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**The Problem of Annual Occurrences of Floods in Accra: An Integration of Hydrological,
Economic and Political Perspectives**

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Abbreviations/Acronyms

AMA	Accra Metropolitan Assembly
CRED	Centre for Research on the Epidemiology of Disasters
DEM	Digital Elevation Model
DREF	Disaster Relief Emergency Fund
EM-DAT	Emergency Events Database
ENSO	El-Nino Southern Oscillation weather
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GLSS	Ghana Living Standards Survey
GMA	Ghana Meteorological Agency
GoG	Government of Ghana
GRCS	Ghana Red Cross Society
GSS	Ghana Statistical Service
HDR	Human Development Report
IDPs	Internally Displaced Persons
MDGs	Millennium Development Goals
Munich Re	Munich Reinsurance Company
NADMO	National Disaster Management Organization
NGOs	Non-Governmental Organizations
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PHC	Population and Housing Census
SAP	Structural Adjustment Programmes
SPI	Standardized Precipitation Index
UNEP	United Nations Environment Programme
USA	United States of America
USAID	United States Agency for International Development

Abstract

Accra, the capital city of Ghana, like many cities in Africa (especially Sub-Saharan Africa) is vulnerable to natural hazards and disasters. The cause of natural disasters and hazards in Ghana has been mainly from water through flooding or stormy rain or drought, and bush fires. The occurrences of floods in Accra have become an annual event with severe consequences mostly felt by the urban poor. We present a brief discussion on the annual occurrences of floods in Accra, Ghana by adopting an integrated approach including hydrological, economic and political perspectives. The social and economic damage costs of floods in Accra and Ghana are presented and analyzed. Case study of recent types and causes of floods in Accra are presented. The weaknesses in the responses to the management of floods in Accra and Ghana are indicated. We also argue that for measures taken in dealing with the annual occurrences of floods in Accra to be effective, the hydrological, economic and political perspectives have to be integrated. The first measures should target the flood-prone areas and these should be “proactive” measures rather than “reactive” measures. Further, the impacts of floods are not evenly distributed with the worse affected areas and people being the slums and urban poor respectively. We conclude by making some recommendations to help improve the intervention options and protection measures available to policy makers in ensuring that Accra becomes a flood-free city and also highlights areas for future research.

Key words: extreme weather events; natural disasters and hazards; floods; urbanization; Accra and Ghana

1.1 Introduction and Background of the Study

In the past five years or more, Ghana –a West African country of 25.3 million people (2012 estimates) and a nominal Gross Domestic Product (GDP) of about US 39,199 million dollars (2011 estimates) -has experienced several forms of natural disasters and hazards ranging from droughts in 2006 to floods in 2007, 2010 and 2012. As in most developing countries in Africa, natural disasters and hazards present serious challenges to recent gains and improvements made in terms of macroeconomic stability and economic growth and development. In other words the recent gains made on the African continent in terms of the Millennium Development Goals (MDGs) could be destroyed by one major or series of natural disasters as observed in Asia such as earthquakes, Tsunamis, floods, among others.

Some studies have linked the issues of drought and floods to climate change and variability, indicating direct correlation and causality. Therefore with continuing climate change and variability one could predict that several forms of floods and other natural disasters and hazards would be prominent in the near future. This would primarily be due to increasing intensity and erratic nature of rainfall leading to flash floods in many areas of Africa including Ghana. Further, other drivers of floods could have more or the same impact as those occurred as result of climate change and variability. The consequences of floods in Accra is further exacerbated by poor development planning of the residential areas and also inadequate (or no) information on the early warning signs. Further the success or failure of early warning signs/systems would depend on the size, slopes and degree of sealed areas of a given water/river basin. Hydrological processes occur at a wide range of scales, from unsaturated flow in a 1 metre (m) soil profile to floods in river systems of a million square kilometres (Blosch and Sivapalan, 1995). As floods or the hydrological behaviour of a catchment imply multi-scales processes, its understanding (or study) invariably involves some sort of across scales analysis. The size of the catchment (meso, macro, among others), and its shape, the topography, the geology and the soils, the land use/cover, among several other factors considerably influence the hydrological behaviour of a catchment. In addition to the characteristics of the catchment, parameters of the rainfall (amount, intensity, spatial and temporal distribution, among others) influence the hydrograph (interacting with spatial and temporal characteristics of the catchment).

Of all the different land use/cover, the urban areas are probably the one that significantly modify the hydrological behaviour of a catchment. Indeed the impervious areas created by the urbanization (roofs, roads, dams, among others) hamper infiltration and create overland flow subjecting urban areas to floods (flash floods) in case of poor drainage system. The urban areas are therefore floods driver, even if some cases studies (for example Chocat, 1997) highlight a negligible role of urbanization in the flood severity, arguing by the fact that the proximity of the urban area to the outlet of the catchment reduces its impact on the hydrology of the catchment. Many other case studies (for example Du *et al.*, 2012) reveal a huge impact of the city on the hydrograph, especially in the reduction of the time to peak and increasing peak flow. The location of the urban areas in the catchment is then a key element in its exposure to floods. The second key element is the planning of the urban area, which determines its water drainage capacity (facilities). As a city development plan provides areas for natural water flow and creates a drainage system to convey out the surplus of water due to the urbanization.

Other issues relating to floods in Ghana are the poor, ineffective and at times belated responses by the central government and other organizations (both governmental and non-governmental) in responding to the aftermath of floods. For instance, between 2006 and 2012 the response by the main organization responsible for the management of natural disaster (National Disaster Management Organization (NADMO)) was reported by some sections of the media to be woefully inadequate and also ineffective. Several communities affected by floods in 2007 to 2012 were in need of relief items. These relief items supplied were not only reported to be insufficient but also arrived late. This led the interventions being either ineffective or late.

The Ghanaian population has become increasingly urban over the past five decades. The percentage of urban population increased from 23.1 percent in 1960 to about 43.8 percent in 2000. This figure further increased to about 51 percent in 2010. The increasing urbanization presents some challenges in terms of provision of basic infrastructure in times of floods and other natural disasters and hazards. Therefore urbanization has effect on national development agenda in terms of management of natural hazards and disasters and also provision of basic infrastructure to contain the effects of floods in Accra and Ghana. The

effects of flooding affect several parts of the country including the coastal, middle and northern areas.

Since Accra is one of the fastest but not coordinated growing cities in West Africa (Yankson and Bertrand, 2012) it is also prone to frequent floods. From a political-economic point of view (especially from Marxist point of view) the urbanization processes which are prior to urban floods are of special interest. Since rapid urban growth is – although in many cases not planned and engineered from a centralized institution – not a product of coincidence, one has to ask about the major forces which produce, structure and fractionate the urban space. The fact of existing urban areas not provided with basic infrastructure (and thus not with adequate drainage- and canalization systems) is not just a result of poor urban planning but also related to a specific logic in market-driven societies.

Floods as a form of natural disaster and hazard have both negative and positive effects. Positive effects of floods in general include sedimentation, increased amount of water of dams for irrigation and also as drinking water, and also flood plains with respect to eco-systems. In most cases, preferences in dealing with the consequences are usually given to the negative effects of these natural disasters and hazards. Therefore there is little (or no) doubt about the negative impacts of floods on the urban population of many developing countries including Ghana. Floods in Accra have become an annual event with its negative consequences mostly felt by the urban poor living in slums due to its densely populated nature. Factors that are usually attributed to the annual event of floods in Accra include increasing flow of water, poor drainage infrastructure/facilities and poor land use/management practices. Major attributes of floods in Accra include the destruction of homes and properties, agricultural and non-agricultural lands, livestock, livelihoods and most of all lost of human lives.

1.2 Problem Statement

Ghana, like many countries, is prone to a range of environmental and natural disasters including floods. The nature and severity of such disasters depend on geographical conditions and the preparedness of the local population. Even though cyclones, “tsunamis” and earthquakes are not common in Ghana, the occurrences of floods have had major impact on the standard of living of people in the country, especially the urban population. For example, in June 2010, there were severe floods in Accra, Agona District and certain

parts of Northern Ghana (for example Buipe) due to intense rainfall, poor drainage systems and the spilling of water from the Bagre dam in Burkina Faso and Akosombo dam in Ghana. As results of the floods, human lives, farm lands and livestock were lost and also there were destruction of properties including buildings which ran into thousands of Ghana cedis. Buipe, Agona Swedru and certain parts of Accra were reported to be in need of relief items, even though relief items were distributed to the affected areas, they were insufficient.

Although Ghana's natural hazards are usually within a short time frame, it is capable of unleashing long term suffering on the populace and the economy as a whole. It is plausible that the newly-attained middle income status of Ghana declared after the rebasing of the country's GDP by the Ghana Statistical Service (GSS) in November 2010 can be lost from a single severe natural hazard. In Ghana (especially Accra), environmental and natural hazards are known to affect the outputs and productivity of the agriculture and related industries; construction industry and water and utilities industries. They also impact the services sector through cutting and destructions to service lines.

In 2005/2006, about 28.5 per cent of the population of Ghana lived below the poverty line, according to the 2005/2006 Ghana Living Standards Survey (GLSS) (GSS, 2007). The 2009 United Nations Development Programme (UNDP)'s Human Development Report (HDR) also indicated that about 53.6 per cent of Ghana's population earned less than two dollars per day (using 2005 economic conditions) based on data set for 2007 (UNDP, 2009). The 2010 UNDP HDR indicated that about 29.9 per cent of the population lived under the poverty line, measured as 1.25 US dollars (using 2005 economic conditions) per day based on the use of 2008 data set (UNDP, 2010) indicating a slight increase in poverty from 2005 to 2008. The increase in poverty from 2005 to 2008 was partly due to the 2007/2008 global food crisis. Another cause of this increase in poverty was the severe floods and moderate drought linked to the El-Nino Southern Oscillation weather (ENSO) phenomenon which occurred over the 2006 to 2008 period. Other climate-related natural disasters such as droughts can drive people into higher levels of poverty. In many cities in Sub-Saharan Africa (including Ghana), due to limited resources, adequate housing and infrastructure that can withstand severe floods tend to be absent especially in crowded urban areas and slums.

Emissions from greenhouse gases into the lower atmosphere since the dawn of the Industrial Revolution in the 19th century have resulted in excessive warming of the earth leading to adverse effects on humans (Abbas, 2009). While climate change affects lives and livelihoods across the world, its impact is greatest on the rural and urban poor, especially those households living in areas frequently struck by natural disasters, which can damage the existing natural resource base of an area (Abbas, 2009). Further the close dependence of both rural and urban poor on natural resources makes them most vulnerable to the impact of climate change. Slum dwellers who are mostly the poor in our towns and cities are also usually the hard hit. Given that natural disasters are closely linked to changes in climate patterns, there is increasing need to study the problem of the annual occurrences of floods in Accra by adopting an integrated approach. This is done with the view that one discipline only is not enough in providing the relevant answers to the causes, effects and mitigating strategies for the problem of annual occurrences of floods in Accra. This study would also highlight some of preventive measures needed to adopt to reduce the social and economic effects (costs) of floods in Accra.

Preparedness strategies envisaged in making the city more resilient to natural hazards and disasters such as floods include increased patronage of insurance products especially by urban people, improved facilities for the Ghana Meteorological Agency to produce improved weather and climate services and products to service various sectors of the economy. Further spatial planning in general could be used in order to avoid as far as possible settlements in most endangered areas (or at least to conceive protection/management measures).

Various studies (see for example Karley, 2009; Nyarko 2000) have been conducted on floods and other natural disasters in Accra, but these studies have mostly employed one dimensional analysis which is usually based on one discipline. This study seeks to take the analysis of the annual occurrences of floods in Accra forward by analyzing its hydrological, economic and political context.

1.3 Research Objectives

The main research objective of the study is to ascertain the hydrological, economic and political contexts and its inter-linkages with urbanization processes and the annual occurrences of floods in Accra. Specifically to:

- (1) To examine the hydrological factors of floods in Accra
- (2) To determine the social and economic damage costs of floods in Accra
- (3) To identify the linkages of urbanization processes, floods and class contradictions in Accra
- (4) To examine the inter-linkages between the hydrological context; political and economic contexts of floods in Accra

The paper is organized as follows: the next section provides the methodology of the study including conceptual framework adapted for the study. The historical overview of natural disasters and hazards is presented next. This is followed by discussions on causes and floods-prone areas of Ghana. The hydrological context of the problem of annual occurrences of floods in Accra is also presented. An analysis of social and economic effects (costs) of floods in Accra is also presented. Urbanisation, slum dwellers and floods in Accra are presented. The conclusions, recommendations for future research and references are reported at the end of the paper.

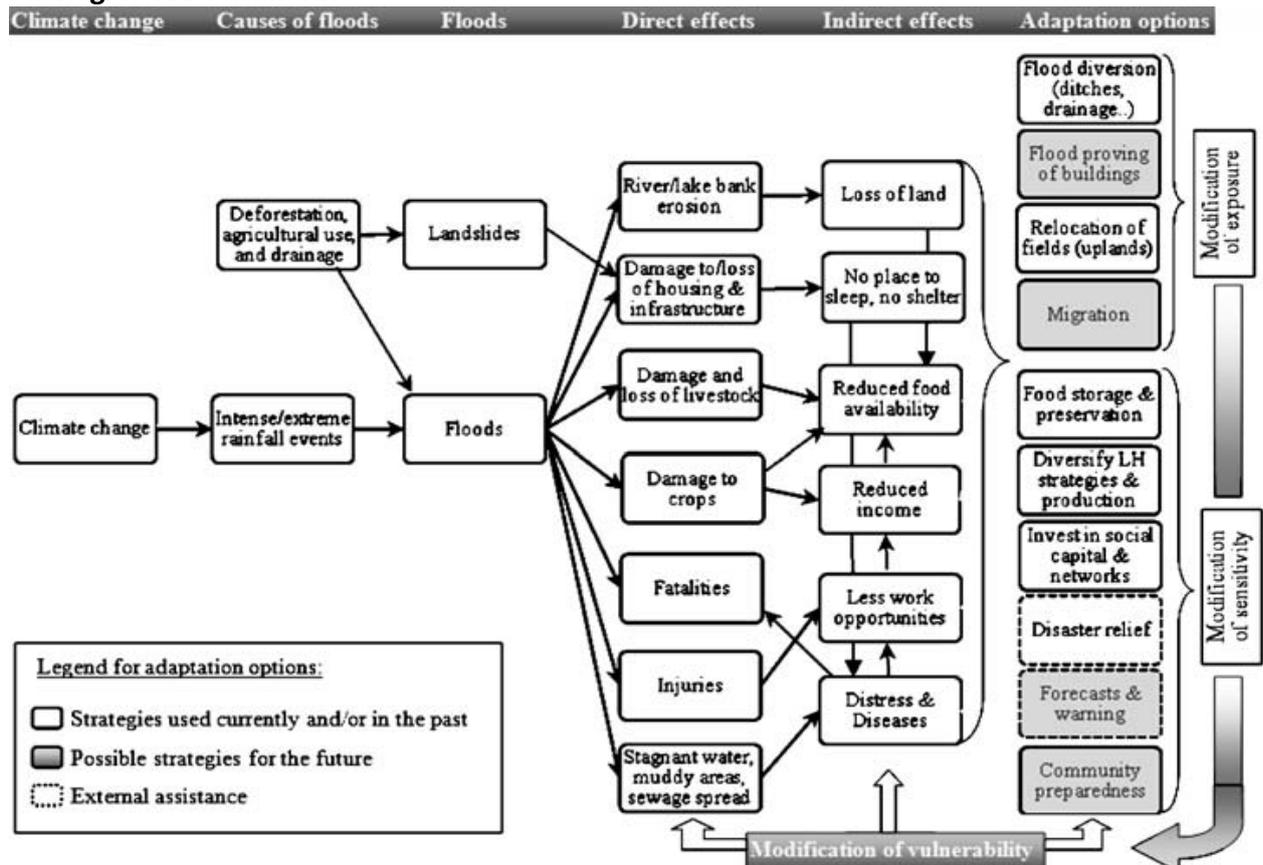
2. Methodology for the Study

2.1 The Conceptual Framework

The adapted conceptual framework (Figure 1) shows the linkages between the intense/extreme rainfall events leading to floods and its impacts on the livelihoods of the affected populace. It also presents the coping strategies/adaptation responses available to affected communities and people. Floods affect existing policies, strategies and institutions involved in the management of natural disasters and hazards. Laid-down policies and strategies in turn affect the severity of the floods in a country or region or community. Further the coping strategies of affected communities or people lead to whether the impact of the floods would be short-term or long term. In Accra most of the affected people, especially the urban poor, have low capabilities of dealing with the short-term consequences and this could lead to long-term impact. Also the poor adaptation responses/measures could also influence the severity of flood disasters. The adaptation responses influence resilience or otherwise of the affected communities or people. The short-term and long-term measures taken to deal with the occurrences of floods influence the perennial occurrence of floods in a particular community. This reduces or increases the number of people that would

be affected by the next flood event. The conceptual framework shows the causes, effects and adaptation responses to a particular flood disaster. Our term paper focuses mainly on the causes and effects of floods on households. It finally highlights the most likely victims of flood disasters and the need to adapt an integrated approach in dealing with the annual occurrences of floods in Accra.

Figure 1: Impacts of Intense/Extreme Rainfall Events and Adaptation Responses/Coping Strategies of Households



Source: Adapted from Tschakert *et al.*, (2010), *Floods in the Sahel: An Analysis of Anomalies, Memory, and Anticipatory Learning*, pp. 491-492

2.2 Study Area

Ghana has ten administrative regions with Accra, the capital of Greater Accra region, being also the nation's capital. The study was conducted in Accra. Accra is located in the Accra Metropolitan Assembly (AMA). The Greater Accra region is the smallest region of the ten regions of Ghana with a total land size of about 3,245 square kilometres. AMA covers an area of about 240 square kilometres. Based on the 2010 Population and Housing Census (PHC), the Greater Accra region has a population of 4,010,054; representing about 16.3 percent of the entire population (GSS, 2012). The region is political divided into 16 districts.

Further, Greater Accra region has about 90.5 percent of the population living in urban areas with the remaining 9.5 percent living in rural areas. This makes the region the most urban populated region in Ghana. Between 2000 and 2010, the Greater Accra region experienced about 38 percent increase in its population and also had an annual population growth rate of about 3.1 percent. According to Obuobie *et al.* (2006), large proportion of the city's population lives in informal settlements or slums in the centre of the city while the middle and upper class moves to its outskirts. According to GSS (2012), the population density of Ghana increased from 79 persons per square kilometre in 2000 to 103 persons per square kilometre in 2010. The increase in population density puts additional pressure on existing social amenities, public services, among other several resources in the city. At the regional level, Greater Accra has the highest person per square kilometre with a density of approximately 1,236 persons per square kilometre compared to 895.5 persons per square kilometre in 2000. Temporary dwelling units such as tents, kiosks, containers and attachment to shops or offices together represent about 2 percent of all dwelling units in Ghana. At the regional level, eight regions had proportion of makeshift structures been less than one percent, except Greater Accra (6.2 percent) and Ashanti (1.8 percent) which had moderately higher levels of makeshift structures (GSS, 2012). In the Greater Accra region, the proportion of the population considered to be extremely poor decreased from 13.0 percent in 1991/1992 to 6.4 percent in 2005/2006. For the same period of 1991/1992 to 2005/2006, population below the poverty line decreased from 26.0 percent to 11.8 percent (refer to Ghana Statistical Service, 2007). Accra is located within the coastal-savannah zone with low annual rainfall averaging 810 mm distributed over less than 80 days (Agodzo *et al.*, 2003; Obuobie *et al.*, 2006). The rainfall pattern of the city is bimodal with the major season falling between March and June, and a minor season falling between August and October (Ghana districts, n.d). Mean temperatures vary from 24 °C in August to 28 °C in March. The above information supports the choice of Accra as the study area.

Figure 2: Map of Ghana Indicating All the Ten Regions and the Study Area

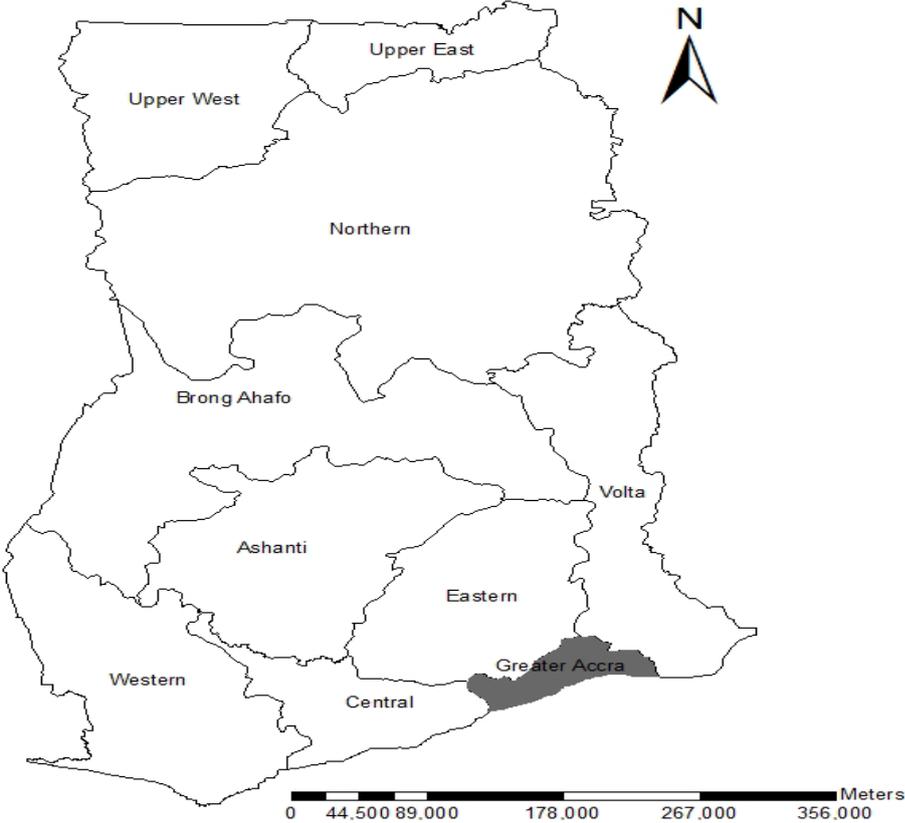


Figure 3: Map of Greater Accra Region



Source: ghanadistricts.com (2012), available at <http://www.ghanadistricts.com/region/?r=1>, Accessed on 10/11/2012

2.3 Type and Source of Data

The data used for the analysis is a secondary data obtained from various sources including internet search, journal publications, reports, and other sources (e.g. newspaper publication). On the internet key words such as natural disasters, floods, Ghana, among others were used to obtain relevant publications on the occurrences of floods in Ghana and Accra. Other publications by the Government of Ghana and private organizations were also used to support the data and information retrieved from the international database including EM-DAT, Munich Reinsurance (Munich Re) Company, among others. Further, personal accounts and observation of the incidence of floods in Ghana were also obtained from other researchers in Ghana. Data obtained include statistics on annual occurrences of floods in Ghana, economic and social damage costs of floods in Ghana and Accra, rainfall time series data, among others.

According to Guha-Sapir and Below (2002), at the global level there are three main sources of data on natural disasters and hazards; these are NatCatService maintained by Munich Re; Sigma maintained by Swiss Reinsurance Company (Zürich) and EM-DAT maintained by the Centre for Research on the Epidemiology of Disasters (CRED, Université Catholique de Louvain, Brussels). Significant differences exist among the three data sources in terms of quality of data. The data by EM-DAT is the only publicly available data for disaster analysis. The differences in the quality of data could be attributed to the main purposes of which the institutions collect the data for. Munich Re and Swiss Re collect the data for insurance purposes and it is used to serve their clients on the availability of insurance for the various forms of natural disasters and hazards (refer to Guha-Sapir and Below (2002) for discussions on differences and quality of data from the three main sources of data for disaster analysis).

2.4 Data Analysis

The study used mainly qualitative data analysis approaches. The study used several data analysis approaches which included literature review/ desktop review, descriptive statistics represented by charts, tables and graphs, rainfall time series data analysis, depending on the specific objective the analysis seeks to achieve. Economic-related issues were mainly analyzed using descriptive statistics, represented in charts, tables and graphs. The hydrological related issues were analyzed using the rainfall time series data. Also other

materials were obtained on the topography of the study area and areas vulnerable to floods in Accra. The political-related issues were analyzed mainly through desk top review/literature review. The desktop review was mainly in narratives to present the picture of urbanisation, social conflicts and class contradictions in Accra and Ghana which have effect on causes of floods in Accra and Ghana and vice versa.

Study on the problem of annual occurrences of floods in Accra from a hydrological perspective; suggest the understanding of the hydrology of the catchments in which the study area (Accra) is located. Due to the complexity of process involved in a catchment, investigative hydrological models are very often used. Models are mathematic abstraction of the complex natural process occurring in the catchment, such as they improve the understanding of hydrological processes. However hydrological model are data consuming that hampers their application in data-poor situations as in the case of the actual analysis based on purely secondary data exploitation. Nevertheless results obtained from previous studies; in which hydrological models have been used to investigate on flood issue in Accra were exploited. The influence of topography will serve to appreciate the exposure of the city to floods and the rainfall time series data analysis will serve in the analysis of the magnitude of flooding rainfalls, and also their recurrence. Changes in land use were also examined.

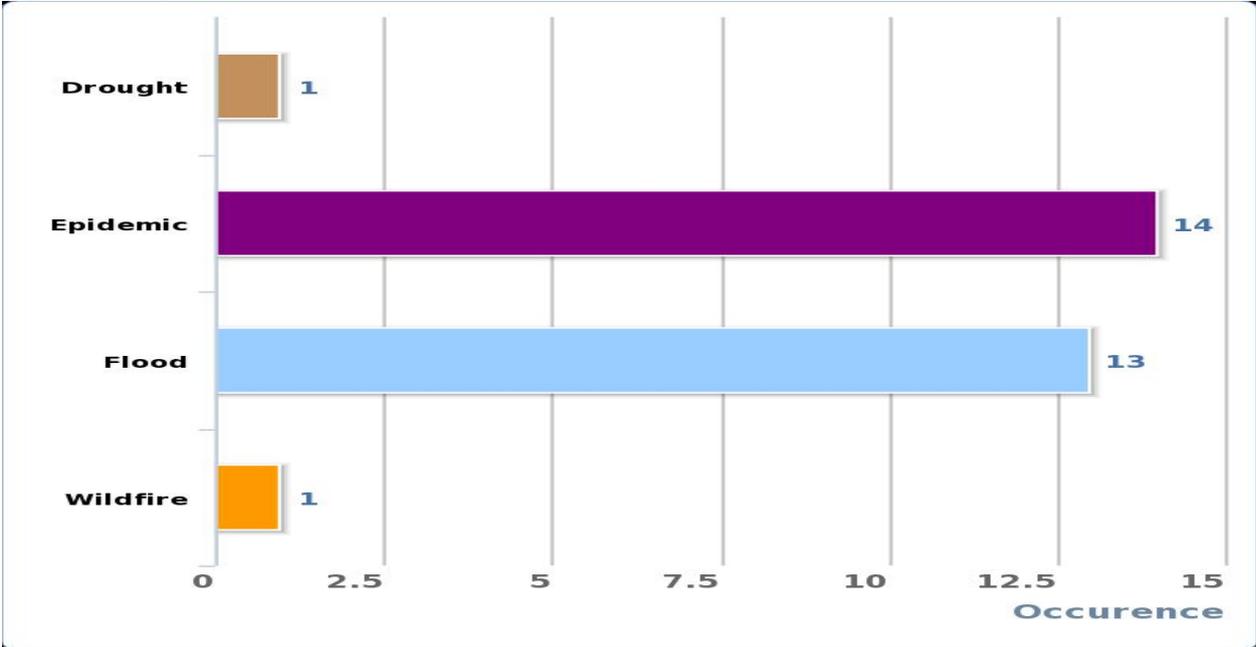
3.1 Historical Overview of Natural Disasters and Hazards in Ghana

According to Amponsah (2004), the first ever earthquake in Ghana was recorded in 1615 with last three major earthquake events occurring in 1862, 1906 and 1939. Therefore the historical overview of natural hazards and disasters could be traced to colonial times. For instance the 6.4 magnitude earthquake in June 1939 claimed 22 lives and also injured about 130 people. The earthquake also led to the destruction of properties. Apart from the June 1939 earthquake, there have been few earth tremors and several forms of natural disasters and hazards ranging from drought to bush fires to floods and epidemic (refer to Figure 1 and Tables 6 and 7).

In 1968, floods in Ghana affected about 25,000 people and this also led to the destruction of properties and lives. Other notable disasters include drought and bush fires in 1983, floods in 2006-2012, epidemic in 1996, among others (refer to Tables 1 and 2). Based on available data from EM-DAT, floods constitute a major form of disaster in Ghana. It features nine

times out of the top ten worst forms of natural disasters in terms of number of people affected. Floods affect many people in Ghana than any other natural disaster and hazard and also are the most frequently occurring natural disasters and hazards in Ghana (refer to Tables 1 and 2). In terms of people killed (lost lives), floods are second to only epidemic. For most of the reported natural disasters and hazards in Ghana in terms of number of people affected and killed, floods feature prominently. For instance, major flood events have affected about 3.81 million people and have also killed about 298 people (refer to Tables 1 and 2), since 1968 to 2011. Figure 4 shows that for the period of 1980 to 2010, there had been about 13 major flood disasters in Ghana.

Figure 4: Reported Occurrences of Natural Disasters and Hazards, 1980-2010



Source: PreventionWeb (2012), Based on Available data from EM-DAT: The OFDA/CRED International Disaster Database, Available at www.em-dat.net - Université Catholique de Louvain - Brussels – Belgium

Table 1: Top 10 Natural Disasters in Ghana for the period 1968 to 2011; sorted by numbers of total affected people

Disaster	Date	Total Number of People Affected
Drought	Oct-1983	12,500,000
Flood	14/07/1991	2,000,000
Flood	5/7/1995	700,000
Flood	10/8/2007	332,600
Flood	Sep-1999	324,602
Flood	27/06/2001	144,025
Flood	17/09/2009	139,790
Flood	26/10/2011	81,473
Flood	Jul-2008	58,000
Flood	Jul-1968	25,000

Source: CRED (2012), EM-DAT: The OFDA/CRED International Disaster Database, Available at www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium

Table 2: Top 10 Natural Disasters in Ghana for the period 1900 to 2012; sorted by numbers of killed

Disaster	Date	Number of People Killed
Epidemic	Nov-1996	411
Flood	5/7/1995	145
Epidemic	Feb-1984	103
Epidemic	Sep-2011	101
Epidemic	Oct-1998	67
Flood	10/8/2007	56
Flood	Sep-1999	52
Flood	20/06/2010	45
Epidemic	Nov-2005	40
Epidemic	2010	27

***Epidemics include: Bacterial Infectious Diseases (Cholera), Bacterial Infectious Diseases, - (Acute watery diarrhoeal syndrome), Viral Infectious Diseases (Meningitis)**

Source: CRED (2012), EM-DAT: The OFDA/CRED International Disaster Database, Available at www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium

Due to the severity of floods in August and September 2007, the Government of Ghana pronounced the three Northern regions (Northern, Upper East and Upper West regions) as a “disaster zone” on the 12 September 2007 (Government of Ghana (GoG), 2007). Floods in August and September 2007 in the three Northern regions of Ghana claimed 56 lives, comprising of 31 in Upper East region, 15 in Northern region and 10 in Upper West region. Further, the level of destruction based on available data by the Government of Ghana figures showed that over 500 kilometres of road was affected, 69 bridges were destroyed, 634 water bodies and dams were affected, and 332,548 people were reported to be

internally displaced persons (IDPs). Also 34,337 houses, about ten schools; 51 health facilities, among thousands of hectares of farms were severely affected by the floods (refer to GoG, 2007).

Figure 5: 2007 Floods in the Three Northern Regions of Ghana



Source: Ministry of the Interior (2007), *Ghana Floods*, Available at <http://www.mint.gov.gh/ghanafloods/>

Reports by United Nations Office for the Coordination of Humanitarian Affairs (OCHA) (2010) and Ghana Red Cross Society (GRCS) (2010), showed massive destruction of various levels been reported as result of the floods in June 2010 with the worse affected regions including Greater Accra, Volta, Central, Western and Eastern Regions. As at July 2010, floods had affected about 33,602 people with up to 15,000 people displaced – living in temporary shelters and 36 dead (ONCHA, 2010; GRCS, 2010). The floods washed away roads, houses, bridges, among others. The June 2010 floods affected the education, agriculture, health, water and sanitation, among other sectors of the affected regions, districts, towns and communities. According to Amidu (2010), floods disasters of 2010 in Ghana claimed a total of 57 lives made up of 33 children, 13 women and 11 men.

A United Nations report on the floods that occurred in Accra on 26 October 2011 summarized its impact as “about 43,000 people affected by the flooding, about 17,000 people lost their homes, 14 people have been killed during the flooding or as an effect of the flooding, some infrastructural damage on roads, waterways and bridges have been reported, and finally about 100 incidents of cholera have been identified during the last week after the flooding” (UNEP/OCHA, 2011).

3.2 Causes of Floods and Floods-Prone Areas in Ghana

Recent studies conducted into the actual causes of floods in Ghana attributes the phenomena to several factors. And it is the combination of these factors that make the consequences of floods severe in certain parts of the country. There is multidimensional or multi-causality factors to floods in Ghana. Therefore one dimensional solution without dealing with the complexities of other equally important factors may not work effectively. Floods come and go annually (although its magnitude differs), but its impact stays permanently.

According to Amidu (2010), the National Hydro-Meteorological Technical Committee and the National Platform on Disaster Risk Reduction and Climate Change Adaptation conducted an evaluation of all flood-prone areas in Ghana and identified several factors causing floods in Ghana. The identified causes included: “defective engineering works; building on waterways; changes in land use due to urbanization; poor land administration and planning, poor sanitation and lack of drain maintenance; obstructive activities by utility agencies; tidal influence of the sea; and inadequate funding for flood mitigation measures”.

Similar studies were conducted to ascertain flood-prone areas (communities) along major rivers and their tributaries and also provided the needed strategies in dealing floods disasters in terms of plan for timely and effective search and rescue, evacuation, and relief operation during flood emergencies. The studies showed that 774,766 persons were likely to be affected and 468,370 displaced in 1,191 communities nationwide (Amidu, 2010).

According to Karley (2009), an analysis of the rainfall time series data in Accra showed that the recent rainfall is not unusual and that could not explain the increased occurrences of flooding being experienced. Instead the causes of floods in Accra could be attributed to the “lack of, drainage facilities to collect the storm water for safe disposal. These could in turn be attributed to the ineffective planning regulations which either ignore or even condone the illegal erection of buildings and other structures on floodplains, and the unhealthy habit of dumping refuse and other solid wastes in the usually open channel drainage systems”. His study recommended “sustainable urban drainage systems” by the city as the main long-term solution to the annual occurrences of floods in Accra (Karley, 2009).

According to Rain *et al.*, (2011), several factors influence the annual occurrences of floods in Accra. The most important factor is the “massive growth of the city of Accra which has led to increased extent of impervious surfaces. Impervious surfaces are materials that prevent infiltration of water into the soils, and include roads, rooftops, sidewalks, bedrock outcrops and compacted soil. This leads to increased discharge that overloads drainage channels. Associated with this rapid urbanization are flaws in the drainage network such as undersized, unconnected or improperly channelled drains. In addition, poor development controls, limited garbage collection and disposal block channels and sewers, which slow drainage through the city. In addition, field reconnaissance has indicated substantial uncontrolled development occurs in low-lying or unsafe areas – often immediately adjacent to and even directly over drainage channels” (Rain *et al.*, (2011)).

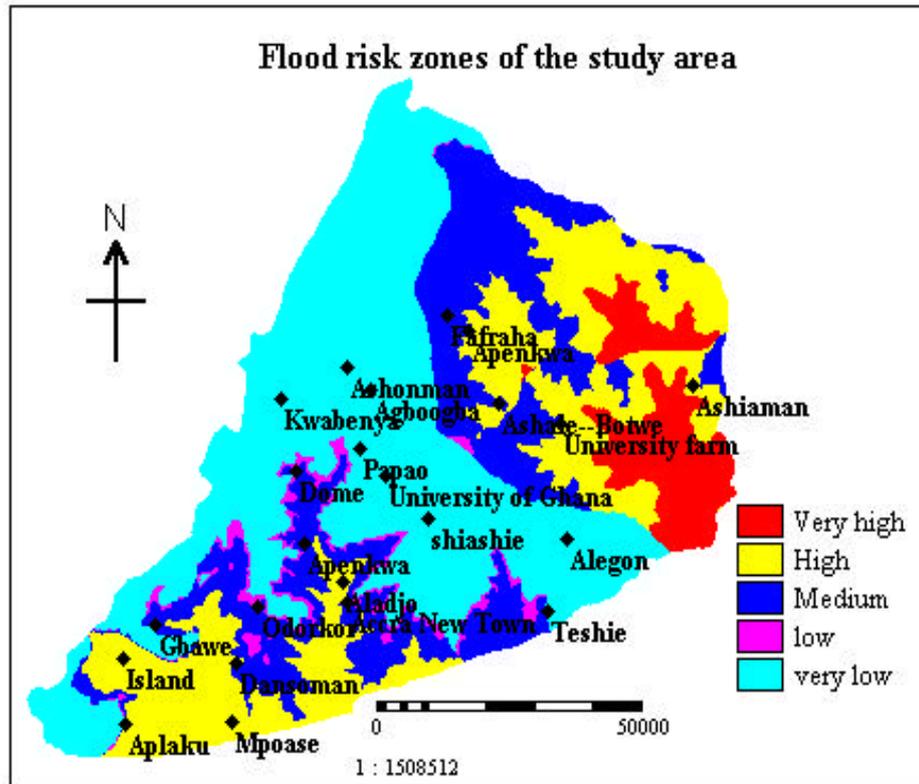
3.3 Hydrological Factors Causing Floods in Accra

This section of the study aims to analyze up to which extent the natural processes/factors could explain the phenomenon of recurrent floods in Accra and along that to highlight the linkage of purely hydrological observations to social, political and economical issues.

3.3.1 The Exposure to Floods

The topography is the first element that determines the direction of infiltration excess overland flow, and it therefore informs on the exposure to flash floods. Further infiltration rate depends mainly on the soil characteristics. Nyarko (2000) combined the Digital Elevation Model (DEM) and discharge maps using an overlay operation method with the geographic information system platform. A spatial association between the two led to a map which could be used to predict runoff rates and flood-prone zones. He termed it flood risk map. The susceptibility and the coping capacity (two important components of risk) having not been taken into account in its methodological approach; the resulting map is better a flood-prone map of Accra (refer to Figure 6).

Figure 6: Flood-Prone Zones of Accra



Source: Adapted from Nyarko (2000)

Table 3: Percentage of Flood-Prone Areas in Accra

Flood intensity	Area (m ²)	Percentage
Low	2269185000	26.85
Medium	2652485000	31.39
High	3012897500	35.66
Very high	515355000	6.1

Source: Nyarko (2000)

The high flood-prone zone covers 35.66 percent of the study area, while the low flood-prone zone covers 26.85 percent. And the potential areas likely to experience periodic floods with a given input of rainfall are mostly below the 350-meter contour. Potentially flood-prone areas in Accra are then known, and as such should be subject to adequate measures. An interesting aspect to investigate would be the planning policy regarding these flood-prone areas, and also to know who (in terms of financial capacity) lives in these areas.

3.3.2 Rainfall Time Series Data Analysis

Accra suffers from perennial flooding. Some notable but not exhaustive dates in the chronology of Accra floods since the 1950s are presented below in Table 4.

Table 4: Historical Overview of Floods in Accra

Date	Precipitation-day before flood (mm)	Precipitation-Flooding day (mm)	Sources
1955	-	-	1
27-06-1960	0	98	1
29-09-1963	0	96	1
22-06-1973	0,3	175	1, 3
1986	-	-	1,3
14-07-1991	2	157	1
4-07- 1995	0	243	1, 2, 3
27-06-2001	27	81	1,2, 3
09-06-2002	0	123	3
26-03- 2007	0	59.2	2
03-06- 2007	0	0	2
18-05-2008	-	-	2
25-10- 2011	-	157	2

Sources: 1- Twumasi *et al.* (2002), 2- Adams (2008), and 3- Rain *et al.* (2011)

Rainfalls that have provoked major floods in Accra had various magnitudes, however it has to be noticed that the lowest magnitude that provoked a major flood in Accra is 59 mm and was registered recently in 2007.

The analysis is based on daily precipitations recorded by Ghana Meteorological Agency (GMA) in Accra from 1960 to 2007 i.e. 3,478 rainfall events, and the floods events highlighted in different reports. It is then worth to remember some assumptions underlying the methodological approach in comparing the magnitude of daily rainfall magnitude.

- The first assumption is relative to the time scale. The daily record process assumes that a rain event starts and ends in a daily scale. But the reality is that a unique rain event can cover two days. Starting from a day and finishing with the second day. So that event will classically be recorded as two different events. In contrast, two rain events occurring the same day are computed as one. Other implication is the ignorance of rainfall intensity and the basin concentration time of the basin which are important in floods analysis. This could significantly affect the analysis.
- The second assumption concerns the spatial distribution of precipitation. The study area is about 240 km², whereas the precipitations are considered for only one climate station. The rainfall distribution is rarely uniform at that spatial scale, especially under tropics. Some events could then be over or underestimated and

others even not recorded. The analysis is then performed under assumption of uniform spatial repartition.

- The third assumption is relative to the measurement and recording equipment and data handling which are assumed errors-free.

Based on the minimum rainfall magnitude recorded during a flood event (59 mm), the rainfall time series from 1960 to 2007 are distributed as shown in Table 5.

Table 5: Rainfall Distribution

Magnitude (mm)	SPI	Number of Rainfall Events
<59	<2.75	3388
>59	>2.75	90

***SPI: Standardized Precipitation Index**

The standardized precipitation index (SPI) method, developed by McKee *et al.* (1993) is used for the temporal analysis of rain event (the method initially was developed for drought events analysis). This method is simple and straightforward since precipitation is the only meteorological variable used. A standardized precipitation series is calculated using the arithmetic average and the standard deviation of precipitation series. For a given X_1, X_2, X_n series, the standardized precipitation series, SPI_i , is calculated from the following equation:

$$SPI_i = \frac{X_i - X_{av}}{S_x} \quad (1)$$

Where X_{av} is the average and S_x is the standard deviation of the precipitation series. Negative values obtained from this equation indicate *precipitation deficits*, while positive values stand for *precipitation excesses*.

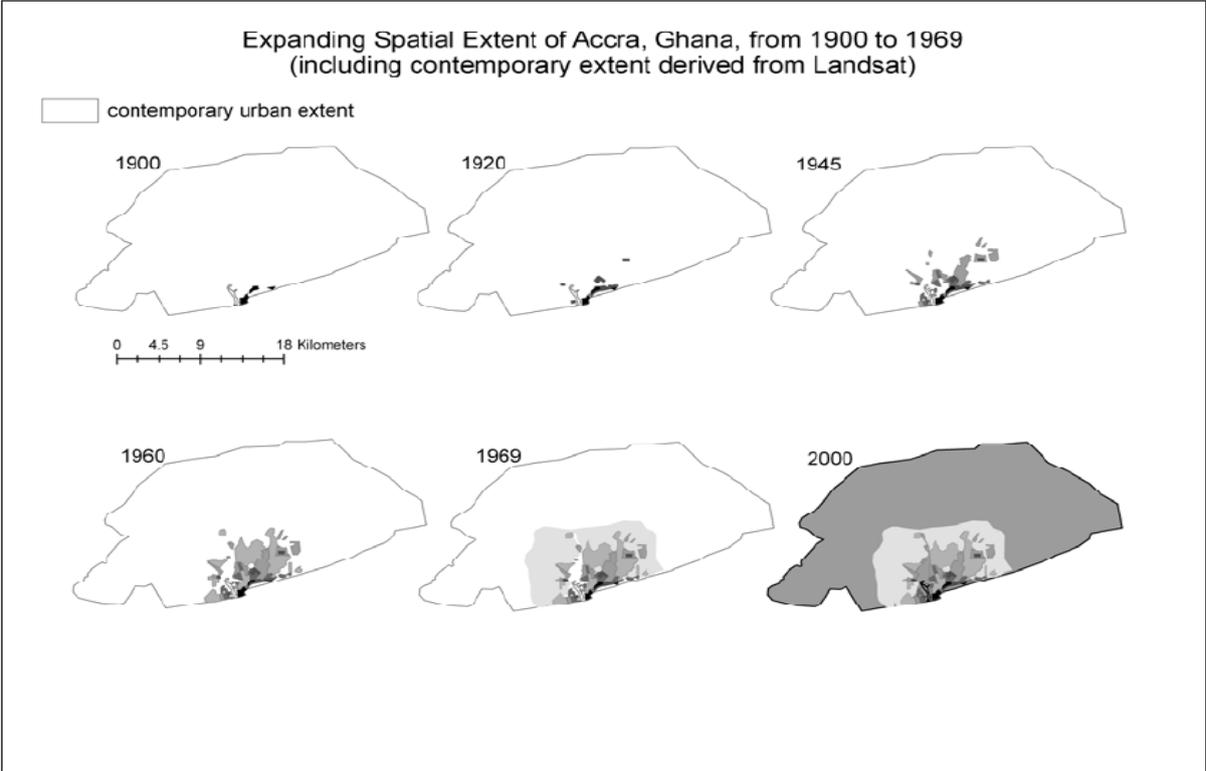
Under the aforementioned assumptions, at least 90 rainfall events should have provoked major floods in Accra. It turns out, however, according to various sources, that only a dozen major events were observed (refer to Table 4). Some flood events may have not been identified, but would be few in number. The gradual reduction of the minimum magnitude of rainfall that provokes floods is most likely to explain these results. Magnitudes which formerly had no potential to cause flooding have for others reasons progressively become potentially hazardous.

About 90 potential flooding rainfalls were recorded between 1960 and 2007, which is approximately equal to a recurrence interval of 0.52 years/flood (0.52 years flood). Although this is an estimate of the probability of the occurrence flood events, it is the basic parameter in designing drainage structures such as channel. Current design criteria normally require considering up to 5-100 year return period events depending on the context (Food and Agriculture Organization (FAO), 2007). It indicates that the potential flooding rains are logically (in theory) taken into account in the design of drainage infrastructure in Accra. As concluded by Karley (2009) the rainfall time series data in Accra showed that the recent rainfall is not unusual and that could not explain the increased occurrences of flooding being experienced. The hazardous parameter and more or less out of anthropogenic control (i.e. rain) being removed, it is important to investigate the anthropogenic side (land use, planning policy, social habits, among others).

3.3.3 Land use/cover

The dynamics of land use in Accra can be captured by figures. The evolution of the urban area of Accra shown in the Figure 7 expresses a huge dynamics in the land use.

Figure 7: The Expanding Spatial Extent of Ghana from 1900 to 2000



Source: Adapted from Rain *et al.* (2011)

This series of maps depicts growth in built-up area for Accra. The gray outline labeled 'contemporary urban extent' is derived from Landsat imagery to show the maximum boundary of physical growth in the year 2000. Such a growth in built-up area has a double consequence from the hydrological perspective.

- Reduction in flood regulating capacity of the city (catchment). The evidence of an urban expansion is the reduction of neighbouring cultivated areas, which by cascading effect leads to new clearing of forests for new agricultural lands. As on average, the infiltration rate on fields (agricultural land) is one third of the rate under natural vegetation or when fallow (Diekkrüger *et al.*, 2004) the result is the reduction of flood regulation capacity.
- Increasing in impervious areas (high runoff coefficient areas), due to built-up, which leads to a higher susceptibility to floods.

These consequences are usually mitigated by land management policies and urban planning such as protection of strategic forests, drainage system in the city, the urban allotment, among others. The factors given by Amidu (2010) are likely to be the predominant causes of floods in Accra: "defective engineering works; building on waterways; changes in land use due to urbanization; poor land administration and planning, poor sanitation and lack of drain maintenance; obstructive activities by utility agencies; tidal influence of the sea; and inadequate funding for flood mitigation measures".

3.4 Analysis of Social and Economic Damage Costs of Floods in Ghana and Accra

Over the years, floods have caused severe social and economic damages in Ghana (especially Accra) and this section presents the social and economic damage costs of floods in Ghana and Accra. The social and economic damage costs could be classified under human, physical, economic and emotional costs. This section uses several sources of data to indicate the economic damage costs of floods in Ghana and Accra. Globally three main sources of data exist; Swiss Re, Munich Re and EM-DAT of Catholic University of Louvain. The analysis of the economic damage costs of floods is mainly based on the data obtained on Ghana and Accra from the Munich Re and EM-DAT of the Catholic University of Louvain. Other sources of data include various reports of international organizations.

3.4.1 Economic Costs

The Table 6 below presents a summary of natural disasters and hazards in Ghana based on EM-DAT database. Floods-related damage costs totals about 33.5 million US dollars. This figure does not include other unaccounted cost due to inadequate information and also unreported cases especially in the rural areas. Munich Re estimated that the economic damage costs of floods that occurred in 2001 and 2002 in Accra were about US 1.5 million dollars and US 5 million dollars respectively. Further the estimated cost of floods in Ghana in 2007 was over US 40 million dollars. The actual economic damage costs of floods are difficult to obtain due to poor and uncoordinated reporting of damages as result of floods. These costs are usually under or over-estimated due to inaccurate estimations by those involved. But available evidence suggests huge costs as result of annual floods in Ghana in terms of social and economic costs. According to Karley (2009), in 2008 the estimated costs of damage of floods in July and August were more than 1 million US dollars. In Accra, total value of assets risk is estimated to be more than 6 million US dollars. Damages as result of floods are expected to increase from US 2 million dollars to US 4 million dollars in the years to come. Further NADMO estimates that floods in Accra in the summer of 2007 caused about US 0.5 million dollars of clean-up costs (Karley, 2009). Although these figures may not be huge in comparisons of effects of floods in South-East Asia, in the Ghanaian context this is a huge figure which would remain significant for some time to come. The current gains made in the Ghanaian economy could be seriously hampered due to the short-term and long-term impacts of floods disasters.

Table 6: Summarized Table of Natural Disasters and Hazards in Ghana from 1900 to 2012

Disaster	Magnitude of Disaster	Number of Events	Total No. of People Killed	Total No. of People Affected	Damage (000 US\$)
Drought	Drought	3	-	12512000	100
	ave. per event		-	4170666.7	33.3
Earthquake (seismic activity)	Earthquake (ground shaking)	1	17	-	-
	ave. per event		17	-	-
Epidemic	Unspecified	1	6	705	-
	ave. per event		6	705	-
	Bacterial Infectious Diseases	14	813	27559	-
	ave. per event		58.1	1968.5	-
	Viral Infectious Diseases	1	27	100	-
	ave. per event		27	100	-
Flood	Unspecified	1	-	25000	74700
	ave. per event		-	25000	74700
	General flood	15	404	3834990	33500
	ave. per event		26.9	255666	2233.3
Wildfire	Scrub/grassland fire	1	4	1500	-
	ave. per event		4	1500	-

Source: CRED (2012), EM-DAT: The OFDA/CRED International Disaster Database, Available at www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium

3.4.2 Human and Physical Costs

Table 7 presents the summary of natural disasters in Ghana from 1980 to 2010. Natural disasters and hazards have claimed about 1,133 human lives. From Table 6 floods alone have claimed 404 human lives; only second to epidemic. Floods in Ghana and Accra affect both government and private businesses. Floods affect many government and private buildings rendering many offices unusable during rainy season. For instance floods in 2011 and 2012 brought many parts of the city into a standstill with little business been done. Transportation business in Accra was brought to temporary halt with the main transport yard (Neoplan Transport Station at Circle) been inundated with flood water leaving passengers and transport owners, drivers, among others stranded. Floods obstruct the free flow of goods, vehicles and passengers by rendering roads and bridges unusable. Further petty traders are also affected due to poor and muddy nature of the trading grounds.

Floods directly affect many people by making them homeless. It also affects agricultural activities by destroying farm lands, crops and farm animals. It also affects the ecosystem by polluting many water-bodies with solid and liquid waste. Torrential rains and floods in Accra disrupt the activities of the telecommunication industry in terms of jamming the telephone lines and also destruction of telephone mask. Floods in recent times destroyed roads, bridges and houses making life unbearable in many parts of Accra, especially among the “slums-living” populace. Private warehouses of many businesses have been affected by recent floods destroying goods and stored products. Many businesses are affected due to submerged buildings with water, lateness to work by employees, and workers absenteeism. The direct and indirect consequences of floods affect productivity of various businesses. For example, floods in October 2011 inundated the premises of Vista 2000 Limited at the South Industrial Area, dealer of items of newsprints and other paper products causing an estimated damage costs of about GHS 6 million.

Table 7: Overview of Natural Disasters in Ghana from 1980 - 2010

Summary of Disasters	Figures/Numbers
Number of events:	29
Number of people killed:	1,133
Average killed per year:	37
Number of people affected:	16,254,250
Average affected per year:	524,331
Economic Damage (US\$ X 1,000):	33,500
Economic Damage per year (US\$ X 1,000):	1,081

Source: PreventionWeb (2012), Based on Available data from EM-DAT: The OFDA/CRED International Disaster Database, Available at www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium

Floods affect several sectors of the Ghanaian economy. The effects of floods could be felt in the education, health, agriculture, transportation, among other sectors. In terms of health, floods increase the outbreak of cholera and other diseases (such as malaria, typhoid, among others). Further floods affect the availability and accessibility of drinking water. The immediate impacts of floods include destruction of personal properties, lack of shelter, food and drinking water. This further exacerbates the already precarious economic conditions of the rural and urban poor. The occurrences of annual floods affect everyone either directly or indirectly. Floods affect the economic and social activities of the populace. But the impact of floods is not evenly distributed with urban and rural poor the worse affected. The urban and

rural poor have inadequate economic and physical capacities to deal with the immediate effects of floods. Short term effects of floods could lead to long-term impact due to delay and slow recovery in the aftermath of the event. Recent floods in Accra led to the destruction of personal properties such as fridges, television, cars, money, food, drinking water, among several other assets of many people.

Figure 8: Picture of 2011 Floods in Accra



Source: Myjoyonline.com (2011), Photo Gallery: Accra Floods

Figure 9: Picture of Floods in Accra, 2011



Source: Myjoyonline.com (2011), Photo Gallery: Accra Floods

Figure 10: Picture of Floods at Neoplan Station in Accra



Source: Myjoyonline.com (2011), Photo Gallery: Accra Floods

In the education sector, floods affect schools by leading to the collapse of school buildings and also submerging of school compounds with water. This affects teaching and learning in many basic and secondary schools. Recent floods in Accra in 2011 led to the ordering for the closure of several schools by the then Education Minister, Mrs Betty Mould-Iddrisu. This indicates that floods affect school enrolment and also lead to teacher absenteeism. This was done to safeguard the interest of school children in the affected areas. Parents have to keep their wards at home for fear of getting drowned by the flood water.

Recent floods have caused loss of human lives. The affected families grieved for longer periods and this affect the social well-being of people. This effect is further prolonged due primarily to the extended family system of many ethnic groups in Ghana. The recent outbreak of cholera and other diseases in Accra and other parts of Ghana could be directly linked with floods. Therefore addressing the occurrences of annual floods in Ghana, especially in Accra would have direct and indirect benefits by improving the living standards of the populace and also improving the productivity of many businesses, especially during the rainy season.

According to GoG (2007), floods have potential effect on the food production through ecological changes of water from dams for dry season farming. Further, debris from rivers and dams which mix with fertile soils presents future challenges to agricultural production.

4.1 Urbanisation, Slum Dwellers and Floods in Accra

Urbanization processes could be explained by various theories and ideologies. But for the purposes of this paper the Marxist perspective of urbanization is adapted. This is done with the view that the Marxist perspective is very applicable to the increasing trend of urbanization in Accra. Various works have been done on urbanization processes relying on Marxist theory (for example Davis, 2006; Engels, 1935; Harvey, 2008; Lefebvre, 1996 and 2003; Pithouse, 2006, 2007, and 2008). According to these perspectives there is a strong linkage between surplus products, class- phenomena and urbanization processes. “From their inception, cities have arisen through geographical and social concentrations of a surplus product. Urbanization has always been, therefore, a class phenomenon, since surpluses are extracted from somewhere and from somebody, while the control over their disbursement typically lies in a few hands. This general situation persists under capitalism, of course; but since urbanization depends on the mobilization of a surplus product, an intimate connection emerges between the development of capitalism and urbanization”(Harvey, 2008).

Thus urbanization has played a very active role in the process of absorption of the surplus product that is driven from capitalist quest for profit and so is an important stabilizer of the capitalist mode of production even on a global scale. In the USA for example – as the 'financial crisis' of 2008 has clearly shown – the housing sector was crucial for the investment of (foreign) capital. “The property market directly absorbed a great deal of surplus capital through the construction of city-centre and sub-urban homes and office spaces [...] American urban expansion partially steadied the global economy, as the US ran huge trade deficits with the rest of the world, borrowing around US 2 billion dollars a day to fuel its insatiable consumerism and the wars in Afghanistan and Iraq”(Harvey, 2008: 29). The urban surplus product absorption can be observed in cities all around the globe, especially when they seek to ascend towards the class of 'global cities' (Pithouse, 2010: 820). Increasingly as Harvey puts it “quality of urban life has become a commodity, as has the city

itself, in a world where consumerism, tourism, cultural and knowledge-based industries have become major aspects of the urban political economy” (Harvey, 2008: 31).

The broader context in which capitalist urbanization is taking place today is the hegemony of neo-liberal theory and practice worldwide. In the era of Fordism and Keynesianism, the state theoretically and practically played a special active role in macro-economic management and social integration (for example through welfare state). The neo-liberal decades since the 1980 are in contrast characterized through the underlying assumption “that self-regulating markets will generate an optimal allocation of investments and resources” (Brenner and Theodore, 2002: 5) and the application of (world) market-oriented macro-economic growth policies and the removal of welfare-states (especially in the capitalist core-states). The societies in the periphery were faced with the imposition of Structural Adjustment Programmes (SAP) “where the state again assumes a greater role, but primarily as a gatekeeper of the neo-liberal project, to ensure a stable investment climate and keep in check those marginalized during the period of roll-back neo-liberalism” (Afenah, 2009: 2, see also Peck and Tickel, 2002). According to Brenner *et al.* (2009) and Afenah (2009: 3) we can observe the inscription of neo-liberalism in the production of urban space, which implies a focus on competition instead of redistribution, a greater integration of sub- and supranational institutions in decision-making and finally 'revitalization' of the urban economy through economic liberalisation, privatisation, decentralisation and stronger fiscal discipline. In the policy sphere like Harvey puts it the neoliberal city is shaped by “developers, who are backed by finance, corporate capital and an increasingly entrepreneurially minded local state apparatus” (Harvey, 2008: 33). By increasingly joining the global competition the aim is to allure foreign production and investment capital. The herein implied wish of the urban elites and their developers – formulated for example in the phrase 'to be competitive' – means in Marxist thinking to move more and more “into line with the naked requirements of capital accumulation” (Peck and Tickel, 2002: 393). Concretely this takes shape by the so called 'regeneration' of “strategically vital city space” which means “redeveloping existing and building new consumption oriented urban space to attract the global urban elite, by reproducing perceived ideals of waterfront developments, cultural spectacles and enterprise and trade zones” (Afenah, 2009: 4).

The gap between those benefiting from these regeneration-policies and those suffering is of special interest here. Particularly in many cities of the so called 'developing world' the urban space is still like Balbo put it nearly 20 years ago "splitting into different separated parts, with the apparent formation of many 'microstates'. Wealthy neighbourhoods provided with all kinds of services, such as exclusive schools, golf courses, tennis courts and private police patrolling the area around the clock intertwine with illegal settlements where water is available only at public fountains, no sanitation system exists, electricity is pirated by a privileged few, the roads become mud streams whenever it rains..." (Balbo, 1993: 25).

One aspect to be highlighted here is the class character of this development, i.e. the negative versus positive implications for different groups living in a city. After more than 30 years of neoliberal policies we can consider, that it widely enlarged the class power of rich (urban) elites (Harvey, 2008: 32). This facet of urbanisation should be of special interest for development research. *First* because this type of research often pretends to investigate in favour of low income groups., *Secondly* because the aspect bears the question whether 'regeneration' efforts (which also include better infrastructure) driven *by an urban elite in market based urban spaces* simply can be understood as neutrally operating improvements (or 'development') for all urban inhabitants or if there can be observed negative implications for low income groups moreover.

Before applying this theoretical considerations to the city of Accra, or more precisely to the settlement of 'Old Fadama', a general hypothesis can be formulated: The re-building of slums in neoliberal manner – which from a upper class perspective could be described as 'creative destruction' – can bare negative results for the urban poor and slum dwellers for several reasons. *First* slum dwellers often are settling on land without legal titles, so that they are exposed to (forced) evictions without compensation. Second, even a "seemingly progressive proposal" to award private property right titles to slum dwellers is overlooking the vivid problem in market-societies that "the poor, beset with income insecurity and frequent financial difficulties, can easily be persuaded to trade in that asset for a relatively low cash payment. The rich typically refuse to give up their valued assets at any price..." (Harvey, 2008: 35). The literature gives several examples of what Harvey calls 'accumulation by dispossession' (Harvey, 2003a) around the globe (for Mumbai see Ramanathan, 2006 and Shukla, 2006; for Paris see Harvey, 2003b) some are market-driven (e.g. through increasingly

rising rental prices) and non-violent, some are backed by direct state violence, i.e. forced evictions. In the following example the slum dwellers could resist an eviction, but only because they were well organized and supported by a network of solidarity.

4.2 Negative Implications of Neo-Liberal Regeneration-Policies for Low-Income Groups and Slum Dwellers – The Example of the Informal Settlement 'Old Fadama' in Accra

4.2.1 The Housing Sector in Ghana

Housing supply in Ghana can be divided into a formal and informal sector. Within the formal sector public enterprises supply social housing primarily for middle class people, whereas private profit driven primarily provides housing for upper class high income groups. The informal sector – responsible for approximately 80% of the total housing supply – consists of self builders and small enterprises and is the only sphere accessible for low income groups. Despite the obvious class specific benefits (in favour of the upper and middle classes) of this housing policy the Government of Ghana (GoG) has continuously concentrated its resources towards the formal sector – due to the conviction that it is better positioned to overcome the unsatisfactory urban housing needs (Arku, 2009 and Afenah, 2009: 10).

In the dawn of the neo-liberal era in the 1980s the GoG – like many other governments around the world – implemented Structural Adjustment Programs (SAPs) in 1983 under assistance of the IMF and the World Bank Group. The policy changes with special relevance for the housing sector were support of the private real estate sector and creation of incentives to this sector to deliver social housing, the liberalization of the industry (which included building material) and land markets and finally the retirement of the state driven direct supply of public services (which included housing) (Afenah, 2009: 10). From a macro-economic perspective the SAP caused significant economic growth of the Ghanaian economy. But the housing needs of the urban poor were even less addressed than before. “The country now faces an overproduction of housing for high-income earners (built by profit motivated developers) and an underproduction of housing for low-income earners. Hence, the continued dependence on the informal sector for housing provision in urban areas” (Afenah, 2009: 10, see also Konadu-Agyemang, 2001: 32, and Arku, 2009).

4.2.2 Liberalization and the Housing Sector in Accra

The liberalization process had several effects on the demographic and housing aspects in Accra, among them the rapid growth of the urban population (Yeboah, 2000 and 2003), rising living and housing costs, introduction of user fees for social services – while wages were frozen. At the same time when – also due to received remittances – “real estate investments in the capital city account for a significant share of the high level of GDP [...] housing in Accra has become more expensive, and appears to be increasingly pricing middle and lower income groups out of the housing market, resulting in sub-standard and congested living conditions for a large majority of the city’s residents” (Buckley and Mathema, 2007: 2). This assumption is supported by an enormous rise in the price to income ratio for private sector housing for a senior civil servant since the 1980s (Konadu-Agyemang, 2001: 25). Further “a recent ranking of the cost of living in the 150 most expensive cities in the world – driven in large part by real estate prices – placed Accra 75th between Melbourne and Houston, cities in countries with per capita income, even on a purchasing power parity basis, more than ten times higher than Ghana” (Buckley and Mathema, 2007: 5-6). Together with the above mentioned poor urban planning problem this shortages of affordable housing “have directly contributed to the development of informal settlements, such as Ussher Town, Nima, Zongo, Maamobi, Labadi, Teshi and Old Fadama” (Afenah, 2009: 12).

4.2.3 'Old Fadama'-A Settlement Prone to Eviction

Old Fadama (also “Agbogbloshie”) occupies an area of 146 hectares and houses an estimated 6,000 families and 25,000-40,000 residents, therefore it is Accra’s largest informal settlement (AGFE, 2007; Grant 2006). It is situated in the very heart of Accra, near to the Central Business District (CBD). Further it is located directly beside the Odaw River and the Agbogbloshie Drain so that floods are a frequently suffered problem. The dwellers do not hold property titles of the (public owned) land they settle on. For a lot of people the slum provides opportunities to survive in capitalist urban everyday life, which is not guided by the needs of people but by capital accumulation. It is estimated that 10,000 people are earning their living from businesses in Old Fadama (Afenah, 2009: 12). The rapid population-growth of the settlement happened in the 1990s and is related to active political influence (e.g. decongestion efforts and the relocation of the yam-market to Old Fadama) and socio-

economic structures as well. According to the Advisory Group on Forced Evictions (AGFE) there are four economic conditions and social driving forces behind this growth of Old Fadama:

1. Migration from the north, due to tribal conflicts;
2. Migration from those forced out of more expensive accommodation in Accra (also middle class people), which is directly linked to the financial impact of the above mentioned SAP of 1980s;
3. The growth of the adjacent market; and
4. Needs of land by those seeking economic and business opportunities in an area free from the bureaucratic constraints and high rentals that exist in the formal market (AGFE, 2007: 54). All together, Old Fadama is a “popular residential and work place for many, due to its low rents and proximity to the city centre and central markets that provide ample income generating opportunities” (Afenah, 2009: 12).

The settlement is an over-crowded area consisting of self-built houses and lacks adequate water and sanitation facilities, so that, as already mentioned, recurring flooding is – like other infrastructural issues – a severe problem. Although these issues are primarily a problem for those suffering from the shortcomings (i.e. the slum dwellers), the Accra Metropolitan Assembly (AMA) is exploiting these facts for its interest – which, like insinuated in the theoretical considerations above, is not necessarily that of the residents of Old Fadama. The imputation of Old Fadama for being mainly responsible for the pollution of the nearby Korle Lagoon is together with the problem of the poor living conditions and the illegal status of the settlement used by Accra by the then Ministry of “Tourism and Modernisation for the Capital City” to justify an eviction of the settlement. Being informed about the diverse reasons for the pollution of the Lagoon not related to Old Fadama and available solutions to the problem without a resettlement – which is illustrated by several studies (see for example Du Plessis, 2005, Boadi and Kuitunen, 2002) – one has to ask for other drivers of the eviction threats of the city government.

The first driver is an interesting example of the sometimes ambivalent character of development efforts. According to Grant (2006), the GoG is under pressure because of “additional costs in the form of extra interest payments that are being incurred...due to

delays in completion of the Korle Lagoon Ecological Restoration Project [KLERP] project, ... [as the existing] loan terms require the removal of settlers to assist in the completion of the restoration" (ibid, 12, cited in Afenah, 2009: 14). The KLERP is funded by several international 'donors' and part of a larger environmental project called the Accra Sustainable Project, implemented by UN Habitat and the GoG (Boadi and Kuitunen, 2002).

The second driver can directly be explained by the Marxist perspective outlined above. The location of Old Fadama in the heart of Accra, direct to the CBD makes it a special case. According to the GoG the settlement "undermines urban planning efforts around the CBD. For instance, the current Strategic Planning Map designates the entire area as a green space for future recreational use" (Grant, 2006, cited in Afenah, 2009: 14). When we consider the AMA's urban regeneration strategy, which seeks to get rid of 'eyesores' like Old Fadama and finally create an environmentally sensitive and green city (Obetsebi-Lampsey) we directly remember Harveys notion of quality of urban life becoming a commodity in a world, where consumerism and tourism have become important aspects of the urban political economy. The fitting of the AMA's regeneration efforts into the above described neo-liberal urban development becomes even clearer, when we take into account the "neoliberal planning lingo" (Afenah 2009: 14) of the then Ghana's Minister of "Tourism and Modernization for the Capital City" (actually this name seems symptomatic), "The modernization of capital cities all over the world have always been viewed from the stand point of social engineering...with the primary aim of making such places most competitive and turn them into the...destination of choice for international gatherings, tourism, investment among others. Ours is no exception" (Obetsebi-Lampsey: 3).

The urban poor, their needs and their will to overcome their precarious situation do not fit into such a neoliberal agenda. This is illustrated by the way the political elites and great parts of the country's press use a derogative language to activate public opinion against Old Fadama's dwellers/residents. Both, officially and in the press the settlement is called "Sodom and Gomorrah" (Afenah, 2009: 15). Only because the settlement is socially and politically well organized and also supported by political networks from outside (see Afenah, 2009: 16). The slum was able to organize a common front against the various intents of evictions.

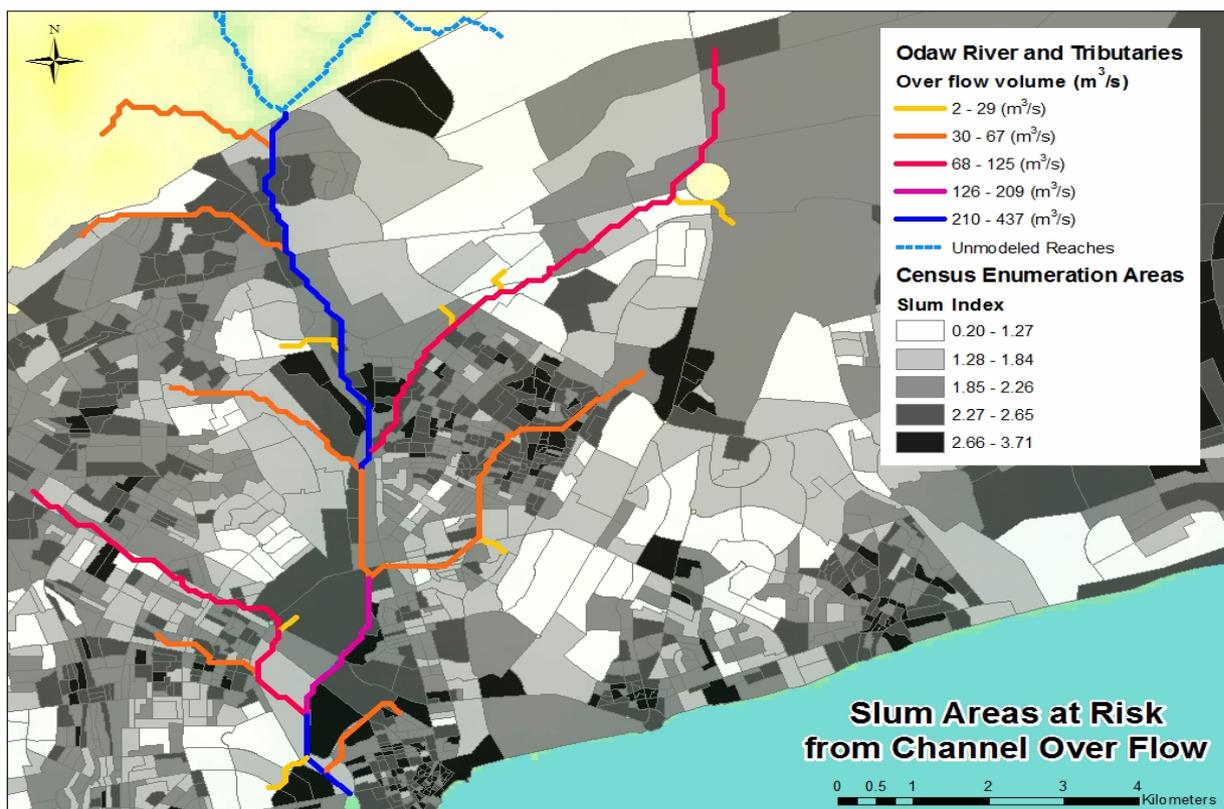
Figure 11: Floods in Slums Areas of Accra



Source: Owusu (2010), *Slum Dwellers Support Economy – Architect*, Available at yawowusu.blogspot.com

Figure 12 below presents the “estimated amounts of overflow for each channel resulting from a 10-year 24-hour rainfall total (167.6 mm). This water would overflow the stream channels and affect the immediately adjacent areas. In addition, the map displays the slum areas in Accra with the darker grays represent a higher slum index” (Rain *et al.*, 2011).

Figure 12: Slum Areas in Accra at Risk from Channel Overflow



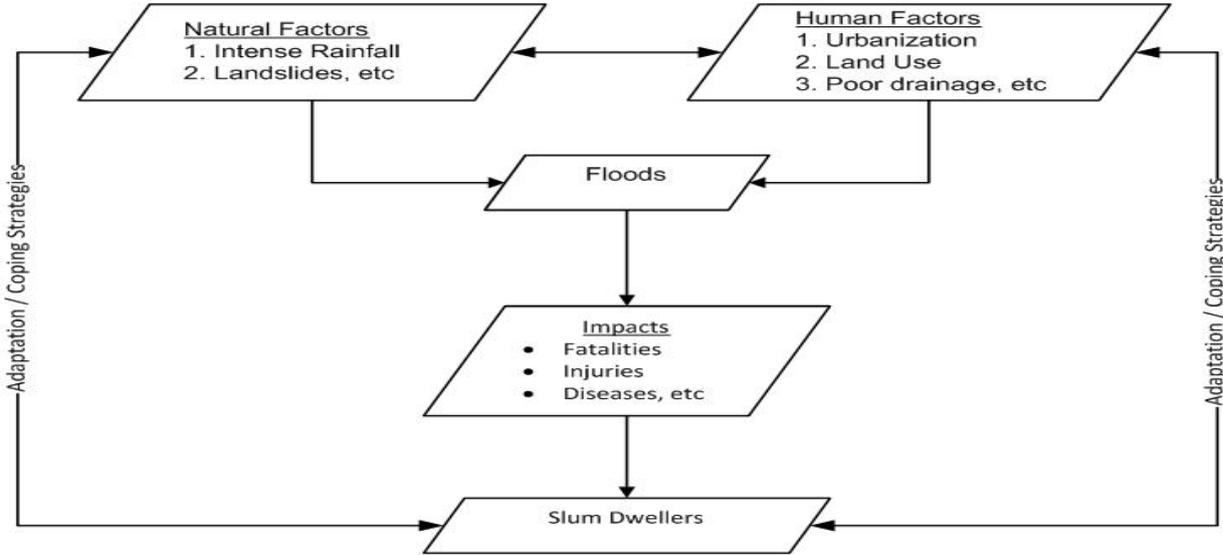
Source: Adapted from Rain *et al.*, (2011) *Accra Ghana: A City Vulnerable to Flooding and Drought-Induced Migration*, p.14

Rain *et al.* (2011) study on floods in Accra shows that slum areas in Accra have higher risk to floods from the Odaw River. Their study further showed that about 33,000 people in Accra live in Enumeration Areas that have the highest slum index. This means that higher proportion of the population of Accra that were likely to be impacted by floods are the slum dwellers who are mostly the poorest and also vulnerable (Rain *et al.* (2011). The problem could be escalated by the inflow of new migrants to the city centre and this could increase the number of people likely to be affected by floods. Slums areas in Accra include Jamestown, Usshertown, Sabon Zongo, Old Fadama (Sodom and Gomorrah), Chorkor, Abuja, among others.

4.3 Linkages between Hydrological, Economic and Political Context of Floods in Accra

Figure 13 below indicates the linkages between the hydrological, economic and political context of floods in Accra. Floods are caused by both natural and human factors. Among the natural and human factors are the hydrological factors such as exposure to floods, land use/cover, rainfall, among others. The floods disasters affect livelihoods of the populace in terms of economic and social damage costs. In Accra the social and economic damage costs are not equally distributed with the most affected populace being the slum dwellers. The urbanization processes leading to living in slums could be best explained by the “marginality approach” developed at the Centre for Development Research (ZEF). Gatzweiler *et al.*, (2011), defined marginality “as an involuntary position and condition of an individual or group at the edge of social, economic, and ecological systems, preventing the access to resources, assets, services, restraining freedom of choice, preventing the development of capabilities, and causing extreme poverty”. Building on the “marginality concept”, the slum dwellers also adapt various coping strategies and this in turn affects the human factors and natural factors responsible for floods in Accra. The coping strategies/adaptation responses also affect the severity of subsequent floods. This indicates that the activities of the slum dwellers in turn feed into the entire cycle.

Figure 13: Linkages between Hydrological, Economic and Political Context of Floods in Accra



4.4. National and International Responses to Floods in Accra and Ghana

Recent flood disasters have resulted to the distribution of relief items. These relief items were obtained from Non-Governmental Organizations (NGOs), Foreign Diplomatic Missions, the International Communities, individuals and Government of Ghana. Major floods victims over the years have received several relief items including rice, maize, roofing sheets, cooking oil, among others. Further non-governmental organizations do respond favourably to government's appeal for humanitarian aid for the flood victims.

According to Amidu (2010), the Government of Ghana assisted over 320,000 persons to move to higher grounds and also evacuated over 50,000 persons along the banks of the Rivers Oti, Ankobrah, Pra and Tano and the White, Red and Black Volta as precautionary measure against floods in 2010. These measures helped to reduce the number of flood casualties in 2010.

Emergency response in times of flood disasters in Ghana are mostly led by NADMO in conjunction of other government and quasi-government organizations such as Ministry of Interior, 48 Engineers Regiment of the Ghana Army, Ghana National Fire Service, district assemblies, volunteers and community member. In June 2010, NADMO coordinated the emergency response/search, rescue and evacuation of flood disasters victims in the Greater Accra, Central, Western and Volta Regions. A total of 25,877 people who were affected

received relief assistance in diverse forms. Further various kinds of food and non-food relief, rehabilitation and reconstruction items worth about GHS 21 million were stock-piled for timely and effective response to disasters. Some of these items were distributed to the regions and districts as part of their strategic stock (Amidu, 2010). Other activities for dealing with various forms of disaster include capacity training for NADMO staff and nation-wide public education to create awareness on the damaging consequences of floods and other forms of natural disasters and hazards.

The severe floods in 2007 to some degree had minimal impact due primarily to existing communal coping mechanisms which allowed many of the internally displaced persons (IDPs) to stay with family members and friends within the various affected communities (GoG, 2007). Therefore the existing social system of extended family system helped reduced the potential consequences. This is very common in the Ghanaian traditional system where family members and friends come to the aid of people affected by natural disasters and other forms of calamities. During period of floods, the various roles played by the informal/traditional leaders are helpful in ameliorating the potential effects through the provision of food-stuffs, shelter, and cash/money, among others. These roles are essential in reducing the number of displaced persons staying in “open” locations and public buildings. The government also compliment these efforts by providing shelter for the people left on the street/open locations. This means the Ghanaian hospitality had played a leading role in dealing with natural disasters and hazards that afflict many communities, areas and people.

Floods victims in Accra and many parts of Ghana in recent times have attracted donations from different international and local organizations. The support came from organisations such as ONCHA, Ghana Red Cross Society through DREF, USAID, among others. For instance in July 2010 an amount US 124,353 dollars was received from the International Federation of Red Cross and Red Crescent Societies through Disaster Relief Emergency Fund (DREF) to support the Ghana Red Cross Society (GRCS) in providing relief items to about 5000 beneficiaries as result of the June 2010 floods and also to improve their stock for emergency preparedness during disasters (GRCS, 2010). In 2007, the Office of United States Foreign Disaster Assistance (OFDA) purchased and distributed emergencies relief items to the tune of about US 50,000 dollars through USAID/Ghana for 2007 floods victims in the three Northern regions of Ghana (USAID, 2007).

5. Conclusions

Our analysis shows that the annual occurrences of floods in Accra, Ghana are multidimensional and also a complex situation, where prescription of one dimensional solution may not yield the required results. We therefore argue that for solutions prescribed to deal with the annual occurrences of floods in Accra to be effective, the hydrological, economic and political perspectives have to be integrated. For interventions to be effective it should target the flood prone areas and proactive measures should be taken instead of reactive measures. Again, the impacts of floods are not evenly distributed with the worse affected areas and people being the slums and urban poor. Even among the urban poor the distributional effects of floods is not even. Measures that are effective in dealing with the annual occurrences of floods have to first target the flood prone zones. The study also shows that about 90 potential flooding rainfalls have been recorded in Accra, during the period of 1960 to 2007 which is approximately equal to recurrence interval of 0.52 years/flood (0.52 years flood). The rainfalls recorded were not unusual and this means that the annual occurrences of floods in Accra are caused by several human and hydrological factors. This is what our first specific objective on hydrological perspectives on floods sought to achieve.

The second specific brought to light the social and economic damage costs of floods in Ghana (with specific reference to Accra) and this has presented the clear picture of the need to deal with the issue of annual occurrences of floods in Accra. It also highlights the gains that could be made lowering the occurrences of floods in Ghana and Accra. Floods in Ghana since 1980 to 2010 have caused an economic damaged costs of about US 33.5 million dollars. It has claimed human lives numbering over 400. Floods in Accra and Ghana affect all the sectors and reducing its occurrences should be seen as urgent need in the “forward march” of Ghana`s current development agenda.

Our third specific objective presented the issues related to urbanisation and class-contradictions in Ghana and Accra and also link it with the people and areas that are mostly affected by the devastating consequences of floods and to a lesser extent discussed the issue of human settlement through rapid urbanization and its potential effect on floods and vice versa. Prior to urban problems like floods, there are urbanization-processes and their underlying structures and forces. Worldwide, urbanization has played an active role in the

process of absorption of the surplus product that is driven from the capitalist quest for profit. Nowadays we can observe the inscription of neo-liberalism in the production of urban space. By increasingly joining the global competition the aim is to allure foreign production and investment capital, which finally means to obey to “naked” requirements of capital accumulation. Urban 'regeneration' efforts often have to do with the fulfilment of these requirements and bare negative implications for the urban poor, evicted by force or by high rental prices. The example of Old Fadama illustrates that a lot of people (also from the middle classes) are living there because in other parts of Accra the rental prices were not affordable for them. When the GoG and the AMA decided to make Accra more competitive the settlement was an obstacle to this aim and they tried to evict the whole settlement. The urban policy was driven by the requirements of capital accumulation and not by needs of the urban poor. This means addressing the challenges presented by slum dwellers should be a major concern of the city authorities.

Our last specific research objective linked all the three perspectives to show the complexities surrounding the issue of annual occurrences floods and the need adopt an integrated approach in dealing with the situation. In general spatial planning could be used to deal with the annual occurrences of floods in Accra.

6. Recommendations for Future Research

This study is mainly based on literature review and also secondary sources of data and information. These hinder the type of data available and analysis one could do. A more detailed analysis using both primary and secondary data would be more appropriate. Further a comparative study using cross-country data and time series and/or panel data analysis procedures would also be very useful.

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