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Analyses Of The Effectiveness Of The Various Measures Employed By People In The Control Of Flooding In Six Communities In Awka Anambra State Of Nigeria.

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Abstract

This study analyzed the effectiveness of the measures already put in place to control flooding in six Communities of Awka including Agulu, Amaenyi, Ezi-Awka,
Amikwo, Ifite and Nkwelle. The questionnaire survey method was adopted in which questionnaire was employed in collecting the data from the respondents which was later collated and analyzed. Three hypotheses were tested and the T-test result showed that: 1. there is significant difference in the various efforts made to check flooding in Awka, 2. there is significant difference in the effectiveness of the various efforts made to check flooding in Awka, and 3. there is no significant difference in the various measures used in flood management in Awka. The study concluded therefore that there are many measures put in place to tackle the problem of flooding in the study area in all the six Communities studied, but the problem still persists because the parties involved are fighting the menace individually. The study thus recommends an integrated approach in tackling flooding in the area, which will include the following: massive campaign against improper dumping of refuse in the drainage system as it not only create room for flooding but also encourages flooding in the area, construction of sound drainage system, creating environmental awareness to keep the drainage system from waste dumps, encouraging people to open their drainage system constantly in order to help check and control flooding, avoiding dumping of refuse in drainage system and the enforcement of all these by a strong governmental force.

1.0 Introduction

1.1. Background of the Study

Flooding is any over land flow of water, over street sufficient to cause significant damages of live and property, traffic obstructions, nuisance and health hazards (Adebayo and Jegede,2010). Conditions which lead to flood occur when the rainfall amount over a particular region is more than a certain amount, normal for that region (Oriola, 2003).

Floods can be considered predictable natural disasters whose effects can be mitigated. Flooding is a common phenomenon in several parts of the world and its damaging effects cannot be overemphasized. During the 1997 flooding in Yuba California, 38,000 residents were evacuated; covering nearly 1,000 acres of residential land, 15,500 acres of farmland and orchards, and 1,700 acres of industrial land were flooded. In all, 322 homes were destroyed, 407 suffered major damages. In England and Wales, according to (Ward, 1978) over 10% of the population is directly at risk from flooding, with a greater percentage of the population being indirectly affected by flooding due to road closures, service disruption and the loss of goods and produce. Nigeria is not an exception to nations suffering from the menace of this environmental disaster called flood. Many efforts have been made and many control measures put in place in many parts of the world to tackle this menace. Upon all these efforts by the government, individuals, communities and some non – governmental agencies to control flooding in the past, the problem still persists.

1.2 Statement of Problem

Flooding is inimical to human activities especially when it occurs on a large scale (Ogunyemi 2002). Flooding has been a threat in the study area, Awka the capital of Anambra State which has been experiencing flood disasters as a result of so many factors like lack of spaces for drainage system, blockage of the drainage system, unplanned building and businesses, poor environmental awareness, inadequate management of wastes, poor construction of drainage system, attitude of the residence towards wastes disposal etc all these help to aggravate flooding during rainy seasons in Awka.

Statistic have it that more than 28 buildings, including schools, churches, hospitals and residential homes, have been submerged by flooding in Awka, Anambra State following torrential rain which lasted for about three hours in July 2012, three churches, two primary/ nursery schools and two hospitals were most badly affected while no fewer than 90 families living within Onwurah, Eziawka, Court Road, and Kwata Streets were rendered homeless, as their homes were taken over by flood water. Motorist always find it difficult to pass through the area during the rainy season this is evident along zik's avenue road by post office, many motorist are trapped in the flood. In these areas many lives, properties worth of billions of naira have been damaged, accidents congestion and loss of aesthetics values and beauty of the environment becomes the other of the day, overcrowding, spread of communicable diseases and water-borne diseases like cholera, typhoid fever have become prevalent in the area, lives have been lost by car accidents as a result of damaged roads, rate of crime and conflict increased as people resort to all kind of social vice in order to stay alive.

Over the years in Anambra State, flood has remained a worrisome natural problem which successive governments in the State could not effectively solve. Flood therefore is still a problem in areas like Awka, Oko, Onitsha, Agamelu, Aguleri, Umuleri, and Adani. In most areas of the state, such as Awka, Oko and Onitsha, flooding has posed a major concern to the occupants of properties. The access roads to some of these properties during rainy season are usually in their worse states and this deteriorates year after year. Many measures have been put in place but little or no impact has been felt. It is against this background that this study analyzed the effectiveness of the measures already put in place to control flooding in Awka, with a view to proffering possible lasting solutions.

1.3 Aim of Study

The aim of this research is to analyze the effectiveness of the measures already put in place to control flooding in six Communities of Awka with a view of proffering lasting solution.

2.0 Literature Review

2.1 Management of Flooding

Flood cannot be prevented but planning the emergency measures through flood management can often reduce their disastrous consequences. Inception of flood management normally beings after a major disaster happens. Throughout history, progress in water-related disciplines often came as a reaction to severe emergency situations, water supply system were extended after major droughts, sewege systems upgraded after outbreaks of major epidemic. Pollution control schemes introduced after major spills of pollutant that destroyed life in water courses, and storm water drainage systems built after major floods. Flood management is a broad spectrum of water resources activities aimed at reducing potential harmful impacts of floods on people, environment and economy of the region. The main limitation of the current flood management methodologies comes from favouring mostly economic impacts and paying minor attention to the environmental and social impacts of floods.

The concept of disaster management should be regarded as an important tool in successfully coping with all impacts caused by disaster. He emphasized that only a comprehensive approach which covers all aspects of disaster management cycle, including an appropriate balance of prevention, mitigation, preparedness, response, recovery and disaster-related development, can be effective. He further stated that in order to define a disaster management policy, it is necessary to consider certain main factors or pillars, such as: an accurate definition of the threat, identification of the effects, assessment of the resources available to deal with the threat, the organizational arrangements which are required to prepare for, respond to and recover from disaster events and any other specific factors which may be applicable, especially those aspect which are concerned with the development and protection of the environment.

Management for flood disaster has been understood as a complex and need to be handled carefully, by involving as many parties as well as the community who has direct impact of the flood. The main purpose of development of flood disaster management is to build and increase awareness of all stakeholders, including local community in order to reduce/minimize flood impact.

The flood hazard disaster management mainly covers mitigation, preparedness and prevention (Oriola, 2003). He states that, mitigation which is defined as any action taken to minimize the extent of a disaster or potential disaster can take place before, during or after a disaster, but the term is most often used to refer to actions against potential disaster. Mitigation measures are both physical or structural (such as flood defence or strengthening buildings) and non-structural (such as training in disaster management, regulating land use and public

education). While preparedness is defined as specific measures taken before disasters strike, usually to forecast or warn against them, take precautions when they threaten and arrange for appropriate response (such as organizing evacuation and stockpiling flood supplies. The term of prevention is not widely used nowadays, since this is unrealistic in most cases. Prevention is defined as activities ensured that the adverse impact of hazards and related disasters is avoided.

Within flood research, it has been widely accepted that absolute flood protection cannot be achieved (Schanze, 2006). Instead, growing attention has been given to a new paradigm of flood management, based on the effective establishment of both risk mitigation (structural, technical flood defence measures, such as dams, dikes, or polders) and adaptation (non-structural, soft measures, such as preparation of the local people, flood insurances, information management, and social networks) measures (Kubal et al., 2009), in their book summarise the short, medium, and long-term objectives, of storm water management strategies. In the short-term, priorities include runoff control flood protection and pollution mitigation strategies, which in many developing countries have yet to be addressed effectively. The medium-term objective focuses on development and implementation of water quality improvement, water conservation, and a strategy to preserve the hydrology of the natural catchment. The long-term objective places a greater emphasis on the preservation of natural resources, the amenity value of water in an urban environment for recreational activities, and the promotion of an increased awareness of environmental issues.

Although these objectives may initially appear to be somewhat idealistic goals, especially considering the existing situation in many developing countries, it is important that planners and designers of urban drainage systems aim to satisfy the needs of future generations by adhering to the objectives of sustainable development, as defined by the World Commission on Environment and Development, in 1987.
The flood management process can be divided into three phases (Ahmad and Simonovic, 2006).
i. Pre-flood preparation and planning - Different flood management options, including structural and non-structural, were analyzed and compared for possible implementation to reduce flood damage.
ii. Flood emergency management - Involves the forecasting of floods and a regular updating of forecasts.
iii. Post-flood recovery - Involves decisions regarding the return to normal life and activities after a period of flooding.
Structural flood mitigation works are usually expensive, and create social disruption and inconvenience during the construction period. Hence, in most cases, the optimal strategy for flood control is one which combines structural measures with non-structural measures, developed on the basis of a comprehensive master plan study that takes into account the future potential for development and land use. There needs to be a wider application of planning and legal instruments through appropriate laws and administrative procedures as these would ensure that future development takes place with the least burden or impact on existing drainage systems, particularly in highly built-up areas where land acquisition, construction, and utility reallocation costs are high or prohibitive.
The problem of urban drainage and flooding is of real concern and must be dealt with properly since it directly impacts on quality of life and the living environment, as well as supporting and sustaining urban growth. A non-structural flood mitigation strategy relies upon action and support from households and local organizations working collaboratively, and requires the participation of inhabitants of areas prone to flooding.
In addition, flood warning systems need to be in place so that warnings can be issued to prepare communities for the onset of a large flood event and for the urban authorities to be on alert during an emergency situation. Although these response strategies can minimize potential damage, there will also be a need to develop appropriate strategies for flood recovery and rehabilitation of the affected communities.
Neo Tong Lee (1995) states that as a country develops, flood mitigation works become larger (in terms of human and financial resources), and it becomes necessary to address the problem seriously. In particular, a wide range of technical and economic options/instruments need to be studied for the following reasons:
i. Engineering options are increasingly expensive, particularly when the improvement works have to be constructed in highly built-up areas. In addition, there are practical difficulties in relocating squatters, services, and public utilities, as well as the limitations of working space.
All of these factors contribute to the spiraling cost of structural measures for flood control.
ii. In many urban centers, the cost of acquiring land or reserves for the construction of drains has become a major concern. There have been situations where the cost of land acquisition was higher than the engineering construction cost.
iii. State governments, local authorities, and the private sector should assume a larger role and responsibility in addressing storm water management problems. For example, there is a general reluctance among housing developers and local authorities to set aside flood retention areas, because this will reduce the net area available for urban development. As a result, the peak flow in a main drain or river system keeps increasing, as the upper catchment areas are progressively developed or urbanized.

iv. There is a need to promote the concept and practice of cost recovery from direct beneficiaries of drainage improvement works. At present, only six states in Malaysia (Selangor, Melaka, Negeri Sembilan, Johor, Penang, and Kedah) collect drainage contributions from housing developers. Even then, the current rates are grossly inadequate to cover the actual cost of urban drainage improvement works.

It is commonly accepted that proper drainage of storm water and protections against flood losses are fundamental for the sustained development and growth of modern cities. However, there are technical and economic constraints on the provision of structural measures to control urban flooding. Sustainable management of urban stormwater involves water conservation, pollution prevention, and ecological restoration.

Goals for sustainable management include flood reduction, pollution minimization, stormwater retention, urban landscape improvement, and the reduction of drainage investments. Such a reduction can be achieved using various methods, such as minimizing peak stormwater discharges from urban catchments, managing pollution loads, harvesting rain and stormwater runoff, functionally incorporating stormwater into urban streetscapes, promoting green areas and innovatively integrating stormwater systems into the urban environment, thereby reducing the cost of infrastructure (Brown, 1997).

For the successful implementation of these measures, it is necessary to ensure that all stakeholders fully understand the causes of urban flooding and recognize that the financial and environmental implications are based on sustainable economic development and sound environmental management. In order to understand and manage floods better in urban areas, it is important to be able to reproduce the flood physics, which consists of the flow over a surface area (i.e. the floodplain) and the flow in function gives advantages in evaluating alleviation schemes and choosing the optimal scheme, which is to be implemented to solve the flooding problem. The most common and acceptable way of providing this information is by using **urban flood modelling**.

Kolawole, Olayemi and Ajayi (2011) carried out a survey titled managing flood in Nigerian cities: Risk analysis and adaptation options – ilorin city as a case study and they found out that Developing countries are already suffering from the impacts of climate change and are the most vulnerable to further change. Flooding is the common and most costly natural disaster, though its impacts are also exacerbated by anthropogenic sources. Quality assessment of the risk impacts of flood will facilitate countries to plan adaptation measures and adapt effectively in controlling and managing flooding in an environment. Flooding affects more people on an annual basis than any other form of natural disaster. A variety of climatic and non-climatic processes influence flood processes, resulting in river floods, flash floods, urban floods, sewer floods, glacial lake outburst floods and coastal floods. These flood-producing processes include intense and /or long-lasting precipitation, snow melt, dam break, reduced conveyance due to jams or land-slides or by storm. Floods depend on precipitation intensity, volume, timing, phase (rain or snow), antecedent conditions of rivers and their drainage basins (e.g. presence of snow and ice, soil character and status (frozen or not, saturated or unsaturated), wetness, rate and timing of snow/ice melt, urbanisation, existence of dykes, dams and reservoirs).

Although a flood can often be assigned to a single event type, on many occasions a combination of flood types and other natural hazards such as hurricanes, hailstorms and earthquakes may have occurred. In these circumstances, problems with insurance cover can arise if some occurrences are covered, but others are not. If global warming leads to rising sea levels and increased storm activity, it follows that it has the potential to increase both the frequency and severity of many of the types of flooding mentioned earlier. As a result, it is increasingly important to resolve the issues relating to flood risk assessment and its possible adaptation options.

Assessing the impacts of and vulnerability to climate change and subsequently working out adaptation needs requires good quality information. This information includes climate data, such as temperature, rainfall and the frequency of extreme events, and non-climatic data, such as the current situation on the ground for different sectors including water resources, agriculture and food security, human health, terrestrial ecosystems and biodiversity, and coastal zones.

If the capacity for assessing climate variability and change, and the tools used for assessing the impacts and vulnerability of countries to climate change is not there, countries are limited in their ability to plan adaptation measures and adapt effectively. .

Historically, natural disasters were viewed as ‘acts of God’, as disruptions to normality. Consequently, responses were directed towards managing floods as external events that affected an unknown and unprepared society (Fleuvrier, 1995). Major flood events in the past century, however, have acted as catalysts for changing policies towards floods. They have significantly increased our understanding and capacity to cope with floods. Yet, for the future, significant revisions to our approach for managing urban flood risk are likely to be necessary for two main reasons..

Consequently, cities are increasingly losing their capacity to deal with fast changes (peak discharges, extreme rainfall events) and the ability to anticipate and adapt to slow changes and trends (population increase, climate change). These changes and trends pose new challenges for urban flood management research and touch upon various disciplines (e.g. urban planning, regional economy). Because urban floods cannot be managed in isolation, there is a need for integrated approaches that address differing spatial scales, ranging from catchments to neighbourhoods.

Climate change as a trend breaker Past development of flood management policies consisted predominantly of a process of incremental change, while reactive responses to flood disasters or narrow escapes have acted as catalysts for accelerating this process. An important notion is that current flood protection measures are based on the accumulated knowledge of past weather events. Major flood disasters have created the need to shift from flood protection to a more integrated approach. In the last decade, however, climate change has become recognised as a potential trend breaker in the way that hydrological variables and existing statistical distributions of flood probabilities are affected. The present challenge seems to be that we must recognise the future as being inherently uncertain and that science will not necessarily reduce that uncertainty.

The long-term horizon of climate change and current scientific uncertainties1 pose special challenges. Strategies that address these challenges recognise that there is no best solution. That they embrace future scenarios that fit a range of distributions of events will not come as a surprise (Schanze, 2006). In this sense, climate change provides new incentives for the need to plan ahead and to anticipate extreme events and trends. A large number of studies show that we should start to adapt to climate change now, to prevent costly 'emergency' interventions in the future. This means that floodrisk management strategies must meet present needs, while providing a path for adjustment for the future.

Flood resilience and multiple scale system-based approach The concept of resilience is often seen as opposed to the traditional perspectives that attempt to control changes in presumably stable systems. This emerging concept may thus provide guidance for an overarching approach to manage urban floods, which devises strategies to cope with change and uncertainty. Resilience is used quite differently in various fields. Consequently, it has a wide range of connotations. However, there are some unifying features and common notions of resilience. These are;

(i) Enhancing resilience is considered a rational strategy to cope with uncertainty and surprise.
(ii) Resilience is an internal property of (complex, dynamic) systems.
(iii) Resilient systems have the ability to cope with and recover from disturbance (short-term response).

More recent formulations also include the capacity to adapt to changing conditions (long-term response) as an aspect of resilience. Hence, the concept refers to the capacity to deal with change and continued development (i.e. to adapt and learn). Robustness and flexibility are generally considered the most relevant mechanisms that deliver resilience. They stem from structural engineering. Other (partly overlapping) mechanisms have also been identified, such as response diversity, reliability, sensitivity, rapidity, reserves, redundancy, autonomy, interdependence, connectedness and information feedbacks.

Few studies have attempted to formulate systematic principles of and proxies for flood resilience and apply them to flood-risk management systems. An analysis of what makes river basins flood resilient and how resilience can be enhanced has been conducted by Berkes, (2007). This theoretical work has developed a set of three indicators to define resilience. These indicators reflect the different aspects of the reaction of a system to flood waves:

(i) The amplitude of the reaction.
(ii) The graduality of the increase of reaction with increasing disturbances.
(iii) The recovery rate.

The resilience of a system is larger when the amplitudes (i.e. amount of damage and number of casualties) are smaller, the graduality is greater or the recovery rate is higher. This means that the resilience can only be assessed by considering the whole set of indicators, and that indicators are neither to be aggregated nor prioritised. Yet, to date, there is no decision-making framework in which to define, measure and manage flood resilience in urban systems. Such a framework should offer guiding principles to formulate resilient urban flood management strategies and to assess their effectiveness.

It is arguable that a system-based approach may provide guidance to define performance criteria for measuring the flood resilience of urban systems. In the last decades, scholars have attempted to model urban systems using

an aggregate systems approach to examine complex issues such distinction is usually made between epistemic and variability uncertainty. The first is due to incomplete knowledge and the second is due to inherent variability. While the epistemic uncertainty can be reduced with measurements, the variability uncertainty represents natural randomness and cannot be reduced.

The development of a systems approach has not yet been researched in the context of urban flood management or for the purpose of enhancing resilience. From the complex adaptive systems perspective, cities should thus be represented as multi-level interacting systems. The city system is made up of various components that act as input–output units, including positive or negative feedback loops. At a lower spatial level, the system is composed of interacting parts or subsystems such as buildings, roads and a supporting social economic environment for agents to interact. At a higher level, it is part of a supra system, 'the catchment'. In principle, at each spatial level, there are three types of measures to reduce the overall system's flood vulnerability based on the type of possible responses of a system to floods.

These are reducing exposure, reducing the system's sensitivity and mitigating the impacts (recovery). Flood exposure is directly related to the physical mechanism underlying the flood propagation through the catchment system. The propagation of a flood wave to lower spatial levels is buffered by thresholds that are set at each level, e.g. flood barriers that protect the entire catchment. Consequently, flood exposure at a certain spatial level is dependent on the interventions implemented at a higher level. In other words, managing flood exposure involves a feedback process initiated from a top-down perspective. In traditional flood-risk management policies, exposure to river and coastal flooding is generally modified through governmental interventions and restricted to measures adopted at the catchment level only. Reducing the system's sensitivity will reduce either the direct or the indirect impacts (or both).

If the urban system is provided with sufficient amounts of redundant attributes, it can switch from one attribute to another. Consequently, these interventions will reduce indirect impacts by limiting 'ripple' or multiplier effects and therefore increase the robustness of the system at a higher spatial level. For example, designing a building that can be made flood proof could be beneficial for the house owner. A number of such buildings will enhance the city's robustness against floods and reduces its dependency on primary flood defense structures. Or, when a major water utility is knocked out during a flood, other utilities can provide backup to ensure continued delivery of water.

In conclusion, urban flood resilience involves multiple spatial levels, and resilient approaches are based on an understanding of their interactions and generally take advantage of interventions at different levels. Apart from the spatial dimension of resilience, there is also a temporal dimension. Much of the urban fabric and structures we see today is the result of decision-making periods of the past. Understanding the role of time and the way it shapes the urban fabric and structure is crucial. Consequently, cities also have to learn from the past in order to develop and implement effective resilient approaches. They have to eliminate unsatisfactory practices through evaluation, investigation, experimentation and, if successful, anchoring and scaling-up of new approaches in guidelines, procedures, policies or regulation.

Shortening lifetime cycles of buildings and infrastructure is one of the means of adapting to long-term changes, correcting old errors and thus increasing flood resilience. In Europe, the building stock is ageing and there is much heritage. Within 30 years, some one third of the European building stock will be renewed . These redevelopment projects may provide a window of opportunity to make adjustments in the urban planning process and to adapt to new conditions. While most buildings in Western countries have a lifetime cycle of 40 years or more, in many flood-prone areas all over the world, regular rebuilding of structures is already a common practice.

Obviously, decreasing lifetime cycles includes a reconfiguration of investment levels and building methods to account for the relatively rapid rate of substitution of buildings and other structures. The implementation of a decentralised, bottom-up, flexible management structure and stakeholder engagement are prerequisites to increasing the adaptability of cities and thus to enhancing their flood resilience. This in turn calls for policy- and decision-making organisations that have sufficient capacity to deal with the challenges associated with this transition. The above underpins the relevance of an accurate assessment of the consequences of floods and their spatial and temporal distribution. In contrast to hydrological and hydraulic research, flood impact modelling at the city scale is a research domain that has received relatively little attention.

According to (Ologunorisa,2004), flood risk is a product of hazard and vulnerability and a real risk level involves a certain level of hazard and vulnerability for a particular location. Flood risk management plans

involve three phases including: preparedness, prevention and the mitigation phases. The three stages in flood risk management are very essential for policy makers both at the national and international levels, as well as those responsible for making decisions at the state and local levels, relief and non-governmental organizations, consultants and producers (such as farmers) suppliers and traders.

The preparedness phase would involve activities such as predicting and identification of zones or areas that have high risk and mapping of these vulnerable areas long before the flooding event occurs. The prevention phase would involve activities such as forecasting, early warning, observation and monitoring, and putting in place contingency plans in case of an eventuality. The final stage is the mitigation and response/reaction phase that handles activities after the disaster and this phase includes damage assessment and relief management (Folorunso et al; 2009).

Flood mitigation can be effective when areas vulnerable to flooding are identified and measures are put in place for preparedness, effective prevention and response. Identification of flood risk areas is of utmost important for policy planners and decision makers especially for management activities. Such information are required by government and other relevant authorities for planning purposes and thus must be collated, processed and presented in a manner that can be understood by the public.

For an effective flood risk management, information on important indicators of flood risk are required. Detailed knowledge about the issues such as rainfall distribution, demography of area, vulnerability of people, built-up areas, economic activities, frequency and magnitude of hazards in a potentially hazardous area is necessary for effective mitigation. Scientific methods can be applied to this information to develop measures that would be useful in flood risk management. In the developed world, these measures are already in their implementation phase, but in Nigeria, management of floods is still in its policy level.

2.2 Remote Sensing and GIS in Flood Risk Management

GIS was first introduced and used in the 1960s and since then, the technique has developed into a useful means of gathering and analyzing different kinds of spatial data related to unique geographical locations**.** GIS has some analytical capabilities that uses scattered and sometimes confusing spatial information about different locations in answering questions about real-world processes by developing models that can be communicated with the help of interactive maps that are useful in predicting events in a location at any point in time.

Two types of data representation used in GIS are vector and raster or grid models. These models are used in the representation of satellite images about different locations of the world. Remote sensing technology is used in capturing of such satellite images. Remote Sensing is the technology that is used in gathering of these spatial information used for identifying, classifying, mapping, monitoring, planning, mitigation and management of natural disasters.

This technology has been used extensively in Asian and developing countries for agricultural, aviation and environmental purposes. For an effective flood risk management plan, it is becoming very important to provide flood risk maps that show different vulnerable areas and the potential adverse consequences of different flood scenarios. For the development of an effective flood risk map, information on important criteria for flood risk analysis including elevation, slope orientation, closeness of built-up areas to drainages, drainage network and density, presence of buffers, extent of inundation, land cover/land use information, rainfall data, cultural practices as well as attitudes and perceptions are needed for mapping studies (Oriola, 2003).

Remote sensing and GIS provide the tool for assessing these informations and have proved to be an effective and perhaps suitable choice in flood hazard preparedness and reduction of potential risk. These digital maps must take into recognition the environmental factors leading to floods. The different data sets gotten from remote sensing can be integrated into Geographic Information Systems (GIS) to create a map that shows vulnerability of a location to natural disasters such as flooding. Such maps are effective ways of presenting the risk of flooding in locations that have been badly hit by floods and are very useful tools for disseminating information about future floods.

They also serve as a worthwhile baseline for priority settings and promote technical, financial and political decision making regarding flood risk management. They are usually the starting point for flood intervention policies (Kolawole et al; 2011). According to them, flood risk maps can be used for various purposes such as:

- They can be used to identify flood vulnerability especially around the coastal areas.

- Flood risk maps provide planners with useful information for development of land use policies and planning of new urban areas. Enable adequate evaluation of costs of flood and flood reduction benefits.
- They help in the identification of the worst affected areas thus facilitate proper planning for dispatch of relief materials and allocation of resources for compensation of flood victims.
- They enable planners to be able to evaluate the costs of floods and can form the basis of any insurance plan.
- They help in public enlightenment on flooding and its associated risk. It provides for better understanding of flood problems around the study area for the purpose of planning and mitigation.

In Nigeria, different studies have been conducted on flood risk assessment and mapping of urban areas as well as coastal plains. (Adeaga, 2008). These different researches have assisted in providing some information about floods in Nigeria, but they have not fully assessed flood risks in all the flood prone zones in Nigeria.

Due to lack of advanced technological methods for capturing geographical data, limitations exist in researches involving urban centres in Nigeria, and flood risk assessments have only been carried out in areas where appropriate data for research can be easily acquired. There is still much left to be done with regards to flood risk mapping of vulnerable areas in the country.

Conclusively, some environmental effects of flooding in the Niger Delta region of Nigeria was reviewed to provide the desired knowledge needed for the effective management of flooding. Floods are caused by many factors: Heavy rainfall, highly accelerated snowmelt, severe winds over water, unusual high tide, tsunamis, or failure of dams, levees, retention ponds, or other structures that retained the water.

Flooding can be exacerbated by increased amounts of impervious surface or by other natural hazards such as wildfires, which reduce the supply of vegetation that can absorb rainfall. The effects of flooding from the sources outlined above are felt by various 'receptors'. These include, people, buildings, infrastructure, agriculture, open recreational space and the natural world. Flood warning is the provision of advance warning of conditions that are likely to cause flooding to property and a potential risk to life.

The main purpose of flood warning is to save life by allowing people, support and emergency services time to prepare for flooding. The secondary purpose is to reduce the effects and damage of flooding. Floods renew wetland areas which in turn host a wide range of flora and fauna. Preventing flood waters from entering such wetland areas will create imbalance to the natural state of things resulting to destruction of natural habitats and even extinction of various species of animals and plants. Floods play an important part in various ecosystems. Humans, therefore, should be careful when they try to prevent or control floods. Oftentimes, human intervention causes more harm than good.

2.3 Gaps In Literature

Amongst other areas not covered by the literature reviewed above, it is evident that none of the studies analyzed the effectiveness of the various measures employed in the control of flooding in Awka Anambra State of Nigeria but this is indispensable to enhance the structuring of a lasting solution to the problem in the area as many control measures are in place but little or no impact has been made and the problem still persists. This work thus tried to fill this gap considering how long the area has been under this siege of flooding and how badly the environment is been affected.

3.0 Methodology

The research adopted a questionnaire survey method in which questionnaire was employed in collecting the data from the respondents which was later collated and analyzed. The population figure of Awka is giving as 104,193 from the projected population of 2006 census (National Population Commission, 2006). To get the number of households in the study areas, the national average household size figure of 6 per family as recommended by the 2006 Population and Housing Census was used to divide the 2006 population of the communities in Awka which stand as 104,193. This gave 17,365.5 households for Awka and 22, 155 total percentage response (%) from six village in Awka, the frequency response is 12, 902.

The sample size for the study is 400. This was determined through the Yaro Yamine's formula (2001) which is given as:

$$S = \frac{N}{1+ N (e)^2}$$

Where S = sample size
N = No. of population
e = is the margin of error assumed (0.05)
1 = is the theoretical constant

No of population for Awka = 104,193. Source: (NPC, 2006)
Sample size for Awka

$$S = \frac{104,193}{1 + 104,193\ (0.05)^2}$$

$$S = \frac{104,193}{1 + 104,193\ (0.0025)}$$

$$S = \frac{104,193}{261.483}$$

S = 0.398.5 x 100 = 398.5 = Approximate to 400.

Therefore, four hundred copies of questionnaire were distributed to residents in Awka metropolis in order to investigate the causes and environmental effects of flooding in the Awka Communities.

To make for random sampling , the streets within the study area were grouped into six clusters on the basis of the six groups that comprise the thirty-four Communities of the traditional area of Awka. Thus, the six clusters were established. They include: Agulu, Amaenyi, Ezi-Awka, Amikwo , Ifite and Nkwelle.

3.1 Result Presentation

Table 1 below, shows the sample size distribution for the six Communities/Towns studied

Table1: Sample Size Distribution of Questionnaire

Towns	Number of questionnaires distributed	Number of questionnaire returned	Percentage returned rate (%)
Agulu	67	57	16.0
Amaenyi	67	61	17.1
Ezi-Awka	65	62	17.4
Amikwo	67	56	15.7
Ifite	67	62	17.4
Nkwelle	67	58	16.3
Total	400	356	99.9

Source: Author's Computation from Field work (2012).

Efforts Made By People to Check Flooding

This section treats the effort made in order to checkmate flooding by individuals and various groups in Awka and it is presented on a frequency/ percentage table. Responses with high percentages in agree and strongly agree indicates that the respective efforts by these groups have positively contributed to checkmating the occurrence of flooding in the Communities.

Table 2: Efforts made on checking of Flooding

1.	Individual efforts to check flood	**SA**	**A**	**NO**	**D**	**SD**	**SA**	**A**	**NO**	**D**	**SD**
	Agulu	19	27	5	7	-	32.7	46.6	8.6	12.1	-
	Amaenyi	25	6	22	8	-	40.9	9.8	36.1	13.1	-
	Ezi-Awka	42	4	2	-	10		6.9	3.4	-	17.2
	Amikwo	28	23	3	4	1	72.4	38.9	5.1	6.8	1.7
	Ifite	18	24	8	3	8	47.4	39.3	13.1	4.9	13.1
	Nkwelle	38	13	2	4	1	29.5	22.4	3.4	6.9	1.7
							65.5				
2.	Communal efforts to check flood	**SA**	**A**	**NO**	**D**	**SD**	**SA**	**A**	**NO**	**D**	**SD**
	Agulu	12	31	8	7	-	20.7	53.4	13.8	12.1	-
	Amaenyi	11	17	28	5	-	18.0	27.9	45.9	8.2	-
	Ezi-Awka	15	24	8	-	10	26.3	42.1	14.0	-	17.5
	Amikwo	11	19	10	8	10	18.9	32.7	17.2	13.8	17.2
	Ifite	6	25	17	6	5	10.2	42.4	28.8	10.2	8.4
	Nkwelle	22	22	5	10	-	37.3	37.3	8.4	16.9	-
3.	Governments efforts to check flood	**SA**	**A**	**NO**	**D**	**SD**	**SA**	**A**	**NO**	**D**	**SD**
	Agulu	10	34	8	6	-	17.2	58.6	13.8	10.3	-
	Amaenyi	11	15	25	8	2	18.0	24.6	41	13.1	3.3
	Ezi-Awka	11	14	1	8	23	19.3	24.6	1.7	14	40.4
	Amikwo	16	6	5	15	16	27.6	10.3	8.6	25.9	27.6
	Ifite	19	26	7	5	4	31.1	42.6	11.5	8.2	6.6
	Nkwelle	19	24	6	10	-	32.2	40.7	10.2	16.9	-
4.	Non-Governmental organization's effort to check flood	**SA**	**A**	**NO**	**D**	**SD**	**SA**	A	**NO**	**D**	**SD**
	Agulu	-	18	26	14	-	-	31.0	44.8	24.1	-
	Amaenyi	5	4	34	15	3	8.2	6.5	55.7	24.6	4.9
	Ezi-Awka	3	16	13	8	17	5.2	28.1	22.8	14.0	29.8
	Amikwo	5	10	11	13	18	8.8	17.5	19.3	22.8	31.6
	Ifite	6	10	26	11	6	10.2	16.9	44.1	18.6	10.2
	Nkwelle	8	10	8	26	7	13.6	16.9	13.6	44.1	11.9

Source: Author's computation from Field work (2012)

In order to find out the efforts made by the residents as well as Government and other parastatals in the study area to reduce flooding, Table 2 above was formulated and analyzed.

From analysis, Individual responses towards their effort in checking flood problems in their area was high, the respondents agreed that individual efforts is highly effective towards checking flood. This could be seen in the table with 79.3%, 50.7% 79.3% and 87.9% for Agulu, Amaenyi, Ezi-awka and Nkwelle, only about 33.7% of the total respondent in the six Communities disagreed, this shows that the individual efforts in flood checking is highly effective.

Table 2 above showed communal efforts in checking flooding problems in Awka. The responses from the respondent in Awka showed that at Agulu, residents were of the opinion that communal effort have done well to check flooding problem in their area with 74.1% responses. At Amaenyi, 45.9% of the respondents have no opinion whether communal efforts have tried to check flooding problem in their area, but in Ezi-Awka, the respondents strongly agreed that communal efforts have help to check flooding problems in their area with 68.4%, while residents in Amikwo, Ifite and Nkwelle Awka also said that communal efforts have also helped in flood control in their area with 51.6%, 52.6% and 74.6% respectively. The implications of the above result are that communal efforts are highly needed in flood control and check in Awka.

Table 2 also showed information on government efforts in checking flooding in Awka the study area. From the table, it was observed that government efforts in checking flooding in Awka are highly needed. Agulu Awka and Ezi-Awka residents were of the opinion that government efforts are needed in order to check and control flooding in Awka with 75.8%, 43.9% respectively. At Amaenyi ,16.4% of the respondents were against the statement and according to them, government efforts in checking in Awka have done nothing as in the area of

flood check, while Ifite and Nkwelle Awka respondents showed that the effort of government in checking and controlling flooding in the study area have done some great changes with 73.7% and 72.9% respectively.

The Table 2 equally analyzed the information on non-governmental organizations efforts towards flood check in the study area. Majority of the respondent did not agree that non-governmental organizations efforts have tried to check flooding problem in their area. The respondents strongly disagreed to the statement that non-governmental organization had done anything in checking flooding. Some of the respondents at Agulu Awka, Amaenyi and Ifite Awka were undecided about the efforts of these bodies having any positive effect towards flood control in their area.

4.6 Effectiveness of People's Effort to Check Flooding

This section treats the effectiveness of the efforts made by groups in order to combat flooding in Awka and it is presented on a frequency/ percentage table. Responses with high percentages in agree and strongly agree indicates that the efforts of these groups were highly effective in combating flood in the Communities.

Table 3: Effectiveness of Efforts

S/N	ISSUES RAISED	FREQUENCY					PERCENTAGE				
1.	Effectiveness of Individual Efforts	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	19	17	2	18	1	33.3	29.8	3.5	31.6	1.8
	Amaenyi	23	9	17	11	1	37.7	14.8	27.9	18.0	1.6
	Ezi-Awka	31	11	2	3	2	63.3	22.4	4.1	6.1	4.1
	Amikwo	27	20	3	6	3	45.8	33.9	5.1	10.2	5.1
	Ifite	10	26	8	11	5	16.7	43.3	13.3	18.3	8.3
	Nkwelle	30	19	2	6	2	50.8	32.2	3.4	10.2	3.4
2.	Effectiveness of Communal efforts	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	11	23	4	18	1	19.3	40.4	7.0	31.6	1.8
	Amaenyi	12	14	26	8	1	19.7	22.9	42.6	13.1	1.6
	Ezi-Awka	9	24	12	1	1	19.1	51.1	25.5	2.1	2.1
	Amikwo	9	20	12	4	11	16.1	35.7	21.4	7.1	19.6
	Ifite	8	25	16	6	4	13.6	42.4	27.1	10.2	6.8
	Nkwelle	20	20	5	11	-	35.7	35.7	8.9	19.6	-
3.	Effectiveness of Government efforts	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	9	23	6	17	2	15.8	40.4	10.5	29.8	3.5
	Amaenyi	9	14	27	9	2	14.7	22.9	44.3	14.7	3.3
	Ezi-Awka	11	14	2	4	15	23.9	30.4	4.3	8.7	32.6
	Amikwo	12	5	10	16	14	21.1	8.8	17.5	28.1	24.6
	Ifite	24	14	8	9	4	40.6	23.7	13.6	15.3	6.8
	Nkwelle	19	24	5	10	1	32.2	40.7	8.5	16.9	1.7
4.	Effectiveness of Non-Governmental Organisation efforts	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	-	14	19	22	2	-	24.6	33.3	38.6	3.5
	Amaenyi	5	-	39	14	3	9.8	-	63.9	22.9	4.9
	Ezi-Awka	2	13	16	8	7	4.3	28.3	34.8	17.4	15.2
	Amikwo	2	14	13	12	15	3.6	25	23.2	21.4	26.8
	Ifite	5	10	28	10	5	8.6	17.2	48.3	17.2	8.6
	Nkwelle	5	18	11	22	2	8.6	31.0	18.9	37.9	3.4

Source: Author's computation from Field work (2012)

How effective individual effort have been towards flood checking and control at the six selected Communities in Awka were verified from the responses of the residents. From the Table 3 Agulu Awka, Amaenyi and Ezi-Awka the percentage of their responses showed that individual efforts towards flood control in Awka is effective with highest percentage shown in Ezi-Awka (85.7%). At Amikwo, Ifite and Nkwelle Awka, respondent's also strongly agreed that the efforts of individual in the study area has been effective toward the controlling of flooding with highest percentage response at Nkwelle Awka (83.0%).

Again,In order to find out how effective communal efforts have tried in flood control in Awka, resident responses were verified. Table 3 showed respondent's opinion as regard the effectiveness of communal efforts in checking flooding in the study area.

From the Table 3, it shows that majority of the respondents strongly agreed that communal efforts toward flood check is highly effective. At Agulu, Amaenyi and Ezi-Awka, respondents showed that they strongly agreed that communal efforts is effective with their responses of 59.7%, 42.1% and 70.2% respectively while at Amikwo, Ifite and Nkwelle Awka respondents also strongly agreed that communal efforts toward flood control are effective with 51.8%, 56.0% and 61.4% respectively.

From the Table 3, it shows that 57.2% responses at Agulu Awka strongly agreed that governmental efforts have been effective toward flood control in the study area. At Amenyi Awka the respondents were not decided whether governmental effort have done any positive or negative effect toward flood control in their area. But at Nkwelle Awka and Ifite Awka, the respondents strongly agreed that governmental efforts have been effective in controlling and checking flooding in their area. While at Amikwo the respondents disagreed with the above result that governmental efforts have been effective in controlling and checking flooding in their area.

From Table 3, it was observed that in Agulu Awka, respondents strongly disagreed that non-governmental organization have positively shown any effect toward checking of flooding in the study area, while most of the respondents in the area also said that they do not have any idea whether non-governmental organization efforts have done change in flood control in the area. Table 3 also shows that respondents in Amaenyi have no idea as whether non-governmental organization efforts have contributed effectively towards flood control in the area. Ezi-Awka residents also testified that non-governmental organization has not contributed effectively in controlling of flooding in the area. In Amikwo, the respondents strongly disagreed to the efforts of non-governmental organization in controlling and checking flooding in the area while Ifite Awka residents said that they do not have idea of such effect and Nkwelle Awka respondents strongly disagreed that non-governmental organization have effectively done anything towards checking and controlling flooding in Awka.

4.7 Flood Management and Control

This section treats the measures used flood management and control in Awka and it is presented on a frequency/ percentage table. Responses with high percentages in agree and strongly agree indicates that the respective measures were most effective for flood management and control in the Communities.

Table 4: Measures for Managing Flooding in Awka

S/N	ISSUES RAISED	FREQUENCY					PERCENTAGE				
1.	Proper use of drainage system	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	33	23	1	-	-	57.9	40.4	1.8	-	-
	Amaenyi	59	1	-	-	-	98.3	1.7	-	-	-
	Ezi-Awka	50	11	-	1	-	80.6	17.7	-	1.6	-
	Amikwo	49	9	-	-	1	83.1	15.3	-	-	1.7
	Ifite	51	11	-	-	-	82.3	17.7	-	-	-
	Nkwelle	39	16	1	2	-	67.2	27.6	1.7	3.4	-
2.	Opening of drainage system constantly	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	35	20	1	1	-	61.4	35.1	1.8	1.8	-
	Amaenyi	60	-	1	-	-	98.4	-	1.6	-	-
	Ezi-Awka	51	9	2	-	-	82.3	14.5	3.2	-	-
	Amikwo	47	11	-	1	-	79.7	18.6	-	1.7	-
	Ifite	43	18	-	1	-	69.4	29.0	-	1.6	-
	Nkwelle	36	15	2	5	-	62.1	25.9	3.4	8.6	-
3.	Avoiding dumping of refuse in drainage system	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	37	16	1	2	1	64.9	28.1	1.8	3.5	1.8
	Amaenyi	58	2	-	1	-	95.1	3.3	-	1.6	-
	Ezi-Awka	52	10	-	-	-	83.9	16.1	-	-	-
	Amikwo	48	11	-	-	-	81.4	18.6	-	-	-

	Ifite	53	9	-	-	-	85.5	14.5	-	-	-
	Nkwelle	38	20	-	1	-	64.4	33.9	-	1.7	-
4.	Construction of drainage system when there is none	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	34	19	1	1	1	60.7	33.9	1.8	1.8	1.8
	Amaenyi	56	5	-	-	-	91.8	8.2	-	-	-
	Ezi-Awka	48	12	1	1	-	77.4	19.4	1.6	1.6	-
	Amikwo	49	9	-	1	-	83.1	15.3	-	1.7	-
	Ifite	51	10	1	-	-	82.3	16.1	1.6	-	-
	Nkwelle	34	19	2	3	-	58.6	32.8	3.4	5.2	-
5.	Creating environmental awareness to keep the drainage system from waste dumps	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	26	25	3	2	1	45.6	43.9	5.3	3.5	1.8
	Amaenyi	54	7	-	-	-	88.5	11.5	-	-	-
	Ezi-Awka	24	31	6	1	-	38.7	50	9.7	1.6	-
	Amikwo	43	16	-	-	-	72.9	27.1	-	-	-
	Ifite	29	29	3	1	-	46.8	46.8	4.8	1.6	-
	Nkwelle	25	27	3	4	-	42.4	45.8	5.1	6.8	-
6.	Massive campaign against improper dumping of refuse in the system	SA	A	NO	D	SD	SA	A	NO	D	SD
	Agulu	17	29	6	3	2	29.8	50.9	10.5	5.3	3.5
	Amaenyi	53	8	-	-	-	86.9	13.1	-	-	-
	Ezi-Awka	27	28	5	2	-	43.5	45.2	8.1	3.2	-
	Amikwo	35	22	1	1	-	59.3	37.3	1.7	1.7	-
	Ifite	19	34	3	5	1	30.6	54.8	4.8	8.1	1.6
	Nkwelle	29	24	3	3	-	49.1	40.7	5.1	5.1	-
7.	Sorting of waste before disposal	**SA**	**A**	**NO**	**D**	**SD**	**SA**	**A**	**NO**	**D**	**SD**
	Agulu	14	28	6	5	4	24.6	49.1	10.5	8.8	7.0
	Amaenyi	49	11	-	1	-	80.3	18.0	-	1.6	-
	Ezi-Awka	15	22	11	10	4	24.2	35.5	17.7	16.1	6.5
	Amikwo	31	19	3	6	-	52.5	32.2	5.1	10.2	-
	Ifite	13	28	13	6	2	20.9	45.2	20.9	9.7	3.2
	Nkwelle	22	30	4	3	-	37.2	50.8	6.8	5.1	-

Source: Author's computation from Field work (2012)

Table 4 above shows measures which have been taken in order to manage flooding in the study area. It explains how effective these measures have been in controlling and checking flooding in Awka. From the Table 4 above, proper use of drainage system in Awka could effectively help in controlling and checking flooding. The table also showed that 100% respondents in Amaenyi and Ifite, agreed that proper use of drainage system will have positive change towards flood incidence and damage. While 98.3%, agreed for Agulu and Ezi-Awka, 98.4% agreed for Amikwo and 94.8% for Nkwelle. The implications of these is that people are aware that floods need free movement and blocking of the drainage system with any form of waste could lead to flooding in an area and therefore should be discouraged.

Table 4 shows that opening of drainage system constantly could help to manage flood. From the responses above, almost 100% of the respondents in the study area strongly believe and agreed that opening of drainage system constantly would help in the management of flooding in Awka and therefore should be encouraged. The table shows higher percentage of response in Amanenyi with 98.4% and Ezi-Awka 82.3% while Amikwo have 79.7% responses and Nkwelle Awka, Ifite Awka and Agulu Awka have 69.4%, 62.1% and 61.4% respectively. The implications of this is that people should be encouraged to open their drainage system constantly in order to help check and control flooding in an area especially in Awka.

Some other measures which could be used in managing flooding in Awka include avoiding dumping of refuse in drainage system. While 100% of the respondent at Ezi-Awka, Amikwo and Ifite agreed to these measure,93%,

98.4% and 98.3% equally agreed that refuse dumping in drainage system should be avoided by all cost in Agulu, Amaenyi and Nkwelle respectively.

From the above Table 4, it was observed that construction of drainage system is highly needed in controlling and checking flooding in Awka. This could be seen from their responses, 94.6%,100%, 96.8%, 98.4%, 98.4% and 89.4% of the respondents in Agulu, Amaenyi, Ezi-Awka, Amikwo,Ifite and Nkwelle agreed that construction of new drainage will help in controlling flood in the area.

From the Table 4, more than 90% of the respondents from the six selected Communities agreed entirely that creating environmental awareness to keep the drainage system from waste dumps could help in providing lasting solution to environmental problems of flooding in Awka. There is need to create awareness to keep the drainage system from waste dumps so that there would be free movement of water which will help to reduce the rate of flooding in Awka.

Also from the Table 4 majority of the respondents from Agulu , Amaenyi , Ezi-Awka, Amikwo, Ifite and Nkwelle strongly agreed that there is need for massive campaign against improper dumping of refuse in the drainage system as it not only create room for flooding but also encourages flooding in the area, with corresponding percentages of 80.7%, 100%, 88.7%, 96.6%, 85.4% and 89.8% respectively.

Again from the Table 4, residents in the six selected Communities strongly agreed to the statement that sorting of waste before disposal could effectively reduce the effect of flooding in Awka. It also reveals that, more than 90% of the respondents were of the opinion that waste should be sorted before taken them to waste dump. At Amaenyi 98.3% of the respondents agreed that sorting of waste is one of the ways that could help reduce the incidence of flooding in Awka. Again, at Amikwo similar response were obtained 84.7% of the respondents strongly agreed that waste should be sorted before disposing them off. At Nkwelle and Ifite Awka, 88.0% and 70.1% of the respondents also agreed that sorting of waste is necessary to help reduce flooding in Awka while at Agulu Awka, 73.7% strongly agree that there is need to sort waste before disposing.

Hypotheses, Test of Hypotheses and Statistical Analyses

In analyzing the data obtained from the questionnaire, appropriate descriptive statistical tools were employed. In determining the average value of the parameters studied and for easy computation and testing of the hypothesis, the mean which is a measure of central tendency was applied. The mean was determined using the method by Pelosi et al (2003) that is the equation:

$$X = \frac{\underline{X}}{N} \quad (2)$$

Where X is the value obtained for each sample
N is the number of samples

The responses from the questionnaire survey were analyzed using cross tabulation and frequency/ percentage calculations.
The frequency corresponding to the responses was converted into percentage using the following formula:

$$\text{Percentage} = (N/Y) \times 100 \quad (3)$$

Where: N = Frequency of responses
Y = Total number of responses
100 = Constant

In testing for the five hypothesis stated, the paired samples T- Test were used. The observations made on the sample members must all be independent of each other just as different sets of people responded independently in the six Communities.

Hypotheses Three

Ho: There is no significant difference between the efforts made to check flooding in the six communities in Awka.

Hypotheses 3 was tested using the T-test. This compared the various efforts made to check flooding in the six communities in Awka. The result is shown in Table 5 (a), (b) and (c)

Table 5: T-Test on Efforts made to check flooding

(a) Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Agree Assessment	1.9700E2	5	62.70566	28.04282
	Disagree Assessment	90.8000	5	37.45264	16.74933

Source: Author's Computation from field work (2012)

(b) Paired Samples Correlations

	N	Correlation	Sig.
Pair 1 Agree Assessment & Disagree Assessment	5	-.885	.046

Source: Author's Computation from field work (2012)

(c) Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Agree Assessment - Disagree Assessment	106.20000	97.41509	43.56535	-14.75681	227.15681	2.438	4	.071

Source: Author's Computation from field work (2012)

Decision Rule:

Reject the null hypothesis if the p – value is greater than or equal to 0.05, otherwise accept it.

The interpretation of the work:

The overall responses of the respondents were checked, and it was found that the p – value is 0.071 which is above 0.05. This means that we reject the null hypothesis and conclude that there is significant difference in the various efforts made to check flooding in Awka.

Hypotheses Four

Ho: There is no significant difference between the effectiveness of the efforts made to check flooding in the six communities in Awka.

Hypothesis 4 was also tested using the T-test. This compared the effectiveness of the various efforts made to check flooding in the six communities in Awka. The result is shown in Table 6(a) (b) and (c)

Table 6: T-Test on the Effectiveness of the Efforts made to check flooding

(a) Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Agree Efforts	1.7600E2	4	64.00521	32.00260
	Disagree Effort	90.0000	4	27.14160	13.57080

Source: Author's Computation from field work (2012)

(b) Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Agree Efforts & Disagree Effort	4	-.883	.117

Source: Author's Computation from field work (2012)

(c) Paired Samples Test

		Paired Differences					t	df	Sig.(2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Agree Efforts - Disagree Effort	86.00000	88.88194	44.44097	-55.43101	227.43101	1.935	3	.148

Source: Author's Computation from field work (2012)

Decision Rule:

Reject the null hypothesis if the p – value is greater than or equal to 0.05, otherwise accept it.

The interpretation of the work:

The overall responses of the respondents were checked, and it was found that the p – value is 0.148 which is above 0.05. This means that we reject the null hypothesis and conclude that there is significant difference in the effectiveness of the various efforts made to check flooding in Awka.

Hypotheses Five

Ho: There is no significant difference between the measures used in flood management in the six communities in Awka.

Hypotheses 5 was again tested using the T-test. This compared the measures used in flood management in the six communities in Awka. The result is shown in Table 7 (a), (b) and (c).

Table 7: T-Test on the Measures used in flooding Management.

(a) Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Agree Management	3.3429E2	7	25.09126	9.48361
	Disagree Management	13.0000	7	13.05118	4.93288

Source: Author's Computation from field work (2012)

(b) Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Agree Management & Disagree Management	7	-.992	.000

Source: Author's Computation from field work (2012)

(c)Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Agree Management - Disagree Management	321.28571	38.07324	14.39033	286.07384	356.49759	22.326	6	.000

Source: Author's Computation from field work (2012)

Decision Rule:

Reject the null hypothesis if the p – value is greater than or equal to 0.05, otherwise accept it.

The interpretation of the work:

The overall responses of the respondents were checked, and it was found that the p – value is 0.000 which is below 0.05. Therefore, we accept the null hypothesis and conclude that there is no significant difference in the various measures used in flood management in Awka.

4.0 Summary of Findings

There is significant difference in the various efforts made to check flooding in Awka. Looking at the responses, it showed that non – governmental organizations' efforts have not made any significant impact towards ameliorating flooding in the study area, which is to say that their presence in Awka with respect to combating flood is not acceptable, whereas , other groups have made significant efforts towards checking of flood in Awka.

There is significant difference in the effectiveness of the various efforts made to check flooding in Awka, looking at the responses, it showed that non – governmental organizations' efforts have not been effective towards ameliorating flood problems in the affected areas, whereas, other efforts made by individual, communal and governmental bodies have been effective in checking flooding in Awka.

There is no significant difference in the various measures used in flood management in Awka. This signifies that all the measures which includes; proper use of drainage system, opening of existing drainage channels, avoid dumping of refuse in drainage channels, environmental awareness, penalties for defaulters, sorting of refuse before disposal and construction of new drainage channels where there is none are all very vital in flood management in Awka communities.

4.1 Conclusion and Recommendation

Critically considering the responses of the respondents and the result of the analyses, it is crystal clear that the efforts were significant but not very effective. The study concluded therefore that there are many measures put in place to tackle the problem of flooding in all the six Communities studied, but the problem still persists because the parties involved are fighting the menace individually.

Recommendations

In line with the findings and conclusion, the study recommends as follows:

1. There is need for massive campaign against improper dumping of refuse in the drainage system as it not only create room for flooding but also encourages flooding in the area
2. That sorting of waste before disposal could effectively reduce the effect of flooding in Awka
3. Construction of sound drainage system is highly needed in controlling and checking flooding in Awka.
4. There is need for creating environmental awareness to keep the drainage systems from waste dumps as this could help in providing lasting solution to environmental problems of flooding in Awka.
5. People should be encouraged to open their drainage system constantly in order to help check and control flooding in an area especially in Awka.
6. Dumping of refuse in drainage systems to be prohibited.
7. Blocking of the drainage system with any form of waste could lead to flooding in an area and therefore should be discouraged.

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