GEOGRAPHICAL PATTERNS AND DISASTERS MANAGEMENT: CASE STUDY OF ALEXANDRA TOWNSHIP

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DECLARATION

I, O.M Mere, declare that this research project on: **"**GEOGRAPHICAL PATTERNS AND DISASTERS MANAGEMENT: CASE OF ALEXANDRA TOWNSHIP" is my own work and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

Signature: _____

Date: _____

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ABSTRACT

The focus of the study is to explore Geographic patterns and Disasters Management in the context of Alexadra Township situated in the Johannesburg Metro. The research evaluates if the Disaster Management Unit in Johannesburg municipality is prepared in terms of policies, community campaigns on flood disasters as well as forming organizations that will assist in times of disaster. It also referes to other South African townships with regard to where most affected townships are located, how the community is affected and how the local government responds. Disaster management infers preparedness for disaster; therefore, measures of preparation from the local government need to be in place to reduce extreme losses, pro-active policies should be in place to guide officials on how to manage disasters affecting their areas.

The South African local government as the third sphere of government is closest to the people and mostly responsible for the community's wellbeing. It is for this reason that local governments should have a strategy on how to deal with disaster. Having experienced natural disaster incidents, most countries in the world have been compelled to develop legislations, disaster management and mitigation plans that guide them on how to prevent and respond to disasters.

In view of a several unimagined disaster incidents in South Africa, the researcher maintains that the concept and practice of disaster management is rather new in South Africa, and many local governments do not have well-informed strategies to manage natural disasters. Unlimited rain caused by climate change, the position of residence and overpopulation can be major attributes to disasters hazards. Floods can easily flow into residential dwellings and destroy the property, not only that, but it can also result in the loss of lives and enhance the spread of diseases. It becomes more of tragedy as most people living in these areas are poor and have all their belongings in the same place which makes them even more vulnerable to disaster.

The location of Stjwetla settlement along the Alexandra Township riverbanks becomes relevant at this point in case. The residents of Stjwetla are exposed to flood threaths, they are very much aware of the risk associated with the low-lying

geographical patterns, overpopulation and the riverbanks. However, they still occupy the disaster prone sites because they cannot afford elsewhere. Stjwetla is an illegal settlement where no one pays rent; there is a serious lack of basic municipal services such as water and electricity in the area. The residents claim to have arrived in this area simply because Johannesburg seems to offer informal job opportunities; therefore, they anticipate good opportunities in terms of employment. Most of them are from Limpopo province and have more than twenty years residing in Stjwetla, and are still unemployed.

The community has formed rescue groups that help in times of regular disasters such as floods and fire. The rescue groups also mediate between the community and the northern Johannesburg municipal Disaster and Emergency Unit. The Disaster and Emergency Unit have formed good relations with the community leaders for support and emergency response. Other organizations, for instance Red Cross Society make regular input, by offering food and clothes to the people affected. Red Cross Society and other organizations work together with the local government to help Stjwetla residents deal better with disaster effects.

However, the residents feel that other government departments, such as social development, health and housing must assist as well. Residents are of an idea that the disaster management unit alone cannot conquer the disaster risk in Stjwetla but social development should help with psychological therapy while health department should intervene to reduce long-term effects of injuries.

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Keywords

Geographical patterns, Disaster Management; Township and Informal settlement; Alexandra Township; Jukskei River

1.1 Introduction

Different disaster events are noticed in different areas of the world, caused by different reasons, some are natural and others are man-made (ISDR, 2004:2). The research aspires to investigate the link between the floods disastrous events and geographical patterns in Alexandra Township as well as the disaster management level in the area from the Metropolitan Municipality. According to Raphael (1986:5) disaster usually means overwhelming events and circumstances that can amongst others, also be geographically related with far-flung human, material, economic or environmental losses. Skinner and Mersham (2002:12) define a disaster as a rapid interruption of ordinary operations causing serious damage to property or injury to people. Disaster is also an incident arising within the complex, which is of such a magnitude that the impacted zone extends beyond the complex boundaries into the surrounding communities and necessitates the activation of the disaster management plan (Raphael, 1986:5).

The study of Geography covers the earth's landscapes, peoples, places and environments; it is divided into two facets, namely; Physical and Human geography. Physical geography gives focus to natural features of the earth, the home of humans, the water, air, animals, and land of the planet earth. Human geography deals with human culture and its impact on the earth, languages, religion, foods, building styles, urban areas, transportation system, politics, and economies (Rosenberg, 2010). The study attends to physical geography, and provides analysis on the contribution of landscape, water and air on the disaster events in Alexandra Township.

More often, the setting of informal settlements is on high-elevated land, noted for steep hills and slopes where storm water easily flows along natural valleys and gullies (Tempelhoff *et al*., 2009:100). It is therefore; possible to relate disasters with geographical patterns of a landscape. For example, China experienced harmful floods in the Yangtze River basin in 1998 due to the high level of rainfall and degraded landscape (ISDR, 2004:56).

Floods in several parts of Africa attribute to landscape formation. Mozambique has experienced floods in a number of times, particularly floods in the year 2000 with impact on 500, 000 whereby 700 people died in the incident; most affected were those in the lower city (Christie & Hanlon, 2001:18). Zimbabwe often experiences floods especially during the rainfall season. Residential areas downstream of Kariba dam but upstream the Cabora Basa such as Guruve and Mzarabani are affected by floods because of their location. The floods in that area have led to the loss of livestock and human life; damage to crops and infrastructure with diseases such as malaria and cholera being quite common during this period (Madamombe, 2004:4). Poor road drainage systems and a lack of proper housing contribute to disasters especially in informal settlements (Tempelhoff *et al*., 2009:100).

In the city of Durban, floods caused a great damage in 1987, people were hurt and buildings were destroyed. About 400 people were left homeless and the damage to communication infrastructure, agriculture and property amounted to R400 million. These are the effects of the river changing as it flows, starting out in the mountains and flowing down in a certain path (de Villiers & Maharaj, 1994:12).

Local municipality is defined in terms of article 155 (1) of the South African constitution, Act 108 of 1996 as a category A municipality that shares municipal executive and legislative authority in its area with a category C municipality within whose area it falls. Alexandra Township falls under Johannesburg Municipality, which has the responsibility to provide basic services to the community of Alexandra Township. Basic municipal services is defined in terms of the Municipal system Act 32 of 2000 as services that are necessary to ensure an acceptable and reasonable quality of life to avoid

public health and safety complications. Johannesburg municipality incorporated with the provincial, national and private sectors to commence on Alexandra urban renewal programme designed for the provision of sustainable and affordable services by upgrading the housing environment to ensure improved living conditions (UN Habitat, 2009:4).

1.2 Problem Statement

Located on the North-eastern outskirts of Johannesburg, Alexandra Township is one of the densely populated black[1] communities in South Africa (Morris, 2004:5). Alexandra primarily serves as the first stop for rural blacks entering the city in search for jobs (Mgquba & Vogel, 2004:31). According to Wisner (2005:272), Alexandra lies on a hillside that slopes from west to east into the valley of the Jukskei River, and many of the residents occupying this area are poor foreigners including war refugees from African countries. These residents are extremely vulnerable due to poverty and lack of relational support networks.

Wisner (1995:272) indicates that Alexandra is subdivided into three parts, with striking differences, 1) Old Alexandra (situated on the west of the Jukskei River) being the poorest and most densely populated area, where housing is mainly informal dwellings and the old hostels. 2) The East bank (situated east of the Jukskei River) is an area redeveloped in the 1980s and now occupied by the middle-class community of Alexandra. This part constitutes less than 5% of Alexandra. 3) Is the far East bank now called Tsutumani. A squatter in terms of South African law is a person who lives on land, in a shelter or shack, without official permission while an informal settlement is a shelter built with material according to un-conventional methods (Cosser, 1991:14). Alexandra Township fits these classifications and thus become the focus of the study.

Research indicates that geographical problems in the Alexandra Township may lead to disastrous events because of insufficient infrastructure. Over-

[1] Blacks refers to one of the previously disadvantaged population groups (Black, Indians and Colored)

population is definitely a major challenge in Alexandra, the infrastructure is designed for a population of 70 000 people, and the influx of people over the years has caused the population to balloon to an estimated 350 000 all resident within a geographic area of 1.6 km² (GJMC, 2000). Such cramped conditions certainly lead to social, environmental and health challenges. With a growing rate of unemployment, the local living conditions deteriorated and crime increased. As space became scarce, people began to build shacks over sewer lines and manholes, resulting in blockages and rivulets of sewerage water flowing freely in the narrow lanes and streets (UN Habitat, 2009:1).

The shallow and much polluted Jukskei River with occasional outbreaks of cholera is one of the hazardous elements to the overcrowded Alexandra community. The Jukskei banks are bound to flood mainly in the regional heaviest summer rainfalls. This amounts to disaster for impoverished residents who live in makeshift shacks along the riverbanks due to overcrowding and the need for access to water for washing, drinking and cooking (GJMC, 2000).

Other infrastructure problems related to the township, place a heavy burden on the existing geographical feature and patterns. Because Alexandra's population is now four times its intended number, the sewage systems have become overloaded (Wisner, 1995:273). The Township also experiences low water pressure due to high demand on water, and in addition webs of dangerous electrical connections in the township endanger many children living in the area. Most residents have built their houses on tributaries exposed to flash floods (Wisner, 1995:274). Government's service delivery level is too low because of high population in the area; while densely populated stands caused by backyard shacks for rental pose safety hazards (GJMC, 2000; Wisner, 1995:260).

1.3 Qualitative Research Design

Qualitative research methodology is applicable for this study mainly because the methodology focuses on the perspective of the insider, talking to or observing subjects who have experienced firsthand activities, as it believes

that firsthand experience provides the most meaningful information (Leedy, 1992:144). The method attempt to gain a holistic view of the study: through records, photographs, observations, interviews and case histories and believes that it is essential to understand the meaning that persons attach to events in their environment (Leedy, 1992:144; Denscombe, 2010:304).

1.4 Hypothesis

- The null hypothesis: The geographical pattern of Alexandra Township in Johannesburg can be the source of floods disaster in that area
- The alternative hypothesis: The geographical pattern in Alexandra Township in Johannesburg cannot be the source of floods disaster in that area

1.5 Research Questions

The research explores the following questions:

- What is the meaning of the concept, geography and disaster?
- What are the impacts of geographical patterns found in South Africa/international and what are the experiences on urban disaster?
- What is the role of South African government in disaster management?
- What is the link between the floods disaster and geographical patterns of Alexandra?
- What is the role of municipal government in disaster management in terms of Alexandra Township?
- What are recommendations to limit the disaster events linked with geographical patterns in Alexandra Township?

1.6 Research Objectives

The following is an outline of objectives for the study:

- To provide a theoretical exposition of the concepts of geographical patterns and disaster;

- To indicate the impact of geographical patterns found in South Africa/internationally and their experiences on urban flood disaster;
- To indicate the role of South African government in disaster management;
- To investigate into the relationship between disaster events and geographical patterns of Alexandra Township;
- To explore the role of the municipal government in disaster management in terms of Alexandra township; and
- To give recommendations that will ensure the reduction of risk events in Alexandra township.

The following section s explain the methedology used in this study.

1.7 Research Methods

Qualitative methodology allows the researcher to understand the complexities of social and political life through people's experiences of that social reality (Bryman, 1988:52; Pierce, 2008:45). This enables the researcher to understand people and activities from a human actor's perspective; the researcher also derives meaning attributed to phenomena (Bryman, 1988:53; Mouton & Marais, 1998:164). Qualitative methods enable access to first-hand knowledge of social life, unfiltered through operational definitions or rating scales (Taylor & Borgdan, 1998:9). The researcher is then able to provide detailed descriptions, processes, relationships, systems, and people from their own frame of reference of the social settings under investigation (Bryman, 1988:63; Taylor & Borgdan, 1998:7-8; Leedy & Ormrod, 2005:94). It is pivotal for the researcher to analyse, contextualize phenomena and verify certain assumptions and theories in constructing theoretical perspectives about phenomena (Mouton & Marais, 1988:163).

1.7.1 Literature Study

Academic journal articles and various academic literature resources enabled an exploration in the theme of Disaster, Geographical patterns and Alexandra Township as conducted essentially for research. The Nexus database, SA e-

Publications and the Disaster Management Act 57 of 2002 provides added information. The North West University Library served as a housing of most sources, inter-library transfers were a great help.

1.7.2 Empirical Survey

Surveys were conducted to collect updated information or scientific investigation that is good, reliable and representative (Hart, 1993:1). Surveys provide view from the public residents, as well as to inform oneself with relevant data collected from a representative sample.

1.7.3 Semi-structured Interviews

Semi-structured interviews contribute in a sense that the researcher provides minimal guidance and allows the respondent considerable latitude to provide input concerning phenomena; this is very important if the researcher is to avoid making distorted inferences about phenomena (Bryman, 1988:46-47). During the fieldwork for this study, interviews were held with at least five government officials' respondents; three from disaster management unit in the City of Johannesburg municipality, community leaders particularly the Alexandra Township ward councillors and the community leaders. The interview then extends to government and non-government organisations; four members from identified organisations that usually assist the vulnerable community of Alexandra.

Up to twenty community members from different households were involved in the process. Their perceptions (Mouton, 1996:127, 175) are necessary to understand the impact of geographical patterns in Alexandra Township. Interviews include the unemployed and self-employed residents, who live in the old Alexandra, the informal settlement that is in the west bank of the Jukskei River. This constitutes a group of residents highly vulnerable to floods because of their poverty and minority status (Wisner, 1995:273).

1.7.4 Group Interviews

Group interviews conducted with different groups at Alexandra Township provide different opinions from different residents. Group interviews add to a very important tool of research, which allows the researcher to focus on group norms and adequately attend to issues under investigation. This type of interview provides valuable input into the study given that various perspectives on the same issue are produced (May, 1997:114).

1.7.5 Biographical list of respondents

The following table represents the list of respondents that participated in the research study within Alexandra; this includes people from government and non-governmental organizations and residents of Stjwetla that usually partake in times of disaster. The respondents took part in the interviews and questionnaires without any compulsion from the research team.

Table 1: Biographical list of respondents

Group	Males	Females	Total
Residents	7	3	10
Community leaders	3	1	4
Community and government Organizations	2	0	4
Johannesburg Metropolitan Municipality - Disaster unit -Fire and Emergency services	2	0	2
Johannesburg Metropolitan Municipality - Disaster Unit -region F	1	0	1
Total number of respondents	15	4	19

1.8 Chapter Layout

Chapter 1: Orientation and Background

The chapter gives the orientation of the study and emphasise the problem statement. The chapter also covers the objectives of the study and hypothesis.

Chapter 2: The Theoretical Exposition of Disasters and Geographic Patterns

The chapter looks into theoretical concepts of disaster and Geographic patterns as well as international experiences on urban disaster

Chapter 3: Geographical patterns and Urban Disasters in South Africa

This chapter looks at South Africa's disaster management and geographical patterns. The study explores urban areas affected by flood disaster, especially those in the informal settlements

Chapter 4: The Empirical Study of Alexandra Township in Gauteng

This chapter reports on the findings of the empirical research conducted at Alexandra Township

Chapter 5: Findings and recommendations

The chapter will also make recommendations to the city of Johannesburg, the municipality that is responsible for Alexandra Township.

2 Chapter Two: The Theoretical Exposition of Disasters and Geographic Patterns

This chapter explores the concept of Disaster, Geographic patterns and further presents International experiences of Urban disasters.

2.1 Introduction

Disasters are common in various places around the world while some are natural, human activities influence other disaster incidents. Disaster is not any one's responsibility to manage. Society expects every member to assist in times of disaster, whether affected or not. Disasters normally force the governments to seek international help as it sometimes overwhelms available resources to can help them manage or reduce the impact of such disasters. Natural disasters do manifest in a different ways in different countries, floods usually affect China and India because of their rains. On the contrary, drought is the most famous type of disaster in Africa (ISDR, 2004:31).

Chapter 1 gives a brief background of the study and the scientific method to implement the research project. This chapter provides a theoretical concept of disaster and geographical patterns. It also looks at international experiences on urban disaster with more focus on countries such as China, India, Bangladesh, Mexico, Italy, and some countries in Africa. With regard to Africa, the study looks at Mozambique, Algeria, Kenya, Cameroon, Tanzania, Congo and Zimbabwe. The purpose is to create a clear understanding before a thorough review of the study. A discussion of different elements associated with disaster such as hazards, vulnerability gives a clear understanding of disaster as a concept. A consideration of geographical patterns that can influence the impact of disaster especially in urban areas, points to the fact that landscape and climate conditions enhance floods impact in most countries.

The chapter will review different countries affected by floods because of their natural features such as the mountains, rivers and climate that influence the

rainfall land as well as the population. Each country will be analysed to give an understanding of the influence of geographical patterns on disaster.

2.2 The Theoretical concept of Disaster

According to Quarantelli (1998:58) disaster is defined in various ways depending on the country, but the core of the subject is based on economically and socially harmful events. Disaster is any event that brings great damage and inconvenience resulting into loss of life and property. The ISDR (2004:3) concurs by accepting disaster as a serious disruption of the function of a community or a society causing widespread human, material, economic or environmental losses that exceed the ability of the affected community.

There are different types of Disaster experienced in different areas. The focal point of the research is on natural disasters, mainly those caused by floods due to geographical patterns found in the area; for example, climate change, dense population and landscape. According to Irasema (2002:108) natural disasters occur worldwide but the impact is felt mostly in developing countries. This is linked to two main factors their geographical location and historical development which reflect their poor economic, political and social standing that act as factors of vulnerability to natural disasters.

Wisner *et al*. (1994:5) maintain that disasters are a complex mix of natural hazards and human action; for instance, wars relate with famine and disease. The occurrence of wars in times of drought makes it more difficult for people to cope. In this view, disaster is not a single event but a multiplicity of various geographic, climatic and natural phenomena. In less developed countries, Wisner *et al.* (1994:5) maintain that vulnerable people often suffer repeated, multiple and sometimes simultaneous shocks to their families, and their settlements. These repeated shocks erode any development, and accumulation of resources and savings. Disasters impose a slow down effect on key socio-economic factors such as human development and welfare (Albala- Bertrand, 1993:77).

At a closer domestic echelon, the greatest impact is through damage to infrastructure such as roads, housing, bridges, hospitals and schools. At a national level, the greatest impact is through displaced people prone to the risk of hunger and diseases (Wisner *et al.,* 1994:5).

Claude (1998:12) explores paradigms developed to define disaster. The first paradigm regards disaster in terms of patterns of war approach. In this sense, disasters bear a great resemblance to war, and explains disaster on external grounds with the causes of disaster sought outwardly. This paradigm uses war concepts such as arms and enemies. The patterns of war approach views human communities as organised bodies that have to react organically against aggression. The war approach paradigm submits that disasters are situations likely to elicit the reactions of human beings to aggressions and to allow adequate test of them. The logical advance to disaster is for that reason indicative of the nature where disaster research embraces a notion of an agent, whereas people harmed by floods bore an extraordinary resemblance to victims of air raids (Claude, 1998:12).

The second paradigm defines disaster as social vulnerability. The new approach to disaster reverses the hierarchy of factors and eliminates the notion of an agent. The new paradigm suggests that the causes of disaster find explanation on structural as well as contextual grounds. It further argues social risk as raised inwards and not outwards into the community, and then there is disaster. Disaster is therefore no longer qualified as a reaction but an action, a result and more precisely as a social consequence (Claude, 1998:13).

The new approach provides basis of moving from disaster as an effect to disaster being a result of the underlying logic of the community. Therefore, the conceptual framework of disaster is neither one of conflict, nor of defence against external attacks, but is the result of the upsetting of human relations. The approach shares the notion of vulnerability; it assumes that social disorder and panic remain central to disaster analysis (Claude, 1998:14).

The third paradigm looks at disaster as uncertainty; it explains disaster as a serious disorder within the community and worst of all, a disorder triggered by communication problems. Disaster is a crisis in communicating within a community, i.e. a difficulty for someone to inform and or, get information (Claude, 1998:16).

The third paradigm manifests in three points. Firstly, it links the uncertainty that occurs in the failure to define the threat facing the community through causes or effects. Secondly, the growing complexities in emerging modern communities increase uncertainty and thus upsetting the system. Thirdly, uncertainty is peaked when actors of modern societies lose their capacity to define a situation that they see as worrying and threatening through traditional understanding (Claude, 1998:16).

Claude (1998:20) indicates that there are various habitual ways of looking at disaster phenomena. While others view disaster as a sudden and an extraordinary interruption of daily life and living conditions, others accept that natural sciences and technology influence disaster (Claude, 1998:21). Quarantelli (1998:22) relies on Perrow (1984), to impress that disaster is a wrong amount of energy at the wrong time and wrong place, or a self-induced resonance between technical subsystems leading to dangerous modulations and collisions.

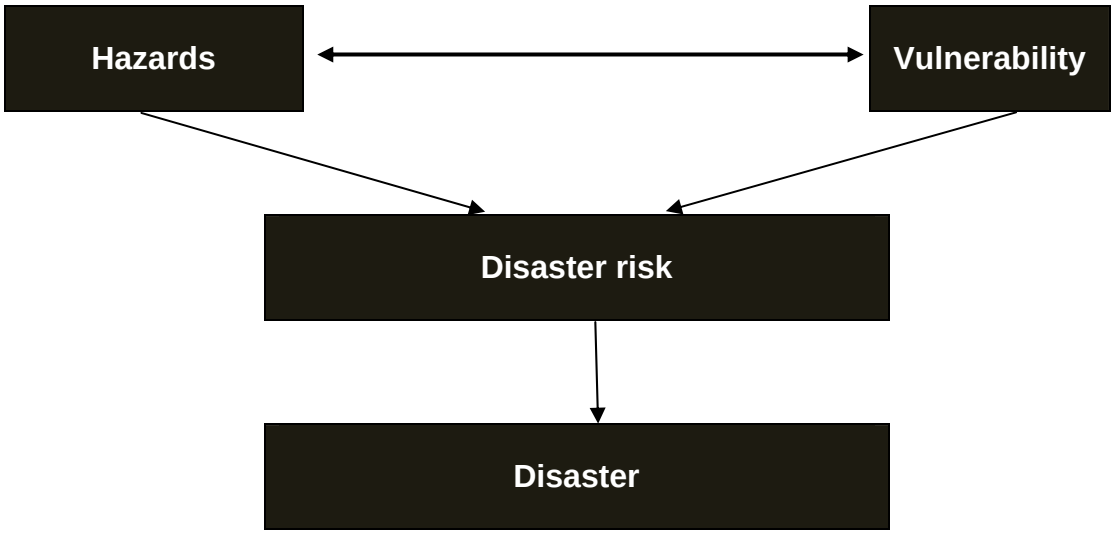
2.2.1 Disaster Risk

ISDR (2004:36) defines disaster as the probability of harmful results from the interactions between natural or human induced hazards and vulnerable conditions; disaster is therefore part of everyday life. Risk awareness is therefore important to engage in disaster risk reduction. The relevance of awareness is in ISDR (2004) arguing that the level of awareness depends on the quantity and quality of available information, as well as the difference in people's perceptions of risk. People are more vulnerable when they are not aware of the hazards that pose a threat to their lives and property. There are two elements that determine disaster risk: namely; hazards, which are potentially damaging events; and vulnerability, which is the degree of

susceptibility of elements exposed to that source (GTZ, 2002). Therefore a risk exists only if there is a vulnerability to the hazards posed by natural or human activity.

The following schematic representation in figure 1, explains the relationship between disaster risk as induced by vulnerability and hazard incidents leading to actual disasters in a given community.

Figure 1: Components of Disaster Risk



Source: (Eschborn: 2001)

The following sections provide a detailed explanation based on the disaster determinants shown in figure 1 above.

2.2.2 Natural Hazards and Disaster

Hazards are potentially damaging physical incidents that may cause the loss of life or damage to property, social and economic commotion or environmental degradation. Such incidents may originate from geologic or biological sources that represent future threats (ISDR, 2004:4). Sorensen (2006:4) concurs that natural hazards such as floods, earthquakes, volcanic eruptions and landslides are physical phenomena caused either by rapid or slow events having atmospheric, geological or hydrological origins on global, regional or national scale.

According to Abhas, *et al*., (2010:340) hazards are dynamic with highly varying potential impacts. Due to changing environments, many countries and regional organizations require greater knowledge of hazards characteristics.

Natural hazards can be divided into five categories; hydrological, geophysical, meteorological, climatological and biological. The variety of geographical coverage and types of impacts vary considerably (ISDR, 2004:37). Natural disasters are a result of the interplay of geographical processes and people, because the introduction of disaster-risk comes to the purview once people and their activities get in the way of natural processes. Geographical settings can influence the impact associated with a particular hazard. For instance, the same magnitude of disaster may hit in two different areas but have different impact or effect because of the physical exposure and human vulnerability. Physical exposure reflects the range of potentially damaging events and their statistical variability at a particular location and human vulnerability reflect the breath of social and economic tolerance to such hazardous events at the same site (Smith, 1996:12).

Natural hazards have increased in urban areas due to factors; such as population growth, urbanisation and climate change. Population growth has caused vulnerability to hazard as seen through overcrowded people in unsafe physical surroundings. Population growth strains infrastructure investment in many countries in the world. Between one third and two thirds of their population is in squatter settlements; which are exposed not only to seismic risk but also to poor water supply and sanitation. This results in endemic disease (Smith, 1996:42). Another contributing factor to hazard is in the relationship of global warming and climate change. The impact will be increased river flows inevitably affecting river management and agriculture development, which might create a shift in disease patterns of animal and human populations.

2.2.3 Poverty, Vulnerability and Disaster

Vulnerability is the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a

community to the impact of hazards (ISDR, 2004:7). The roots of disaster vulnerability are pre-existing patterns of community settlement and development, including the social order; its everyday relations to the habitat and to the larger extent; the historical circumstances (Morrow, 1999:2).

According to Smith (1996:25), about 25% of the world population lives in areas at risk from natural disasters, but the most vulnerable people are the poorest; greatest economic impact and loss of life is manifest where poverty stricken people are heavily concentrated. In urban squatter settlements, population may reach 150, 000 per km2, possibly ten times of the established areas or in rich areas. Most buildings on steep slopes or flood prone land remain exposed to strong winds because the building material is inferior, devoid of any reference to safe building codes (Smith, 1996: 25).

Morrow (1999:3) concurs with Smith (1996:1) that the poor typically live in poorly built and inadequately maintained housing; their dwellings are often in the most vulnerable locations such as floods plains. This virtually erases everything they might have accumulated (Sorensen, 2006:5). According to Morrow (1999:4), vulnerability varies with age, gender and household arrangement, the old and the young are the most vulnerable in the community because of their unstable health, relevant experience, education and skills.

Because of cultural household responsibilities given to women, it is the responsibility of women to care for the family members. It then becomes difficult for employed women to respond when disaster incidents strike.

The old, the young, women, immigrants and the minority in the community are the most vulnerable because they have no networks and sometimes excluded from the community disaster planning and preparation activities (Morrow, 1999:8). Wisner *et al*., (1994:12) posit that there are various important differences between the vulnerability of the rich and the poor. There is less disaster impact on the rich people compared to the number of poor victims of disaster in various cities. The reason could be, that money can buy design and engineering that minimises the frequency of disaster impacts even if living on an exposed slope. The rich live in hazardous environment by choice while

the poor are compelled to live in slums in order to organise livelihood activities such as proximity to workplaces, informal labour, prostitution, drug dealing, crime and crafts, crime and prostitution. People decide to live in disaster prone areas so long that implies proximity to services and opportunities necessary for day-to-day living (Wisner *et al*., 1994:12).

2.2.4 Disaster and Development

Disaster can wash away the achievements of economic development; roads, telecommunications and railway infrastructure. The disaster incident in Mozambique in 2000 bears the testimony of this assertion. Catastrophic disasters destruct fixed assets and physical capital (UNDP, 2004:20).

Disaster events have the potential to destroy social development benefits such as health, sanitation, housing and education sectors; above all, a greater burden is manifested in the simultaneous occurrence of disaster and incidents of malnutrition or national conflict (UNDP, 2004:21).

2.3 Geographic Patterns

The following section covers geographic patterns and their contribution to disaster incidents as well as the impact on humans.

2.3.1 What is Geography?

The concept of Geography derives meaning from the Greek word ‘geo’, which means earth, and ‘graphein’, which means to write, hence to write about or describe the earth. Constant changes initiated by natural forces as well as by people cause the field to remain dynamic and challenging. There are several definitions of geography, for instance; geography is the study of the areal differentiation of the earth’s surface. On the other hand, geography is the significance of differences from place to place. Although the stress is on differences, it is clear that there is implication to similarities as well. The interrelationships among different areas, in terms of their physical and biological attributes, are significant to people’s habitation on earth, as well as their understanding and appreciation of it (Doerr, 1990:1).

Geography is the study of the relation of people to their environment. All these definitions include people and environment, how people have adapted to or made modifications to their physical world while creating a uniquely human setting.

The distributional patterns on earth's surface are central to all definitions of geography, the ultimate objective of geography is to understand, adapt and adjust to the world in which we live. People's activities are not controlled by the physical environment, but natural forces and phenomena significantly affect economic and cultural development (Doerr, 1990:2). For instance as the population increases so thus the human requirements such as food and fuel, consequently, people expand the cultural landscape while modifying the physical environment (Doerr, 1990:2).

Geography appears on social and science geography categories. Geography as a science includes the study of physical components of the environment at or near the earth's surface, as well as a synthesis of the various inter-relationships that exist. The planetary relationships referred here, are those relationships that permit life; the fade and flow of seasons and the inevitable march of time. The height, slope, the relief of the land the amount and rate of erosion and deposition; the land formation; the march of temperature from place to place and season to season and lastly the ecological succession (Doerr, 1990:3).

These and other elements of the environment connect together in producing the physical world, which is the home of man and many other species like plants and animals. Geomorphology, hydrology, meteorology, climatology, and biogeography are elements of physical geography. Geomorphology is the study of landforms; Hydrology is the study of water patterns, origins and distributions and Meteorology is the study of weather. Climatology is the study of the distributions of climate over a long-term; and Biogeography is the study of ecological developments and biological distributions that exist on earth (Doerr, 1990:4).

2.3.2 Geography of Urban Disaster

According to Pelling (2003:22), urban disaster is mostly influenced by the urban growth rates. In 1990, urban dwellers were almost 600 million in Africa, Asia, Latin America and Caribbean, and most of them were living in health hazardous areas and environmental risk. About 86 over 100 largest cities in developing countries remain exposed to natural hazards (Pelling, 2003:22). The contemporary exposure of cities in Africa, Asia, Latin America and Caribbean to natural resources stems from their expansion under European colonial control (Pelling, 2003:23).

2.4 Climate Change and Urban Disaster

According to Van Niekerk (2009:13), increasing everyday changes in human activities such as hunting, agriculture, deforestation and technology influence climate change. Technology developed many forms and sources of energy like fossil fuel and coal that release a large amount of carbon dioxide into the atmosphere. Carbon dioxide is the largest amount of gas released into the atmosphere but there are other gases such as methane generated from the production of food. The production of Methane occurs in the stomach of livestock as a subsidiary of indigestion. As societies started domesticating and adapting to certain forms of edible plants and livestock for food production, correspondingly the amount of methane increased in the atmosphere.

Alma (1993:20) is in agreement with Van Niekerk that carbon dioxide is not the only gas released into the atmosphere but methane has its own effect in the atmosphere. Alma (1993:20) argues that methane is a common product from the breakdown of organic matter, including waste. It is produced during the burning of biomass because of incomplete oxidation. Africa and other continents such as Europe, Asia and North-America experience climate change which results in some form of disaster (Van Niekerk, 2009:13).

Urban surfaces absorb significantly more solar radiation. This is because the city structural design and construction materials retain a significant amount of radiation. The concrete city surfaces have both great thermal capacity and conductivity, so that heat is stored during the day and released during the

night while in the rural area; plants act like insulating blankets that enforce lower temperatures by day and night. Urban areas also produce a large amount of artificial heat produced by industrial, commercial and domestic users. In general, urban areas experience high temperature due to densely built-up areas near the city centre and decrease markedly at the city perimeter (Goudie, 1990:277).

2.5 Infrastructure in Urban Areas and Floods Disaster

Urban development increases disaster susceptibility in various ways; cities can be associated with naturally risk locations such as floodplains. Firstly, settlement may take advantage of safe sites but subsequent growth typically spills over into the adjacent high-risk areas. Secondly, the physical process of building cities often creates or exacerbates existing environmental risk (Mitchell, 1999:27). A look at paving on watersheds for instance, it results in lower infiltration, speeds runoff and increases flood volumes. Thirdly, cities increase disaster potential because of all the concentration of wealth and people. Wealth is in the form of buildings such as commercial buildings, industrial spaces, infrastructures in the form of communication networks. Fourthly, the cities contain old buildings with outdated designs nature that fail to match contemporary principles for hazard resistance. Fifthly, most urban areas include vulnerable populations particularly concerning disaster. The most vulnerable are migrant workers who reside in foreign landscapes oblivious of disasters related with the area of their residence. They have minimal support and unable to recover in times of disaster due to poverty which is a common factor to such a group (Beall *et al.,* 2000*)*.

2.6 Floods Hazards and Urban Disaster

Floods refer to an intemperate water accumulation and flow across a land surface (Roger *et al*., 2004:7). According to Smith quoted by (Roger, 2003:44), the common cause of floods is rainfall. The floods event is often predictable with occurrence mainly in seasonal rains. Some floods are rather astonishing, with occurrence during storms whereby flash floods ensure. Geographic aspects such as topography, land use and modifications on the

river may contribute in the speed and duration as well as the flood impact. Flooding can also take different forms from relatively predictable seasonal occurrences to devastating flood events that obliterate the coping capacities of the affected (Roger, 2003:44).

Flood hazards may have varying degrees of impact, from insignificant damage to damage of catastrophic proportions (Roger *et al*., 2004:7). Floods is one of the environmental hazards that normally claims over 20,000 lives per year with negative effects on more that 75 million people worldwide (Adikari, 2010:189). Residence in slums, poor drainage conditions, settlement below flood plains and low-lying areas expose people and infrastructure to water related hazard events such as floods.

Flood disasters cause damage to property especially in urban areas. They also cause less tangible losses because of illness after floods; an outbreak of diseases is common in less developed countries with damaged sewage systems and low sanitation standards. Some other water related diseases such as malaria and typhoid may double above the endemic rate, and some disaster survivors suffer mental illness. This was evident after the Buffalo Creek, West Virginia, disaster in 1972 where over 90% of survivors were suffering from mental disorder (Smith, 196:256; Wisner *et al*., 1994:220).

Less developed and developed countries experienced a significant period of floods in the past decade due to different reasons. For instance in 1993 in the Mississippi basin and in Australia, an area twice the size of Texas was under water and in parts of eastern and central Europe in 1997 and the worst of all in 2002. This shocked not only victims but also government, planners and insurers. Flooding in less developed countries is increasingly frequent and serious in countries such as China and Bangladesh where floods occur almost every year. In Africa, Mozambique and Malawi in 2000, Ethiopia and Somalia in 1997 experienced severe floods (Wisner *et al*., 1994:201).

2.6.1 Physical Exposure of informal dwellers to floods

The smaller the drainage basin, the greater the unit depth of flood runoff and the more rapid the flow concentration into the channel is likely to be (Smith 1996:264). It is however cogent to note that, when rivers flood because of extreme rainfall and water breaks through the banks of the river, it is not a hazard if human life and infrastructure are not at peril. Pelling (2003:28, 29) points out that throughout the world, a majority of populations resident in squatter settlements are at risk of flooding and cyclones. The following picture is a good example of a geographical pattern and the disaster vulenrability aspect associated with human settlements in disaster prone areas.

Figure 2: Flood exposure of poor residences in Manila, Philippines

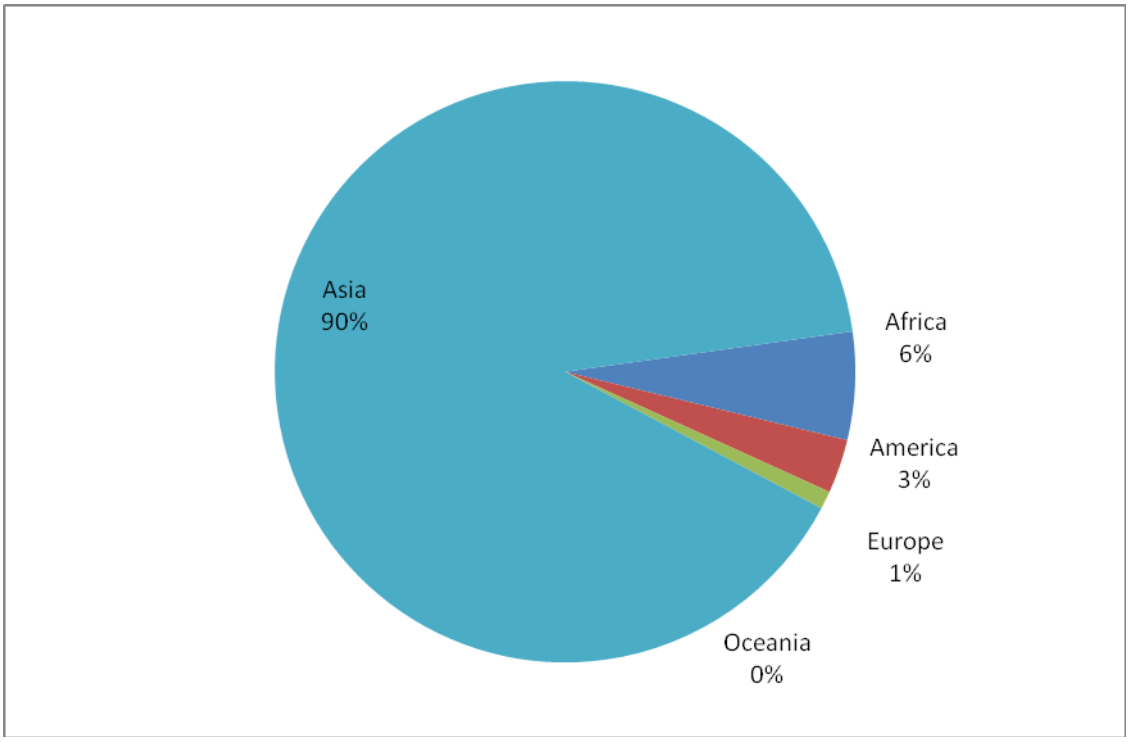
Source: (APFM, 2008:32)

This portrait illustrates how Manila as an informal settlement is physically exposed to floods hazards, mainly because of its position.

2.7 International experiences on urban Disaster

Natural disasters occur worldwide, but developing countries experience greater impact compared to more developed countries, for example; disaster impacts are lower in USA, Italy, Switzerland, and France than in countries such as China, India, Bangladesh and Mexico (Arasema, 2002:113). For instance developed countries have about 6% slums whereas developing countries have more than half of their population living in slums physically exposed to floods disaster, 80% of countries such as Ethiopia, Mozambique, Haiti and Bangladesh lives in slums (Adikari, 2010:187).

Figure 3: The ratio of water related fatalities and people affected from 1980 to 2006



Source: (Adikari, 2010:187)

This chart illustrates the impact of flood disaster as per continent since 1980 until 2006, Asia is the most vulnerable and affected continent. Africa reflects a 6% ratio as the second highest continent on the list affected by water related victims.

2.7.1 Asia

Most major cities in Asia are located in riverbanks, garbage dumping sites and city outskirts with 43% and increasing vulnerable slum populations. These regions are the most typhoon and cyclone prone in the world; therefore, they are the most vulnerable communities during calamity (Adikari *et al*., 2010:188).

Bangladesh

Because of its location at the confluence of the Ganges, Brahmaputra and Maghna Rivers, Bangladesh is incredibly prone to floods. Generally because of the runoff volume that overwhelms the drainage channel leaving very little alternatives for residents to escape or prevent floods. Almost all of the land in Bangladesh is subdued by extreme flood events. Floods bring severe damage on the economy of Bangladesh, for instance in the year 1987; floods damaged 2.06 million houses displaced 45 million people with 12.8 million houses destroyed in the year 1988 (Monirul Qader Mirza, 2002:127). The 1998 floods affected 32 million people in 52 of the 64 districts in Bangladesh; the fact that almost 60% of the country is lower than 6 meters above the sea level explains reason for prevalent flood disasters in Bangladesh (Monirul Qader Mirza, 2002:127).

Dhaka City

The Mughal Emperor Jahangir established Dhaka City in 1609 on the banks of the river Buriganga; Dhaka is currently the capital and largest city of Bangladesh (Huq & Alam, 2003:121). Various distributaries of two major rivers, Brahmaputra and Meghna enclose Dhaka city and bring periodic flooding to a population of more that 10 million people in the metropolitan area. During the 1988 flood, almost 85% of the city was covered at 4.5 meters depth disrupting city life, air travelling and communication. The vulnerability of the city is reflected in the spill over from surrounding rivers flowing to and from major rivers of the country. Floods impacts include severe and moderate damage to roads, water supply and housing with millions of people displaced.

India

Nearly 40 million hectares of land in India is prone to floods and every year nearly hectares are affected by floods (Stecko & Barber, 2007:3).

Mumbai

The 2005 floods called for attention to Indian's vulnerabilities and illuminated weaknesses in the city's disasters management. The growing risk is indirectly and directly linked to the rapid growth of the population; the population of the city and its surrounding suburban areas increased by 38%. Mumbai alone takes in 350 families every day. Due to the increase of population numbers, the state and municipal governments find it difficult to house and provide services for the growing populations. About 12 million urban poor with limited resources and entitlement rights live in severely dilapidated informal settlements or urban slums located on flood prone areas. The city's poor physical environment makes all Mumbaikers susceptible to disaster (Stecko & Barber, 2007:3).

China

According to Wisner *et al*., (1994:208) floods affect all 240 million people in all provinces equivalent to almost the entire population of the USA. People had to abandon their homes. The worst hit region was the Yangtze basin and especially the middle reaches where a number of rivers converge with the Yangtze. This area is a low-lying plain with lakes that receive records of rainfall.

Shanghai

Shanghai is located at the mouth of the Yangtze River, and consequently becomes a product of riverine and marine processes. Local tidal flows and runoff deeply influence the evolution of the landscape in Shanghai (Shebinin *et al.,* 2007:13). Shangai is also China's most populous urban area with a 200 million population wherein 16.5 million lives within the municipality and almost 10 million in the city. The floods events are a norm in cities such as

Jingdezhen; as a result, floods have killed thousands of people over the last century. In 1954 an estimated 30,000 people perished and many drowned, while in 1931 floods and subsequently diseases killed as many as 3.7 million people along the Yangtze River (Wisner *et al*., 1994:208).

Philippines and Sri Lanka

According to Van Wyk (2011:9), La Nina caused severe flooding in 2011. Asia is one of the affected continents; floods killed 57 people in Philippines, and 43 people killed in Sri Lanka while heavy rains affected more than a million people.

2.7.2 Europe

There is a considerable decline in loss of lives and injuries due to flooding in the past centuries, but now there is a new general concern about flood hazard. Severe flooding has affected much of the country during the 1990s and early 2000s due to atmospheric warming and marked change in land cover and land use (Mitchell, 2003:567).

According to ISDR (2004:49), Europe experienced unusual heavy rains reaching flood in the year 2002. Germany, Slovakia, Italy and Austria are countries affected by the flooding of major rivers where over hundreds of people died, thousands were evacuated, and losses of more than 15 billion Euros because of damage to basic infrastructure, and private sectors. Europe has recently experienced floods disasters where flash floods devastated South and central parts of Poland. This claimed 15 lives, forced 120 schools to close and jeopardy to more than 100,000 people (Sobczyk, 2010).

Netherlands

Floods were the most common disaster, between 1996 and 2005. Like a thief in the night, a 1953 flood incident occurred devoid of warning in the night with hurricane force and exceptional high tides killing 1.835 people with 3000 homes destroyed and 200 hectares of land swamped (UN-HABITAT, 2007).

2.7.3 North America

North America will very likely continue to suffer serious losses of life and properties due increased numbers of people. Field (2007:626) posits that flood hazards do not abound to coastal regions alone, but river basins such as the Fraser, Red River, and upper Missisippi have a history of major floods and thus illustrate the sensitivity and the critical importance of infrastructure design standards, land use planning and weather/flood forecasts.

Mexico City

Sergio (1999:297) explains that Mexico City is the dominant of Mexico, where it stands as the head of a growing number of large centres. Mexico City has become a paradigm of fast anarchic urban growth during the second half of the twentieth century. Mexico as a whole is affected by wide range of natural hazards, and geographical hazards but hydrological risks such as floods are also significant.

In Mexico City, external neighbourhoods are deficient in housing, infrastructure and services; the illegal occupation of the outer city is rife with squatter settlements in poorly serviced areas vulnerable to disaster (Sergio 1999:314). In June 2000, wastewater covered 80 hectares of urbanised land in the Chalco valley while floods were a result of the rupture and discharge of an open-air sewage (La Compania Canal) that collects domestic water from two municipalities in the state of Mexico.

Fernando (2007:478) points that gastrointestinal, skin and waterborne diseases, affected more than 6,700 households; piped water, road transport, electricity and food supplies.

USA

A glance at Cohen and Miller (2001:762) reveals that floods are the most frequent natural disaster in the United States, and a foremost cause of death from natural disasters.

CANADA

Floods incidents in the Red River displaced more that 25 000 people in 1997 while 119 relief workers were injured in the sandbagging activities in the 1993 midwest floods. Cohen and Miller (2001:762) argue that flood victims may be at risk of posttraumatic stress disorder and depression, which are risk factors for suicide. According to Krug *et a*l., 1998 quoted in (Cohen & Miller, 2001) suicide rates increased from 12.1 to 13.8 per 1000 000 population in the four years after floods.

2.7.4 Australia

Flood disasters characterized the hindrance of settlers in Australia; for instance Gundagai Township had to be relocated from between two rivers to a much higher land as a result of 36 per cent of its population was in flood and 250 people drowned in 1852. At least 2 231 people died between 1788 and 1996 because of floods. Australia continues to experience harsh floods accompanied with major damages and death casualties.

Gelineau and Pickard (2011:4) report that in the year 2011, a terrifying wall of water roared through the streets of the northeast Australian city, inflicting damage to city infrastructure such as offices and bridges. At least 20 people died and 78 went missing. The crisis accelerated gradually with swollen rivers overflowing their banks and engulfing towns while moving to the ocean. The high water headed next to Australians largest city. Rescue officials pushed through the agitated waters and pulled a man to safety but others including five children were unlucky and brushed off to death. About 300 people were air lifted in military helicopters to safety. This is one of the small communities in the floodwater path, but the authorities said they were preparing for flooding incidents that affected about 15 000 people in 80 suburbs.

2.7.5 Continent of Africa

Africa is on a rapid population growth and most people are poor living in squatter settlements, extreme hydro meteorological events such as floods are common in African countries. Floods affect large numbers of people with loss

of life, disease outbreaks and damage to infrastructure as seen in the past disaster incidents (UNEP, 2010:276).

2.7.5.1 North Africa

Few North Africa countries are normally affected by disasters particularly flood disasters. Algeria has a disaster experience that saw over a million people affected. Morocco features with a loss of several lives, while disasters in Egypt struck 289, 342 people (Brauch, 2003:158). As indicated earlier in the study, overpopulation, poorly built housing along flood prone regions and poorest city sectors contribute to the high disaster vulnerability (Brauch 2003:159).

Algeria

Algeria is a major country in the Mediterranean basin on the north boundary of the African tectonic plate; Algeria is located in a moderate seismic activity zone and its northern part has experienced numerous destructive earthquakes.

The most recent disasters to affect Algiers are the huge 10 November 2001 flash floods that hit Bab El Oued and other regions of the country (Benouar & Meziane, 2009:170). People damaged the forest covers between two catchments to build informal settlements of Bab El Oued on deposits of unstable fill, slope debris and quarry waste (Benouar & Meziane, 2009:171). The increase of population in hazardous urban locations is a matter of growing concern, as most houses are located on riverbanks. A flood and mudflow in Algiers on 10 November 2001 caused the loss of 712 lives with an additional 116 listed as missing, 350 were injured and about 1800 housing and 56 schools, roads, and bridges were damaged.

Egypt

Since January 2010, Egypt experienced floods as the result of heavy rainfall and winds that affected Gaza strip, Israel and Jordan. On this occasion, dozens of lives perished with infrastructure damages and hundreds of people

displaced. The Ports of Ain Sokha, Al Adbeya, El Ataka, El Zayteyat and port Tawfik had to close down because of the bad weather (Red Cross, 2010).

2.7.5.2 East Africa

Severe Floods causing more than 200 deaths and 250 people missing were experienced in the eastern part of Africa, in august 2006 (UNFCCC, 2006:17).

Kenya

Kenyan urban centre is characterized by expandable informal settlements, poor water services and sanitation infrastructure. Kisumu City is one of the oldest towns in Kenya and lies at the head of the railway from Mombasa.

The city is situated on the low-lying Kano plains by Lake Victoria and suffers floods during rainy seasons (Yitambe *et al*. 2009:93). Kenya is vulnerable to extreme flood risks especially within the Garissa, Ijara and Tanya river districts of Nairobi. Kenya experienced floods in 1997, which required a massive relief operation. The floods displaced thousands, destroyed massive properties and affected the livelihood of the riverine population.

Floods caused by excessive rainfall occur on an annual basis and cause displacement and death, especially in the western Kenya. The effects of floods normally force the riverside people to flee for their lives while flood receding irrigation and water supply systems were swept away during the peak floods. Travelling was extremely challenging; health conditions were very miserable as children were annoyed by illnesses such as cholera. For three months, people were stranded in camps (Gadain *et al*., 2006:165).

Tanzania

The majority of the urban national population resides in Dar es Salaam, the capital city of the country. Due to lack of effective urban planning about 75 per cent of Dar es Salaams population resides in unplanned settlements, which lack municipal services. The dominant house architecture is the single storey low-rise house that occupies about 50 per cent of urban land. The majority of urban dwellers in Tanzania are vulnerable because of the conditions in which

they live; therefore, hazards such as floods can cause disaster (Wisner & Pelling, 2009:128).

Floods mostly affect houses developed in low-lying areas that were either wetlands or river courses. Informal settlements experience floods during the rainy season. Floodwater spreads human excreta from toilets and uncollected solid waste into residential areas. Water stagnates in the settlements making it unhealthy for human habitation during and after the rainy seasons. Surface water and groundwater pollution are serious disaster risks in these areas as majority of the population depends on groundwater as the main source. Malaria and water borne diseases like cholera are also among the main causes of death in Tanzania (Kiunsi *et al*., 2009:138).

2.7.5.3 West Africa

The region is exposed to risk of natural disasters that include floods. During the annual rain season, increasingly unpredictable rainfalls often result in floods, displacing hundreds of thousands and destroying houses and road infrastructure. In the year 2007, floods affected more than 800 000 people, with over 44,000 displaced and 210 killed in 13 countries (Red Cross, 2010:3).

Senegal

According to Diagne and Ndiaye (2009:151) Saint-Louis is developed by the water; on three islands isolated by arms of the Senegal River, their tributaries and the site. The region is characterised by the omnipresence of water. The water table is shallow, and some low-lying areas are at altitudes of less than 2.5 meters above the sea level, consequently Saint-Louis is exposed to the outpouring of groundwater when water levels rise sharply. Since 1990, the city has suffered frequent flooding due to a combination of rainwater and peak flows of the Senegal River. Uncontrolled urban development has led to the shrinkage of zones that can absorb the floodwaters and the use of the riverbed as a dumping site for household garbage may contribute to the rise in river levels. A continuum of risk exists that includes the danger of drowning in the river, collapse of dilapidated buildings or infrastructure, tidal waves, and

also public health hazards related to poor sanitation such as the outbreaks of cholera.

Ghana

Ghana experienced torrential rain in 2001, which caused floods in Accra the capital. BBC News (2001) reported that more than 100 000 homes were destroyed and roads in Accra were under water; others destroyed. Ghana experience floods more predictable frequently in the rainy season as a routine but flash flooding might happen at any time (Songsore *et al*., 2008; Red Cross, 2007).

Nigeria

Floods destroyed housing and other infrastructure especially in poor areas of Nigeria. Water from the dam is one factor that contributes flooding, floods have a major impact because of poor drainage systems in some areas. Disaster events were registered in nine federal states of Nigeria, Lagos, Ogun, Plateau, Sekoto, Nasarrawa, Bauchi, Yobe, Borno and Kebi (Red Cross, 2007).

2.7.5.4 Central Africa

The region registered significant floods in most countries of Central Africa (Red Cross, 2008:1).

Congo

According to the Red Cross Bulletin (2007:1), Brazzaville the capital of Congo registered torrential rain, which caused flooding in the main city in 2007. Republic of Congo experiences flooding every year and this is due to torrential rain, poor drainage and the fact that the capital is situated in the riverbank of Congo River, which separate Democratic Republic of Congo and Congo Republic. DRC is one of the most affected by floods. The flooding of the river presents a serious threat to the Riparian populations, including 12 000,000 inhabitants of Kinshasa, the capital (Red Cross Bulletin, 2007).

Cameroon

Most of the floods in Cameroon were from extensive and prolonged rainfall. For instance, the Municipality of Limbe experienced excessive rains that destroyed a large area of agricultural land, urban land and surrounding suburbs, especially those poor residents. Floods had direct and indirect impacts on human, environment and economic losses (Ayanji, 2004:4).

2.7.5.5 Southern Africa

The region experiences floods mostly during the rainy season, less vegetation is more of a reason for food vulnerability in drier areas that receive heavy rainfall with little absorbtion considering the massive water brought about by flooding (UNEP, 2010:176).

Mozambique

According to Christie and Hanlon (2001:18) Tropical cyclone, Connie was no longer officially a cyclone when it hit Southern and central Mozambique on Friday to Monday (February 4-7, 2000). Nevertheless, she brought substantial local damage, huge ravines were cut into several neighbourhoods in Maputo and houses were washed away.

The heavy rains flooded the commercial centre of Maputo. Flooding on the Umbeluzi River closed the water intake and treatment station for Maputo and the neighbouring city of Matola to South Africa (Vaz, 2000:1). Mozambique government took up the offer of help from South Africa, for five fixed wing aircraft and five helicopters and rescued 2800 people. The report shows that 700 people died during this incident and 45,000 were rescued, even though there were no major outbreaks of disease and no serious malnutrition in isolated accommodation centres holding up to 500,000 people who had to flee their homes (Christie & Hanlon, 2001:20).

Zimbabwe

Zimbabwe is affected by two types of floods; first are seasonal floods that occur during the rainfall season. Cyclone induced floods is a second type that occur. In March 2003, the basin was hit again by cyclone Japhet that caused flooding in areas such as Guruve and Mzarabani because of their location. Major dams are often at full capacity during heavy rains; as a result, there are scheduled water discharges from the dams. This results in flooding incidents to settlements downstream the Cabora Basa dam. This accrues to disease outbreaks, loss of human life, livestock as well as damage to crops and infrastructure (Madamombe, 2004:4).

2.8 Disaster Risk Reduction

UNDP (2004:135) posits that disaster risk reduction is a systematic development and application of policies, strategies and practices to minimise vulnerabilities, hazards and unfolding of disaster impacts in society. UN-Habitat (2007:168) concurs and adds that disaster reduction involves the following:

- *Mitigation*

Structural and non-structural measures taken to limit the severity of frequent natural hazards

- *Preparedness*

Measures taken in advance to ensure effective response to the impact of hazards, this include, early warnings and temporary evacuations of people to a safe location

- *Response*

The intervention during or after the disaster to preserve those who are affected

- *Recovery*

Actions taken after a disaster to restore and improve the pre-disaster living conditions of the affected community, this include rehabilitation and therapy

- *Resilience*

The capacity of a community exposed to hazards to adapt and maintain an acceptable level of functioning and structure.

According to Pelling and Wisner (2009:45) Disaster risk reduction entails actions and processes that will reduce risk. Techniques, policies, politicians and the public are the main components that can build towards disaster risk reduction. The government should facilitate the policy formation and development plans so that they include risk reduction. Africa governments have begun to incorporate disaster risk reduction into development planning. Policy frameworks for disaster risk reduction are being formed worldwide; for instance South Africa formed a Disaster Management Act 57 in 2002. The Act identifies responsibilities for all government spheres regarding risk reduction.

Land use planning contributes to disaster risk reduction, almost 1 billion of the world's city dwellers live in slums and densely populated settlements exposed to natural hazards. This is more of a reason for governments to design disaster management plans. Looking at UN-Habitat (2007:206) it suffice that Brazil, Egypt, Mexico, South Africa, Thailand and Tunisia make a commitment to upgrading service provision which has led to an overall reduction in the growth of slums. Early warning systems are a vital tool to improved disaster management practices; cooperation and nurtured trust among the users of such systems enhance. the dexterity and legitimacy of national early warning systems. The quality and timeliness of such information is a key factor in saving and protecting property.

2.9 Summary

Chapter 2, provides the theoretical concept of disaster and geographical patterns. The chapter also gave a view of international experiences with regard to floods in urban areas especially in the townships.

Disasters are a complex mix of natural hazards and human action, for instance wars, famine and diseases are viewed as disasters but did not result from the natural hazards such as earthquakes, volcanoes and floods. Disasters are the results of vulnerability and hazards, natural hazard become a disaster when if affect people. This is evident in most developing countries especially in urban areas, where informal settlement are common. Bangladesh, Mumbai, China, Mexico, Haiti and Mozambique have experienced most floods disasters especially in the urban areas where informal settlements are widespread. Vulnerability is associated with socio-economic position, race, gender and age. The poor suffer more from hazards than the rich do, although vulnerability cannot be read directly off from the poverty; the two are highly correlated.

Urban floods disasters are mostly influenced by their Geographic patterns, for instance urban areas experience high temperature which influences rainfall and consequently floods spread throughout the informal settlements where most damage is experienced, due to their landscape, over flow of rivers caused by garbage that has decreased the river intake and also over population in those areas. Most of the informal settlements are built near the river for socio-economic purposes like water consumption for washing and drinking, and to maintain their informal businesses like hair salon.

These informal settlements are mostly occupied by poor people who cannot afford building material and resort to boxes, plastics and old material to construct a house, this group live with all their assets in one place hence they experience the most hazards in times of disasters.

3 Chapter Three: Geographical patterns and Urban Disasters in South Africa

This section is a contexualised preseantation of Geogrpahic patterns and Urban Disasters in South Africa; the role of South African Government in Disaster Management is also a feature i\n the discourse.

3.1 Introduction

This chapter will focus on South Africa's disaster management and geographical patterns. The study looks at urban areas affected by flood disaster, especially those in the informal settlements. This section is a historic view of geographical patterns in South Africa and the impact of flood disaster in the country per province. Informal settlements seem to have more incidents of disaster in most international countries because of their location. This chapter seeks to re-view similar cases identified in South Africa. Urban populations experience common challenges in many of the countries of the world. Population growth, poverty and poorly constructed houses appear at the top of the list as basic factors responsible for disaster vulnerability. Disaster management policies and programmes available to deal with disaster in the country will be viewed.

3.2 The Historical Geography of Informal Settlements and its physical exposure to Flood Disasters in South Africa

Since the second half of 1980, the South African urban landscape is well known for the prevalence of informal settlements on the periphery of the country's towns and cities (Tempelhoff *et al*., 2009:99). This came as the result of increased urbanization as observed on a global scale for the greater part of the twentieth century. Nevertheless, informal settlements are also the consequence of the relaxation of control measure by the former apartheid government in the 1980s (Tempelhoff *et al*., 2009:99). The flow of people into the urban environment took place at a considerably faster rate because of the greater degree of personal freedom of movement. The highly industrialized regions of Gauteng, Kwa-Zulu Natal, the Eastern Cape and the Western Cape

Peninsula have not been an exception of the growth of these settlements. Squatter camps are naturally not strong enough and do not offer secure shelter in the event of extreme weather conditions. The land on which informal settlements have been set is generally on a high elevated and is noted for the steep hills and incline down which storms water easily flows along natural valleys and gullies.

Johannesburg is one of the cities that have experienced a high influx of people seeking employment especially illegal immigrants from African countries such as Malawi, Mozambique and Zimbabwe. The immigrants are currently living in Informal settlements of areas such as Soweto, Alexandra and Ekurhuleni. Areas occupied by these groups of people are usually not in the right condition and provide minimal protection from extreme temperature. These houses are at most, built on land previously used as a dumping site, or on the flood line of the river (Mathee *et al*., 2010:10). EThekwini Municipality in KwaZulu-Natal experienced urban growth in 1980s, which perpetuates the informal settlements in the area. Nearly half of the African population in the municipality are living in informal settlements. Houses are constructed in plastics, corrugated iron and timber, as most of the residents are unemployed and poor (Marx & Charlton, 2003:5).

Policies of racial discrimination structured the national urbanisation, economic and social trends of South Africa. For instance, before 1990, access to the urban areas was restricted for the majority of the African population and only those regarded as necessary to the labour needs of whites were allowed in urban areas. The poor African population was located furthest from the urban centre in state planned townships that were unregulated and under-serviced settlements (Marx & Charlton, 2010:1).

3.3 The Climate Change and Urban Disaster in South Africa

The Republic of South Africa occupies the southern most part of the African continent, stretching attitudinally from 22 to 35 south and longitudinally from 17 to 33 East. Its surface is 1 219 090 km2. South Africa has common boundaries with the republics of Namibia, Botswana and Zimbabwe while the

Republic of Mozambique and the kingdom of Swaziland lie to the Northeast. South Africa is covered by mountains in the southeast and by Atlantic and Indian Ocean on the south, west and east of its territory (NAEA, 2010:757).

South Africa has a lengthy coastline of about 3000 km. this coastline is swept by two major ocean currents; the warm south flowing Mozambique Agulhas current and the cold Benguela. The contrast in temperature between these two currents partly accounts for important differences in climate and vegetation between the east and west coasts of South Africa. Three major subdivisions can be recognized: the eastern plateau slopes, the cape folded belt and adjacent regions and the western plateau slopes. The subtropical location accounts for the warm temperature conditions. The country also falls squarely within the subtropical belt of high pressure making it dry, with the large quantity of sunshine (NAEA, 2010:757).

The wide expanses of ocean on three sides of the country have a moderating influence on its climate. South Africa has an average annual rainfall of 464mm, compared with world average of 860mm. Studies show that 65 percent of the country receives the annual rainfall of less than 500mm, which is regarded as the complete minimum for a successful dry land. South Africa is regularly afflicted by drastic and prolonged droughts that end in severe floods (NAEA, 2010:757).

3.4 Urban Growth and Disaster in South Africa

According to (UNESCO, 2006:502), approximately 28 million people which is 59% of the overall population in South Africa live in more than 3, 000 urban communities including informal settlements. The fast growth of informal settlements in the country presents a major challenge. About 16 million residents occupy nine cities that provide 50% of the nation's work force covering only 2% of the overall surface area of the country. Recent statistics reflect that 5 million people live in informal settlements without proper water services infrastructure, which pose a major challenge to the municipalities and services providers as they carry a mandate to address urbanisation and the creation of sustainable human settlements, and job creation.

Some informal settlements are located beside the river, exposed to waterborne diseases and vulnerable to flooding. Wisner and Pelling (2009:1) also highlight that most people migrate from rural areas to growing African cities like Johannesburg, which raises a concern, as urban centres are becoming hotspots of disaster risk and makes it difficult to manage disaster risk.

3.5 Urban Poverty, Vulnerability and Disaster Hazards in South Africa

South Africa has 9 provinces with 283 local governments that include 234 local municipalities, 6 Metropolitan governments and 43 District municipalities. Limpopo and Eastern Cape provinces have the highest occurrence of poverty and deprivation while the Western Cape and Gauteng provinces are with the least (Naude 2007:8).

South Africa has an enormous number of informal inhabitants. Hundreds of people live in squalor informal squatter settlements. Most of them are wage earners in neighbouring cities who cannot afford decent housing and the cost of travelling in and out of the city burdens their livelihoods. Hence, they resort to overcrowded slums. Poor people are vulnerable to several threats such as floods because poorer people often erect their shelters in flood prone areas, which they may lack the resources to prevent (Swartz, 2010:52).

Satterthwaite (Quoted by Pelling, 2003:30) states that closer to 50% of urban settlements population live under their basic needs. This is set at a level equal to estimated average cost of acquiring the basic needs such as secure housing, subsistence food, clothing and basic education and health care. Vulnerability is an interface between exposure to the physical threats to human wellbeing and the capacity of people or community to cope with. Vulnerability has two sides: an external side of risk, shocks and stress to which an individual or household is subject to and an internal side, which is the means of coping without damaging loss. Vulnerability is nevertheless not the same as poverty but rising poverty is a contributing factor to rising vulnerability.

Drimie and Van Zyl (2005:5) affirm that most people in South Africa have few choices concerning their location and employment; they are less able to access food, to save and accumulate assets. Urban population growth in 21 urban areas in South Africa has increased from 18.4 million to 21.1 million. Informal settlements are usually located on the banks of streams or against steep hills, which have the accompanying dangers of flooding and mudslides. Access to safe water, storm water drainage and sanitation services are problems that increase vulnerability of inhabitants to infectious diseases. Mark and Rubin (2002:5) highlight those certain qualities of the location, such as settlement in the steep slopes that increase vulnerability to disaster. This resonates with South African informal settlements such as Inanda (Durban), settlements within flood planes like Alexandra (Johannesburg) and settlements close to mines dumps like East rand near Johannesburg.

Figure 4: Informal settlements in the Cape Flats

Source: (Roberts, 2005:4)

This image represents the informal settlement of Cape Flats found in Western Cape Province. The settlement is exposed to flood disaster due to its location, Cape flats is in the lower lying terrain, and as such experiences floods which will also be exacerbated by the rising of the water table in the area and also

the rise of the sea level (Roberts, 2005:4). People in this area are vulnerable. Wisner *et al*., (1994:12) describe vulnerable groups as those that find it difficult to reconstruct their livelihood after the disaster have struck as they might lack legal rights such as insurances, and social networks as a tool to survive after disaster.

3.6 The Impact of Disaster in the Development of South Africa

Natural disasters are bound up with the development status of a region, they disrupt or impair development (GTZ, 2002:8). Disasters have negative impacts on non-formal sectors that often under estimate approximate costs of disasters, mainly because small-scale disasters go unrecorded and do not receive national priority. These minor disasters affect households and individuals negatively, mostly due to the loss of income or members of the family who are breadwinners. Non-formal economies are left depressed as they lose their equipments, infrastructure, housing, lives and household's utensils. Disasters delay years and years of investments in development, for instance 1995 to 1996 floods destroyed transport and utility system in Limpopo (RSA, 1998).

Natural disasters devastate development gains hence South Africa has joined in with other countries to include disaster risk as the important part of development so as to achieve the eight millennium development goals that were agreed upon in 2000 to be achieved in 2015. These goals are set to reduce the number and effects of natural and man-made disasters. Natural disasters are the results of the occurrence of hazardous events and the vulnerability of communities to recover from the hazardous impacts. The eight set goals will direct development planning towards priority goals and also contribute in a reduction of human vulnerability to natural hazards (UNDP, 2004:26).

According to UNDP (2004:25) the millennium development goals (MDGs) are as follows

- *Eradicating extreme poverty and hunger*

Statistical analysis proves that human vulnerability to natural hazards and income poverty are largely co-dependent. Hunger can lessen the capacity of an individual to deal and cope with disaster stress while disasters can destroy assets thereby leading to hunger.

- *Achieving universal primary education*

The goal is to ensure that children everywhere complete a full course of primary education; basic literacy would help individuals to engage in the society, and broadening participation in development decision making as a central tenet of disaster risk reduction.

- *Promoting gender equality and empowering women*

Forming disaster risk policies that build on the social capital represented by women can enable a more informed policy. The facilitation of women and girls participation in the development process and efforts to reduce risk is a key priority.

- *Reducing child mortality*

Children under the age of five are normally vulnerable to the impacts of environmental hazards such as inadequate sanitation, injuries following disasters as well as psychological effects of the preceding disaster, therefore policies aiming to support the reduction of child mortality need to built in strategies to reduce disaster risk.

- *Improving maternal health*

Women, girls, children and the aged are mostly vulnerable to maternal ill health, as they do not have entitlement to household or assets. Investment in education and health will contribute to household resilience as maternal health indicators improve.

- *Combating HIV/AIDS, malaria and other diseases*

For diseases transmitted through vectors, there is a risk of epidemic following floods or drought; it applies to the destruction of water, sanitation and health care infrastructure. The spread of and the increase of HIV/AIDS and other diseases will be reversed.

- *Ensuring environmental sustainability*

The goal is to help integrate the principles of sustainable development into country policies and programmes to reverse the loss of environmental resources. Disaster management policies have to include and confront the vulnerability of slum dwellers to disaster incidents such as earthquakes, tropical cyclones, flooding and drought.

- *Developing a global partnership for development*

The international trade terms, national debt burdens, and lack of adequate technology, hinder the reduction of human vulnerability to natural hazards associated with global climate change. Therefore, these MDG aim to address less developed countries provide decent and productive work, as well as access to affordable essential drugs.

3.7 The History of Floods Disaster in South Africa

Between 1975 and 2001, South Africa experienced different types of natural disasters; of which 16 were floods disasters that led to the loss of 1 179 lives and directly affected 76 300 people while 22 835 people were left homeless. South Africa has experienced severe floods in December 1999 through to March 2000. More than a million people in the northern provinces of South Africa had no access to portable water, hundreds of lives were lost and many hundreds taken to the camps[2]. Severe damage was accounted on more than 200 bridges and several thousand kilometres of roads. The estimated costs of

[2] Temporal shelter for disaster victims

repair in South Africa and Mozambique was estimated to be more than a R1000 million (Alexander, 2002:2). Severe floods occurred in the Pietermaritzburg area and claimed 173 lives in 1995, there was a need for emergency shelter to accommodate 4 000 people.

In Ladysmith, floods caused severe damage to infrastructure 1996 amounting to R25 million. Flood damage in the Northern Province amounted to R105 million while in Mpumalanga it caused damage amounting to R500 million in the same year (Buys, 2005:1). The country experienced even more floods disaster in February 1988; North West, Free State, and Northern Cape were the most affected provinces. This incident was followed by a tropical cyclone Eline in February 2000, which swept through Limpopo, Mpumalanga and Gauteng; 50 people were killed, and structures amounting to R1 billion were damaged. In 2008, Kwazulu-Natal experienced heavy rains along its coast which caused severe flooding in June; four people died while another four went missing and 500 were left homeless (Van Wyk, 2011:8).

3.8 Recent floods experiences in South Africa

South Africa as a country has frequent occurrence of floods especially in the current year (2011). The reports given by Van Wyk (2011:8) in City Press reflect an estimate damage of flood to R600 million, and this table excludes billions of rands in flood related infrastructural damage in Gauteng and unconfirmed damage to the agricultural sector of nearly a billion. At least 70 people were declared dead in February 2011 and 33 municipalities within eight provinces declared disaster areas.

Escape (2010:2) gave a report in the Sowetan newspaper about few other incidents that occurred around the country; 30 people were displaced in Orlando West, while in Kliptown 50 houses were submerged in water, displacing between 150 to 200 people in Lenasia extension 2 and 13 had their houses flooded. Boikhutso Township in Lichtenburg had 17 people evacuated and accommodated at a town hall after their shacks were flooded. Twenty five people in Florida Lake were also evacuated and in Protea South 20 shacks

were also flooded. Not only did people lose their houses, but the Kolobeng River in Thabazimbi burst its banks and eroded the newly built bridge.

Seale and Cox (2010:1) report in The Star corroborate the Sowetan report cited above and further reported on few other events of flooding that occurred mostly in Soweto Townships. More than 200 people in Klipspruit informal settlement were evacuated after more than 100 shacks and houses were flooded while 11 other people were rescued in a vehicle trapped in a submerged bridge.

According to Van Wyk (2011:8) report in City Press, the worst hit areas in Gauteng province were Centurion, Mamelodi, Vaal, Alexandra, Soweto, Ivory Park in Tembisa, and the areas along the Klipspruit River. The South African national disaster management centre announced that more than 6 000 people were displaced across the country. Swart *et al.,* (2010:13) in Sunday Times count 1 200 people displaced only in Gauteng, and the rest in some part of the country.

Mthethwa (2010:12) also report in Sunday Times that Kwazulu-Natal was also regarded as the worst hit province by recent floods where 88 people died while 147 were injured and 22 519 people were left in dreadful straits by the floods. At least 1 472 homes were demolished and 4 799 were damaged.

Table 2: Estimated Damage per Province on 23rd February 2011

Provinces	Cost of disaster
North West	R 80.3 million
Kwazulu-Natal	R 300 million
Northen Cape	R 50 million
Eastern Cape	R 150 million

Source: (Van Wyk, 2011:8)

The above table is a representation of all damages that occurred in different South African provinces during the latest flood disaster on February 2011. Most provinces experienced the unpleasantness caused by the floods occurrences in their household; however, the general loss is in monetary terms by the government in the above table**.**

Table 3: Significant Flood events in the History of South Africa

Date	Region	Event	Details
September-1968	Port Elizabeth	Flooding	Communication links were broken, People, buses, building and cars were washed away and eleven people drowned. Damage estimated to R400 million
March 4, 1974	Central interior	Flooding	At Upington, Orange River flooded 80% of houses along the river. In Cradock 200 homes were covered.
January 25, 1981	Laingsburg	Floods	104 people drowned, 185 homes, old age home and 23 offices were destroyed
January 28, 1978	Pretoria	Floods	Homes, factories and flats were flooded and 11 people died
September 28, 1987	Natal	Floods	Homes were washed away, collapsed and buried in mud, roads were damaged. 388 deaths and 68 000 homeless

Source: (Roger, 2010:15)

The following sections provide flood disaster accounts in various South African provinces.

3.8.1 Western Cape Province

Cape Town is in the Western Cape Province, south of South Africa. Cape Town experiences a Mediterranean climate with relatively dry summers and wet winters. Despite the climate change, flood risk has been a growing

concern with the increase of urbanization where people occupy high flood risk sites. Cape Town has 56 informal settlements with 88 000 inhabitants at risk of flooding that require proactive measures of relocation. Informal settlements are densely populated and poorly designed to facilitate the drainage of surface and ground water. The living conditions are a health risk to the residents. The flood risk in informal settlements is predictable; an average winter can result in 4000 flood victims.

Settlements that are specifically at risk of flooding are highly populated areas on the Cape Flats, and that include areas of Khayelitsha, Gugulethu and Philippi. The Cape flats is a sandy, low lying and poor drainage area. In the past three winters between 32 000 and 34 400 residents have been relocated from informal settlements in Cape Town to escape flooding caused by heavy rains (Ziervogel & Smit, 2009:4). The table below explain the flood history from 1968 to 1987 in South Africa.

In 2001 between July and August, the largest flood event caused by rains displaced 44 000 people, that is 13% of all the informal settlement residents in Cape Town. The flooding of the informal settlement is brought by ground saturation and accumulation of water in a poorly drained area. Flooding can damage the informal settlements dwellings made of corrugated sheet on a wooden frame. The residents can also experience a health related impact as water may polluted after the floods. Residents might feel the economic impact as they have to spend money replacing or repairing their residences, and may lose out on many days of potential income (Ziervogel & Smit, 2009:4).

3.8.2 KwaZulu-Natal Province

The province of Kwa Zulu-Natal is situated on the eastern side of South Africa. It has a rugged topography which rises steeply from the Indian Ocean to the Drakensberg escarpment over a distance of some 300 km. The steep, deeply dissected hinterland is drained by an abundance of small rivers, each flow into the Indian Ocean via an estuary. Physiologically there is little diversity in the structure and surface of the floodplain. It a relatively flat

landscape that rises steadily from the river with abandoned meanders and highly eroded escarpment in the west (CSIR, 1989:16).

The channel pattern in the flood plain is bifurcated with an average width of about 40 meter. The river mouth is about 5 km from the floodplain, which has the total area of just less than 1 000 hectares (CSIR, 1989:16). KwaZulu-Natal is vulnerable to flooding, especially during summer season. South Africa has experienced severe floods 15 years prior 1995 and two of them were in KwaZulu-Natal (Anon, 1998:5).

3.8.2.1 The floods Disaster events in Kwa-Zulu Natal

Floods disasters are largely influenced by subtropical climate with a warm, wet summer, cool and dry winter in Kwa-Zulu Natal. Due to the steep hinterland, flow velocities during floods are particularly high. The province of Kwa-Zulu Natal experiences over 1000 mm of rainfall annually, however extremely high rainfall over a few days may occur leading to widespread flooding (CSIR, 1989:17).

Severe floods are associated with abnormal weather conditions. The region experienced floods between 28 and 30 September 1987, these were amongst the most devastating to have occurred in South Africa. The Mdloti river is situated 20 km north of Durban, The Mdloti catchment experiences a subtropical climate with an annual rainfall that varies around 1 000 mm. Heavy and prolonged rains which fell during the flood period resulted in widespread flood conditions. Within a short period, between 400 - 600 mm of rain fell in th Mdloti catchment in September 1987. This rain resulted in serious flood conditions which damaged agriculture, communications, infrastructure and property to the cost of R400 million and left 50 000 people homeless and nearly 400 people killed (Maharaj & de Villiers, 1994:9).

There is a huge population, inadequate housing on rivers known for flooding their banks for instance; floods struck Pietermaritzburg on Christmas day in 1995 where low income residents of informal settlements near Edendale Hospital were severely hit by the floods, More than 150 people drowned (Anon, 1998:4).

3.8.3 Limpopo Province

UN-Habitat and UNEP (2007:6) show that the Limpopo River basin supports approximately 14 million residents. This makes it the second populated basin in the Southern African Development Community (SADC) region after the Orange River basin. The geographical distribution patterns of human settlements in the Limpopo River basin reflect the influence of the aridity within the basin as all settlements are close to the river valley or stream banks. Limpopo Province is one of the provinces with the highest poverty rate in South Africa.

The Limpopo basin is exposed to variable rainfall and runoff that normally result in drought and floods. The climatic conditions are difficult to predict due to the variability in rainfall, this consequently pose a threat to a large proportion of the 14 million human inhabitants in the basin as well as the diverse ecosystem. The province experienced floods in February 2000. According to Masingita and Julian (2010:275) Limpopo province experienced flood disaster in February 2000. The flood resulted in more than 84 people lost their lives and 300,000 people left homeless due to the 45,000 destroyed dwellings. The destruction of road infrastructure worth more than one billion Rands and the closure of schools in the region were also noticed. Cases of illness were identified immediately after the floods, cholera, malaria and diarrhoea were amongst the diseases and other respiratory diseases (UNEP, 2007:6).

3.8.4 Gauteng Province

The following sections attend to disaster incidents that occured in the Guteng province, there is reference to some of the most recent incidents as well.

3.8.4.1 Pretoria

Itireleng is an informal settlement located in the city of Tshwane Metropolitan Municipality, in Gauteng Province. Itireleng was found in the 1940s, although it is a small area, Itireleng is one of the few informal settlements, whose boundaries have remained the same; nevertheless, new residence have been

established. The area has grown to accommodate more than 12 000 people comprising of local as well as foreigners from different places like Malawi, Mozambique and Zimbabwe (Staden, 2006:2).

The settlement is built on a steep slope and if flooding occurs, it would surge through the settlement with great force and speed. Itireleng experiences hazards such as flooding and sinkholes in the dolomite rock beneath. The lower one fifth of the settlement, is in the flood plain of a river that is dry most of the year, history suggests that it has flooded once since 1940 (Staden, 2006:2).

3.8.4.2 Ekurhuleni

Ekurhuleni is one of mostly densely populated areas in South Africa, with a total land area of about 2,000 square kilometres, which accommodates a total population of about 2.5 million. The existing settlements pattern represents the usual apartheid planning structure, where the dwellings are situated on the periphery of the urban area. Nearly a third of the approximately 2.5 million people in the area live in poverty; currently unemployment is estimated at 40%. Most people living on the urban periphery are below the poverty line, consequently forced to resort to desperate measures to survive (Cities Alliance & Sau Paulo, 2008:19).

These settlements are subject to a range of environmental problems linked with a lack of basic services, such as unhygienic conditions, smoke pollution and health related problems. Most of these settlements are situated on land not suitable for housing purposes and poses a danger to the inhabitants. They are situated on the low lying areas within the flood lines of rivers, and land underlain by high risk dolomite formations (Cities Alliance & Sau Paulo, 2008:19).

3.9 Disaster Management in South Africa

Government holds the responsibility of decision-making process such as economic policy formulation, disaster reduction policies, and then policy implementation at an administration level. Government bears the primary role

to ensure the safety and security of the community; but government cannot handle this on its own, hence civil society and private sector contribute to help in disaster risk reduction and disaster management especially at the local level (UNDP, 2004:76).

According to South African Disaster Management Act 57 of 2002, disaster management is defined as an integrated, multi-sectoral, multidisciplinary process of planning and implementing measures aimed at the prevention or reduction disaster risk. Vermark and Van Niekerk (2004:556) add the aspects of disaster mitigation, emergency preparedness, rapid and effective response as well as post disaster recovery and rehabilitation.

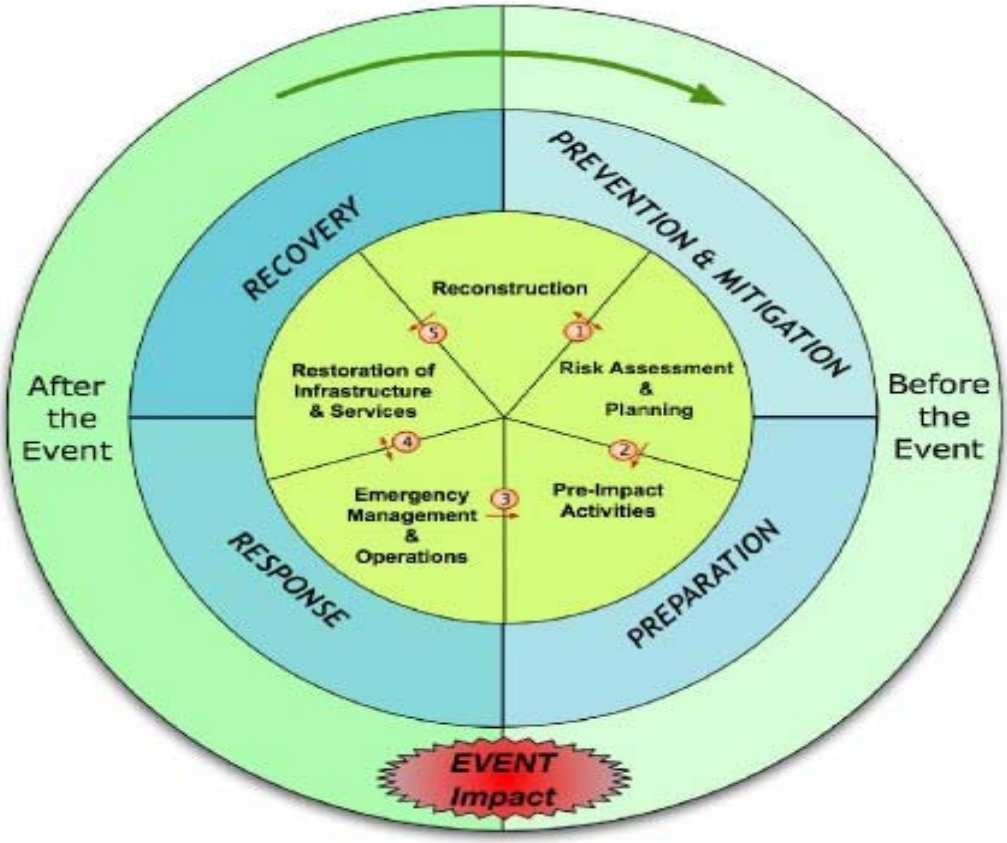
- Prevention and Mitigation- the National Disaster Management Centre, Provincial centre and Local Municipalities Centre must give guidance to organs of state, the private sectors, NGOs and communities to evaluate and prevent or reduce the risk of disasters and vulnerability of communities and increasing the capacity of the community to minimize the risk.

- Preparedness and Recovery- the National Disaster Management Centre, Provincial centre and Local Municipalities Centre must progress with the preparation and updates of disaster management plans and strategies and include the integration of these initiatives with development plans.

In attempt to reduce the vulnerability of the poor people to disasters, experienced in previous years such as the June 1994 floods in Cape flats and the devastating floods in 2000, South African government took an initiative to review the disaster management and policies that will minimize the severe disaster consequences. The Cabinet recommended for the establishment of a formal structure for disaster management. As a result, the National Disasters Management Committee was established in 1996, with the functions of coordinating and managing disaster management policy (Vermark & Van Niekerk, 2004:565).

The following schematic representation in figure 5 provides understanding on the philosophy and practice of disaster management.

Figure 5: Disaster Management Cycle



Source: (Anon, 2010)

A Green Paper on Disaster Management was developed and officially launched in 1998. This policy provides an opportunity to reflect on current approaches to a disaster management and risk reduction by all stakeholders, it further provoked thinking around future strategies that will be in keeping with international trends more relevant to future needs within the country as well as the Southern Africa Region. A White paper on Disaster Management was developed and officially launched in 2000. The policy presented an approach that puts emphasis on prevention rather than primary focus on relief and recovery. The emphasis in this policy is put more on the importance of preventing human, economic and property losses and avoiding environmental degradation. All these actions culminated in the development of the Disaster Management Act 57 of 2002, which was promulgated on the 15th of January 2003 (Buys, 2005:2; Marjanovic & Nimpuno, 2003:199).

The Disaster Management Act 57 of 2002 stipulates that there should be information management and communication among all spheres of government. This includes private sectors and the community because disaster risk management involves all of them. Information management will enable timely preparation because hazards are studied and information disseminated to the role players for early warning to prepare responses to disaster incidents. Section 15 and 20 (2) of the Disaster Management Act 57 of 2002 specifies the promotion of education and training and inclusion of disasters risk management and disaster risk avoidance in school curricula (Buys, 2005).

Government policy recommends that all municipalities must have Integrated Development Plans (IDP's), which will then incorporate the disaster management plan (Vermaak & Van Niekerk, 2004:559). An IDP is a legislative requirement, which has legal status, and therefore supersedes all other plans that guide development at local government level. The disaster management plan is to improve the capacity of the municipality to assess risks, prevent and deal with hazards, and to veto proposed development that are subject to high risk and possible disaster. South Africa has joined in with other countries to include disaster risk as the important part of development to achieve the millennium development goals.

3.10 Summary

The chapter presents the overview of urban disaster in South Africa. It is clear that South Africa is also experiencing urban disaster particularly in the informal settlements due to their location. Most informal settlements are located on the urban periphery that is usually on the riverbank or near the river streams. Most people move to urban areas in a search for employment opportunities, therefore people that normally reside in these areas are poor people that cannot afford the urban life. The Apartheid policies seems to have had an influence in this geographic distribution patterns as the policies enforced that blacks cannot reside in urban areas, unless if it is for labor benefits. Informal settlements are presented by flood disasters in times of rains and river overflow, this affect the dwellers, as they lose their

possessions, lives and also catch on diseases such as Malaria, Cholera, lung diseases and some experience psychological effects.

4 Chapter Four: The Empirical Study of Alexandra Township in Gauteng

This chapter provides an account of the research implementation within a defined study area; as well as interview comments derived from respondents during the research filedwork.

4.1 Introduction

This chapter reports on the findings of the empirical research conducted at Alexandra Township. The information is gathered from government officials who included one official from the Metropolitan Municipality disaster management center region F, two officials from emergency and disaster unit of city of Johannesburg region 18, as well as four community leaders in Alexandra West known as Stjwetla. The communication was made with relevant government and non-government organizations such as churches, South African Red Cross Society, climate change unit in Johannesburg Metropolitan to attain more information on the effect of floods in Alexandra. These organisations are regular donors in times of disasters at Alexandra. Ten members residing near the Jukskei River were also interviewed. These include self-employed individuals, unemployed individuals, immigrants and old people. The chapter starts with the description of research tools and concepts such as sampling, interviews and group interviews. This is followed by questions posed to respondents and analysis of responses.

The previous chapters gave insight on how flood disaster affects many other countries, among them, India, Australia, North America, and some European countries as well as those in African. Most of these countries seem to have been affected by floods due to inconsistent rainfall and the location of residences near the riverbank. These residences are mainly squatter camps or townships and their inhabitants reside in these areas because they are unable to afford decent sites. These are working class migrant communities from rural areas and foreign countries to work in the urban areas.

This chapter focuses on Alexandra Township in Gauteng, to examine the information raised in previous chapters. Alexandra Township is perceived to be one of the many well-known townships in South Africa especially that it is located in the fastest growing city of Johannesburg.

Floods are a regular feature during rainy seasons in the area, particularly in the western part of the Township where the river runs through. The chapter presents the results after a discussion with the residents on their experience regarding floods and also the discussion with the government officials on disaster management plan.

4.2 Research methodology

The following section outlines research methods employed to obtain data during the research project.

4.3 Literature study

Literature review has been part of this study, in compiling the information on the study and providing an intensified and reliable data. According to Bless and Smith (1995:23), literature review helps the researcher to sharpen and deepen the theoretical framework of the research, and to be more familiar with the latest developments in the area of research. Leedy (1992:87) concurs with Bless and Smith that literature review can help the researcher reveal the sources of data that the researcher thought they never existed and reveal investigations similar to the researcher's current work.

4.4 Interviews

The surveys of this study are based on semi-structured interviews. The researcher identified relevant people that can be classified as respondent's, these individuals are people found within the study area. Interview is another effective method in conducting a research hence it forms part of this specific research study. An Interview is a very flexible method that allows interviewers to probe for answers that are more specific and to reiterate questions when the misunderstandings arise in the process of the interview. Interview also

allows the interviewer to observe the nonverbal behavior and to assess the validity of the respondent's answer (Bailey, 1987:174; Denscombe, 2010:175).

Interview is very advantageous as it allows spontaneity; the interviewer can record the spontaneous answers, the respondent does not have a chance to retract from his first answer and write another (Bailey 1987:174; Allison, 1996:106). Semi-structured interview as a research method was relevant for this study seeing that the research required straight answers from the residents, municipal officials and political office bearers within the area of study. Interviews were conducted firstly with the residents within the area, and secondly with the political office bearers as well as the community organizations in the area to sustain the information given by the residents they represent. Thirdly municipal officials of City of Johannesburg and climate change officials of Johannesburg were interviewed to gain information on how disaster has been dealt with and to verify what the residents seem to be experiencing in their area.

4.4.1 Group interviews

Group interviews with a group of residents proved valuable in the case of this research project, residents provide different opinions about their experiences in terms of disaster management by the local government and their input on disaster management as the community.

4.5 Empirical survey

Observation or survey is one of the most fundamental tools in research as it allows the researcher to have a firsthand knowledge of the study area. The researcher used a small group of residents in the study area to identify and test the focal point of the study. The small group possessed general characteristics as the entire population (Bless & Smith, 1995:86; Allison *et al*. 1996:30).

According to Bless and Smith (1995:86) gathering data on a sample can assist the researcher to save time, and lessen the costs as the population might be spread over a large geographical area which would be time

consuming and expensive. Group interview help minimize such costs when conducting research. According to Leedy (1992:200) quota sampling is a variant of convenient or availability sampling and data can be collected at an arbitrary location just as in accidental sampling. The researcher consequently combined the two methods of sampling to collect data.

4.6 Data analysis

According to Leedy (1992:319), researchers should not make the fault of not exploiting the data from many angles. They should rather not be easily satisfied with the data acquired from single approach, but also avoid being judgmental because they want to prove their focal point. Researchers must understand that they are only the servant of the scientific method and might not like what the facts say, as they might not confirm their preliminary opinions. The researcher in this study made use of questionnaires, interviews, samples and observations to acquire the data. The respondent's views were collected from municipal officials, government and non-government organizations as well as the residents in order to validate the data from various parties.

4.7 Ethics in Research study

According to Bailey (1987:406), researchers should take note of the ethics of research. He explains ethics as conforming to the acceptable professional practices. The researcher in this study followed the ethics of research by requesting permission respondents to participate in the research process. No respondent was compelled to take part and no respondent's right of confidence was violated. All respondents voluntarily participated and were provided with enough information and understanding regarding the purpose of the study prior the research. The researcher did not deceive the respondents with wrong information in order to acquire the facts, especially that the study, to some extent, might involve emotions and better desires.

4.8 Challenges encountered during the study

The researcher came across some difficulties during the research. The area of study was unknown not conducive for the researcher to navigate on her own. Hence, a team of research fieldworkers would boon the research process considering the crowded nature of Alexandra Township. The researcher was much interested to explore more about the living conditions in terms of disaster supervision in the Alexandra area. The most identified problem was the finances to conduct a convincing research project, as no finance was available to make all travelling and to ensure the security of fieldworkers. A car was necessary as well as everyday provision such as food for the team working with the immediate researcher; consequently, no one was available to assist under the above-mentioned circumstances.

Contact numbers of relevant organizations and government officials were available and used but most of the responsible people were not willing to respond to such research, even though they agreed on the appointment's date while others did not answer. Other organizations and government officials felt that they were not relevant for such interview, even after reassurance that the research was just for academic purposes; they sent the researcher from pillar to post in securing the interview participants.

The timing of research was also inconvenient for the respondents such as the community leaders, ward councilors and the Metropolitan Municipality officials. Municipal officials cancelled scheduled appointments in order to respond to floods disaster incidents that engulfed Japan. They were part of the rescue team selected to fly to a mission in Japan; they were not available for at least two weeks scheduled for the appointments. The Ward councilor was unavailable as per appointment because she had to attend to the matters concerning her second election in the office. She was busy campaigning and involved in endless meetings within her area. The community leaders were also busy arranging food and other necessary packages for the community as Alexandra experienced floods in the first weeks of March.

The researcher had to postpone the entire empirical research from the month of March and scheduled to a more appropriate date in the end of August. In August only one organization and one government unit availed themselves, this was better because Metropolitan Municipality officials in disaster management unit already had their interview in March. Most employed and self-employed people living in the area of study were not available because they spent almost the whole day in the near town (Johannesburg).

Six shacks at the area of study (Stjwetla) were burned a night before the research was conducted. The residents in that area were furious and not willing to communicate with anyone especially people who come and act as if they care but offer no help. Therefore, not everyone was willing to communicate with the researcher and personal security became pivotal. The residents were busy preparing for a protest to the housing department in Johannesburg concerning the house demands, and the slow pace from the local government in dealing with Alexandra. It was fortunate that there is one civil society organisation leader who had made arrangements for the researcher to interview community residents; the appointment sessions were then honored by respondents.

4.9 Study Area

This section provides information about the physical location of Alexandra Township

4.9.1 Alexandra township area in the city of Johannesburg

South Africa's population is divided between urban and rural areas. Reporters argue that poverty is much concentrated in rural areas; however, poverty seems to be growing in large metropolitan areas due to the large number of people migrating from rural areas to live in urban informal settlements. The Apartheid segregation laws resulted in blacks occupying sites illegally hence the name squatter or informal settlements. Therefore, 30% of the population living in larger metropolitan areas is situated within informal settlements exposed to various disaster risks such as floods and fires.

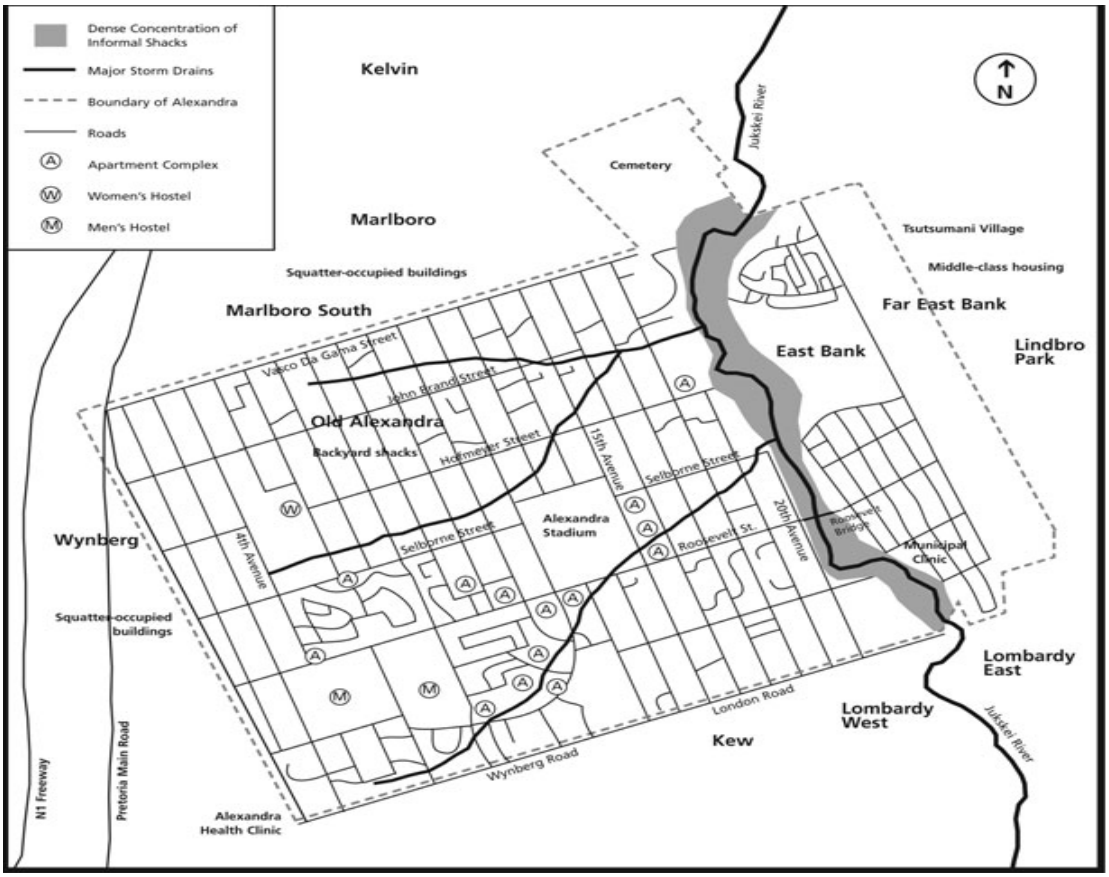
Most of the houses are congested and built on the plains near the riverbanks and close to mine dumps, which makes residents vulnerable (Mark & Rubin, 2002:4). Alexandra Township is one of the South African most densely populated townships that have experienced an influx of black young people in search for employment. This calls for more informal squatter settlements as most of these newcomers are unable to secure residence in the formal townships closer to the city centre or even afford to pay a decent rental price in the backyard of the existing townships. The poor of the poorest have no alternative but to seek shelter without an official endorsement whereby occupy Alexandra informal settlements (Murray, 2009:174; UN Habitat, 2009:1).

Alexandra Township is located about 12 km North-east of the Johannesburg city center and 3 km from up market of Kelvin, Wendywood and Sandton, the financial heart of Johannesburg (UN Habitat, 2009:1). Alexandra covers an area on a hillside that slopes from the west to the east into the Valley of Jukskei River. Squatters have occupied every square meter of open space, and this does not leave out the areas on and near the three major storm drainage that elope the hillside into the river. There are four extensive areas of shack development including those near the west bank of Jukskei River (Wisner, 2009:272).

For instance influx control and pass laws were not implemented in Alexandra; this as a result attracted a large number of people to find a place to stay even after the government's several attempts under the national party since 1948 to remove the residents to other areas. According to Mgquba and Vogel (2004:31), Alexandra Township had an estimated population of 350 000 living in an area initially designed for 70 000 people which is considered as being overcrowded. Wisner (2009:269) posits that Alexandra Township is an old township established in 1905, and was the only area where black people could own property, which he regards as an unusual privilege. Tanya (2001:4) confirms that unlike other South African townships Alexandra is the only township during the apartheid time that served as a freehold area for black persons.

The following (figure 6) represents the Alexandra area; mostly highlighting the Jukskei River passing through the township and the concentration of informal shacks built on top of the storm drainages.

Figure 6: Alexandra Township area landscape



Source: (Murray, 2009:176)

For a better view of the real life situation concerning infrastructure in Alexandra Township, the following (figure 7) is a reflection of informal settlements built along the riverbanks. This is the group of people mostly prone to flood hazards and at risk of disaster in times of heavy rainfall and river overflow. According to Scoones and Smith (quoted by Mgquba and Vogel, 2004:30), vulnerability is defined as a person being susceptible to damage, or the uniqueness of a person or group in terms of their capacity to cope with, resist and recover from the impact of a natural hazard.

Figure 7: Residence along the Jukskei River

Source: (Murray, 2009:188)

Alexandra Township is one of the poorest and vulnerable townships in the country; one of the contributions to its vulnerability is the historical processes that shaped the area. The geographical proximity to the hazards, the status of the society and availability of resources in the area are some of the factors contributing to the township's vulnerability.

The geography of Alexandra includes a nearby river called Jukskei, the overcrowded population located below the flood line and torrential rainfall during extreme weather seasons puts the area under threat (Mgquba & Vogel, 2004:32). For instance during the year 2000 the area experienced floods; the flood disaster risk was aggravated by a variety of aspects such the poverty of people residing near the Jukskei river. Compacts of shacks also caused less infiltration of water into the soil and as result increased the surface runoff. Several drainage pipes in the Jukskei River were blocked with waste that caused the river to overflow.

Wisner (2009:273) concurs with the fact that the illegal dumping of garbage into Jukskei narrows the river channel, and increases the risk of river runoffs during the heavy summer rainfall. This affects poorest people living in shacks near the river plain. Mgquba and Vogel (2004:35) state that Alexandra experienced floods in the year 1994, 1995, 1997, 1999 and the year 2000 which were regarded as the worst; homes and belongings were swept by flooding water of the Jukskei River. Mkhize and Manzi (2010:6) report that Alexandra is one of the townships that experience flood disaster during December. Floods force residents out of their houses during the rainy season as they are scared that their houses will be flooded.

4.9.2 Responses from the Metropolitan Municipality officials on Disaster Management

The government has been keeping the records of floods events and the cause thereof, they tell of two boys who drowned on the 22nd February of 2010. Government officials are definitely aware of the risk associated with the Alexandra Township. One of them said;

> "We are aware of the risks and that include, river outburst which can create lot of problems for people near the river as they stand to lose all that they posses. Health problems and even death threats, for instance; we have found a dead child in March 2010 after he disappeared for few days, only to find that he was swamped'' (per. Comm., 2011-03-30: Respondent 01 and Respondent 02).

The two respondents believe so much that frequent blockages as a result of shacks built on the drainage system is the main source of regular floods in the area. The first respondent argues that; people occupied every space that was there and as a result, water is redirected during the rainy season. They strongly believe that land invasion is also a factor of vulnerability because people reside on low-lying areas and along the river where the water easily flows. The geography of Alexandra contributes to the maximum floods as most people are situated along the river especially on Second Avenue.

Second Avenue is a densely populated low-lying area just below the river; it receives much of the water during rainy season. The poor if the poor people who cannot afford to build standardized houses occupy Second Avenue.

> "Floods in this area have caused the government and people residing in the area a lot of money that amounts to millions. Structures invested by government and houses built by residents are usually destroyed in times of floods, while people young and old are left psychologically depressed and with health problems. People are often left without their belongings and others suffer long-term injuries" (per. Comm., 2011-03-30: Respondent 01 and Respondent 02).

One official explains that not the whole Alexandra is vulnerable to floods but Sjwetla is the main area that is usually affected. This is an informal settlement built on a low-lying area along the Jukskei River. The area is overcrowded with people that cannot afford to build a normal house, as most of them are unemployed. This makes them even more vulnerable because they normally lose everything during the floods. Regardless of the government's effort to relocate them, one still finds people residing in that area.

Respondents 01 and 02 (per. Comm., 2011-03-30) affirmed that the government, particularly their region is prepared in terms of policies such as Disaster Management Act 57 of 2002 to assist residents in times of disaster including risk reduction. Other than the policy, the municipality took steps to educate people about disaster preparedness and mitigation. In terms of floods, the municipality installed early warning systems in Sjwetla.

The government is not working solely in managing disaster in the area but other organizations have joined in solidarity to prevent major losses. The South African Weather Services assists by warning the community on hazards and prepares government officials to respond in advance. Media liaison officers communicate through community radio stations to seek assistance for disaster relief and to inform the residents of any changes in the weather patterns affecting the area. Environmental health organizations regularly visit

the area to educate more about health issues. A waste removal company (Pikitup) and the municipal electricity service provider (City Power) also assist communities on a regular basis.

> "Government and non-government organizations usually work together with the community to alleviate the damage caused by flood disaster. They donate to the homeless and also provide shelter" (per. Comm., 2011-03-30: Respondent 01 and Respondent 02).

The area had a warning system but it does not work anymore because of vandalism. The warning system was a bell that people had to ring for the community to vacate disaster prone areas. Another intervention was a public phone installed for emergencies only; it is no longer working as well. In response, the municipality had a community project to educate people about how to communicate with the emergency and disaster unit in time of disaster. The municipality bought whistles for community members and gave them the emergency unit phone numbers to communicate directly with the unit. Lamenting the efficiency of these interventions, respondents put:

> "While the whistles will make other community members aware of the danger the river might cause. Becase of rapid floods, the river itself will let people know that they need help" (per. Comm., 2011-03-30: Respondent 01 and Respondent 02).

A discussion with one local government official working on disaster relief in Alexandra Township, it is clear that the disaster vulnerability situation in Stjwetla is complex and requires some extent of political will to ensure that residents are not eposed to flood hazard.

4.9.3 Responses from the organizations in the area on Disaster Management

A civil society representative in Johannesburg (per. Comm., 2011-08-30: Respondent 01) states that Alexandra especially, Stjwetla is linked with risks that include health hazards, floods that usually cause a loss of life. According to the Respondent (per. Comm., 2011-08-30: Respondent 03), floods in the area occur every year mainly because of the ground it sits on. He affirms that Stjwetla is on a low-lying ground, with drainage systems that are not well structured and useless because people built their houses on top of them.

A government official dealing with Johannesburg climate change issues concurs with the civil society representatives that Alexandra Township is densely populated.

> Alexandra Renewal Project (ARP) does focus on disaster mitigation. The challenge is however, a repeated invasion of disaster prone areas such as Stjwetla- when people are relocated, in a blink of an eye, other have occupied. This is a major concern for the city of Johannesburg since storm water drains are blocked most of the time, thus exacerbating flood.
>
> Public Life Education Relations (PIER) is a company in close cooperation with regional disaster officers and urban management. One needs to consider that Alexandra is a port: i.e. Arrival and departure, it also harbours foreigners (illegal immigrants) who hide from the law until such time that they find residence elsewhere in the country. On the other hand, people take residence in Alexandra, particularly in disaster prone areas in order to twist governments' arm, i.e. to speed up service delivery such as housing allocation. Despite being aware of the dangers associated with staying in such areas. They know that when they are hit by these natural disaster events, the government will have to intervene. Most people have been warned against staying in these areas.
>
> (per. Comm., 2011-03-15: Respondent 01)

It is now burdensome on the government system, therefore it is difficult for the municipality to manage daynamics in that residential area (per. Comm., 2011-08-30: Respondent 04). They both believe that the only way to reduce floods vulnerability is by settling the residents in a different location because the current geographic setting is the main factor to the recurring floods disasters.

This government official (per. Comm., 2011-08-30: Respondent 04) mentions the importance of weather variability and the fact that the location will always determine the effects; this is with and understanding that weather varies per season. He expands on saying that Alexandra can receive the same volume of rain as any other area but because of its location, the effects will not be the same because it is in a low-lying area.

Loss of lives, injuries, loss of belongings, bad smell from drainages and psychological effects are frequent usually after floods hit, however different organizations are always prepared to help. The Red Cross Society and other community organizations are always ready to donate food, accommodation and blankets. Because climate change is part of the local government, the local government authority has regular communication with non-governmental organisations to prepare them of any atmospheric changes. Interviews with a government official and a civil society representative (per. Comm., 2011-08-30: Respondent 01 and Respondent 04) confirm the relationship between government and civil society organisations such as the Red Cross Society.

Local government and civil society relations range from campaigns to educating, training communities and recruit volunteers for disaster managemnet. Therefore, the disaster management is working hard to manage and reduce floods disaster in Alexandra Township is well as building and receiving as much support as possible from different organizations.

4.9.4 Responses from the Community Leaders in the study area

Community leaders of Alexandra Township are also aware of the risk facing the study area (Stjwetla). One community leader (per. Comm., 2011-09-01: Respondent 01) mentions few hazards prevalent within the study area. Some ranges from death threats, injuries and psychological effects that are common

risks mostly experienced by the residents. Just like any other resident, this community leader came in the area to look for a job in 1997, and he has no other place to reside except here in Stjwetla because he cannot afford a decent residence. He last experienced floods in December 2010, where most residents lost their belongings, he affirms that the main reason to flood disaster in Stjwetla is its low-lying location near the river. He motivates the opinion with a statement that the Jukskei River is wide and becomes full during the rainy season, as a result, the river floods houses built alongside it.

The community leader (per. Comm., 2011-09-01: Respondent 01) applauds the disaster management unit in Johannesburg municipality, for assisting them during the floods. The Johannesburg emergency unit always avail themselves in time of floods. The respondent indicates that the department of social development and the department of health ought to intervene but they are very passive.

> "These departments should be part of disaster management because they can help victims by giving them psychological therapy. People, especially the old and young are usually left with severe psychological effects that take a long time to heal" (per. Comm., 2011-09-01: Respondnet 01).

Few organizations such as Red Cross society and Twala Mama Africa work together with the local government, to reduce the impact of disaster in Stjwetla; they usually provide shelter, food and clothes to the victims of flood disaster.

4.9.5 Responses from the community / Residents in the study area

Most members of the community were available as the unemployment rate in the area is very high. Old women and young people in the area were the most available. All community members interviewed by the researcher are from Limpopo. The researcher found a group of people arranged to be interviewed fixing and putting together six incinerated shacks after a neighbor left a lit candle in the previous night. Residents were not in a good mood for interview,

because they were arranging a protest march to the Department of Housing to complain about their living conditions.

One resident (per. Comm., 2011-09-02: Respondent 01) attests that Stjwetla is not a safe residential area because floods regularly threaten their lives. He explains that he came in Alexandra in 2001 to look for a job, but he is still unemployed and lives in this area. He says the reason he stays at Stjwetla is because he cannot afford to stay elsewhere, therefore he is forced to stay until he can maintain himself in another place. The residents usually lose their houses and other belongings during the rainy season.

The other resident (per. Comm., 2011-09-02: Respondent 02) confirms that Stjwetla is not safe and they need as much help as possible. He complains about the local government response during their time of need. The disaster management is not doing enough, they should educate the community about disaster and find a way to communicate with the housing department as well as the Alexandra Renewal Program (ARP), to relocate them and build houses for them.

Participant 03 indicates that there are no changes made, the local government removed people who were on the higher part of Stjwetla, and left those on the flood plain, on a low-lying area exposed to floods (per. Comm., 2011-09-02: Respondent 03). She moved to Alexandra in 1981 and stays in the same shack she stayed in when she first arrived. During the rainy season people lose everything, the emergency unit always rescues people especially during floods. Organizations assist with food, clothes and shelter but it is not enough. The respondent further makes emphasis that people living at Stjwetla have to be moved to a better place (per. Comm., 2011-09-02: Respondent 03).

One can see the stress in this community; most of them are very poor, because they are unemployed. Most of them have been in this area for more than twenty years and they have been experiencing flood disaster almost every year. People sit outside their houses reclining in the sun during the day and converse, because they have nothing more to do. They are worried about the coming rainy season because their houses are still in the same condition,

built in every type of material like tents, boxes and steel doors. One resident spoke with a very sad face while she explained how she lost her house and belongings in the previous flood disaster.

She is a young woman who came at Stjwetla in 1998 to look for a job. She expects a lot from the local government like every South African citizen who cannot afford to buy or build a house (per. Comm., 2011-09-02: Group of residents).

4.10 Summary

The chapter outlined the research design and gave insight on the modes used to reach the satisfactory information. Research ethics ensure that the final product is not biased. Qualitative methods, survey, samples and interviews helped to complete the research. An outline of study limitations and biographical descriptions of respondents reveal that the research project is a product derived from the actual social setting.

The following chapter will present the findings and recommendations where the study had limitations. The chapter will give answers to the objectives and questions outlined in chapter 1.

5 Chapter Five: Findings and Recommendations

The section deals with the research findings, recommendations as well as the conclusion of the study.

5.1 Introduction

This concluding chapter outlines the extent to which the objectives of the study have been realized. It also comments on the hypothesis posed in the study. This ascertains that the analysis of the hypothesis throughout the study. The chapter will also make recommendations to the city of Johannesburg, the municipality that is responsible for Alexandra Township.

Chapter 1

In this chapter the researcher pointed out the interest to research about the influence of geographical patterns and disaster management, the study focused on floods disasters in the townships and the government response thereof.

Chapter 2

In this chapter the researcher gave greater attention to the first two objectives of the study, namely, the theoretical exposition of geographical patterns and disaster, as well as the international experiences on floods disaster occurring mostly in urban areas. The researcher focused on townships or areas occupied by poor residents and looked into the influence of geography pertaining to the physical portraits of the land, the climate as well as the extent of the population.

Chapter 3

The chapter focused on the second and third objectives of the study as they apply to South Africa. The geography of the country was looked at, mainly the physical landscape, the climate and its population. The chapter navigates the influence of floods disaster normally occurring in South Africa, especially in townships and low-lying areas. Disaster management in the country was also

a focus. The researcher's aim was herein to investigate the role of South African government in disaster management.

Chapter 4

The chapter outlined the research design applied through qualitative research methods. Semi-structured and group interviews were the main tools used in gathering the information from Alexandra residents. Respondents include local government officials, organizations, community leaders as well as the public. The study area receives much attention in the chapter. The geographic details of the location are explained; these include the landscape structure, the population number as well as the climate. Alexandra Township is an area situated North of Johannesburg region and supposed to be receiving their services from that region. Disaster management unit ensures the reduction of flood disasters. Working with organizations is one way to help reduce the impact of disasters in the area. The chapter covers the government officials', organizations as well as community responses on disaster management in the area.

Chapter 5

The chapter focuses on findings of the study and seeks to verify whether justice is made to the objectives of the study. The chapter outlines findings and recommendations on how to improve the situation in the Alexandra Township. The chapter also draws the conclusion on the study.

5.2 Findings

Local governments carry the responsibility to provide basic services to the community, which includes among others, to ensure that their communities live in a safe and healthy environment. Alexandra Township particularly Stjwetla location poses a threat to the community's safety as the area is built along the river of Jukskei. This river is wide open which leaves communities along its bank vulnerable to floods risk. Vulnerable communities are mostly unemployed and cannot afford to relocate to any other area, because they will have to pay rent. Most people residing at Stjwetla have been there for more

than 20 years and they have different experiences with regard to the local government and disaster management interventions.

They agree that the residential area is built along the riverbanks in low-lying regions; they would like the government to help them move to more secure regions and build better houses for them. Residents normally lose all their belongings to flood disasters and mainly depend on organizations and government to care for them by providing shelter, food and clothes. Although they indicate dissatisfaction with their local government's responses in times of need, they mention that the disaster management unit in the area is doing its best together with support from the Red Cross organisation.

The disaster management system used in this area is responsive instead of being pro-active. Much still needs to be done with regard to enhancing sustainable and structured programs for public awareness on disaster threats. The emergency alarm system in the area is no longer working; therefore, every community member received a whistle to use in times of emergency to call for help. There is a group of community leaders, which links the local government with the rest of the Stjwetla community. This group normally assists by calling the disaster management unit, and helps to rescue affected communities.

5.2.1 Hypothesis

The null hypothesis was proven correct based on the following:

a) The geography of the study area (Stjwetla) proves to be the main reason for frequent flood disaster; the area is located on a low-lying area along the riverbanks expose all the residents to a risk of flood disaster.

b) The population residing on this area is more than what the land can accommodate. It is densely populated which implies that the effects of floods are severely felt, with lots of people affected.

c) Stjwetla usually experiences heavy rains during summer, due to the proximity of the residents to the River; flash floods are bound to affect residents along the stretch of the river.

5.3 Recommendations

Subsequent to the research findings above, the study presents the following recommendations to the Johannesburg Metro council:

- That the Municipality adheres to the stipulations of the Disaster Management Act 57 of 2002, which outlines the key responsibilities of local government with regard to disaster management at a local municipal level.

- The disaster awareness campaign should receive more attention and be presented to the community on a regular basis.

- The early warning system must be active at all times and disaster mitigation plans be in place to allow every resident a chance to escape danger.

- The community should be encouraged to form groups or community organizations that will be responsible for regular communication with the local government.

- The local government requires political will for strengthened law enforcement to discourage and stop people who want to reside on disastrous regions near and along the riverbanks.

- The local government should maintain excellent relations with the weather services office to eliminate the element of surprise concerning unusual weather circumstances and prepare for such before hand.

- More organizations should be mobilised to partake in the development of disaster reduction and management interventions so as to increase the sources of help.

- The disaster management unit should not operate on its own, but should rather have interdependent relations with other government departments such as housing, education, health, social and developments to assist in the aftermath of floods occurrences.

5.4 CONCLUSION

Local governments carry the responsibility to provide basic services to the community and to ensure a healthy and safe environment for the constituency. Although residents indicate dissatisfaction with the responsive nature of local government's disaster response performance, the Disaster Management Unit is said to be doing its best together with support from the Red Cross organisation in Stjwetla. There are good relations with local government and civil society organisations, but these needs to be enhanced for the greater good of the community.

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INTERVIEWS

Metropolitian Municaipality officials (Disaster Management):

per. Comm., 2011-03-15: Respondent 01

per. Comm., 2011-03-30: Respondent 01

Per. Comm, 2011-03-30: Respondent 02

Civil society representatives (Disaster relief):

Per Comm, 2011-08-30: respondent 01

Per Comm, 2011-08-30: respondent 03

Per Comm, 2011-08-30: respondent 04

Metropolitan Municipality Official (climate change):

Per Comm, 2011-08-30: respondent 04

Community leaders:

Per Comm, 2011-09-01: respondent 01

Community Residents:

Per Comm, 2011-09-02: respondent 01

Per Comm, 2011-09-02: group of residents

Per Comm, 2011-09-01: respondent 02

Per Comm, 2011-09-01: respondent 03

APPENDIX A: A LETTER TO JOHANNESBURG METROPOLITAN MUNICIPALITY REQUESTING PERMISSION TO CONDUCT RESEARCH

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
VAAL TRIANGLE CAMPUS

05November 2010

TO WHOM IT MAY CONCERN

This certifies that Ms OM. Mere is a Masters candidate in Development and Management at the North-West University. Ms Mere is conducting research to complete a mini-dissertation entitled "Disaster Management and Geographical pattern: a case-study of Alexandra Township".

It would be appreciated if permission would be granted to Ms Mere in order to conduct research on the matter. The purpose of the research is mostly academic.

Yours sincerely

Dr. MT Lukamba

Supervisor

APPENDIX B: A LETTER FROM JOHANNESBURG METROPOLITAN MUNICIPALITY GRANTING PERMISSION TO CONDUCT RESEARCH

a world class African city

City of Johannesburg

Emergency Management Services

San Jose Fire Station
C/o Grayston and Linksfield
SANDOWN
2196

P O Box 1456
Johannesburg
South Africa
2000

Tel +27(0) 11 883 2300
Fax +27(0) 11 883 4651
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17 November 2011

To Whom It May Concern,

This letter serves to confirm that permission was granted to Ms. Oniccah Mere to conduct research in Alexandra Setswetla Informal Settlement within the months of March, August and September 2011. Disaster Management at Northern Region.

Hope everything is in order.

Kind Regards

Nokuthula Ntukoane

Disaster Management

Northern Regions

Tel: (011) 286 6012/3

NokuthulaNt@joburg.org.za

APPENDIX C: RESEARCH INTERVIEW QUESTIONNAIRES

General-Residents and Community leaders: Flood disaster in the study area

The section seeks the information mainly on the impact of flood in Alexandra Township, the community experience, and how they survived the past disaster events

- Why did you come and stay in this area?
- Are you aware of any risk associated with the area you are living in?
- If yes, please mention them?
- What health problems do you experience in the area?
- Are they related to the environmental conditions in the area?
- Have you ever been exposed to floods since you moved in this area?
- If yes when was that?
- What did you lose during the previous flood disaster?
- What do you think contributes to floods in the area (Alexandra?)
- What did the local government do as a response, to previous flood disasters experienced in this area?
- What do you see the government doing to deal with the disaster hazard caused by the river-any measures taken to prevent severe damages?
- Are there community organizations that work with local government to prevent and respond to disaster events
- If yes which ones do you know

Disaster management by the Metropolitan Municipality

The section seeks the information mainly on the impact of flood in Alexandra Township and the Metropolitan Municipality's involvement in disaster management

- Are you aware of any risk associated with this area? If yes, please mention them?
- Do you have official records of flood occurrences in the Alexandra area?
- When last did you experience floods in the area?
- What is the main cause of the Flood occurrences?
- To what extent does physical location and geography contribute to disaster vulnerability in the area?
- How much damage was done by the floods?
- Which area is normally affected and what do you think makes it more physically exposed to flood disaster?
- Is the municipality prepared in terms of policies to manage disasters?
- If yes which Policies are guiding the municipality in terms of disaster management?
- Is the policy in place a reactive one or does it include the prevention measures to limit the risk?
- What measures are in place or in development to deal with disaster in Alexandra?
- Are there organization working with the local government, to manage disasters?
- If yes, please mention:
    - What awareness campaigns do you have to reduce disaster vulnerability in the area?
    - Is there a warning system in Alexandra?
    - How effective is the system?

Disaster management by the local organizations

The section seeks the information mainly on the impact of flood in Alexandra Township and the local organization's involvement in disaster management

- Are you aware of any risk associated with this area?
- If yes, please mention them?
- Do you have official records of flood occurrences in the Alexandra area?
- According to your records-When last did floods occur in the area?
- What do you think was the main cause Flood occurrences?
- To what extent does physical location and geography contribute to disaster vulnerability in the area?
- How much damage was done by the floods until this far?
- Which area is normally affected and what do you think makes it more physically exposed to flood disaster?
- Does your organization normally help in Alexandra?
- How would you define the type of help you offer?
- What measures are in place or in development to deal with disaster in Alexandra?
- Does your organization work hand in hand with the local government, to manage disasters?
- If yes, please elaborate: e.g. do you normally have meetings to engage in future development of Alexandra Township
- Do you normally have awareness campaigns to reduce disaster vulnerability in the area?
- If yes, what have you done so far to make the community aware and prepared?

APPENDIX D: A LETTER FROM THE LANGUAGE EDITOR

TO WHOM IT MAY CONCERN

EDITING CERTIFICATE LETTER

This serves to confirm that the academic work in the form of a mini-dissertation belonging to:

Ms. O.M Mere

titled

DISASTER MANAGEMENT OF GEOGRAPHICAL PATTERNS: THE CASE OF ALEXADRA TOWNSHIP

was grammatically edited by the undersigned during the week of October 3 October 8, 2011.

Mhlongo GJ (Mr.) 8/10/11

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