings destroyed, as well as the fishing tools destroyed and the owners in 2014 flood year. After assessment and subsequents impact assessment, the result was distressing as it indicate overwhelming negative impact on environment especially the Social-

economic impact on the people in the area, However, the analysis indicated that the effect of flood is not utterly pessimistic as pointed by many researchers but also have it optimistic impact on the physical environment.

4.2.2 THE NEGATIVE IMPACTS ARE AS FOLLOWS:

A. Safety: this measure in number of Deaths recorded and is the chance that people will lose their lives when flooding occurs. Two Hundred and Seventy Seven (277) persons were internally displace in 2014 YABA Flood, though no life was lost but there are cases of snake bite to one or two affected victims as the results of floods, who has recovered from the injury through the local traditional medicine.

B. **Human Health:** This is the probability that physical or way of life of the people will be disrupted by flooding; this risk is measured by injuries suffered by the community also the epidemic, diseases outbreak and metrics of mental and social health. In 2014 Yaba Flood there were many cases of snake bite which cause injuries to their victim and the cases of Cholera ,diarrhea outbreak as a result of water pollution in this study area but quick intervention by the Federal Capital Territory Administration brought it under control.

C. **Economic Activity:** this is the probability that individuals or the Yaba Community have lose their property and structures, or loss of production, distribution and consumption of goods and services. This risk is measured by economic metric such as cost and loss of employment opportunities disruption of markets days in the study area thereby slowing business activities.

D. Agricultural Activity: from the field investigation, we observed in 2014 Yaba flooding alone, about Three Hundred (300) hectares of farmland made up of Rice, maize, Millet and Guinea Corn were washed away and destroyed by flood thereby causing threats to FCT food security yearly. Since this area is one of the major hub for agricultural production activities in FCT.

E. Cultural Heritages: most of the tangible and intangible attributes of their cultures were destroyed by this flood menaces such cultural attributes like religious artifacts and places of worships(churches and mosques) were destroyed during this infernos. Thereby affect there spiritual activities yearly.

F. **Water Pollution:** The Yaba Community does not have any source of clean and portable water they still use Streams and wells as well as River Gurara and it tributeries for drinking, but is always polluted as the result of floods, incidences that happened annually. This make the community vulnerable to water born disease like Cholera.etc.

G. **Environment:** the quality and quantity of water, land or air in this area is badly affected due to death of animals as the result of floods, this risk is measure by such metric as measurement of water quality, quantity, soil loss and habitat loss and the overall degradation of the ecosystem in this study area. This affect the quality of life of the people in the area.

H. **Infrastructural Facilities:** Critical community infrastructures like Access Road to Yaba Community linking the Abuja-lokoja express way, were badly affected others like school, building and Health Centers were badly affected by the flood menace and reduce the social activities that were taking places in these centers. Cracks in bulding walls, Foot paths to streams and neighborhoods including separation of villages and communities.

I. **Loss of Economic, Tress and Hamlet:** Damage to properties, Hamlet and loss of Economic trees during the flood events. Force migration and re-settlement elsewhere from the people's ancestral land.

J. **Flood Plain are Inundated:** there was an increase survival rate of Lava fish due to increase forage on the flooded zone along the river channel. the failure of the flood plain to become inundated may lead to a serious decline in the fish biological productivity and the volume of fish in this river both in terms of species number and absolute number. Fishermen who depend on flood plain fishing for their livelihood will have to migrate to the river channels area where they have to adopt to open lake fishing.

K. The cessation of flooding and the creation of a smaller channel adjusted to the smaller regular discharge, there will be a gradual recession of the ground water along the flood plain for a considerable distance with this recession, runoff in the main channel and the tributaries will not be sufficient for the Fadama cultivation of tubers cereal and vegetable will be severally hampered.

L. Agricultural areas on flood plain quite often depend on nutrient affluent silt to maintain yield, but as deposit is no longer put on the flood plain the loss of nutrient must be rewarded for by the use of fertilizers to maintain agricultural productivity. This has it own serious problem particularly with regard to alkalization by various fertilizers salts.

4.2.3 THE POSITIVE IMPACT OF FLOOD IN THIS STUDY AREA

1. **INCREASE SOIL NUTRIENTS:** the higher the flood waters from the river, the better the harvest for that year in the study area after the flood. The benefit of flood effect is when the Gurara River overflows and the flood water flows into it banks, sand, salt and Debris are deposited into the adjacent land, after the river water subside and go back to it regular flow, the dumps matter helps the land to be more affluent or more fruitful, the deposited matter make the surrounding soil more productive and fruitful.
2. **NUTRIENTS TO RIVER CHANNEL:** Flooding adds a lot of nutrient to the river channel and land to enhanced fisherie.The above impacts had been highlighted with the objectives that the social cost involved during and after flood event be vented. This is possible if ameitiorative measures are recommended and are in-built into both natural and human development process to reduce the menance (completely pain free) to the people of the study area.

4.2.4 ANALYSIS AND INTERPRETATION OF SOCIO-ECONOMIC AND CLIMATIC VARIABLES

The summary of number of house type in the community that were affected by the 2014 flood disaster in Yaba is presented in Table 4.2.1 below

Table 4.2.1: House Types Affected by Flood 2014

S/N	HOUSE TYPES	NO	PERCENT (%)
1	Storey buildings	2	3
2	Boungalow	7	10
3	Thatch	30	44
4	Block of rooms	20	20
5	Others unspecify	10	14
	Total	69	100%

(sources Fema 2014)

Table shows the condition of environments in terms of house types in the study area affected by flooding with various degrees of destruction/dilapidations, the survey revealed that about 44% of thatch house score the highest percentage of houses affected by the flood event in 2014, Block of rooms houses have the second percentage of about 29%, follow by 14% others unspecify. Boungalows have 10% and last but not the least, the storey building which have 3% destruction. The implication of this is that many residents in this area are more vulnerable to external aggression and diseases there is need for relocation for protections and relief. For the people.

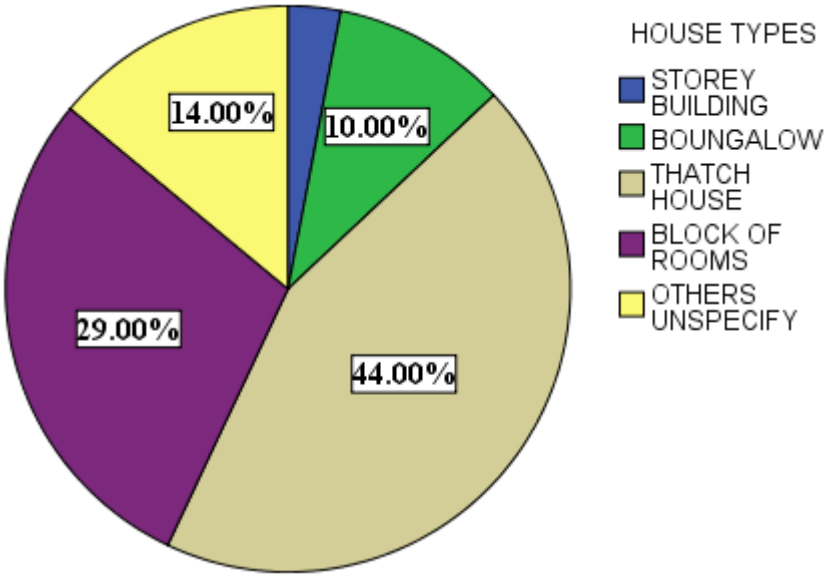


Fig. 4.2.1: Pie Chart showing Percentage Distribution of House Type affected by Flood 2014 in the Study Area.

TABLE4.2.2: EMPLOYMENT OPPORTUNITIES AFFECTED 2014 FLOOD.

S/N	OCCUPATIONAL TYPES	NO	PERCENT %
1	Unemployed	50	21
2	Farmers	102	43
3	Fisher men	30	13
4	Artisans	45	19
5	Trading	10	4
	Total	237	100

(sources Fema, 2014)

Table 4.2.2 shows the occupational opportunities affected by flood in 2014 year in the study area. The survey revealed that farmers have the highest percent of 43% affected by flood in the year, followed by unemployed people of about 21% in the area.

The artisan have about 19%, fisherman about 13%, the last livelihood affected are the traders which have about 4%.

The **implications** of farmers having the highest percents of the destruction of about 43% by flood in 2014 year shows that, there will be threats to foods security, also threat to work force that enhance production and agricultural activities leading to unemployment and hunger in the area, and can affect the FCT in general. Since the area is one of the major area for agricultural activities in FCT.

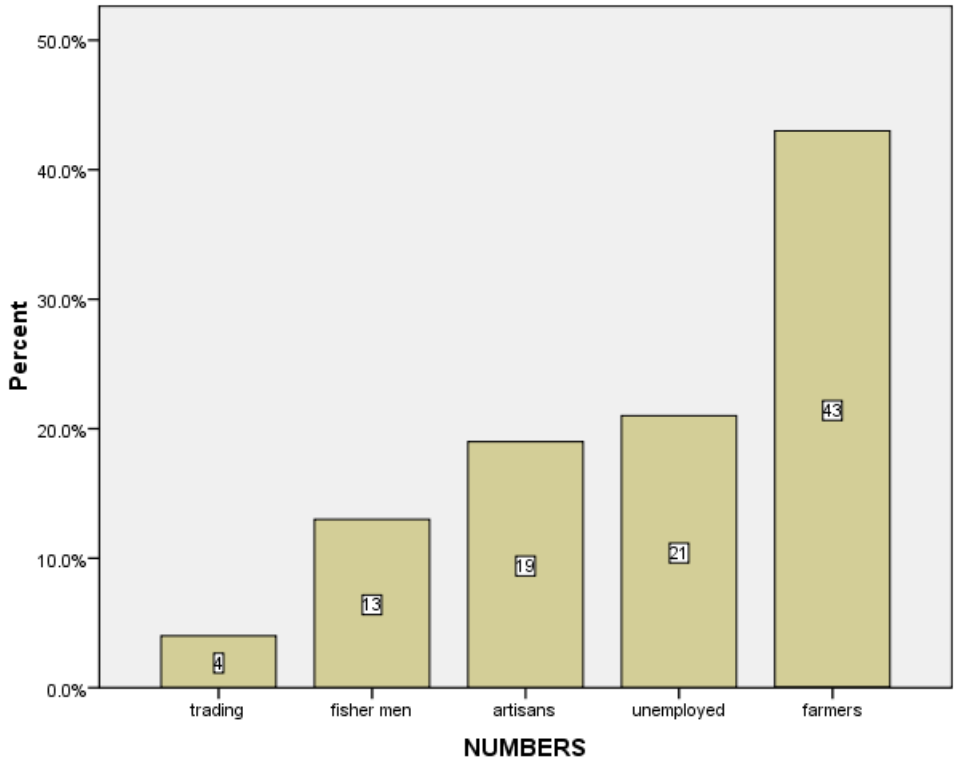


Fig 4.2.2 Bar-Chart showing employment/livelihood of the people affected in the study area during 2014 flood year.

TABLE 4.2.3: SUMMARY OF PERSONS (AGE GROUPS) AFFECTED BY 2014 FLOOD YEAR

S/N	Age group	Male	Female	Total	Percent %
1	1 – 15	32	36	68	25
2	16 – 30	68	63	131	47
3	31 – 45	24	32	56	20
4	46 – 60	15	3	18	6
5	60 – above	4	-	4	2
	Total	143	134	277	100

(source Fema, 2014)

Table 4.2.3 showing the classification of the age group affected by the 2014 floods, the survey shows that the most vulnerable groups is between age 16 – 30 with 47%, follow by age group between 1 – 15 mostly children and teenage with 25% than 31 – 45 with 20%, 46 – 60 with 6% and last age group from 60 years and above with 2% degree of destruction.

The implication of this indicates that, the most vulnerable group affected by this flood is the children and youths (work force) in this study area: this implies that there be destruction in schools activities and productive work force of the area.

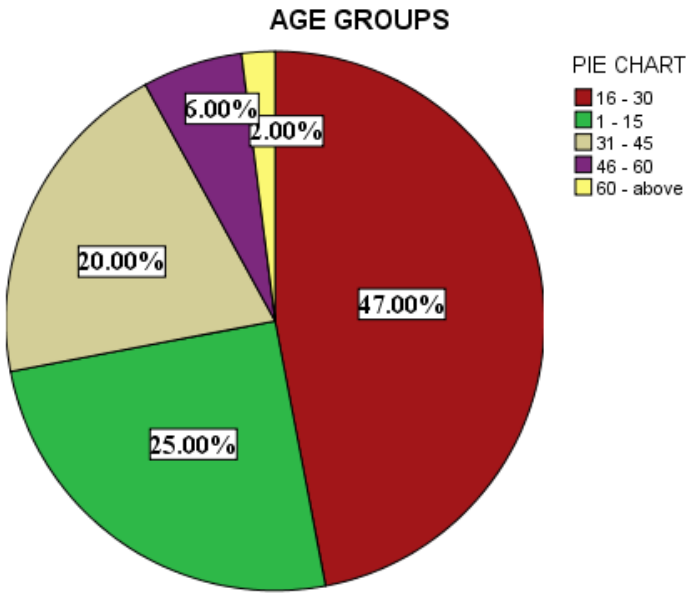


Fig 4.2.3: Pie – Chart showing classified age groups most affected by flood in 2014 flood year.

TABLE 4.2.4: SUMMARY OF CROPS DESTROYED AND OWNERS IN 2014 FLOOD YEAR.

S/N	TYPES OF CROPS	OWNERS OF CROPS	PERCENTAGE	SCORE CARD
1	Rice	141	34	2
2	Maize	207	50	1
3	Cassava	25	6	3
4	Yam	13	4	4
5	Groundnuts	25	6	3
	Total	411	100%	

(source Fema, 2014)

Table 4.2.4 above shows the conditions of cash crops affected or destroyed during 2014 flood year. The available data shows that maize have 50% (percent) destruction during the flood, also the highest percentage of destruction, followed by rice cultivation recording 34%, cassava and groundnut records 6% respectively and yam cultivation is the last with 3% level of destruction in in 2014 flood year alone.

The implication of this effect will affect the livelihood income of the people since the people in these areas are predominantly peasant farmers and also threat the local food security of the people, disruption of market activities which can affect their socio-economic well being, thereby indirectly or directly affecting FCT food security.

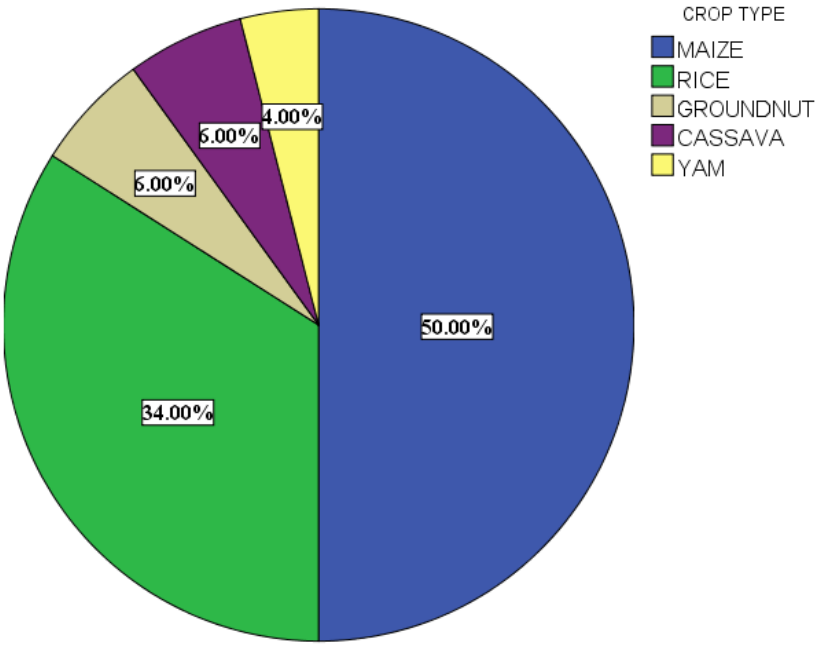


Fig 4.2.4 Pie – Chart showing percentage distribution of crops destruction in the study area, 2014 flood year

TABLE 4.2.5 FISHING TOOLS DESTROYED IN 2014 FLOOD YEAR

S/N	FISHING TOOLS	OWNERS	PERCENTAGE	SCORE CARD
1	Canoes	6	18	2
2	Nets	8	24	1
3	Paddles	6	18	2
4	Local fishing hooks	8	24	1
5	Calabash	5	16	3
	Total	33	100%	8

(source Fema, 2014)

Table 4.2.5 showing the various degree or percentage destruction of fishing tools by local fishermen in the area during 2014 flood. The local nets and hooks for fishing have the highest percent of about 24% respectively. Follow by canoes and paddles instrument which also have 18% respectively. The last instrument is there local calabashes which have 16% level of destruction.

The implication is that there ability to undergo fishing activities has been reduced, this also can lead to reduction in the socio-economic activities of the people in the area. Both there employment opportunities and productivity is affected.

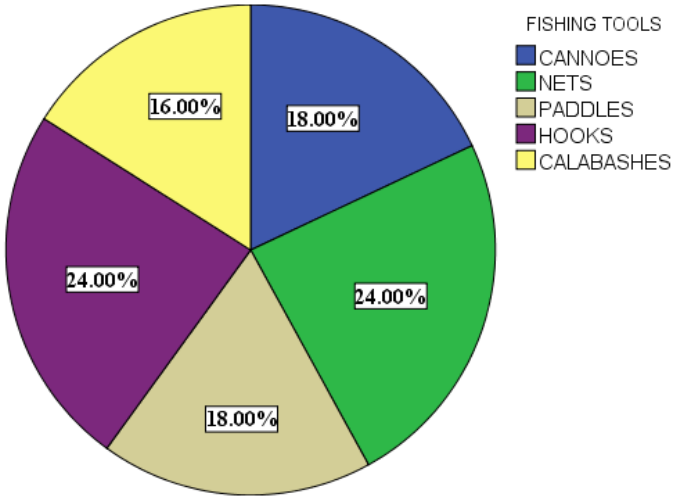


Fig 4.2.5 Pie – Chart showing percentage of fishing tools destroyed during 2014 flood year.

Table 4.2.3 Presents an annual Sediment Yeild for River Gurara over the past 20 years (1996-2011).

TABLE4.2.3 ANNUAL SEDIMENT YIELD FOR RIVER GURARA IN (MM)

14	23	08	31	(05)	26	11	27	32	(46)
08	28	12	36	16	09	42	30	07	22

(SOURCE FEMA 2014)

The table shows annual sediment yield generated(mm) in Gurara River Channels for the past 20years that causes overflow of the river.

Using the data above to developed a frequency distribution table to determined the volume of accumulation over the past 20 years by finding the tally and frequency of the data below.:

Table 4.2.4 FREQUENCY DISTRIBUTION TABLE

YEAR	SEDIMENT YIELD	TALLY	FREQUENCY
20	46	1	1
	45	0	0
	44	0	0
	43	0	0
	42	1	1
	41	0	0
	40	0	0
	39	0	0
	38	0	0
	37	0	0
	36	1	1
	35	0	0
	34	0	0
	33	0	0

	32	1	1
	31	1	1
	30	1	1
	29	0	0
	28	1	1
	27	1	1
	26	1	1
	25	0	0
	24	0	0
	23	1	1
	22	1	0
	21	0	0
	20	0	0
	19	0	0
	18	0	0
	17	0	0
	16	1	1
	15	0	0
	14	1	1
	13	0	0
	12	1	1
	11	1	1
	10	0	0
	09	11	2
	08	1	1
	07	1	1
	06	0	0
	05	1	1

After determining the tally and frequency, Using thumb rule formula $5(\log^{n}_{10})$ to determined the number of classes for the grouping of the data above

$$5 \quad (\log^{20}_{10})$$

$$= 5 \times 1.301$$

$$= 6.50$$

K = 7 classes out of 20 variable

K = No of classes

CI = Class intervals

$$CI \quad \frac{\text{Highest Values (HV) Lowest Value (LV)}}{\text{No Classes (K)}}$$

$$= \quad \frac{46 - 05}{7}$$

$$\text{CLASS INTERVAL} \quad = \quad \frac{46 - 05}{7}$$

Class Interval = 5.85 Apart

C.I. = 6 Apart

The above data was too larged to be use to determine the volume of accumulation of sediment we therefore use the Thumb rule to group the data to make it smaller for computation as shown in the table below.

TABLE 4.2.5: FREQUENCY DISTRIBUTION TABLE, (GROUP DATA)

CLASS	**MID-POINT X**	**FREQUENCY**	**CUMMULATIVE FREQUENCY**	**CF%**
05-10	7.5	5	5	25
11-16	13.5	4	9	45
17-22	19.5	1	10	50
23-29	25.5	4	14	70
29-34	31.5	3	17	85
35-40	37.5	1	18	90
41-46	43.5	2	20	100
		n = 20		

$$\text{Mid-point X} = \frac{\text{Lower Limit + Higher Limit Value}}{2}$$

$$\frac{5+10}{2} = \frac{15}{2} = 7.5$$

Cumulative Frequency = First Value = Next Value

= Total Value

= 5+4=9+9+1=10 etc.

$$\text{Cumulative Frequency Percentage} = \frac{\text{Individual Value}}{\text{Total Value}} \times 100\%$$

$$= \frac{5}{20} \times 100\%$$

$$= 0.25 \times 100\%$$

$$= 25\%$$

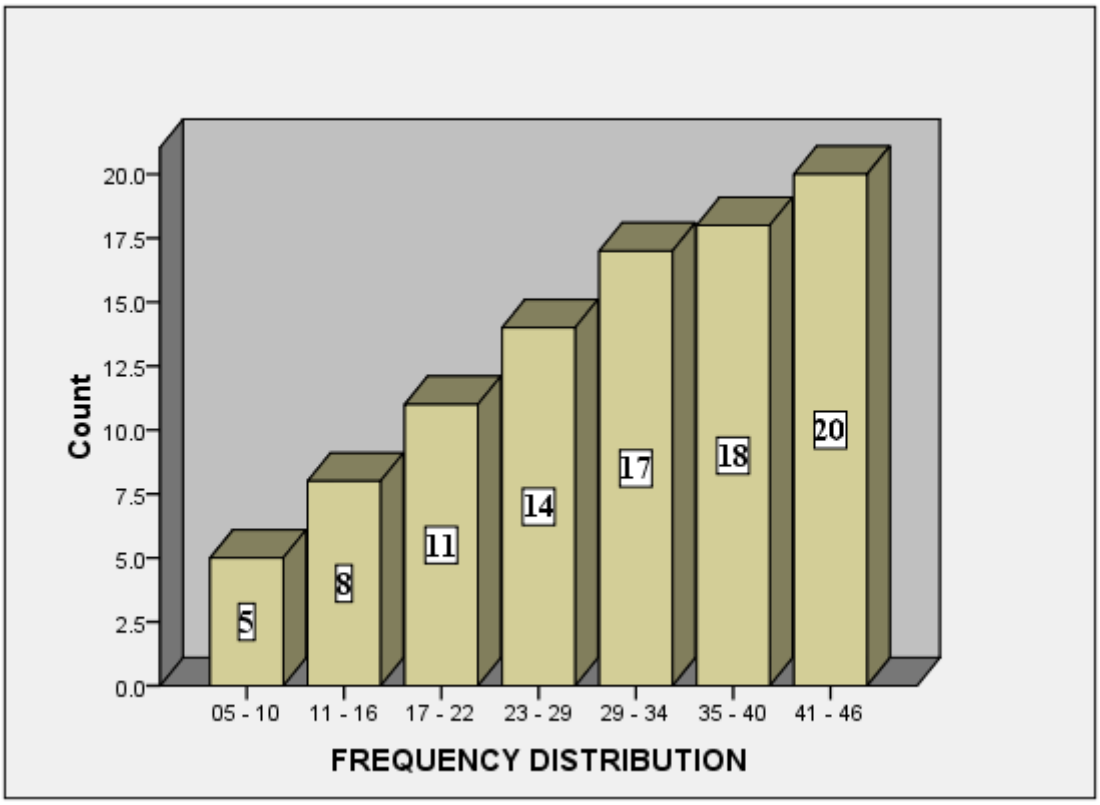


FIG.4.1.0 BAR – CHART SHOWING SEDIMENT ACCUMULATION IN RIVER GURARA

The above graph indicates a sharp increase in sediment Accumulation from class 05-10 and 11-16 maintained on the same level from 11-16 to 17-22 class and from there it rose sharply from class 17-22 to the end. This therefore concluded that there is need for dredging of the Gurara River Channel to allow free flow of water, thereby reducing the rate of flooding in the study area.

Find the mean deviation X = $\frac{\sum \overline{X}}{n}$

$$\overline{x} = \frac{14+ 23 + 08 + 31 + 05 + 26 + 11 + 27 + 32 + 46 + 08}{20}$$

$$= \frac{433}{20} = 21.65$$

$$\overline{x} = 21.65$$

Solution

$\sum (x-\overline{x}) = 118.9$

$\sum (x-\overline{x})^2 = 1{,}031.26$

$\sum x^2 = 12{,}261$

Find Average Absolute Deviation $= \frac{\sum (x-\overline{x})}{n}$

$$= \frac{118.9}{20}$$

$$= 5.945$$

Finding the measure of variance $= \frac{\sum (x-\overline{x})^2}{n}$

$$= \frac{1{,}31.26}{20}$$

VARIANCE = 51.56

Find the Standard Deviation = $\sqrt{\frac{\sum (\bar{x}-x)^2}{N}}$

$\delta = \sqrt{\frac{1,031.26}{20}}$

$= \sqrt{51.56}$

$\delta = 7.18$

TABLE 4.2.7: Present the magnitude of flooding and the degree of destruction of crop yield in the study area.

Magnitude of Flooding	50	48	75	46	14	90	70	56	67	48	18
Destruction of crop yield (kg	22	66	56	9	42	69	55	67	70	21	32

(Source: FEMA 2014)

Using the spear man rank coefficient, to determine the correlation between the magnitude of flooding and cucumber yield destroyed over a eleven farms. Land in the study area.

From table 4.2.7 appendix E Find x and y from the Highest ranking number to the lowest rank numberThe formula for calculating the spear man rank correlation coefficient is

$$r_x = \frac{1\text{-}6\varepsilon d^2}{n3\text{-}n}$$

$$rx = 1 - \frac{1\text{-}6\varepsilon d^2}{n3\text{-}n}$$

While d = difference in rank

n = number of pairs of items

Thus $rx = 1 - \frac{1\text{-}6\varepsilon d^2}{n3\text{-}n}$ $\varepsilon d^2 = 5$ $n = 11$

$$= 1 - \frac{6 \times 5}{11^3 - 11}$$

$$= \frac{1 - 30}{1{,}331 - 11}$$

$$= \frac{1 - 30}{1{,}320}$$

$$= 1 - 0.0227$$

$$= + 0.9773$$

In order to test the significance of the correlation coefficient. We can again use the student's t distribution. The formular below:

$$t = r \sqrt{\left[\frac{n-2}{1-r^2}\right]}$$

Where r is the correlation coefficient and n is the number of pairs of observation in this case r = 0.97

$$\text{Therefore } t = \sqrt{\left[\frac{n-2}{1-r^2}\right]}$$

$$t = 0.9773 \times \sqrt{\left[\frac{11-2}{1-0.9773^2}\right]}$$

$$t = 0.9773 \times \sqrt{\left[\frac{9}{1-0.955}\right]}$$

$$= 0.9773 \times \sqrt{\frac{9}{0.045}}$$

$$= 0.9773 \times 3 \sqrt{200}$$

$$= 0.9773 \times 14.14$$

$$= 13 . 819$$

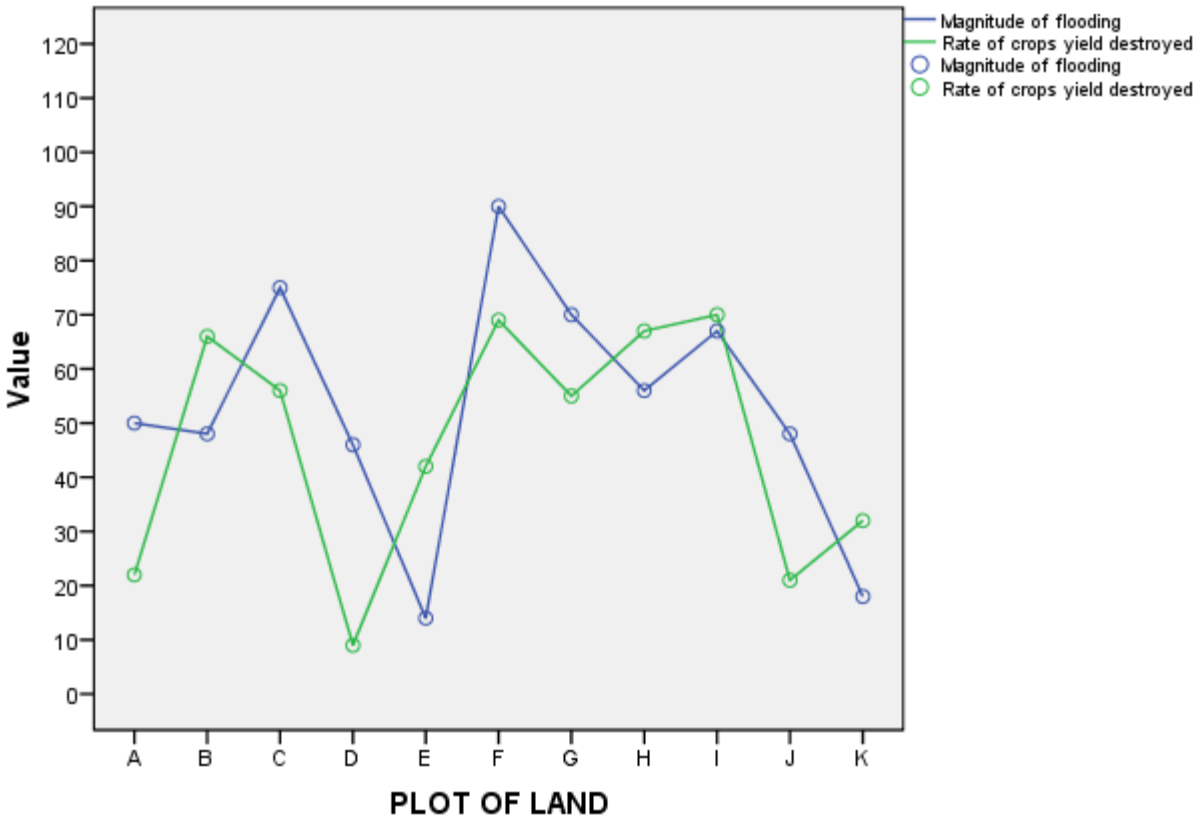
$$t = 13.82$$

t = 14

Answer

There is a perfect positive rank correlation at the 99% probability level between flood magnitude and crop yield destroyed (r = 0.9773 which a t value of 13.82 = (14) and (9) degree of freedom is statistically at the 99% level). This shows that increase in volume or magnitude of flood may not lead to high rate of crop yield destroyed in some areas of study due to some local factors like the high porocity of soil in some areas e.t.c.

Graph below: showing farmland A TO K (11 plots)



Result

Graph showing the perfect positive Rank Correlation between Flood Magnitude and crop yield destroyed in eleven farmlands in the study area, the result shows that the variables(flood magnitude and crop yield destroyed) are inter-dependence on each other, increased in one variable can lead to increased to another.

Temperature	30.2	30.0	32.0	32.5	35.0	30.0	29.5	28.4	24.0	26.5	30.2	30.5
Rainfall mm	0.0	2.7	12.5	32.4	100.2	165.7	280.9	395	165.9	40.8	9.8	0.0

the micro-climatic element of rainfall and atmospheric temperature of the study area as follows. Find x and y highest ranking number dx and dy to the lowest ranking number from table 4.2.9 appendix F.

$$r = \frac{1 - 6\varepsilon d2}{n3 - n}$$

$$rx = \frac{1 - 6\varepsilon d^2}{n3 - n}$$ while d = difference in rank

n = Number of pairs item

$$r = \frac{1 - 6 \times 69.5}{12^3 - 12}$$ $\varepsilon d^2 = 69.5$, $n = 12$

$$= \frac{1 - 417}{1{,}728 - 12}$$

$$= 1 - \frac{417}{1716}$$

$$= 1 - 0.243$$

$rx = +\ 0.757$

In order to test the significant of the correlation co-efficient, we can again used the student t. distribution the formular this time is: $t = r \sqrt{\left(\frac{i-r^2-2}{n}\right)}$

when r is the correlation co-efficient and

n is the number of pairs of observation in this case r = 0.757 and n = 12

Therefore $t = r \quad n-2$

$i-r^2$

$$= 0.757 \times \sqrt{\left(\frac{10}{1- 0.5730}\right)}$$

$$t = 0.757 \times \sqrt{\left(\frac{10}{0.427}\right)}$$

$$= 0.757 \times \sqrt{23.4}$$

$= 0.757 \times 4.837$

$= 3.661$

$t = 4$

Answer

Table's 4.2.9 appendix F shows rise in rainfall from June(165.7mm), july having about (280.9mm) reach it peak about (395mm) in August, with attendant heavy excessive downpour characterized with rain storm having intensity of about 80mm/hr. The temperature also rise between March to april (32oc) and reach it peak in may, about (35oc) lead to evaporation of water vapour to the atmosphere eventually come down as heavy rainfall in august causing flooding in the area..

The r-1 values is 0.757 which shows a strong positive relationship between rainfall and climatic temperature, the t-test shows a significant relationship at both 1% significant level, this indicates that the higher the temperature within the year the higher the mean annual rainfall that can occure within the year that can lead to higher volume of flooding.

CHAPTER FIVE

5.0.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1.0 SUMMARY OF FINDINGS.

There are severe incidences of flooding disaster in Yaba Community of Abaji Area Council of FCT, because the community is located down stream of lower usuma dam and on the floodplain of river gurara and have recorded series of flooding disaster too numerous to mention some of the recent flooding incidences include those of 2010, 2011, 2012,2014, 2015 and 2016 respectively, the were highly devastating.

5.1.2 The annual prolong and excessive torrential Rain falls that occurs during late July to August extending to October every year in the last ten years .as the result of climate change effects had lead to increase in water volume of the river guarara channel causing the overflows of it banks and inundate the entire community. The serverity and magnititude so much that Most of the houses or settlements and public utilities badly affected.

5.1.3 Gurara River Channel need improvement due to annual sediment or accumulation of debris over the years this have reduce channel transporting capacity have aggravated the situation and hinder the free flows of the water within it channels and this facilitate the overflowing it banks annually.

5.1.4 The findings of rapid assesement conducted immediately after the flood indicate the poor soil infiltration rate of some area in the community and lack of good or no drainage network. Within the community, the soil infiltration rate along the flood plain is low, thereby allows water to stay a flow in this area for a long time, that is why most of the community members or settlement along the flood plain are badly affected than others within the community.

5.1.5 It is also estimated that Flooding in this area has become an annual event with it attendant devastating effects and it become more pronounce with serious destruction of Houses other properties as well as farmlands about 500 people were affected in 2012.

In 2014 floods the flood water overtopped the major access road and bridge loading into the community thereby inhibiting effective rescues operation and movement in and out the community during the period.

Most of the houses and farmland badly affected by 2014 flood disaster were located along the flood plain, about fifty-two (52) houses along the flood plain were destroyed through most critical community infrastructure likes schools and health centre, activities were disrupted, no life was lost but there was cases of snake bite to some affected victims who has since recovered from the injury through the local traditional medicine.

5.1.6 Despite series of campaigns and sensitization visit from FCT Administration annually, the community members still farm and live along flood plains.The community does not have any source of clean and portable water. in the interim the level of susceptibility of Yaba Community to climate change risks depend on how a great deal of the community inhabitants and economic – social resources are located in the high-risk area exposed to flood tragedy. This is link to the following factors like lack of adequate land-use planning, feeble structural defense system, and neglects of building codes and unfettered development of disaster prone areas of FCT including the study area.

5.2.0 CONCLUSION

There is no doubt that flooding has become common disaster in all nations of the world and the FCT shares in the Bitter experience is discuss in this Research work. The efforts of FCT Administration in flood management are overwhelmed with challenges that reduce the expected outcomes and make flooding a major source of future concerned in this area. The world has come to realized there is no permanent, once and for all solutions to some natural disasters like flooding. However, it is also agreed that the Impact of unavoidable disasters can be avoided or mitigated through effective management actions; therefore, FCT Administration needs to take actions to overcome the existing challenges in order to reduce the risk and the vulnerability of Yaba Community to flood disaster in achieving this, the following recommendation are made.

5.3.0 RECOMMENDATION

5.3.1 IMPROVEMENT OF INSTITUTIONAL CAPACITY AND ADEQUATE COORDINATION OF DISASTER MANAGEMENT IN FCT;

There is the challenge of low institutional capacity for disaster management in FCT There is need for more effective decentralization of Administrative framework of disaster management functions in FCT. The current six Area Councils and some operational offices of (FEMA) FCT Emergency Management Agency should be established for more coverage and effective responses. Also, the FCT Administration should as a matter of priority, empower the (FEMA) FCT emergency Management Agency through Legal and /Legislative backing, funding, personnel recruitment and training, equipment procurement, etc. to make them functional. Area Council Emergency Management Council (AEMC) should be mandatory set up in all the six Area Councils of FCT Abuja and be empowered to carry out disaster risk reduction activities at the local or community level in addition to this, FEMA should established inter-sectoral committee involving all stakeholders to assist in strategic areas of disaster management.

The decentralization of disaster management functions required effective coordination of the activities of the line department and agency (MDAS) in FCT who are involved in disaster operations and management. The FCT platform for Disaster Risk Reduction should be made functional for effective coordination of disaster management activities.

FCT emergency management Agency (FEMA) should embark on capacity building, massive investment in flood control infrastructure and equipment (flood drainage, shelter and rescues infrastructure) adequate manpower training is required to build the capacity of the Emergency Management Agency in FCT. Although the Federal Government taken a good initiative by establishing Six Centre of Disaster Management and development studies in Six Universities in Nigeria.(futminna,ABU zaria,futa etc) The training efforts of the centres should be complemented with regular specialization practical training in search and rescue, relief Oparations, camp and victim management.

The FCT Administration needs to invest more on Flood Management Infrastructure. The Flood Shelter Programmes Initiated in the affected areas should be completed. The FCT

Administration should provide more funds for the Flood Shelter Project in order to provide alternative accommodation for communities like Yaba Community living on floodplains The Ministerial Monitoring Committee of Projects should be re-constituted into a task force for proper monitoring and to ensure they complete the project in all Area Councils also provision of more standard flood water drainages in flood prone areas of FCT, search and rescue and transportation equipment are required for effective mitigation and responses.

FCT Emergency Management Agency in collaborations with Nigeria Meteorological Agency need to step up and sustain the current level of flood early warning services to FCT Flood Prone Areas. Early warning information not well disseminated or not heeded is useless. More efforts should be directed to ensuring wider dissemination, use and compliance with early warning by communities at risk. Above all the early warning service should culminate into massive community. Sensitization and persuasion (through incentive) with a view to eventually relocating vulnerable communities to safer areas.

A better and more sustainable approach to effective flood disaster management in FCT lies in the implementation of existing reports and disaster management plans. The PDNA Report, the National Disaster Recovery Strategy/Framework and the 2012 flood Recovery Action Plan contained well though-out and useful strategies for managing flood disasters in FCT. The FCT Administration should show commitment and good political will to implement the provision of the documents. If this is done, the Territory will certainly be on the path of effective flood disaster management which will mitigate the Impact of unavoidable flooding and build community resilience.

5.3.2 THE FOLLOWING ARE RECOMMENDED STRATEGIES FOR FLOOD DISASTER RISK REDUCTION IN THE AREA

The united nation and a host of the world bodies considered the huge losses associated with flood disasters throughout the world encouraged a concerted effort by national and intergovernmental agencies to develop pragmatic measures to deal with flood disasters. One of these approaches approved by the united nations is the use of space technologies (remote senses and GIS) for disaster reduction and management.

Over the years two dominant approaches have been adopted for flood management which I shall recommend for use in this study, which include the following:

Engineering/structural approach and non-engineering flood management approach. The **Engineering/structural approach** entails

-The constructions of dams along the river gurara river drainage basin upstream of the yaba community to control or to be able to store water flow so that it can be discharge at convenient rate.

- Embankment/levee/dike along the banks of river gurara drainage basin so as to restricts flood water to low volume.

-The construction of good drainage network channels within the community to reduce the impact also regular evacuations of water ways even though recent flooding event have shown the inadequacies of this techniques to tame this surge of flooding in some communities.

-Improvement of river gurara drainage channel basin by clearing sediment and debris that had been accumulated over the years or improving river gurara channel drainage by deepening and widening the river bed and thus reducing the area of the floodplain. New channel construction may be a realistic alternative to the cost of moving a whole settlement to another place.

The non-engineering/non-structural approach to flood management in this area includes but not limited to the following methods

----Floodplain management this include the acquisition of floodplain by development control department of FCT by swaps that offer alternative for construction sites, also no key progress must be allowed in areas establish to be theme to be flood prone areas

---Floodplain zoning this involve recognizing vulnerable areas or rudiments by preparation of flood- hazard maps and then integrating that imformation into a plan for preparedness and growth.

---Flood forecasting, flood alert system provide the base for flood predictions, caution and awareness system from cheap network which include volunteers who observed rainfall and stream stages to complement networks of gauges and automated models ways of disseminating warnings includes radio, television, warning sirens or bells, public address system, at community level the use of bicycle and on foot.

---Flood disaster preparedness plan this include, issuing cautions at the local community level, by organizing work parties to maintained embankments or clear debris from drainage areas, pile sandbags and stockpiles needed materials, preparation of emergencies supply of food and clean water, identifying customary mitigations and alertness measures and determing there efficacy.

---Flood proofing this include control and regulations of building materials in curtained zones or part of the community, wooden building and erstwhile light structures ought to be prevented in some cases and mud houses are allowed only if flood fortification measures are taken. And build up escape routes

---Flood insurance this involves organisation of incentives like loans or subsidies, taxes breaks to maintain vista development on safer sites using safe methods of constructions. Also changing of farming crops such as planting flood opposing crops or adjusting the planting seasons establishing cast and flood reserves.

5.4.0 FUTURE RESEARCH DIRECTION (OPTIONAL

5.4.1 RECOMMENDATION FOR FUTURE RESEARCH:

1. In order to enhance the occurrences of this research on causes and effects of flooding in this study area. They should take into consideration the study of character or behavior of Gurara River to ascertained it attribute during dry and wet seasons.
2. in view of the fact that the flood depth and flood duration maps for the floodplain in Yaba were not established in this research. Further research may generate flood hazards maps with different returns period (e.g. 5, 10, 100years event) in order to established floor hazard zones in the area.

REFERENCES

Abubakar A.S. (1993) parametric approach to hydro-meteorological aspects of flood forecasting. An M.Tech. these was submitted to Geography Department, Federal University of Technology, Minna Academic Research International Vol. 2 No. 1 PP. 448-468.

Action Aid (2006) Climate Change, Urban flooding and the rights of the urban poor in Africa key findings from six African Cities. A report of Action Aid International October.

Adeaga .O. (2008) Flood hazard mapping and risk in part of Lagos Department of Geography Faculty of Environmental Sciences University of Lagos. Akoka Lagos Nigeria.

Adeleye .A. and .R. Rustum (2011) Lagos (Nigeria) flooding and influence of Urban planning .J. Urban Design and Planning (Ice). 164(3): 175-187 ISSN: 1755-1793 E-ISSN: 1755-0807.

Aderogba .K. (2012a) Global warning and challenges of flood in Lagos metropolis, Nigeria, 2012b qualitation study of recent floods and sustainable Growth and Development of cities and town in Nigeria International Journal of Basic and applied Science Insan Akademika Publication, October PP 200-216.

Aderogba .K. (2012 c) Substantive causes and effects of floods in South western Nigeria and sustainable development of the cities and towns Journals of emerging trends in Education Research Policy studies (Jetraps) 3(4): 551-56.

Babanyara Y.Y Usman, H.A. and Saleh U.F (2010) An overview of Urban poverty and environmental problems in Nigeria Journal of Human Ecology 34: 135-143.

Balogun F.T and Okoduwa .A. (2000) "Application of GIS in Flood Risk Mapping: A Case Study of Benin City Journal of Cartography and GIS 1 (1) 37-46.

Bariweni P.T.A Wari .C. and Abwei .J. (2013) Environmental Effect of Flooding in the Niger Delta Region of Nigeria Published by the International Journal of Fisheries and Aquatic Science I (1) 35-46.

Burton .I. (1970) Flood Damage Reduction in Canada in Nelson J.G. and M.J. Chambers (eds) Walter, Landon: Methuen

Christopherson .R. (1997) Geosystem an Introduction to Physical Geography, London practice – Hall (Third Edition) PP.423.

Curtis .A. Mills J.W. (2010) GIS Human Geography and disaster Cognella University Readers Inc. U.S.A.

Darling M.J. (1959) "Flood in Maryland and Frequency" US.GS Open File Report.

Douglas .L., Alam .K. Maghenda, .M. Mcdonnell, Mclean and Campbel (2008) unjust water: Climate Change flooding and the urban porr in Africa Environment, Urban 20(1) 187.

Etuonoube .A. (2011) the devastating effect of flooding in Nigeria paper presented at the FIG working week, Marrakkech, Morocco 18-22nd May. European Parliament and Council of the European Union 2007, on the assessment and Management of Flood Risk, off .J. Eur. Union legislature 50, 27-34.

FAO (2000) Simple Soil water and plant testing techniques for Soil Resources Management International Institute of Tropical Agriculture.

Farther B.C (1974) The Impact of Rapid City Flood on Public Opinion about Whether Modification Institute of Behavioural Science University of Colorado.

FEMA(2014) ministerial committee on flood disaster in Yaba community of Abaji area council FCT.

Folorunsho R. and L. Awosika, (2001) Flood Mitigation in Lagos Nigeria through wise management of solid wate: A Case of Ikoyi and Victoria Island: Nigeria Paper presented at the Unesco-CSI Workshop, Maputo 19-23, November.

Giwa PN. 2005 Menance of Flood in a Democratic Society: A Case Study of Kafachan Town, Nigeria, A Paper Presented at the School General studies week. Held at the Kaduna State College of Education Gida Wye Guranko E (2004) Introduction, In:E.

Goolsyby D.A. Battaglin. W.A & Thurman, E.M (1993) Occurrence and Transport of Agricultural Chemicals in the Mississippi River Basin July through August 1993, Washington D.C. U.S. Geological Survey Circular 1120-C U.S. Government Printing Office. Gwary, .D. (2008) Climate Change, Food Security and Nigeria Agriculture,

Ppaer Presented at the Workshop on the Challenges of Climate Change for Nigeria Niser 19th -20th May, 2008.

Henderson L.J. (2004) Emergency and Disaster: Pervasive Risk and Public Bureaucracy in Developing Nations Public Organization Review: A Global Journal 4.103-199

Hualou .L. (2011), Disaster Prevention and Management; A Geographical Perspective Disaster Advance 4(1) January 2011 ICSU (International Council for Science) (2008) A Science Plan for Integrated Research on Disaster Risk: Addressing the challenge of Natural and Human-Induce Environmental Hazards. Paris, France ICSU.66P.

IFRC (2003) W orld Disaster Report. (Geneva. IFRCRCS) Retrieved January 9th , 2012 from www.ifec.org. Kates .R. (1985) Hazard Assessment Arts Science and Ideology West View Press. PP251.

Kershi J. & Simon R (2005) the essential of the environment London: Hodder PP 30.

Kolawole O.M, Olayemi A.B. and Ajayi K.T (2011) M flood in Nigeria Cities: Risk Analysis and Adoptation Option. – Ilorin City as a Case Study Archives of Applied Science Research 3(1): 17-24 Available online at www.scholarresearchlitracy.com.

Krutilla J.V. (1966) An Economic Approach to Copping with Flood Damage, Water Research 2. 183-190.

MMOM P.C and Alfesechi, P.E.E. (2013) Vulnerability of Niger Delta Coastal Communities ro Flooding Journal of Humanities and Social Science 10(6) 27-33 Http://dx.doc.org/10.9790/08037-1062783.

Mwape, Y.P. An Impact of Flood on the Socio-economic Livelihood of People: A Case Study of Sikamzwa Community in Kazungula District of Zambia, 2009.

NEMA (2012) Report on 2012 flood disaster in Niger .

NOTT .J. (2006) Extreme Events: Physical Risk Assessment (PSA)

Offodile M.E. (1991) An approach to Ground Water Study and Development in Nigeria Mecon, Jos.

Ogba .U. (2008) Integrated Approach to Urban Flood Adaptation in the Niger Delta Coast of Nigeria, Integrating Generation, FIG Working Week 2008, Stockholm Swedan 14-19 June, 2008 Available at http/www.fig.net./pub/fig2008/papers.

Okupe .L. (2002) Private Sector Initiative in Housing Development in Nigeria How Feasible Housing Today

Oladunjoye A.O (2005) Implementation of the Sustainable Cities Programme in Nigeria, Havana 2005-Documentation of Experience SCPLA21 Sustainable cities.

Ologunorisa E.T and Adeyemo .A. (2004) Public Perception of Flood Hazard in the Niger Delta Nigeria the Environmental Netherland Vol. 25. No. IPP.39-45.

Omuta (1988) Flood Problem in Benin City? In Environmental Issues and Management in Nigeria Development (eds) Sada P.O. and Odemerho O.O Ibadan: Event Publish.

Onokorheraye G.A (1995) Urbanization and environment in Nigeria Implication for sustainable Development Benin City: the Benin Social Science Series for Africa.

Oriola .O. (1994) Strategies for Combating Urban Flooding in Developing Countries: A Case Study from Ondo "The Environment Vo. 14; No. PP. 57-62.

Oyo State Government (OYSG) (2011) " Assessment of the August 26th 2011 Flood Disaster in Ibadan Metropolis" Report of the task force on flood Prevention and Management Ministry of Physical Planning and Urban Development Ibadan. November, 2011.

Pilgrim .D. and Cordery, .F. (1993) Flood Runoff in D.R. Maidment. Handbook of Hydrology New York: MCGRAW Hill Inc. PP.9,1-9.9.42.

Saceed .T.U and Attaullah. .H. (2013) Impact of Flood on Water Quality. British Journal of Environment and Climate Change (inpress).

Siemens (2010) sustainable cities, sustainable development for urban infrastructure. Siemens A.G Munich.

Simone .A. (2004) for the City Yet to come: Changing African Life in four Cites Durban: Duke University Press.

Tarhule .A.A. (1988) The Magnititude and Frequency of Flood in Kwara State East of Longitude $4^{0}32$" umpublished BSC. Original Long Essay of Geography and Planning University of Jos; Nigeria.

The Nation Newspaper July 11th, 2011

The Punch Newspaper July 12th, 2011

Twigg .J. and Bhatt M.R. (1998) Understanding Vulnerability, South Asian Perspecyive London and Colombo Intermediate Technology Publication

UNDP (@004) Reducing Disaster Risk: A challenge for Development. A Global Report UNDP.

UNDRO (1991) Mitigation Natural Disaster Phenomena Effects and Options. A Manual for Planner.

UN-Habbitat (2003) The Challenge of Slums: Global Report on Human Settlement 2003 Earth Scan London.

Upa callistus Terungwa And Ityortyer Clara Torkwase(2012) current issues in flood disaster: challenges implications for science and technology to enhance environmental education

Un-International Strategy for Disaster Reduction (UN-ISDR) (2008) Disaster Risk Reduction Strategies and Risk Management Practices: Critical Elements for Adoptation to Climate Change" Submission to the UNFCCC Adhoc working Group on long Term Cooperative Action Available at: www.unisnr.org/..../RiskReduction/climatechange/...../IASC-ISDR Paper CC and DDR.PDF (Accessed 16 oct.2011)

United State Environmental Protection Agency (USEPA) 2002 Water Quality Monitoring for Coffee Crack (forter Country, Indiana) Retrieved from: http/www.usepa/research.htm.modecode=62-28-00-00 (accessed on September 29th 2006).

Ward R.C (1978) Flood: A geography Perspective New York. John Wiley.

World Socialist Website. W5w5. (2001) Northern Nigeria Hit by Floods Available from (http//www.wsussorg/index5html (accessed October 9th, 2007).

Wright .T. (2011) Water Logged Pakistani Children Push a motorbike through flooded streets after rain in Lahorerin the wall street Jurnal-London.

Yande P.M. (2009) An Impact of Flood on Socio-Economic Livelihood of People: A Case of Sikaunze Community in Kazau Gula District of Zambia. Mini Dissertation submitted in partial fulfillment of the requirement for the master Degree in Disaster Risk Management Faculty of Natural and Agricultural Sciences University of the Free State.

LIST OF ABBREVIATION

NEMA	National Emergency Management Agency
NSUK	Nasarawa State University, Keffi
ISDR	International Strategy for Disaster Reduction
DPC	Disaster Preparedness Centre
FEMA	FCT Emergency Management Agency
IFRCS	International Federation of Red Cross Society
GIS	Geographic Information System
NIMET	Nigeria Metrological Agency
UNDRO	United Nations Disaster Relief Organization
UN-ISDR	United Nations International Strategy for Disaster Reduction
NGO	Non-Governmental Organization
AMAC	Abuja Municipal Area Council
EM	Emergency Management
UNEP	United Nation Environment Programme
MSC	Master of Science
ERM	Environmental Resource Management
SS	Social Science
WSWS	World Socialist Website
FCT	Federal Capital Territory

GLOSSARY OF TERMS

1 **Adaptive capacity; A**doptation is a purposeful and on going response, rather than a single response and is share responsibility that reguires a framework of share governance.

2 **Anticipatory planning; p**re-emptive and rebust planning attention to the root causes unfavorable conditions, focusing on the big picture of social and development problems for example

3 **Coping capacity: m**echanism to deal with, or resist harzads and plain to over-come them, coping capacity is defined in the disaster community as the means by which people or organization use available resources and abilities to face adverse consequences that could lead to a disaster(unisder 2014).

4 **Command and control floodplain managements: A** hierarchically structure exercises of authority and direction by properly designated agencies that provide roles and responsibilities to attached department for the accomplishement of set goals and policy.

5 **Critical mass: T**erm is used to refer generally to the minmum amount of something; a minimum population or development level needed to sustain the community or community action.

6 **Cross-scale linkages/interaction: A**re dynamic interaction that exist among emergent institution at the local ,national and international levels.

7 **Exposure: th**e existence of hazards to people or region that is mainly a product of physical location describe the hazardous characteristic of a surranding environment both national and man-made.

8 **Frequency: th**e ratio of times an events occurs. Events are often categorized by their magnitude or impact and frequency is calculated according to these categories.

9 **Hazards: A** possible source of danger. Flood hazard ; to expose to danger or harm; toxic storage. A situation with a potential for causing harm in terms of human injuries, damage to health properties the environment and other things of value or some combination of these.

10 **Intergrated risk management: th**e consideration of risks at all level of government and stake holders organization, from the strategic to the day to day happening of the

public and private sectiors. IRM into community-base planning means adopting a risk-base framework and using risk management tools to plan reduce risk internally, and improves management through adoptive learning.

11 **Inundation: w**hereas flooding events occure over the physical environment and are measure in peak discharge, inundation denote the human impact of flooding and measure. Loss potentials.

12 **Magnitude: D**enote the physical impact of hazard. It however does not imply intensity which denote the impact of hazard on human(Burton etal 1993)

13 **Mitigation: p**urposeful action or adjustment to reduce risk and vulnerability; to cause to become less, harsh ,hostile; severe or painful; to moderate or secondarily, to carryout sustained action to reduce the risk to life property and the environment from disasters of all types

14 **Probability: th**e likelihood that a given event will occurs the quality or condition of being probable; likelihood.

15 **Resilience: th**e ability to maintain a system (ecosystem community)and to recover after an impact. Residence is a measure of the rate recovery from a stressful experience reflecting social capacity to absorb and recover from the occurrence of hazardous event(Hewitt 1997).

16 **Resilience Community: C**ommunity that takes intentional action and to enhance the personal and collective capacity of its citizens and institution to respond to and influence the cause of social and economic change(centre for community enterprises 2000 p5)

17 **Resistance: th**e ability to absorb impacts below threshold in order to maintain functioning, resistance can also reflect economic, psychological and physical health and their system of maintenance (pelling2003)

18 **Risk: A** combination of the probability and magnitude of hazard and the exposure of humans to that hazard from vulnerability.

19 **Risk transference: th**e danger or risk pass on to the future generation from current development and planning that ignore real risk and increase long term vulnerability

20 **Social amplification of risk: occurs** when the secondary influence of risk perception(values, beliefs, subjective or intuitive knowledge, media) can function as

filter in the diffusion of information and have the potential to distort risk communication and perception (kasperson etal 1988)

21 **Social capital: th**e alttitude, spirit and willingness of people to engage in collective civil activities over time social capital builds what may be term as social infrastructure, a key item discuss in the strategic social plan.

22 **social learning: l**earning that occurs as a function of observation, retaining and replicating behavior observed in other.

23 **vulnerability: th**e susceptibility to physical o emotional injury can result from the magnitude of an event or the human and social characteristics or condition in a population vulnerability can be comprises of three component; exposure resistance, and resilences (pelling 2003)

LIST OF APPENDICES

APPENDIX A Frequency distribution table(group data) Showing annual sediment Accumulations in river gurara.

TABLE 4.2.5: FREQUENCY DISTRIBUTION TABLE, (GROUP DATA)

CLASS	**MID-POINT X**	**FREQUENCY**	**CUMMULATIVE FREQUENCY**	**CF%**
05-10	7.5	5	5	25
11-16	13.5	4	9	45
17-22	19.5	1	10	50
23-29	25.5	4	14	70
29-34	31.5	3	17	85
35-40	37.5	1	18	90
41-46	43.5	2	20	100
		n = 20		

APPENDIX B Frequency distribution graphical chart. Showing sediment Accumulations in river gurara(mm) in 20years 115.

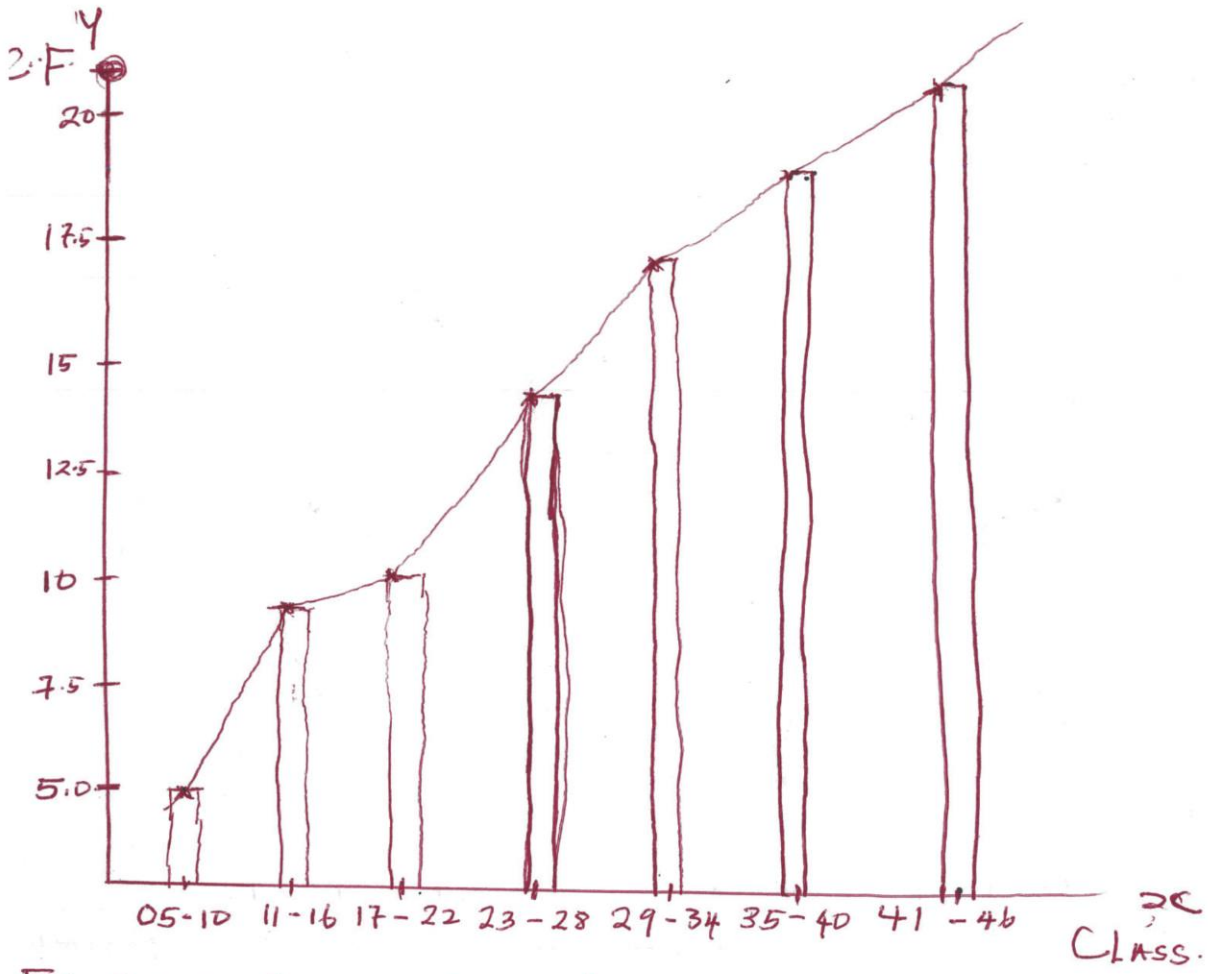


FIG 4.1.0 GRAPH SHOWING SEDIMENT ACCUMULATION.

APPENDIX C

Table 4.2.6 Table showing annual sediment accumulation in gurara river in 20years

S/NO	SEDIMENT YIELD (DATA X)	$\overline{X}$	$(X-\overline{X})$	$(X-\overline{X})^2$	X^2
1	14	21.65	-7.65	-58.52	196
2	23	"	1.35	1.82	529
3	08	"	-13.65	-186.32	64
4	31	"	9.35	87.42	961
5	05	"	-16.65	-277.22	25
6	26	"	4.35	18.92	676
7	11	"	-10.65	113.42	121
8	27	"	5.35	28.62	729
9	32	"	10.35	107.12	1,024
10	46	"	24.35	592.92	2,116
11	08	"	-13.65	-186.32	64
12	28	"	6.35	40.32	784
13	12	"	-9.65	93.12	144
14	36	"	14.35	205.92	1296
15	16	"	-5.65	-31.92	256
16	09	"	-12.65	-160.02	81
17	42	"	20.35	414.12	1764
18	30	"	8.35	69.72	900
19	07	"	-14.65	-214.64	49
20	22	"	0.35	0.12	484
			118.9	**1031.26**	**12261**

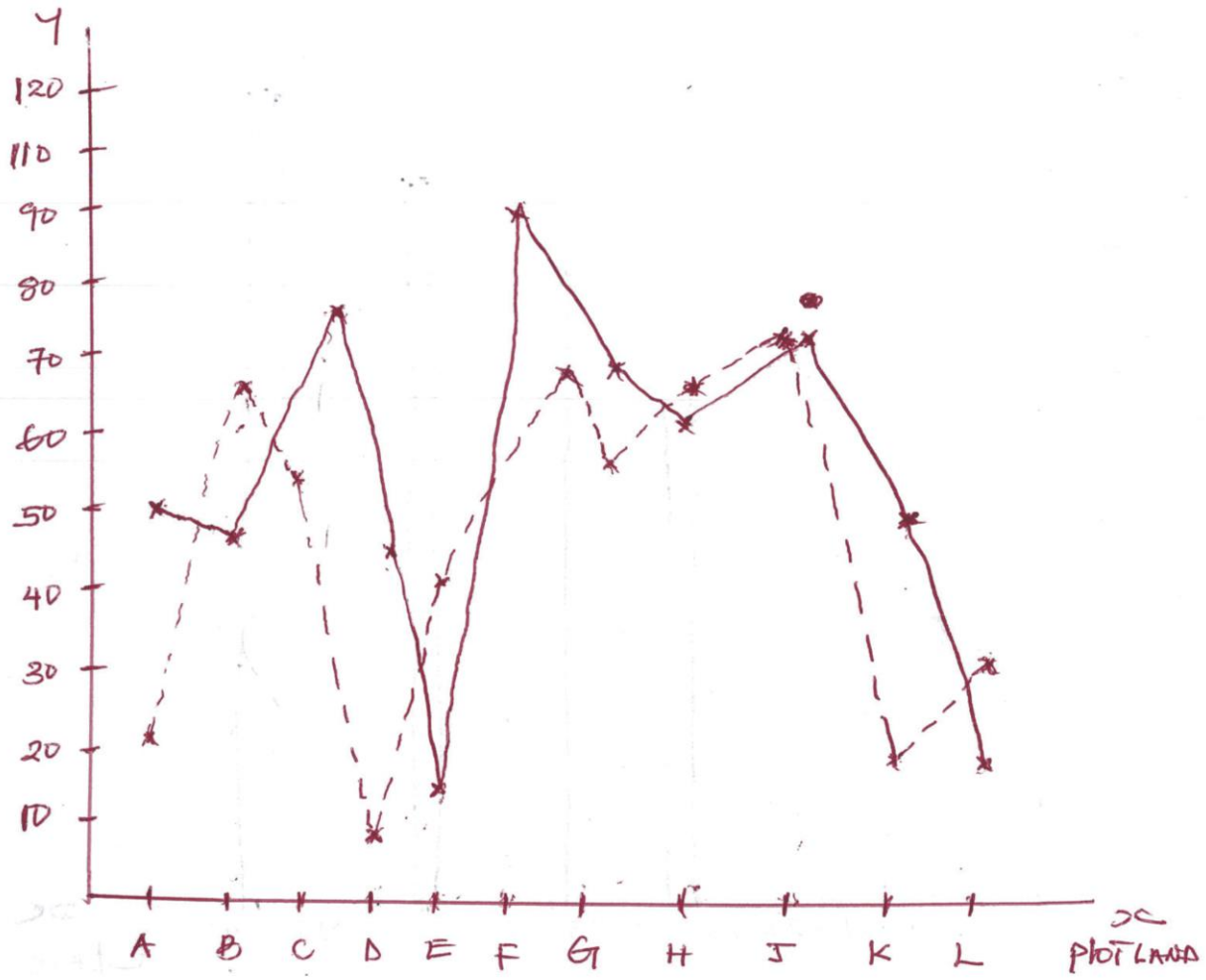
APPENDIX D spear-man rank coeficient correlation

Table showing Positive Rank Correlation, between Flood Magnitude and Crop Yields Destroyed in Eleven Farmlands in the Study Area.

TABLE 4.2.7 SPEAR-MAN RANK COEFFICIENT CORRELATION

Farm Lands	Magnitude of Flooding	Rate of Crop Yield Destroyed (kg)	d^x	d^y	d	d^2
A	50	22	6	9	-3	-9
B	48	66	7.5	4	3.5	12.25
C	75	56	2	5	-3	-9
D	46	9	9	11	-2	-4
E	14	42	10	7	3	9
F	90	69	1	2	-1	-1
G	70	55	3	6	-3	-9
H	56	67	5	3	2	4
I	67	70	4	1	3	9
J	48	21	7,5	10	-2.5	-6.25
K	18	32	11	8	3	9
						$\sum d^2=5$

APPENDIX E Graph showing the perfect positive rank correlation between Flood magnitude and cucumber crop yield destroyed in eleven . farmlands in the study area.


Y
120
110
90
80
70
60
50
40
30
20
10
A
B
C
D
E
F
G
H
J
K
L
PORTLAND

APPENDIX F

TABLE 4.2.9 Spear-man Rank Coefficient Correlation Table between Rainfall and Temperature in the Study Area.

Month	x Temperature(c)	Y Rainfall (mm)	dx	dy	d	d^2
January	30.2	0.0	4.5	11.5	-7	-49
February	30.0	2.7	7	10	-3	-9
March	32.0	12.5	3	8	-5	-25
April	32.5	32.4	2	7	-5	-25
May	35.0	100.2	1	5	-4	-16
June	30.0	165.7	8	4	4	16
July	27.5	280.9	10	2	8	64
August	28.4	395	9	1	8	64
September	27.0	165.9	11	3	8	64
October	26.5	40.8	12	6	6	36
November	39.2	9.8	4.5	9	-4.5	-2025
December	30.5	0.0	6	11.5	-5.5	-30.25
						$6\varepsilon d^2 = 69.5$

91-112

PPENDIX D Formula for calculation

Chi-square = $X^2 = \sum (O-E)^2$

E

THUMB RULE = $\underline{5(Logn)}$

10

$$\text{Class interval} = \frac{H-LV}{n}$$

$$\text{mid-point } x = \frac{LL+HL}{2}$$

the mean deviation $\overline{X} = \frac{\sum X}{n}$

Average Absolute Deviation $= \frac{\sum (x-\bar{x})}{n}$

the measure of variance $= \frac{\sum (x-\bar{x})^2}{n}$

the Standard Deviation $= \frac{\sum \sqrt{(x-\bar{x})^2}}{n}$

APPENDIX G Person consulted for imformation

Fct emergency management agency (Fema)

National emergency management agency(Nema)

Nigeria meteriological agency(Nimet)

Nigeria hydrological agency

Fct water board.