FLOOD RISK MAPPING AND VULNERABILITY MODELING OF GIDAN KWANO VILLAGE, BOSSO LOCAL GOVERNMENT AREA, MINNA, NIGER STATE.

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ABSTRACT

Flood management encompasses the holistic and continuous assessment, evaluation and reduction of flood risks. To manage flood in real time format and with high accuracy, it is important to explore both direct and social survey approach. In view of seasonal flooding within Gidan Kwano village resulted to this research. Data were acquired using "Hi-Target V30" Differential Global Positioning System (DGPS), receivers on Real Time Kinematic (RTK) mode; the acquired data were in Nor things, Easting, and Height (N, E and H) format in order to determine well densified spot heights of points on the ground. Contour map of the area was produced using 0.5 contour interval (C.I), Digital Elevation Model (DEM) of the area was produced to show the raster surface of the area using Surfer 10. Carlson AutoCAD 2010 was used to process the data and stream network was generated to show the direction of flow. Questionnaires were administered within the locally perceived to be prone/vulnerable to flood, to ascertain the nature, degree and consequences/impact of the flood occurrence. The shape file of the structures and other details where overlaid on the spot heights of the area; vulnerability map of the area was produced, together with the shape file of the stream using Arc GIS 10.2 and a buffer zone was determined from the center of the stream after thorough examinations of all the sets of data. Drainage of high standard should be constructed taking the stream course. Those houses within the buffer zone should be demolished *and smaller drainage should be constructed within the buildings which are not within the vulnerability zone.*

Keywords: Receivers, Flood, Risk, DGPS, Drainage, Constructed, Demolished and Stream.

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INTRODUCTION

Flood hazards are world-wide considered as one of the most significant natural disasters which are caused either by any of the following been above its normal level; the sea, ground water, reservoirs and surface water, flooding and the accompanying landslides (mainly caused by abundant precipitation) affect and destroy houses and households, bridges, roads, railroads and power network, crops, water supply system hydrometric installations, leading to dysfunction in the warning and hydrological forecast activities (Gheorghe, 200).Flooding incidences are becoming a more frequent occurrence in Nigeria. Between2011 and 2012, there were number of reported cases of flooding in several parts of the country. The major floods that overtook most parts of Kogi, Delta and Bayelsa states and Onitsha in 2012 are an example. Areas around the River Niger were totally submerged by floods and over 600,000 residents were rendered homeless, farmlands lost and many killed (Chidima and Vincent, 2015). Like rightly said; in the year 2012, Nigeria witnessed the highest flood disaster in 100 years, where over ten states of the Federation came greatly under water. According to experts, the floods were caused by excess rainfall which resulted in the over flooding of Rivers Niger and Benue and their tributaries, from Taraba to Adamawa all the way to the southern states of Nigeria (Chidima and Vincent, 2015). This incident was predicted by The Nigerian Meteorological Agency. About 90% of these happened as a result of heavy rainfall and the diverse effect it has in terms of human impact and economic losses of which Gidan Kwano village happen to be one.

Also, is the ravaging flood in parts of Niger Delta; the recent one was that of Delta State that drawn an 11-year old girl, a visually impaired graduate at Okpai in Ndokwa East Local Government area of the state. The victims in Ndokwa East where relocated to somewhere in Ashaka Utagbogble and the stadium at Kwale, somewhere taking to Asaba township stadium. The most recent and severe flood occurred on 16th of August 2015 at Gidan Kwano village leaving many dwellers mostly students homeless for almost three to four (3-4) days and a life lost before the water level went down. This is a reoccurring flooding which happened virtual every year for the past four years now, because a proper flood disaster management procedure has not been implemented within the area. Not until the federal University campus was moved to its permanent site which is Gidan Kwano village in the year 2003. This now made the village to experience exponential developmental activities, structurally, economically and socially. Land becomes invaluable; because of its proximity to school. Since, flooding is a part of nature. It is neither technically feasible nor economically affordable to prevent all properties from flooding. Inasmuch as this is true, greater effort is needed to minimize the damage that may result from flooding. Number of students admitted into the university increases and the hostel is not adequately enough to accommodate the students. The issue of constructing houses in form of hostel opposite the school since it's close to the institution now attracts student. Some of those houses are on water ways without proper drainage system which now leads to flooding.

Fig.1 Flood Site in Port-Harcourt. Source: headof.blogspot.com

There is no one definition of flood risk, but one that proves very useful for a strategic framework is; Hazard is a potential harm, loss or damage. Hazards exist wherever land is liable to flooding and it increases with probability and depth of inundation and with velocity of flow. Exposure where a hazard exists, there is no risk unless there are assets that can be damaged, or there is danger because people live in, work in or simply transit through the location of flood hazard; creates the potential for personal danger or property damage to occur during floods. The consequences of flooding, and therefore the risk also depends on how vulnerable people and their assets are to danger and damage. Vulnerability can be reduced if people and authorities; take appropriate precautions in advance of flooding, know what to do to limit danger, damage during floods, receive adequate warning and appropriate assistance during and after floods.

Fig.2 Flood Site in Lokoja. Source: www.estatetimesnigeria.com

The Study Area

Fig.1.0 shows the study area within Gidan Kwano village in Minna, Niger state and the only major stream that passes through the settlement. Most of the rainfall flows from North-East and South-East of the Federal University of Technology are channeled to the stream making the settlement vulnerable to seasonal flood, most especially when there is heavy rainfall. The major land use covers are residential, commercial and agricultural cropland land use types. Geographically, the study area lies between latitude 9°32′3.78″ N, longitude; 6°28′2.64″ E and latitude 9°32′9.63″ N, longitude;6°28′23.92″ E as per WGS84 coordinate system, the river flows from a height of about 224m above mean sea level.

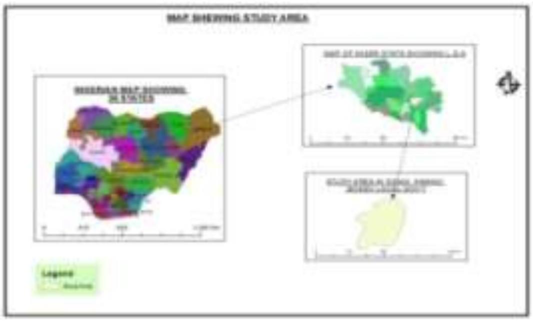

Fig. 3.0 Map Showing Study Area.

In early and late 1990's only the local resident are harboring and exploring the environment; the stream serves as the only source of water for their daily activities, and there has never been any issue of flooding.

Aim and Objectives of the Study

The aim of this study is to analyze the impacts and vulnerability to flood risk in Gidan Kwano Village and the resident's responses to reducing the existing disaster risks affecting the community and to map out the affected area. The specific objectives are to;

1. Examine the dimensions and drivers of flood vulnerability in the study area
2. Examine the current and potential impacts of flooding in the affected community
3. Examine real cause of flooding within the area and mapping of the area using real time field observation.
4. And to apply at least two statistical test to the questionnaire results.

LITERATURE REVIEW

Chidima and Vincent, (2015) mapped out Surulere south East area of Lagos state using geographical information system (GIS) in order to know the areas that are prone to flood. They were able to map out the areas that are prone to flood with the help of topographic sheet and ikonos imagery. Samarasinghe et al, (2010)developed, demonstrated and validated an information system for flood forecasting, planning and management using remote sensing data with the help of flood hazard maps for different return periods (10, 20, 50 and 100 years). Assessment of the population and physical vulnerability of the lowest administrative division subjected to floods was also investigated by the research, the result of which was used to conduct a flood risk analysis of the area. Aliyu, (2013), used social survey, infrastructure analysis and flood impact information of the most recent flood disaster collected by the federal and state agencies responsible for disaster management. The questionnaires were administered to the households areas that have experienced heavy damage as (zone 1), medium (zone 2)and light damage (zone 3), He was able to generate an index for each zone relative to strength of coping measures at each zone. Evans, et al (n.d.) used LIDAR data at 2m grid which provides a good representation of the floodplain Topography, and bathymetric survey to have a comprehensive spatial data set for the river channel, floodplain and the flood defense of the Medway estuary. They were able to present a model result such as flooding, extent, depth, velocity, flood progression and flood hazard levels. Considering the necessity to improve the means and methods to assess and monitor flooding, remotely sensed data and GIS techniques to manage flooding and the related risk in the basin-test of Romania.

The study encompassed both the risk degree levels associated with various parameters that condition and determine flooding and the one which takes into account the human presence in sensitive areas. This approach implies establishing the vulnerability degree defined function of the costs of human and material nature which flooding may determine. According to (Adeaga 2009); The need to resolve flood incidence severity within Lagos Mega city, call for a well-defined decision planning and warning tool with a detailed preparation and planning network. In this study a flood probability map and land use/land cover pattern information of part of Lagos NE region, was used to estimate flood risk and probable peak discharge of the different land use/land cover classes. This information was spatially integrated within the geographical information system (GIS) decision support system framework towards the provision of a detailed flood pre-disaster and lead time geo-information services within the city. Plans towards adopting a GNSS technology options for the creation of early flood warning signal system within the flood disaster management plan was also discussed. Clement, (2013) used the application of Geographic Information Systems (GIS) in mapping flood risk zones in Makurdi Town, by digitizing a topographical map and other themes of the area. Through GIS overlay and manipulative functions, he was able to develop; Digital Elevation Model of the study area; and a classification map of flood risk zones in Makurdi town. The map of flood risk zones generated shows that Makurdi town is generally susceptible to flooding and very little has been done in steering away development from 'highly susceptible' areas. The study recommends the need for town planners to steer development away from areas of high risk to low risk. Zitta, et al (2015), used Shuttle Radar Topography Mission(SRTM) data for regional study and analysis of drainage pattern, and drainage basins and water flow paths were validated for the study area (Niger State); flood events around the settlements along river Niger are not consequent upon the topography of the region but as a result of other hydrological factors that affect a river regime. Their study shows that the topography of the region naturally drains much of the water from the Northern parts into smaller lakes, streams, and dams uphill before slightly seeping them in a regular gradient into the river Niger and that Government construct artificial drainage paths in areas where large basins have been identified (Wushishi, Edati and Mashegu LGA) to avoid flood erosion in the nearest future.

According to Olorunfemi, (2011) there is a growing need to address vulnerabilities to climate change through adaptation efforts, complementing mitigation efforts aimed at reducing the rate and magnitude of climate change. At present, this development has taken place largely in parallel to the increasing shift from disaster management to disaster risk management. Disasters are associated with extreme weather events. Climate change directly interacts with the exposure to climatic extremes. The challenge in the context of adaptation is to move from the understanding that climate change is occurring to concrete measures that reduce existing vulnerabilities of human and natural systems. This study focused on impacts and responses to flood risk among the urban poor living in the highly vulnerable informal settlements in the Cape Flats of the City of Cape Town, South Africa and those living along the Asa River channel in the city of Ilorin, Nigeria. It explores the underlying vulnerabilities of the two areas and the challenging problem of how to effectively shape human institutional responses to the risk of natural disasters with a special focus on floods. The Social Risk Management (SRM) and asset-based approaches on which the study was based provide a conceptual framework for understanding the sequential links between risks; human exposure and sensitivity; the impacts of risky events; and risk management (or adaptation) strategies. The study utilized primary and secondary data. The outcome of the study shows marked differences in the vulnerability factors and the management of flood related disasters in the two study areas. Conventionally, flood emergency management, both public and private, usually responds to crisis rather than being concerned with the fundamental issues of vulnerability and its management (Shrubsole, 2001). The primary reason for this is the lack of information avail-able to assess past and future flood events. The results of this study revealed the manifold and multi-dimensional capabilities of integrating multi-scale and multi-temporal data for flood risk analysis and assessment.

How can the Public and other Stakeholders Influence Decisions more Directly?

Until late twentieth century, little was done to involve those other than farmers living in the floodplain in the development of flood mitigation activities. Public participation is now universally considered to be an essential element of FRM, and will take an increasing role. Attention is being focused in Europe and the United States on use of advanced public involvement techniques such as shared vision planning and similar approaches that bring the public into the decision process in a collaborative manner, (Gg Penning-Rowsell, 2013). China has successfully worked to organize the army and civil society to manage flooding on a scale largely unseen elsewhere. Ownership of local ecosystem rehabilitation and construction activities is starting to emerge, such as returning farmland to forests, planting trees and conserving soil and water to restore original ecological features, together with the engagement of the public in monitoring the condition of river channels and dykes. The next decades, with the ubiquitous availability of information through multiple media, will see an increase in demand for participatory decision-making by those affected by and having an interest in FRM. Flood professionals will have to develop methods to better educate and engage the public on the new risk management processes, and secure their active participation in planning efforts – both locally and nationally to ensure support for what is likely to be significantly increased resource expenditure.

MATERIALS AND METHODS

This research employs the use of Differential Global Positioning System "Hi-Target (V30)" receivers, handheld GPS, 100m steel tape and a computer system and the distribution of questionnaire to residents within the community. Software packages used are AutoCAD-Carlson 2010, Arc GIS 10.2 and SPSS 21. The method involves collecting 3D (x, y, and z) coordinates of spots using direct field survey with the aid of the DGPS receivers and its accessories. The base was set up on a control point "GPS001" within Federal University of Technology Minna, and all necessary, temporary adjustment were done e.g. setting the base; Control point coordinates entered, set the parameters and average parameters to ascertain the discrepancies and Ok. The rover was set on Real Time Kinematic (R.T.K) and all necessary adjustment were done e.g. connect G.P.S "rover to base" and the port selected and OK. Observation commenced as it shows int. Figure 2 shows the algorithm of the methodology/work flowchart used from data acquisition to composite map production of the area. The data obtained were in 3dimention (Northings, Easting's and Height).Sixty five (65) questionnaires were administered to the resident living within the area, in order to ascertain their level of flood risk management, degree of damage done by the flood, what measure is being taking to avert future re-occurrence, etc. As observation process was initiated, the following edges were captured; the stream edges, the fence line, the business centers, the major road that connects Minna and Bida, the un-tarred community roads, culverts edges, spots heights of points in order to plot contour map of the area and to produce Digital Terrain model (DTM) of the area. The questionnaires were analyzed, to harmonize responses.

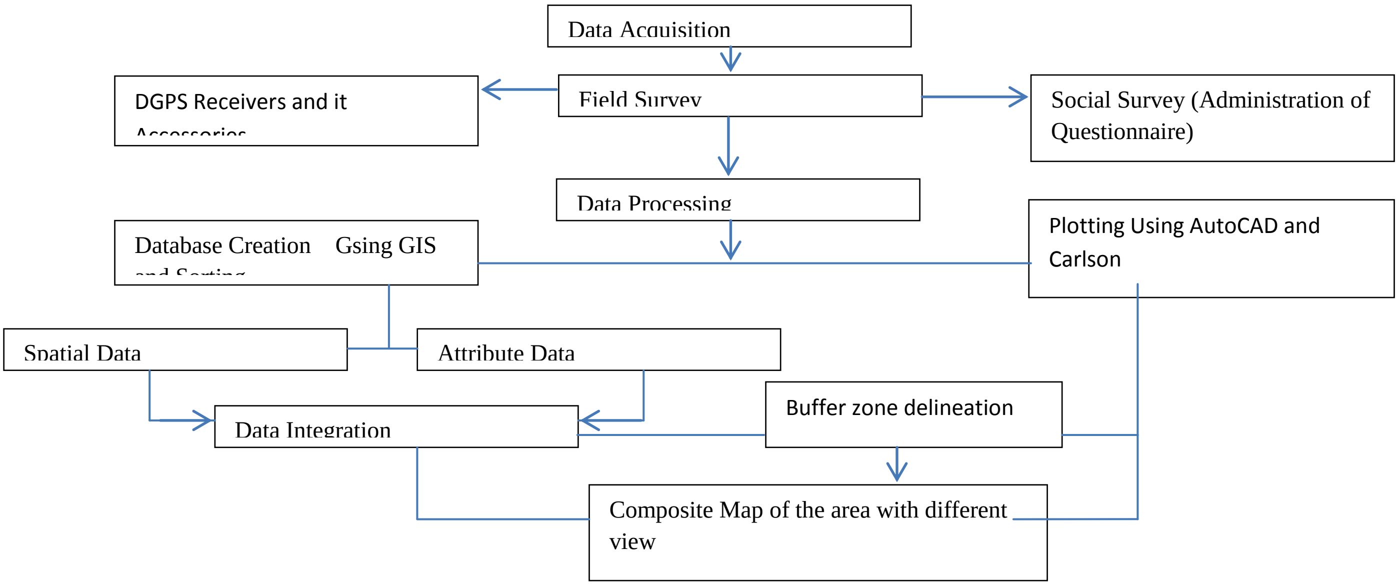

Fig. 4 Methodology Flow Chart

Statistical analysis tool (SPSS); is statistical analysis software "for data analysis" that was used in this study, is a free downloadable statistical software with the capacity for almost all statistical analysis, its further advantage over others is the availability of several downloadable and updateable plugins which could be used for advanced statistical analysis. This was used to analyze the questionnaires administered.

RESULTS AND ANALYSIS

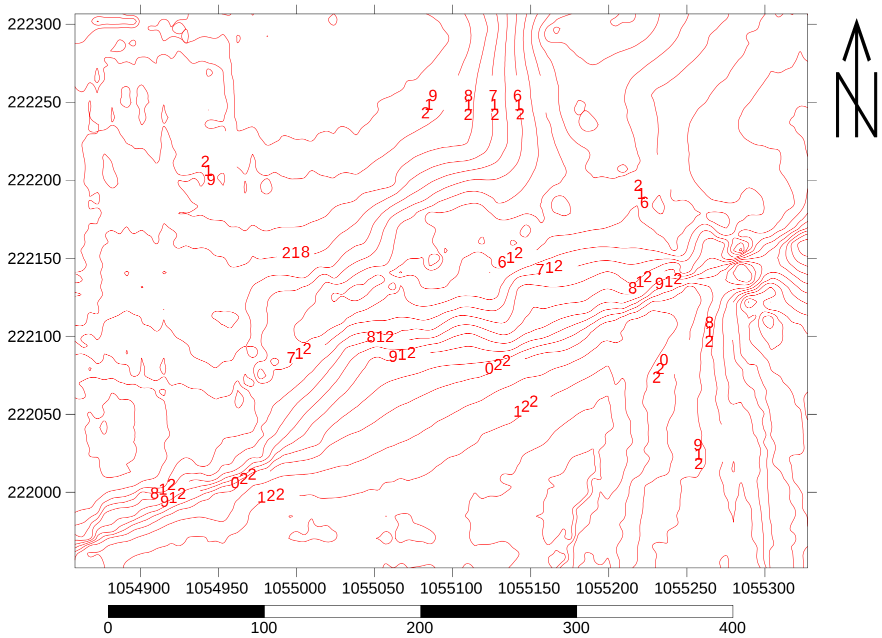

Fig 5. Contour Map of the Area

A contour line is an imaginary line containing points of equal elevation and it is obtained when the surface of the ground is intersected by a level surface (S.K. Roy, 2006). In Fig 3. The contour curve tolerance is 1.015, the label to label distance 2.00 inch. The contour interval used is 0.5 meter due to its perceived efficiency to effectively define the surface in terms of reality and shows the actual nature of the terrain. The closer the contours lines are to each other, the deeper the terrain and the farther they are apart, the flatter the surface. From Figure.3 the area whose contours lines are closely knitted together shows that the areas are very deep and the ones that are not (far apart) flat surface. The numerical within the contours, on the map indicates the spot heights.

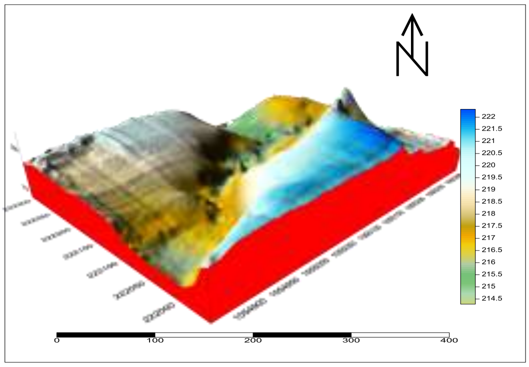

Fig.6 Digital Elevation Model of the Site

Fig.6 shows Digital Elevation Model (DEM) of the study area. The colour scale shows the elevation of points from 222.000 meters to 214.500 meters in decending order of magnitude. The valley shows the stream network, and the far North is the lowest point with height of 214.5 which is approximately 7.5 meters difference from the highest point. The area with blue colour, which indicates areas with highest points is the area closed to the major roadthat connects Minna and Bida i.e. South East of the Map. The Western part of the map, is the area most occupied with structures and most affected by the flood. The Southern and Western part of the map are the major source of stream flow which converged at the northern part and formed a single cheannel, when it rain heavilly, the stream experienced increase in water level and velocity thereby resulted to flood.

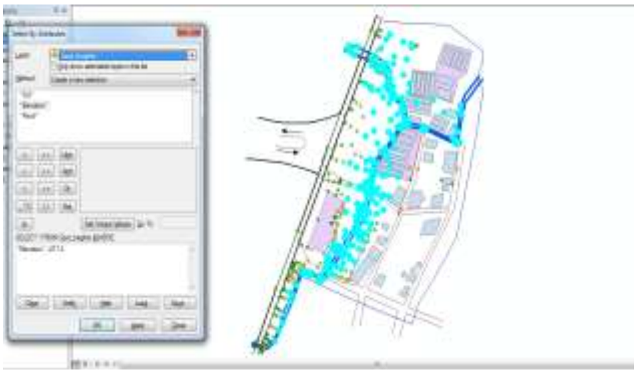

Fig.7 Shows Data base Query.

Database was created where information needed about the spots height, the smallest polygon area can be queried, total area and other spatial data and attribute can also be queried. Fig. shows the query made about elevations that are less than 217.2 meters; the points on the map above with cyan (light blue) colour are the points that are less than 217.2 meters.

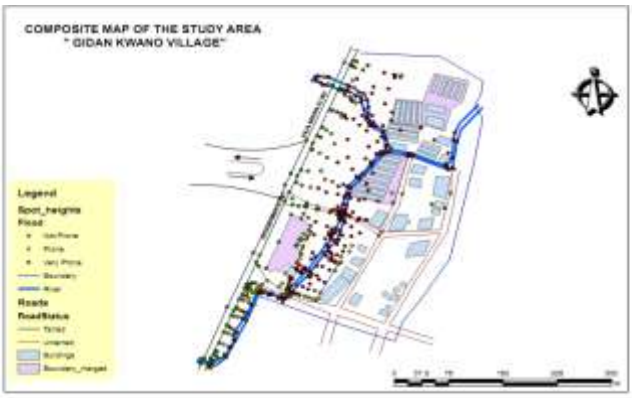

Fig.8 Composite Map of the area.

In Fig.8 shows spots heights of different colours, buildings with different shapes and sizes, the major road that leads Minna to Bida, roads connecting the communities all lying in the south west as seen on the map, road that leads to Federal University of Technology Minna, in the West direction. On the map, spot height with red shows areas that are very prone to flooding; all the area with red spots height were affected in the last flood that took place in Gidan Kwano village. Spot heights that are yellow show areas that are prone to flooding i.e. they are within danger zone. Spots height with green shows areas that are not prone to flooding but they need to take or apply proper risk management factors. The blue thick line, shows the stream network, one can see the meandering nature of the stream as it passes to the residential areas, just about 2 meters away from some structures. On the far northern and the far southern part of the map, the stream crosses the road that connects Minna and Bida with a cells culvert in both directions and this water flows from the University, it is not a deliberate act, but as a results of the terrain nature. These flows of water from both directions usually aggravate the flooding whenever there is heavy rain fall.

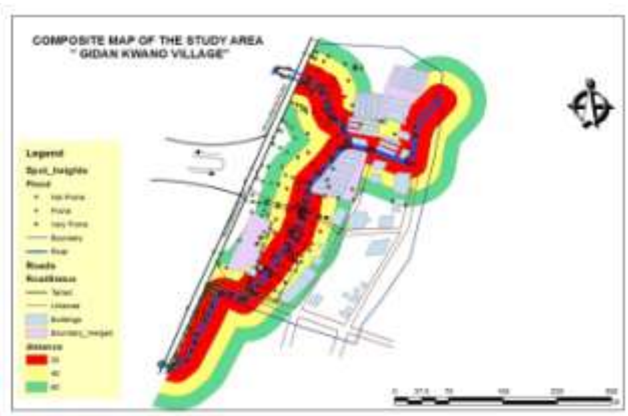

Fig.6 Composite Vulnerability Zone Map with Structures above the Buffer Zone.

The buffer operation is used to generate buffer zones around geographical features. A buffer zone is any area that serves the purpose of keeping real world features distant from one another. Buffer zones are often set up to protect the environment, protect residential and commercial zones from industrial accidents or natural disasters e.g. flood or prevent violence. Though, there is no fixed standard for buffer zone delineation, but depends on the subject of study. The figure above shows buffer zone of three colours "red, yellow, and green" 20 meters from the center of the stream to each edge for red zone i.e. from the center of the stream to the left is 20 meters and also 20 meters to the right, 10 meters for yellow and 10 meters for green. The buffer zone been over laid on the structures. It was observed that, it covers approximately 57 percent of the structures in the area.
It is clear that most of the danger zone (spots height with red) falls on the danger zone, the ones at risk 'warning zone' (the spot heights with yellow) also falls just some distances away. This shows that most of the houses between the buffer zone experience the flood in one way or the other.

Categories	Colour	Risk Classification
1	Red	Danger Zone
2	Yellow	Warning Zone
3	Green	Save Haven

Tab.1
The result sheet of the questionnaires distributed to the residents (respondents) living within the community. 39 out of the respondents are male, while 12 are female and 39 are between the age range of 15 – 25, 11 between 25 – 35, and 1 between 45 – 55 years. 50 of the correspondent are students, which show that 98.03% of the correspondents are students. In the course of the flooding they lost a lot from credentials, electronics, matrasses, learning materials, food stuff etc.

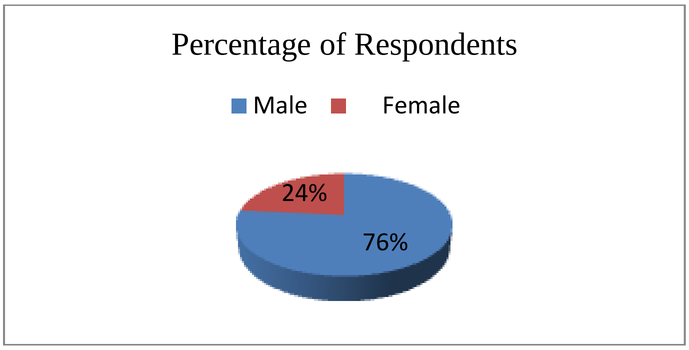

Fig.7

The result shows that 45 said yes their area is prone to flood and 6 said no their area is not prone to flood, in percentage of 88% and 12% respectively.

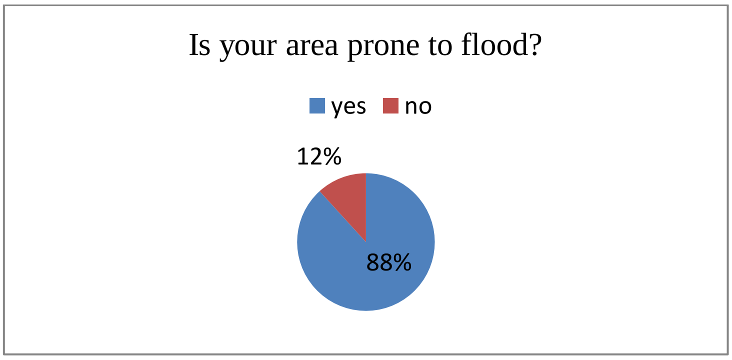

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Fig.8

13 respondents affirmed to have lost one thing or other as a result of the flooding and 38 said once it is flooding, it is usually violent and aggressive, and 8 said gentle and 5 said low.

STATISTICAL TEST

Tab.2 What, in your opinion is the probable cause of the flood

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	obstruction to water way	17	32.7	32.7	32.7
	absence of drainage system	9	17.3	17.3	50.0
	inadequately constructed drainage system	26	50.0	50.0	100.0
	Total	52	100.0	100.0	

The table 2. above shows the frequency distribution of the correspondents responds to the question " what, in your opinion is the probable cause of the flood" 32.7% said it was has a result of obstruction to water way, 17.3% said it was as a result of absence of drainage system while, 50% said it was as a result of inadequately constructed drainage system. From the table above, it can be concluded that the area is not properly drained.

Tab.3 Age Range

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-25	40	76.9	76.9	76.9
	25-35	11	21.2	21.2	98.1
	45-55	1	1.9	1.9	100.0
	Total	52	100.0	100.0	

Tab.3 shows the age range of the correspondents, out of the 52 correspondents "100%" 76.9% are within the age range of 15-25, 21.2% are within the age range of 25-35 and 1.9% is within the age range of 45-55. These show that the highest percentages are within student age bracket.

Tab.4 One Way ANOVA with Factor "If the flood is violent /Aggressive, does it lead to loss of life and properties?"

F test ONE WAY ANOVA		Sum of Squares	df	Mean Square	F	Sig.
is your area prone to flood	Between Groups	.368	2	.184	1.823	.172
	Within Groups	4.940	49	.101		
	Total	5.308	51			
in your opinion, what is the nature of the flooding pattern?	Between Groups	.481	2	.240	1.465	.241
	Within Groups	8.038	49	.164		
	Total	8.519	51			

Tab.5 Correlations Using Pearson Correlation between Variables

		If the flood is violent/aggressive, does it lead to loss of life and properties?	Within the last 12 months, what has been the degree of the impact of the flood?
If the flood is violent/aggressive, does it lead to loss of life and properties?	Pearson Correlation	1	.296*
	Sig. (2-tailed)		.033
	N	52	52
Within the last 12 months, what has been the degree of the impact of the flood?	Pearson Correlation	.296*	1
	Sig. (2-tailed)	.033	
	N	52	52

*. Correlation is significant at the 0.05 level (2-tailed).

The closer the correlation tends to positive one or negative one the stronger the correlation in the positive and negative direction respectively, and then, the closer the correlation tends to zero, the weaker the correlation. If the correlation is zero, it means there is no correlation between the two values. In correlation table, the first row value must be equal to the value on the second row and column i.e. the diagonal value must be equal and monoatomic correlation is when the value of item A goes up, the value of item B goes up also. While, non-monoatomic one goes up the other goes down. The two stars (**) means correlation is significant at the 0.05 level (2-tailed) means that correlation is significant at 0.05 levels i.e. at 5% significant level (alpha is one percent). On the correlation table above N stands for the number of observation (number of correspondents). The correlation between "If the flood is violent / aggressive, does it lead to loss of life and properties?" and "Within the last 12 months, what has been the degree of the impact of the flood?" is positive 0.296* at the probability value of 0.033 and also the correlation between "Within the last 12 months, what has been the degree of the impact of the flood?"and "If the flood is violent/aggressive, does it lead to loss of life and properties?"is0.296*. This shows that there is a correlation between the two tests, but the correlation is not strong enough.

Correlations

			Have you seen any practical measure of the necessary government agency geared towards ameliorating this menace?	Social status
Kendall's tau_b	Have you seen any practical measure of the necessary government agency geared towards ameliorating this menace?	Correlation Coefficient	1.000	.393**
		Sig. (2-tailed)	.	.005
		N	52	52
	Social status	Correlation Coefficient	.393**	1.000
		Sig. (2-tailed)	.005	.
		N	52	52
Spearman's	have you seen any practical measure of the necessary government agency geared towards ameliorating this menace?	Correlation Coefficient	1.000	.396**
		Sig. (2-tailed)	.	.004
		N	52	52
	Social status	Correlation Coefficient	.396**	1.000
		Sig. (2-tailed)	.004	.
		N	52	52

**. Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION AND RECOMMENDATIONS

Flooding is an evil that human should try and mitigate its impact on the environment. Using the information and results gotten from social survey and the one presented on the generated map, this study concludes that Gidan Kwano village is potentially susceptible to flooding in the event of profound rain fall. Though flooding cannot be done away with completely, but its impact can be reduced to the barest minimum. The adoption of a socially defined flood management concept will offer residents, most especially the ones in highly disturbed region, the opportunity to be meaningfully involved in flood risk mitigation action, besides the planning of structural measures. Drainage should be constructed within the area taking standardization in to consideration. Those houses within the buffer zone should be demolished.

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Appendix

4.1 Questionnaire Results Sheet

1. Sex of Respondent. Male **39** Female **12**
2. Age Range. 15 – 25 **39** 25 - 35 **11** 35 -45 **0** 45 – 55 **1**
3. Nature of Residence: Permanent **4** Temporary **47**
4. How long have you been residing here? Less than 1 year **33** 1- 3years **12** less than 3 years **6**
5. Social status: Civil servant 1 Student **50** Others .
6. If student current level and institution………………………………………………
7. Is your area prone to flood? Yes **45** No **6** .
8. If yes to question 7, at what predominant period of the year? Jan – Mar **3** , April – June **13** July to September **35** October – December **0**
9. Which of the months do you experience the highest degree/velocity of flood? …………
10. What, in your opinion is the probable cause(s) of the flood? Obstruction of water ways 13 , Absence of drainage system 11 inadequately constructed drainage system **27** .
11. In your opinion, what is the nature of the flooding pattern? Gentle **8** Violent/Aggressive **38** Others 5 .
12. If the flood is violent /Aggressive, does it lead to loss of life and properties? Yes **33** , No **18**
13. Within the last 12 months, what has been the degree of the impact of the flood? High **36** Very high **8** Low **7**
14. Have you personally lost any possession to the flood before? Yes **13** , No **38**
15. If yes to question 14, list the said properties:……………………………………………
16. Is any government agency aware of this flood saga? Yes **10** , No **1** , I don't know **40**
17. Have you seen any practical measure of the necessary government agency geared towards ameliorating this menace? Yes **3** No **48**
18. If yes to 17 above, have they visited the site before? Yes **8** , No **43**

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