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The Consequences of Flood on Occupational Trips Duration and Flood Risk Assessment of Aba North Local Government Area of Abia State, Nigeria

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ABSTRACT

The main purpose of this study was to identify the implication of poor drainage on socio-economic activities in Aba North Local Government Area (L.G.A). The objectives of the study include the identification of the causes and types of flooding in the study area; assessment of the effect of flooding on duration of trips for occupational purposes; determination of the effect of flooding on residential household properties and structures; execution of a Geographical Information System (GIS) mapping based Flood Risk Analysis (FRA) of the study area and environs; and provision of solutions to identified problems from the study. Relevant information was gathered from the literature review related to the study. The survey research method was also adopted. A total of 313 copies of the questionnaire were randomly distributed to respondents in 4 out of 9 communities for primary data collection. Also 41 willing to participate traders were monitored for trips duration to business premises from home on flood and non- flood days within Aba North LGA. A Flood Risk Map (FRM) of Aba North, Aba South and Osisioma LGAs indicating flood prone zones was adopted for the study. The flood risk map shows that most of the settlements considered are located in and around the capital city, around the center of the study area. Flood vulnerable areas were indicated in the flood risk map. The null hypothesis (H_o) which states that "there is no statistically significant difference between duration of trips to work on flood days and non-flood days" was accepted. This outcome was unexpected and contradicts oral interview findings. The results also indicate that poor drainage, poor waste disposal and prolonged rainfall are the major causes of flooding, which results in destruction and reduction in the financial values of landed properties, reduction in residential housing and environmental quality, as well as considerable level of disruption of trips from home to business locations. Recommendations proffered include, the prohibition of refuse dumping into run-off channels and urban development control by government, in areas liable to flooding.

KEY WORDS: Flood, Occupational Trips Duration, Flood Risk Assessment, Geographical Information Systems, Environmental Hazards

1. Introduction

Flood is among the most devastating natural disasters in the world, claiming more lives and causing more property damage than any other natural phenomena.. Flooding is the most common of all environmental hazards and it regularly claims over 20,000 lives per year and adversely affect around 75 million people world-wide (Smith, 1996). Across the globe, flood events have posed tremendous danger to people's lives and properties. Floods cause about one third of all death, one third of all injuries and one third of all damage from natural disaster (IFRC, 2008). Several manifestations and effects of climate change and variation have been studied (NEST, 1991; Njoku, 2006). For instance NEST (1991) indicated that current and future vulnerability include human settlements and health, water resources, wetlands, agriculture, food security, coastal zones and land degradation. Land degradation reduces the quality and productivity of land. One of the causes of land degradation which has been on the increase as a result of climate change is erosion and flood.

Urban flooding is a global phenomenon which causes devastating and economic losses and will continue to do so. Aderoju *et al* , (2014) stated that flooding in 2010, affected 178 million people. Urban settlement as indicated by Kesiena (2011) encompass the major economic and social hubs of any national population. Urban flooding is often regarded as devastating than rural floods and typically causes massive damage and disruption beyond the scope of the actual flood waters. A report by the World Bank (2011), pointed out that developing countries are presently characterized by rising flooding events, one of the effects of increasing urbanization which ultimately alters the fluvial process of the area, because urbanization increases surface run-off due to increase in relative proportion of impervious surfaces.

In urban areas in Nigeria, flooding has been known to be caused by a combination of excessive precipitation and inadequate flow channel capacity of sewer system, (Soba, 2008). Flooding may result when there is excessive rainfall or when natural or artificial channel is too small, relative to the discharge or when the land level is too low and less permeable to the water that gathers on top of the ground surface. Floods are linked to increases in communicable diseases, but studies indicates that certain endemic disease, especially

gastrointestinal diseases rise to epidemic proportions, where sanitation standards are low (Orji, 2010). Other health impacts of flooding are prevalence of communicable diseases, shortage of food supply, dispersion of household waste into the fluvial system and contamination of community water supplies and wildlife habitats, with extreme toxic substances (Njoku *et al*., 2010).

Odermerho (1988) has pointed out that land- use and land cover in adjoining peri-urban areas, often determine the timing, extent, magnitude and locations of floods in Nigerian cities. Similarly, Enakhimion, (1981), elaborately showed that these factors drive flood incidence in Benin City. According to Soba (2008), floods and flooded areas in rapidly urbanizing Owerri area are potentially determined by the amount and intensity of precipitation soil texture, land use and cover types, gradient and direction of slope.

The effects of these factors are more critical because cities in Nigeria evolve without well planned facilities and integrated sewage network (Njoku *et al.*, 2010). Consequently, run-off associated with increasing proportion of impervious surfaces is ponded as pools on urban terrain

Flood as a nuisance in Aba metropolis and environs is acute and rising. These followed the phenomenal growth of the city in recent years, marked by expansion of impervious surfaces as a result of spatial structures and infrastructural facilities/amenities, and the virtual absence of drainage and sewage systems. Flooding in the city follows complications introduced by active urbanization and the absence of adequate run-off disposal system. This usually results in the unending spillage of run-off on the street surfaces, obstructing socio-economic activities and wreaking havoc in the city.

Based on the foregoing it is clear that there is a dire need for an examination of implication of poor drainage in Aba North Local Government Area. Poor drainage has been a major cause of flooding in Aba City. Other factors appears to include poor waste disposal, population growth and poor road networks. During high intensity rainfall, roads are flooded with debris littered on the road, buildings area submerged, accidents occurrences rise, transportation, infrastructures and other settlement features are often affected. Such flooding events equally restrict free flow of communication and movements within the city, as well as serve as breeding centres for mosquitoes, which reflect negatively on the health of the inhabitants. Victims of the disaster often development psychological ill-health, associated with shock caused by the flood disaster, which makes them unfit to go about their normal businesses.

Consequently, this study focused on the examination of the consequences of flood on occupational trips duration and will utilize a Flood Risk Assessment (FRA) including Aba North Local Government Area of Abia State, in the analysis. The specific study area is Aba North Local Government Area. Specifically it includes areas such as Ogborhill, Umuola, Egbelu and Ariaria. The objectives of the study are includes: to identify the types of areas affected by flooding in Aba North Local Government Area; to assess the effect of flooding on duration of trips by traders to their market locations within the study area; to determine the effect of flooding on residential household properties and structures in the study area; to utilize Flood Risk Map (FRM) in carrying out a Flood Risk Analysis of the study area; and to proffer solutions to identified problem from the study.

2. Research Hypothesis

In view of the highlighted problems in the study the area, the following hypothesis was formulated:

Ho: There is no statistically significant difference between duration of trips to work on flood days and non-flood days in Aba North Local Government Area.

H_1: There is a statistically significant difference between duration of trips to work on flood days and non-flood days in Aba North Local Government Area.

3. Study Area

The study area is Aba, in Abia State which is located in the South Eastern Nigeria, which lies within approximately latitudes $4^0 40^1$ and $6^0\ 14^1$ North, and longitude $7^0\ 10^1$ and 8^0 East. Aba is the biggest town in Abia State this is followed by Umuahia, the state capital.

The specific study area, is Aba North local government area. The area covers about 60% of the urban area of Aba, it is located in Southeastern Nigeria, on latitude $5^0 7$N and longitude $7^0 22^0$E.

According to the 1991 provisional census, the population of the area now split into two local government areas (Aba North and south) was 494, 152 people. Aba North Local Government Area had population of 125,183 persons following the 1991 census. Its headquarters is at Eziama, it covers a total area of about 3440 hectares. It has nine communities which include; Eziama, Uratta, Usoke Amato, Umuola Egbelu, Umuogo osoke, Umunneato Ariaria, Ogbor, Asa Okpulo.

It has physical features i.e the Aba River, popularly known as “water side:, and a high land in Ogbor Hill. In landmarks, it is the smallest in Abia State; it is bounded on the South by Aba South Local Government Area, in the East by Obingwa and on the West by Ugwunagbo and Ukwa West Local Government Area. Figure 1, shows a map of Abia state indicating Aba North, while Figure 2, presents a map of Aba North Local Government Area, which is the study area.

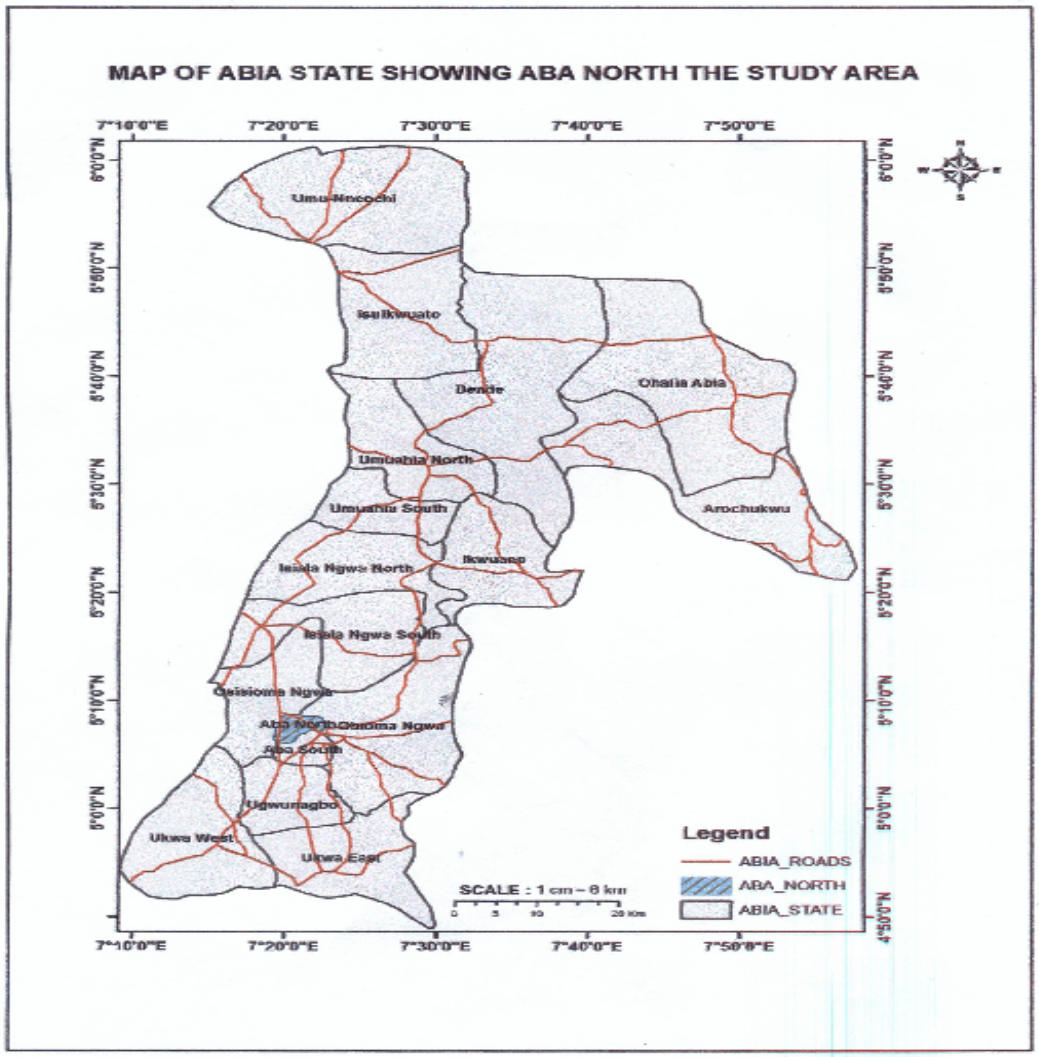

Figure 1: Map of Abia State showing Aba North Local Government Area.

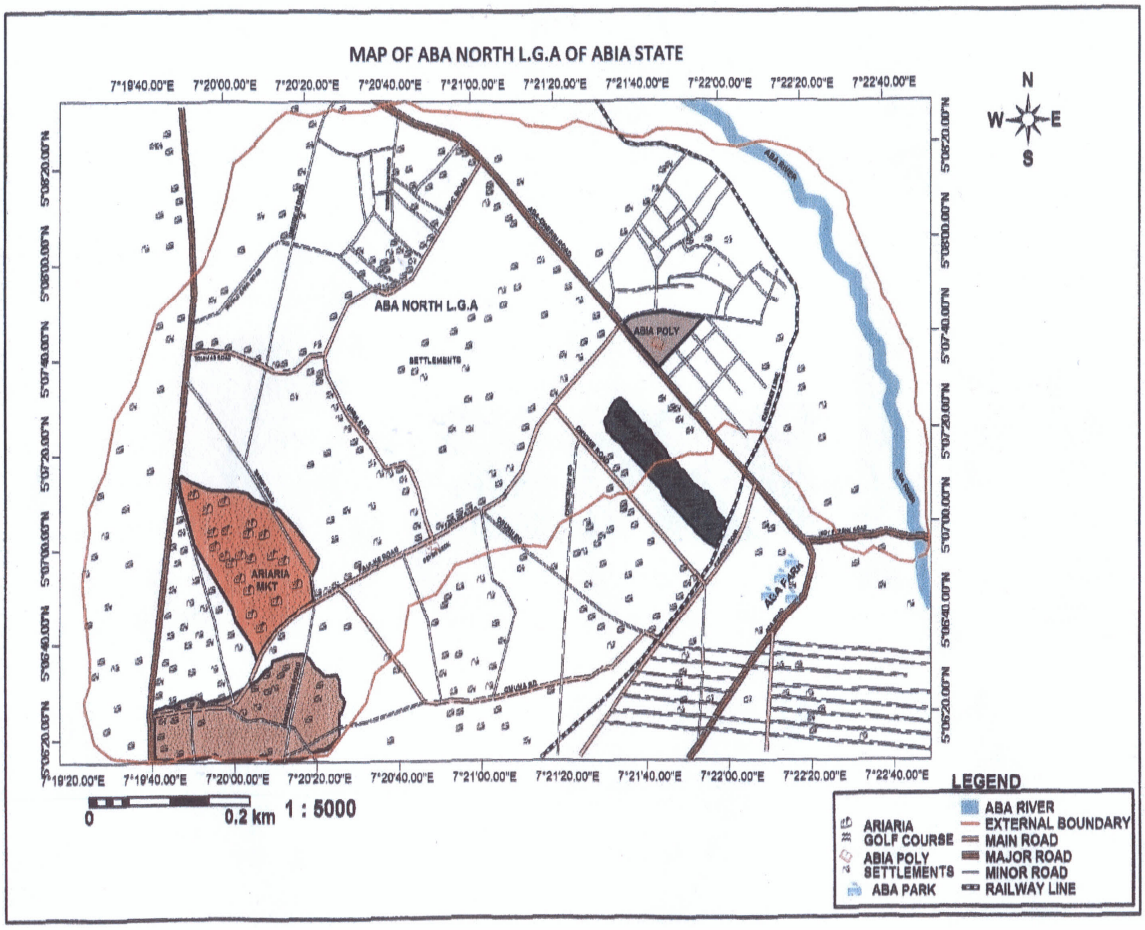

Figure 2: Map of Aba North Local Government Area (Study Area)

Source : Nwoko (2013)

3.1 Geology, relief and drainage:

The geology of Aba urban Area and the adjourning areas is made up of the coastal plain sand due to the areas closeness to the Atlantic Ocean. Aba urban has a low and relatively even topography which could also be called Peneplain. Figure 3, presents the geology map of the study area. Highest relief is about 21 metres along Port Harcourt - Aba express way near Alaoji area in Aba. Aba Urban area is mainly drained by the Aba River and other streams such as Okpuloumuobu stream etc. (Nwoko, 2013).

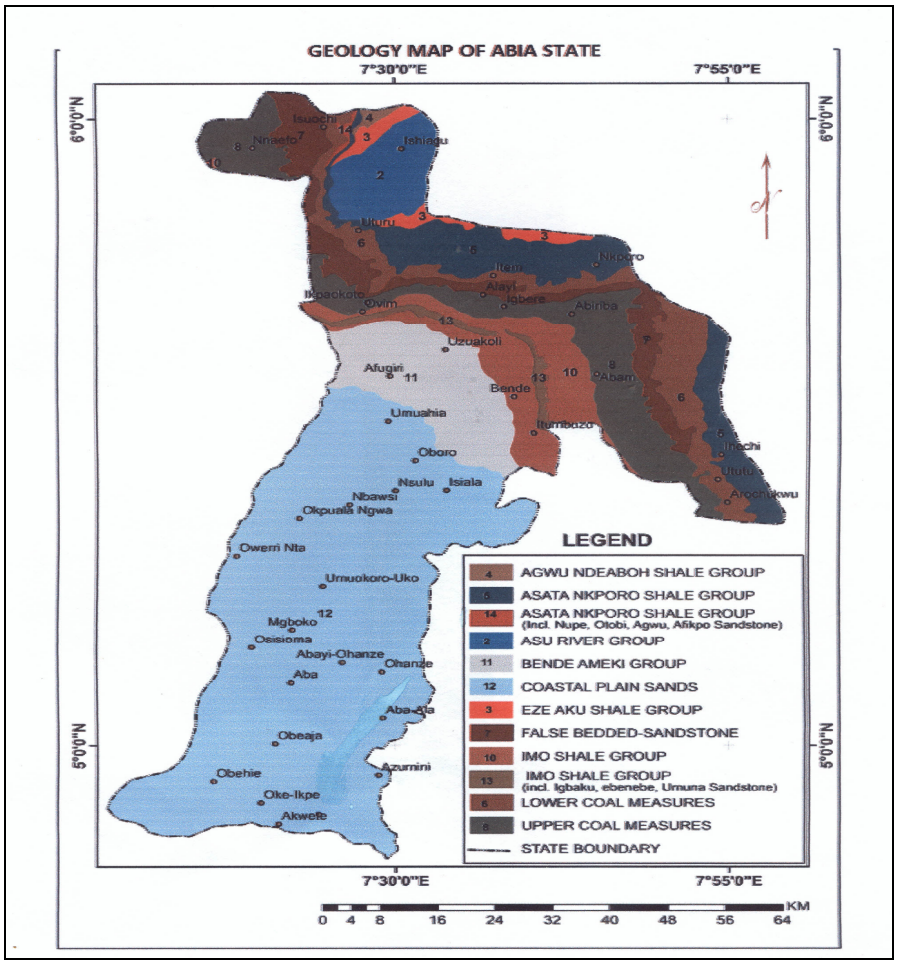

Figure 3. : Geological Map of Abia State
Source : Nwoko (2013)

3.2 . Climate

The study area is within the humid tropical and rainforest zone of Southeastern Nigeria. The rainfall distribution pattern is reminiscent of the scenario in Southern Nigeria. The rainfall regime is bimodal and peaks in July and September with little dry season known as August break in-between. The rainy or wet season begins about February or March and last till October or early November. The length of the wet season is at least 7 months including the period of August break. The dry season last from December to February long term rainfall trends show some evidence of swings or periodic variation, in the region and country (Nnaji 1998, 1999; FGN, 2003; Njoku, 2006). The mean annual rainfall of Abia State is between 2550mm and 2890mm.

However, increasing spatial and temporal variation and decline in rainfall trend, has also been reported by Njoku (2006) and Ulor (2007). Temperature regime for Aba is also identical to the regional pattern, and is generally high and uniform throughout the year. Njoku, (2006) reported that temperature showed a rising trend for southeastern Nigeria (especially towards the end of the last decade).

Temperature of southeastern Nigeria rose, as 1970-1979 is 22.0C, 1980-1989 is 26.7^0C and that of 1990-1999 is 27.3^0C. The mean minimum air temperature of the area is 22.8^0C, while the mean maximum for the period is 32^0c. The

hottest months are January and March. The cooling influence of the Harmattan winds last from December to February. Figure 4, presents the climate map of Abia State.

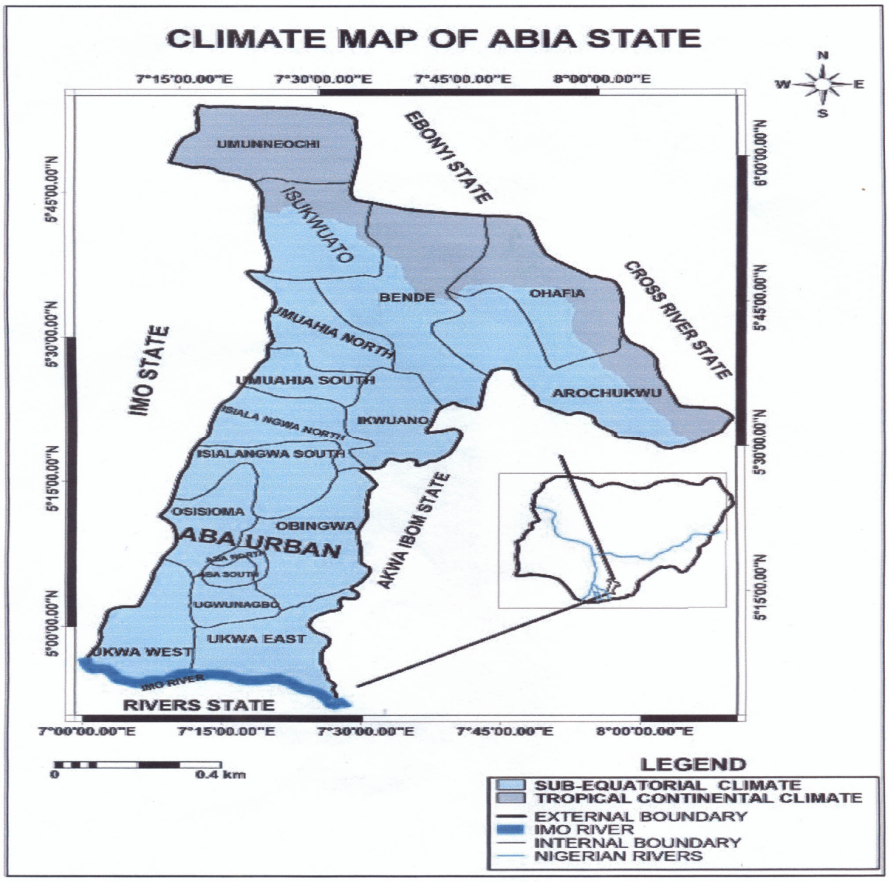

Figure 4. : Climate Map of Abia State
Source : Nwoko (2013)

3.3 Socio-economic Activities

Aba, the famed commercial capital east of the Niger possesses the experience and savvy to reproduce any technological product manufactured anywhere in the world. Both skilled and unskilled power abound. Aba is the largest commercial centre in the state with the famous Ariaria market sited west of the town. Besides, there is the Ngwa market, the cemetery market, and virtually every street in Aba has its share of the business activities for which the town is known. There are a good number of both public and private industrial establishment as well as financial instructions.

Aba is surrounded by oil wells which separate it from the city of Port-Harcourt. 30 kilometer, (19m) pipeline powers Aba with gas from the Imo River natural gas. Its major economic contributions are textiles, pharmaceutical, plastics, cement and cosmetics, which made the Ariaria international market to become the largest market within the city. Aba is also known for its handicrafts. In Aba North Local Government Area where this research work is centered, the inhabitants are predominantly traders and public servants with few farmers. The local government is an urban setting with few villages in

Uratta Area. The area has some notable factories and companies like Patterson Zochonis Plc., Unilver Plc., Nigerian Breweries Plc., Star Line Nigerian Limited, and 7-up Bottling company Plc. etc.

4. Method of Study

The study utilized both primary and secondary data. The primary data were obtained through questionnaire instrument, field observation and oral interview of respondents. A total of 340 questionnaire were distributed to four randomly selected communities including Eziama, Uratha Amaise, Umuneato and Umuogo Osoke, which were randomly selected from the existing nine (9) communities within the study area. The sample population include traders, civil servants, students, business men and women. Physical observation of the phenomenon and oral interview of respondents, and Key Informants (KIs) was carried out in the field. Three hundred and thirteen (313) copies of questionnaire were retrieved, representing 90.1 percent of distributed questionnaires..

Questions related to the theme of the study , such as incidences of flooding types of flooding and areas affected by flooding, causes of flooding, presence of drainage channels and their level of adequacy, socio-economic implications of flooding, level of damage to buildings, loss of lives, destruction of amenities and disruption of traffic flow, days of flooding and duration, duration of trips to business premises from home on flood and non-flood days, diseases outbreaks associated with flooding, government and community efforts at combatting flooding. The questionnaire instrument was validated using the Cronbach Alpha. The internal consistency coefficient of 0.81 was obtained for the instrument**.**

Secondary data were derived from the National Population Commission (NPC), Internet materials, Unpublished Reports on flood and GIS maps on Flood Risk Assessment.

5. Method of Data Analysis

The research subjected the data obtained during the research study to analysis, using a number of statistical analysis and data presentation methods such as tables , summations and simple percentages, while the null hypothesis was tested using the Analysis of Variance (ANOVA) statistical techniques.

It should be noted that F-value shows the ratio of two mean squares When the F-value is large and the significant level is small (typically smaller than 0.05 or 0.01) the null hypothesis can be rejected. In other words; a small significant level indicates that the results probably are not due to random chance. The significance value shows the conditional probability that a relationship as strong as the one observed in the data would be present, if the null hypothesis were true. It is often called the P-value. Typically a value of less than 0.05 is considered significant. Sum of squares indicates shows the sum of the squared deviations about quantity. The df-Value is associated with a test statistic that is used in determining the observed significant level.

6. Discussion of Findings

This chapter presents a detailed description of the collected data, which are displayed in tabular form for the purpose of understanding and also for easy calculation of the collected data to aid interpretation.

6.1 Major Types of Flood Experienced in Aba North

Table 1: shows that 65 respondents (20.77 %) indicated that “Flash flooding” is the major type of flood experienced in the area, while 201 respondents (64.22%) also assert that “ All of the above” types of flood were experienced in the study area. From the table, the major type of flood experienced in the study area is flash flooding.

Table 1: Types of Flood Experienced in Aba North

S/N	Types of flood	No. of respondents	Percentage of total sample
1	Flash flooding	65	20.77%
2	Ground water Flooding	4	1.28%
3	Overbank/Riverine flooding	41	13.10%
4	Coastal flooding	0	0.00%
5	Sewer Flooding	2	0.64%
6	All of the above	201	64.22%
	Others (specify)	0	0.00%
Total		**313**	**100%**

Source: Fieldwork, 2015.

According to United Kingdom Environmental Law Association (2014) coastal flooding is caused by heavy storms or other extreme weather conditions. Combined with high tides , it can cause sea levels to rise above normal, forcing sea water to encroach into the land and cause coastal flooding. River flooding is a type of flooding, which occurs where a river bursts or overtops its banks and floods the areas around it. It is more common than coastal flooding. River flooding is generally caused by prolonged, extensive rain. Flooding can be worsened by melting snow in Europe. Flooding can also occur if the free flow of a river gets blocked by fallen trees, natural overgrowth or rubbish. Flash flooding also occur

in form of a fast-moving and unexpected flood. Flash flooding is usually due to heavy rain, while natural events may be responsible for most flash flooding. It may also occur if flood defenses fail or drainage systems are insufficient. In recent time it is common to expected that flash flooding may become more frequent due to climate change and over-development in flood plains.

Another type of flooding is Groundwater flooding, which occurs when water levels underneath the ground rise above normal levels approaching the surface. It is usually caused by prolonged periods of rainfall. Groundwater flooding can last for weeks and months. Also there is Sewer flooding, which may be caused by a failure of the sewerage system. It may also happen when the sewer system does not have enough capacity to take water entering the system from heavy rainfall or river or highway flooding. Sewage water flowing into a building is classified as internal flooding. When it floods a garden or other open space such as roads or public grounds it is considered as external flooding. (United Kingdom Environmental Law Association, 2014).

6.2 Causes of Flood in Aba North LGA

Table 2: presents data on causes of flood. The major cause of flood as indicated by 103 respondents (32.91%) was "lack of adequate drainage". A total of 85 respondents (27.16%) sees prolong rainfall as the major cause of flood. A lower percentage of the respondents which were 43 respondents (13.74%) indicated that poor road construction was the cause of flood. The findings thus reveal that the amount of drainage available is inadequate, while prolonged rainfall has also contributed to flood in the study area.

Table 2: Causes of flood in Aba North LGA

S/N	Causes of flood	No. of respondents	Percentage of total sample
1	Poor waste disposal	77	24.60%
2	Poor road construction	43	13.74%
3	Lack of adequate drainage	103	32.91%
4	Prolonged rainfall	85	27.16%
5	Others (specify)	5	1.60%
	Total	**313**	**100%**

Source: Fieldwork, 2015.

6.3 Socio-Economic Implication of Flooding in Aba North LGA

Table 3: shows that "disruption of travelling/trips" as indicated by 91 respondents (29.07%) is the most important socio-economic implication of flooding in the area. Also 81 respondents (25.88%) revealed that "reduction in property value" is as a result of flood incidences in the area. However 43 respondents (13.74%) indicated that all the socio-economic consequences of flooding indicated in table 3, are important. These also imply that flooding has profound implication on socio-economic activities of residents in the study area.

Table 3: Socio-economic Implications of Flooding in Aba North LGA

S/N	Socio-economic implication	No. of respondents	Percentage of total sample
1	Disruption of trading	91	29.07%
2	Reduction in housing/industrial property value	81	25.88%
3	Damage to Roads and Traffic flow	45	14.38%
4	Reckless disposal of solid waste during rainfalls likely to result in infections and disease outbreak	53	16.93%
5	All of the above	43	13.74%
	Total	**313**	**100%**

Source: Fieldwork, 2015.

These indicate that flooding has adverse effect on residential household properties as inhabitants tend to lose their properties or its environmental quality to flood, or even receive lower financial offers for such structures, in form of annual/monthly rents or outright sales.

Table 4: Effect of Flooding on Residential Housing Property in Aba North LGA

S/N	Effect on residential household property	No. of respondents	Percentage of total sample
1	Collapse of buildings	36	11.50%
2	Destruction of non-building properties (Cars, Ornamental plants and flowers e.t.c)	112	35.78%
3	Reduction of residential housing environment quality	160	51.12%
4	Others (specify)	5	1.60%
	Total	**313**	**100%**

Source: Fieldwork, 2015.

6.4 Suggested Solution to Flood Problem in Aba North LGA

Table 5: shows that 107 (34.19) respondents suggested "building of more drainage system". We also observe that a total of 63 respondents (20.13%) suggested "proper waste disposal system", while 19 respondents (6.07 %) advised that other solutions such as; construction of roads, enactment of legislations and their adequate enforcement against building on flood plains, definition of land- use patterns and proper planning promotion , as well as flood insurance system should be promoted.

Table 5 : Suggested Solution to Flood Problem in the Study Area

S/N	Solutions to flood problem	No. of respondents	Percentage of total sample
1	Building of more drainage systems	107	34.19%
2	Proper waste disposal system	63	20.13%
3	Regulation against building location in floodable areas	52	16.61%
4	All of the above	72	23.00%
5	Others	19	6.07%
	Total	**313**	**100%**

Source: Fieldwork, 2015.

7. Test of Hypothesis on Effect of Flooding on Duration (in Minutes) of Trips to work on flood days and non-flood days in the Study Area

In order to test the null hypothesis (H_o) which states that : "there is no statistically significant difference between duration of trips to work on flood days and non-flood days in Aba North Local Government Area data were collected on three different days of flood and another three different days when flood did not occur. A total of 41 respondents willing to participate were purposely sampled. These were part of the 313 respondents to whom questionnaire copies were distributed.

Table 6: presents descriptive statistics of data on trips to business venues on flood and non-flood days by traders. The mean period in minutes for 'Day one of flood, Day two of flood, Day three of flood' and 'Day one of no flood, Day two of no flood, Day three no flood' respectively are '53.76, 56.37, 53.76', and '35.54, 37.90, 35.93'. This shows that the mean duration of trips to work in minutes for respondents, were noticeably low during non -flood days and high during flood days. The data were also analyzed using the analysis of variance (ANOVA) statistical technique. Table 7: shows the result of the analysis of variance (ANOVA) conducted on the collected voluminous data.

Table 6 : Descriptive Statistics of Data on Duration (in Minutes) of Trips to Work on Flood and Non-Flood Days

DESCRIPTION	DAY1FLOOD	DAY2FLOOD	DAY3FLOOD	DAY1NOFLOOD	DAY2NOFLOOD	DAY3NOFLOOD
Mean	53.7561	56.36585	53.7561	35.53659	37.90244	35.29268
Standard Error	3.523749	3.317315	2.787993	2.42248	2.549941	2.425536
Median	45	52	48	35	35	34
Mode	35	45	45	35	25	25
Standard Deviation	22.563	21.24118	17.85186	15.51144	16.32759	15.53101
Sample Variance	509.089	451.1878	318.689	240.6049	266.5902	241.2122
Kurtosis	-1.03217	-0.70195	0.790495	-0.14111	0.007333	1.495646
Skewness	0.482221	0.495381	0.660905	0.719162	0.762328	0.940103
Range	70	73	87	59	63	77
Minimum	25	22	15	13	12	8
Maximum	95	95	102	72	75	85
Sum	2204	2311	2204	1457	1554	1447
Count	41	41	41	41	41	41
Largest(1)	95	95	102	72	75	85
Smallest(1)	25	22	15	13	12	8
Confidence Level (95.0%)	7.121762	6.704544	5.634743	4.896016	5.153624	4.902191

Table 7: Result of analysis of variance (ANOVA) of data on trips to Work on flood days and non- flood Days in the study area

SUMMARY

Groups	Count	Sum	Average	Variance
da1 flood	41	2204	53.76	509.089
day 2 flood	41	2311	56.37	451.1878
day 3 flood	41	2204	53.76	318.689
day 1 no flood	41	1457	35.54	240.6049
day 2 no flood	41	1554	37.90	266.5902
day 3 no flood	41	1447	35.29	241.2122

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	21137.53252	5	4227.506504	12.51128	8.398	2.25164871
Within Groups	81094.92683	240	337.8955285			
Total	102232.4593	245				

Table 7: shows a P- value of 8.398 and F- value of 12.51128, as well as F-crit value of 2.516871. Since the P-value is more than 0.05, then the null hypothesis can be accepted, while the alternative hypothesis is rejected.

8. Discussion of Flood Risk Map of the Study Area

Flood Risk Analysis (FRA) was based on the interpretation of Flood Risk Map (FRM) by Nwoko (2013) as shown in figure 3.While this study focuses on Aba North only, the study by Nwoko (2013) considered Aba Urban, which include urbane parts of Aba North , Aba South And Osisioma. However the reference to the study by Nwoko (2013) is aimed at having a holistic understanding of the spatial occurrence of flood problems in the study area, and providing brief but extra knowledge of areas external to the study area. Figure 3, reveals that about 60% of the entire landscape of Aba urban is prone to flooding especially in densely populated areas with industries, market and low income residency. Areas marked with ‘’black” which indicates high flood risk zones are characterized by paved or tarred surfaces, blocked drainage system poor waste disposal uncontrolled development and poor land use planning. They include cemetery road, faulks Road, Umunle vicinity, Ariaria, Uratta. The areas indicated with ‘deep brown’ are medium flood risk zones, although flood is experienced here it is less severe compared to the high flood risk zones due to few vegetation cover and fair drainage system. while areas indicated as low flood risk zones which are coloured ‘light brown’ are places with uneven relief pattern with good drainage system as well as good vegetation cover and water drains in the Aba River. These areas are: factory road, Okpulo Umuobu Road, Ogborhill road and Umuoba Road.

Nwoko (2013) also indicated that the flood risk map reveal that most of the settlements are located in and around the capital city at the center of the study area. The vulnerability of these settlements to flooding can be viewed in three different aspects: The presence of shelter on high grounds and its accessibility especially during flooding events; the location of the settlement in different flood risk zones; the extent of damage that can be caused by even moderate floods in settlements with high population density. All three aspects can increase the vulnerability of settlements in Aba North (including Aba South and Osisioma) to flooding.

Notably, flood vulnerable areas are marked by lower slope angles of the particular area. The lower the slope the closer the area to water level. Another important factor to be considered in
determining vulnerable areas is the slope steepness of the elevation. Thus, it is possible that some areas within the risk zones are well above water level than other areas and such will be less vulnerable to flooding than the latter.

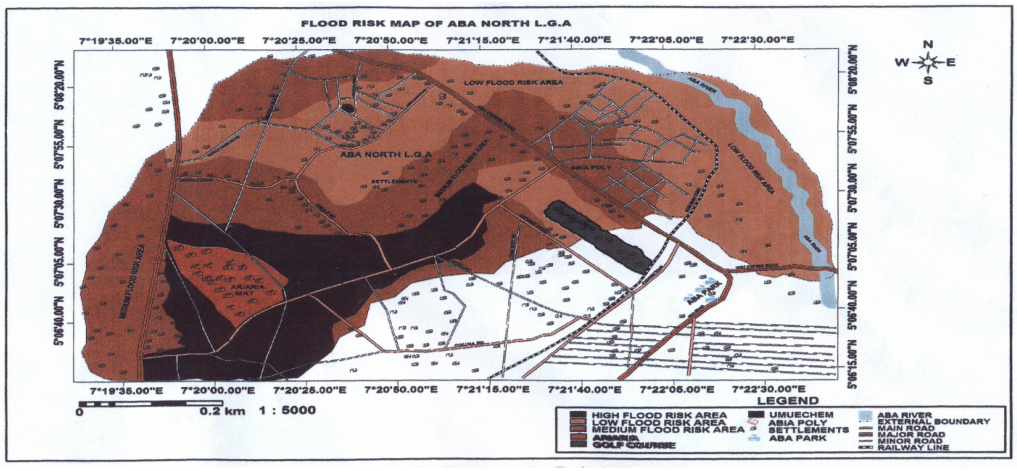

Figure 3 : Flood risk map of the study area

Source : Nwoko (2013)

9. Discussion of Research Findings

The result of the questionnaire administered in the study area reveals that perception of what areas are affected by flood in the area varies. Flooding in Aba North is also influenced by the flat and table land topography of the area, poor drainage systems, as well as prolonged rainfall, which affects most parts of Aba North. These when combined with improper waste disposal worsen the flood situation, especially in densely populated areas such as Ariaria, Faulks road, Uratta road, and Umule vicinity.

Responses during oral interviews , also revealed that the presence of a very large population in a limited area of land (high population concentration) is one of the causes of flooding. Increase in population of the inhabitants invariably leads to increase in waste disposal, as available drainages are blocked with dirt. The major loss that is experienced from flood occurrence in the study area is the destruction of properties, dilapidation and collapse of buildings.

In order to proffer solution to the alarming flood problems, respondents suggested that the best control measure is creation of adequate drainage systems, proper waste disposal system, as well as legislation against unapproved construction of buildings. Other suggested control measures include: proper land- use planning, better road construction techniques, and flood insurance for potential flood victims in areas highly liable to flood events.

10. Summary

The study focused on the implications of poor drainage on the socio-economic activities in Aba North Local Government Area, of Abia State. The findings shows that flooding has adversely effected the inhabitants of the study area, causing destruction of properties, losses of lives, and damage to crops amongst others.

From the study it was discovered that the government paid little attention to flood menace in the area. Respondents suggested the provision of adequate drainage and proper waste disposal systems which have to a large extent contributed to the impact of flood in Aba North Local Government Area. It is assumed that by careful implementation of these suggestions, flooding and its negative consequences will be adequately managed in Aba North local government area .

11. Recommendations

Based on the findings of this study, the following recommendations were made:

1) The three tiers of government should make provision for proper drainage system.
2) There is need for adequate land use planning.
3) Dumpling of refuse into runoff water should be prohibited.
4) Flood insurance policy should be adopted in order to compensate flood victims.
5) Development of flood monitoring and forecasting system.
6) Emergency response plans should be put in place.
7) Flood preparedness strategy should be adopted in order to reduce the adverse effect encountered by inhabitants of the study area.
8) There is need for environmental education and awareness Programmes to sensitize the people on flood issues.
9) The government should control development in areas liable to flooding.

12. Conclusion

Flood is a natural hazard that makes no distinction in its ravaging of the status of any society in the world. Its occurrence in different parts of the world has shown that it is a global phenomenon that does not ostracize any community. The common characteristics of all flood disaster are massive devastation of the physical and emotional fabric of the environment.

Thus, there is dire need for collaborative efforts by local/state/federal governments and stakeholders in Aba North LGA to support town planning, hydrological engineering and other professional efforts aimed at combating flooding, so as to avoid its long-lasting consequences. The media should also assist in educating the public on flood consequences.

Based on the findings and result of the study, recommendations were proffered. These include the expectation that the government of Abia state should prioritize the issue of flooding in not just Aba North, but in the entire city of Aba to ensure sustainable development.

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