FLOOD RISK PERCEPTIONS AND COPING STRATEGIES OF RESIDENTS IN THE KABBE CONSTITUENCY OF THE ZAMBEZI REGION (NAMIBIA)

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ABSTRACT

This empirical study was conducted in the Kabbe Constituency of the Zambezi Region which is inundated by recurrent floods of varying magnitudes each year. The flood risk perceptions and coping strategies used by the indigenous residents have not been given much academic attention. Although the flood mitigation approaches applied in the Kabbe Constituency seemingly ameliorate the disastrous impacts, they have proved inadequate. This study used 150 unstructured interviews and field studies to ethnographically explore flood risk perceptions and coping strategies of the residents in the Kabbe Constituency. Desk-top research analysed to what extent the Namibian National Disaster Risk Management System had incorporated indigenous knowledge in disaster risk reduction policies in relation to the Hyogo Framework for Action 2005-2015.

The results of the empirical research revealed that 80% of the residents have advanced levels of flood risk perceptions and 83% showed high sense of belonging and attachment to the floodplain. Significantly, men and women weigh flood risks differently. Men weigh the risks according to the benefits they derive from the floods, while women weigh the risks according to effects on property, children and themselves. To cope with floods, the residents rely on indigenous flood knowledge passed on from previous experiences. During floods, division of labour occurs between men, women and children. Men are usually found on lower terraces fishing while women and children are usually on higher terraces. Residents practice seasonal migration to alternative homes located away from the floodplain when floods are above normal and maintain some resilience by living on fish and lily tubers as

alternative foods. An assessment of the Namibian National Disaster Risk Management Policies revealed deficiencies, particularly favouring modern disaster risk reduction approaches over indigenous flood knowledge.

In conclusion, the author refers to construction methods applied in the Asian Pacific Region, which could be modified in the Kabbe Constituency to allow people to live with floods. Further recommendations include the development of a policy framework to document and integrate indigenous flood knowledge in the Namibian National Disaster Risk Management Policies and programs.

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I thank all my interviewees in the Kabbe Constituency, the Zambezi Regional Disaster Risk Management Committee (RDRMC) technical members and the Munitenge Tribal elders for their support and willingness to express their feelings. Without you it would have been impossible to complete this research. I express my gratitude to the Ministry of Environment and Tourism (Country Pilot Partnership-Integrated Sustainable Land Management) staff in association with United Nations Development Programme (UNDP) for providing the research funds throughout 2011.

Principally at the University of Namibia, I sincerely thank my supervisor Prof. Fritz Becker, for couching and providing the most valuable support. I have greatly appreciated your wisdom, stillness and backing throughout my graduate and postgraduate program. I wish you abundant wellness in years to come!

DECLARATIONS

I, Lameck Frank Chipman Mushabati, declare hereby that this study is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution of higher education.

Lameck Frank Chipman Mushabati [24 April 2014]

DEDICATION

This research is dedicated to all my family living around the Zambezi River Basin since year 1895.

Thank you all.

Lameck Frank Chipman Mushabati [24 April 2014]

LIST OF ACRONYMS

ADPC	Asian Disaster Preparedness Centre
AP	Asian Pacific
CDRMC	Constituency Disaster Risk Management Committee
DDRM	Directorate of Disaster Risk Management
DDRR	Directorate of Disaster Risk Reduction
DRR	Disaster Risk Reduction
GRN	Government of the Republic of Namibia
HFA	Hyogo Framework for Action
IDNDR	International Decade for National Disaster Reduction
IK	Indigenous Knowledge
ISDR	International Strategy for Disaster Reduction
ITCZ	Inter Tropical Convergent Zone
KC	Kabbe Constituency
MAWF	Ministry of Agriculture, Water and Forestry
MDGs	Millennium Development Goals
NamVAC	Namibia Vulnerability Assessment Committee
NDP	National Disaster Plan
NDRM	National Disaster Risk Management
NDRMC	National Disaster Risk Management Committee
NDRMP	National Disaster Risk Management Policy

NDRMS	National Disaster Risk Management System
NFPF	National Focal Persons Forum
NGOs	Non-Governmental Organisations
NPC	National Planning Commission
NRCS	Namibia Red Cross Society
OKZ	Owambo/Okavango-Kalahari-Zimbabwe Axis
OPM	Office of the Prime Minister
RDRM	Regional Disaster Risk Management
RDRMC	Regional Disaster Risk Management Committee
RP	Risk Perception
RUA	Riverside Urban Area
SADC	Southern Africa Development Community
SADF	South African Defence Force
SARF	Social Amplification of Risk Framework
SDRMC	Settlement Disaster Risk Management Committee
SWAPO	South West Africa People's Organisation
UNAM	University of Namibia
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISDR	United Nations International Strategy for Disaster Reduction

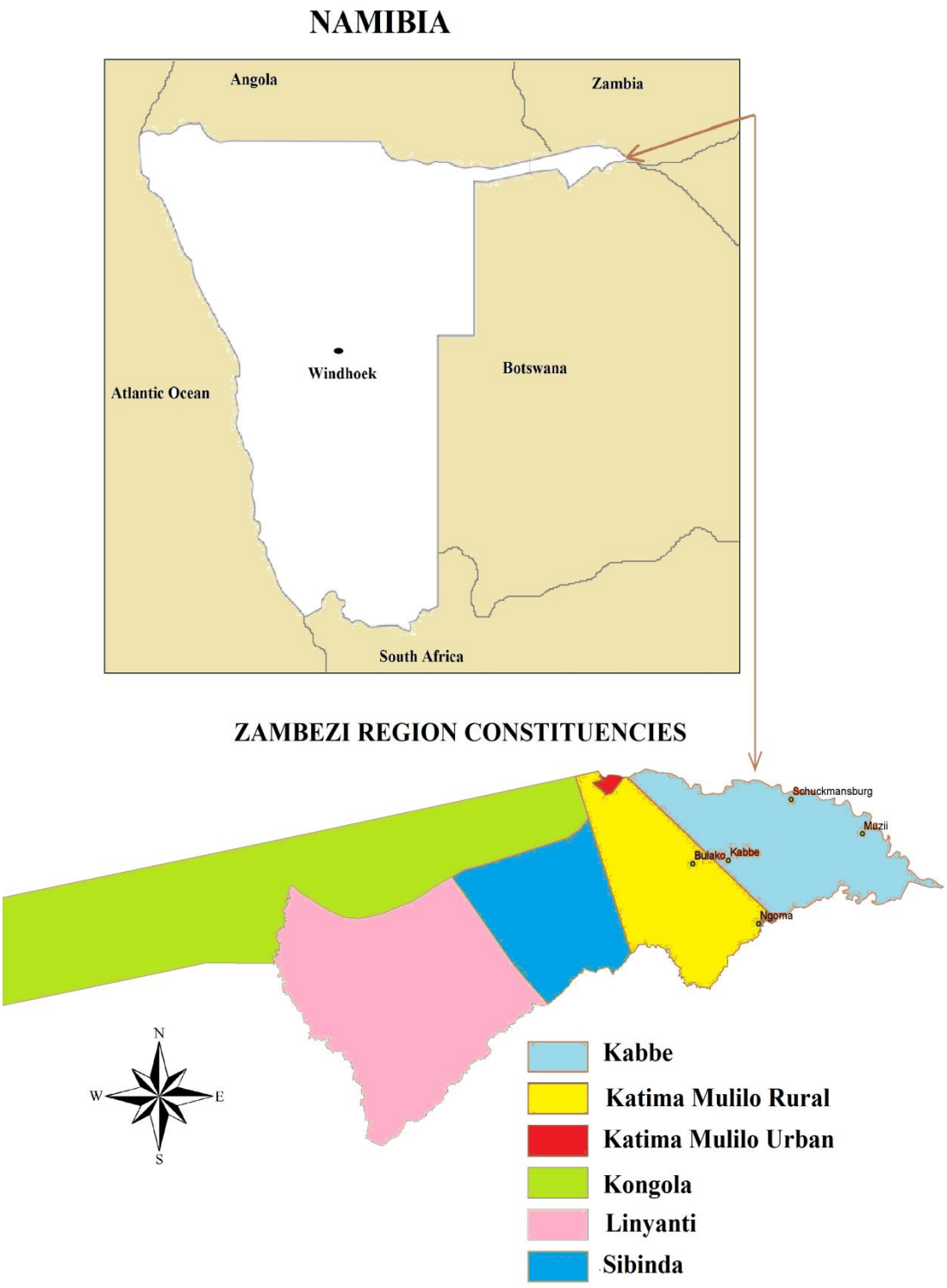


Figure 1: Map of the study area (Namibia, the Zambezi Region and Kabbe Constituency).

CHAPTER 1: INTRODUCTION

1.1. **Background to the study area**

This study was conducted in Namibia's Kabbe Constituency (KC) in the far eastern part of the Zambezi Region (Figure 1). It is one of the six administrative districts in the region consisting of several villages with insufficient infrastructure.

Biophysical characteristics of the Kabbe Constituency

Major floodplains of the Upper Zambezi River Basin are the Barotse (Bulozi) and the Zambezi Strip floodplains. The latter is dominated by the Kwando (Cuando) River and the mighty Zambezi River, which in turn form the Linyanti and Chobe streams. The Kabbe Constituency is delineated by the Zambezi River (bordering Zambia) and the Chobe River (bordering Botswana). In its own right, the far eastern floodplain of the Zambezi is called the Zambezi-Chobe floodplain. This system of treeless wetlands is inundated annually, from early January to September, by waters from the Zambezi and Kwando catchment which is situated in the far north-west corner where Zambia meets the Democratic Republic of Congo and the Republic of Angola. The Zambezi and Kwando Rivers cover an area of about 507 600 km^2, representing 39% of the total Zambezi River catchment area extending from the Central African Plateau in Angola and north-western Zambia to the Kazungula-Kasani intersection of the four basin states, Botswana, Zambia, Namibia and Zimbabwe (Chenje, 2000). Being part of the Upper Zambezi Basin and catchment area, the Kwando and Zambezi Rivers are important water ways (Table 1).

Table 1: Rivers along the eastern Zambezi strip.

River	Length along Namibian border (km)	Catchment area/km^2	Average volume of water per year (mil/m^3)
Kwando-Linyanti	340	57000	915
Zambezi-Chobe	340	334000	40000

Source: Mendelsohn, Jarvis, Roberts & Robertson (2002).

The Zambezi-Chobe floodplain, where the Kabbe Constituency is situated, evolved as a result of geomorphic activities around Central-Southern Africa during the Jurassic, Cretaceous and the early Tertiary geological periods. During the Jurassic and Cretaceous Era, the Upper Zambezi and the Kwando Rivers drained south-easterly into the Palaeo-Limpopo River system via the Shashe River (Moore, Cotterill, Main & Williams, 2007; Stankiewicz & de Wit, 2005) near the present day town of Maun, located in northwest Botswana. Towards the end of the Cretaceous Era and the early Tertiary Era, the drainage system was interjected and reorganised by crustal upliftment along an area geologically called the Owambo/Okavango-Kalahari-Zimbabwe Axis (OKZ) (Moore, Cotterill, Main and Williams, 2007). During these crustal processes, the four corner boundary of Botswana, Zimbabwe, Namibia and Zambia developed the three up-faults-the Chobe, Linyanti and Mambova Faults (Figure 2, 3 & 4). The rest of Eastern Zambezi developed into a down-fold. It is suggested that the uplifted Chobe Fault, which runs along the present Chobe stream, and the uplifted Linyanti Fault, which runs along the

present Kwando and the Linyanti streams, diverted the waters "from a former south-easterly course (across northern Botswana) to the north-east to link with the Zambezi River via the Linyanti-Chobe floodplain" (Moore, Cotterill, Main & Williams, 2007, p.326).

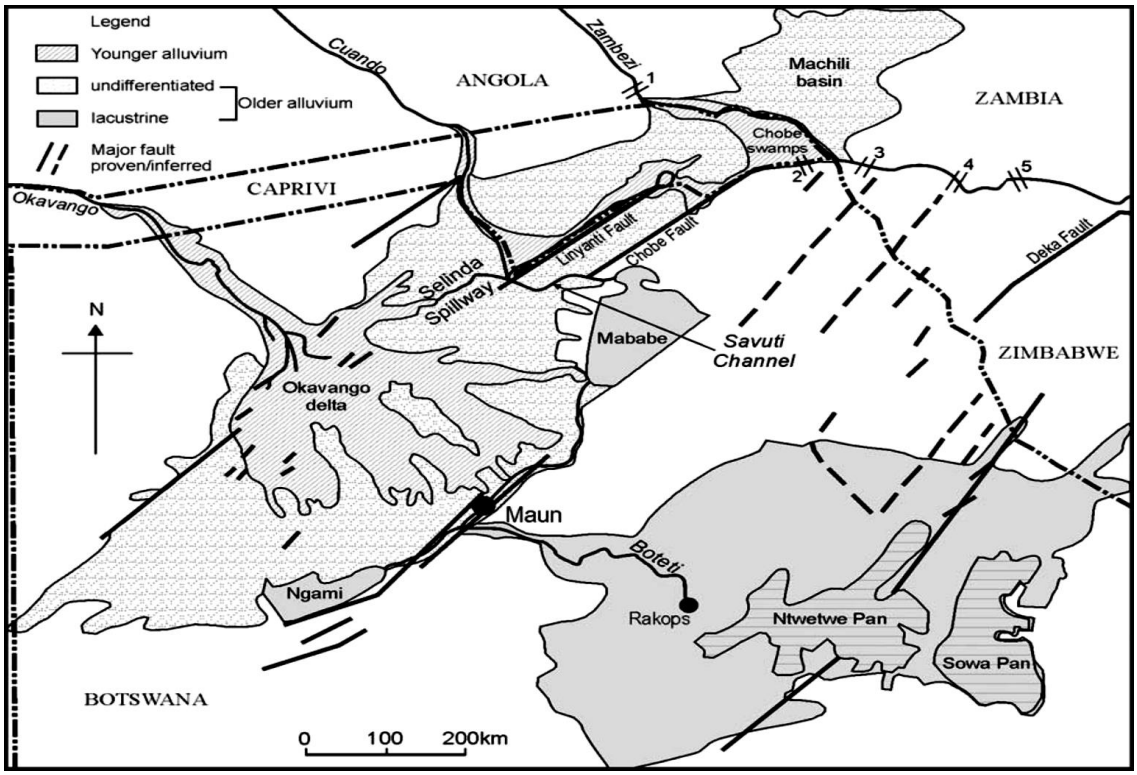


Figure 2: Linyanti, Chobe Faults and associated swamps [*Source*: Moore, Cotterill, Main & Williams, 2007].

During the seasonal floods in the Zambezi-Chobe floodplain, the water that flows in the north-eastern direction from the Kwando, Linyanti, Chobe and the Zambezi rivers gets backed up at the Mambova up-fault and expands. The huge volume of water from the three rivers cuts through the Mambova up-fold, forming the Impalila Island which extends up to the Kazungula border. The altitude of the KC is approximately 930m

above sea level except for Impalila Island which rises almost 995m above sea level (see Map on page 128). Zambia and Botswana, adjacent to the KC, are a little over 1000m above sea level (Mendelsohn & Roberts, 1997). Thus, excess flood water flows back in the KC because of the lower elevation (Figure 3).

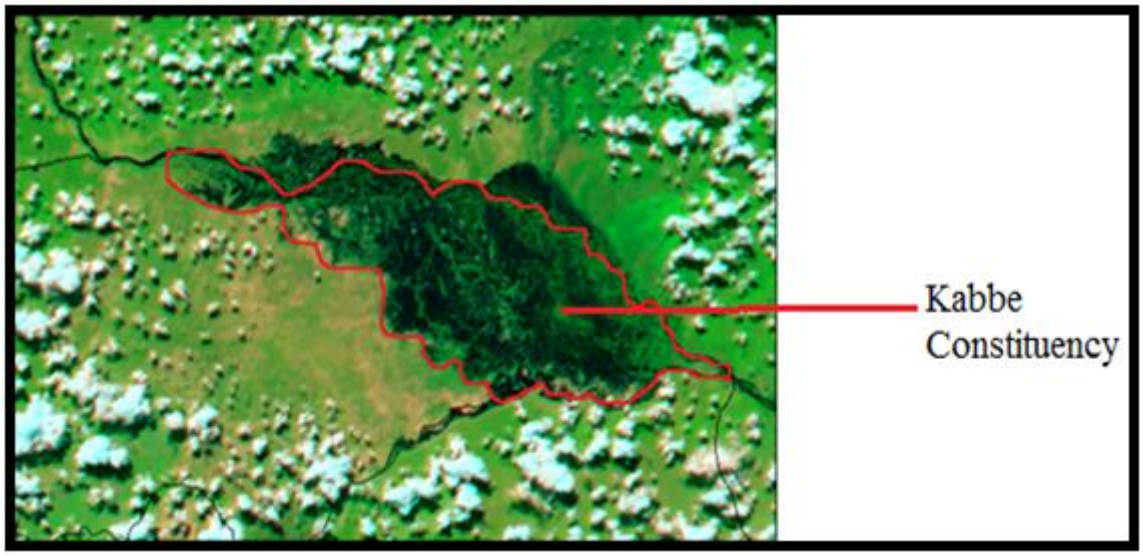


Figure 3: Flooding in the KC [*Source*: NASA, April 2006].

The average climate in the KC is described as sub-tropical and is influenced by the Inter-tropical Convergent Zone (ITCZ) and the north and south easterly prevailing winds (Chenje, 2000). These air masses bring heavy clouds and rain as early as September to late April. In the Kabbe Constituency, rainfall reaches up to 700 mm annually while temperatures can rise up to thirty-six degrees Celsius (36^{o}C) during summer and as low as fourteen degrees Celsius (14^{o}C) in winter. The highest temperatures are experienced in the months of September and October (Chenje, 2000). During this time, the floodplain becomes muddy and dries completely as the sun scorches the plain into a dusty and

thirsty land. The grass then turns yellow and as a traditional practice, it is burnt around late October to 'increase' soil fertility.

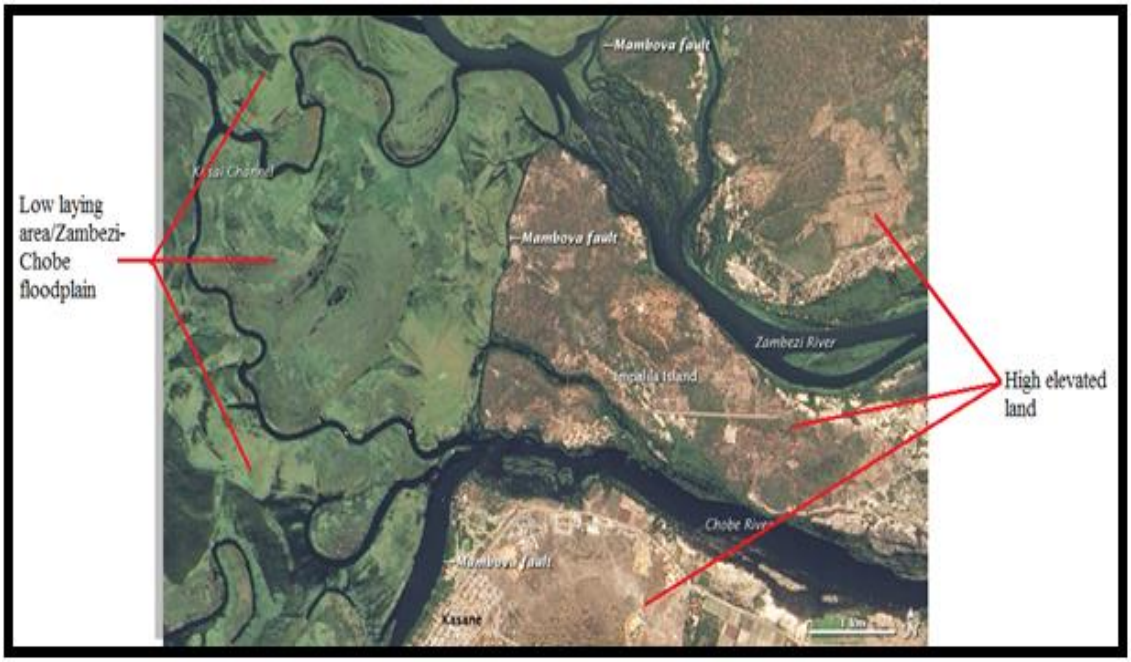


Figure 4: Geomorphology of the eastern KC [*Source*: NASA, May 2010].

Although part of the Zambezi sub-Basin that receives low rainfall in relation to the northern basin, the Kabbe Constituency has dense riverine woodlands and the Zambezian grasslands that serve as grazing grass for herds of livestock and game in the treeless floodplain. The vegetation is classified as Zambezi floodplain channels, Zambezi floodplain grassland, Zambezi transition grassland, Zambezi woodland, Chobe wetland and Chobe swamp grassland (Mendelsohn & Roberts, 1997, as cited in Turpie, Smith, Emerton & Barnes, 1999, p.31). The rest of the vegetation is Mopane woodland near Katima Mulilo. The banks of open water channels are fenced by many reeds and sedges or papyrus that are harvested for handicraft making. Sometimes these are cut or

burnt to make space for riverside cultivation. The main channel is sometimes covered with many types of water plants. The use of these varies, from medicine to food. The dominant floodplain grasses are the *Eragrostis* spp., *Hyparrhenia* spp., *Tristachya superba*) and the extensive lawns of *Cynodon dactylon,* which form an important grazing resource for both wildlife and livestock (Turpie, Smith, Emerton & Barnes, 1999).

The Kabbe Constituency has almost no resident populations of large wild herbivores and reptiles except for those associated with the Chobe National Park in Botswana (Turpie, Smith, Emerton & Barnes, 1999). Large herbivores include elephants, hippos and reptiles like crocodiles. Animals have free movement between the Kabbe Constituency and Botswana's Chobe National Park. Herbivores are attracted to the Kabbe Constituency because of the sufficient grazing grass and open plain. Here, they are sometimes shot at by local residents for food especially during the floods when they are stranded on mounds or the dry season when the Chobe River is shallow enough to cross. This has advanced into border conflict with the Botswana Government.

Rainfall and the flow of the Zambezi River and Sub-basin Rivers have been measured at various hydrological and meteorological stations throughout the Zambezi River Basin (Table 2). The longest and most complete flood and rainfall records have been compiled at Victoria Falls since 1907 (Chenje, 2000; Tyson, 1987). The Katima Mulilo Hydrological Station only has flood records dating from 1943 to 1953 and 1965 to 2013.

Table 2: Upper Zambezi Basin hydrological stations.

1. **Zambezi** (Chavuma, Lukulu, Kalabo, Matongo Senanga, Sioma-Ngonye and Katima Mulilo)
2. **Kwando** (Kongola)
3. **Chobe** (Ngoma)
4. **Bukalo Channel** (Bukalo)
5. **Linyanti** (Linyanti-Chinchimani)

Source: Adapted from Ministry of Agric. Water & Forestry [MAWF] (2011).

Table 3 shows rainfall, drought and floods recorded in southern Africa from 1948 to the year 2000. Table 3 and the graph (Figure 5) illustrate a good rainfall and Zambezi River flow variation since 1940 to 2011. The five major floods documented in the area since the 1940s, occurred in 1958, 1969, 1978 and 2009. Close to these foremost floods were the 1966, 1968, 1970, 1975/1976, 1979, 2004, 2007 and 2010/2011 devastating flood waves. During these particular years, much of southern Africa received above normal rainfall.

Table 3: Rainfall regimes and successive floods in southern Africa (1946-2000).

PERIOD	EVENT
1946-47	The years experienced a severe drought.
1950s	There was abnormally high rainfall in some parts of the region.
1967-73	This six-year period was dry across the southern African region.
1974-80	This period of six years was relatively moist over much of southern Africa. In 1974 the mean annual rainfall was 100%above normal throughout the region.
1981-82	Most of southern Africa experienced drought.
1982	Most of sub-tropical Africa experienced drought.
1983	This was a particularly bad drought year for the entire African continent.
1985	Conditions improved.
1986-87	Drought conditions returned.
1991-92	Southern Africa, excluding Namibia experienced severe drought.
1992-93	Conditions slightly improved, but the previous year's drought effects continued.
1993-94	Conditions improved.
1994-95	SADC countries hit by worst drought, surpassing the effects of the 1991-1992 drought in some parts of the region.
1995-96	Widespread rains in most parts of the SADC region, bumper agricultural yields.
1996-97	Normal rainfall for most of the region.
1997-98	Normal rainfall throughout the region including the northeast although impacts of El Niño were significant.
1998-99	Near normal rain in most of the region except in the northeast, namely Tanzania, where below normal rainfall was experienced.
1999-00	Most of the SADC countries received normal to near normal rainfall except Tanzania which experienced dry conditions. Widespread floods devastated several countries in southern Africa with Mozambique the most affected.

Source: Adapted from Chenje (2000).

The flood of 2009 affected over 80% of the Kabbe Constituency residents. Over 10 000 people living in the floodplain needed to be relocated to camps on higher ground. Some of the relocation camps, like Schuckmannsburg, faced sanitation problems and insufficient water. Some 4 000 people shared two pit latrines at Schuckmannsburg during the 2009 flood [National Planning Commission (NPC), 2009]. Roads were cut-off, cattle were left stranded on termite mounds in the floodplains, houses and crop fields were submerged (Figure 6).

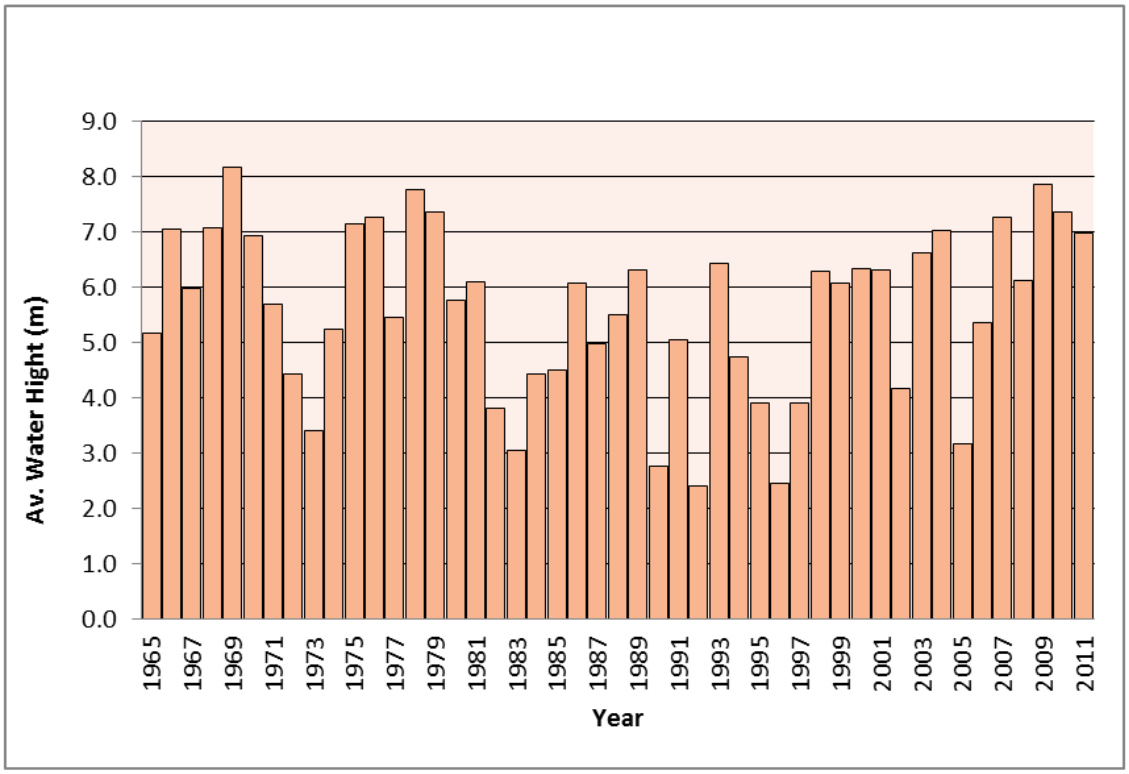


Figure 5: Average water level of the Zambezi River, 1965-2011 [*Source*: MAWF, 2011].

According to the NPC (2009, p. 90), "Namibia lacks a clear national legislation and contingency plans defining the roles and responsibilities of the various agencies during a

national emergency". In early April of 2009, for example, local authorities in the Zambezi were still using relief supplies and procedures from the previous year's drought. In the KC, there are only eight [8] health clinics. They are difficult to reach, especially during the flood season. The limited number of clinics is due to a national health policy that requires populations of between 8 000 and 15 000 to set up a health clinic (NPC, 2009).

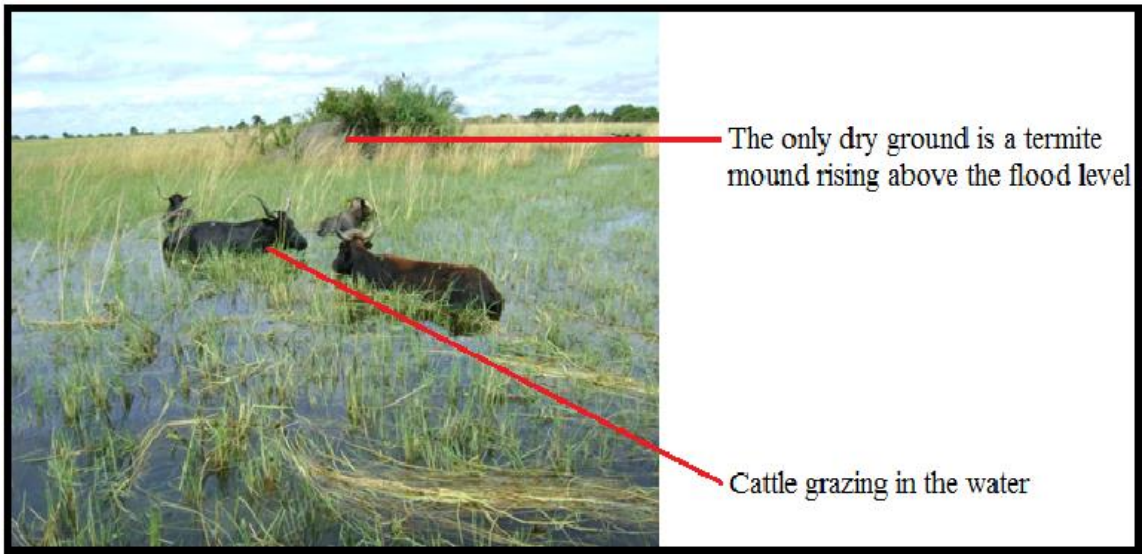


Figure 6: Stranded cattle in the floodplain near Mbalasinte (March 2011)

Consequently, the 2009 flood defied the local government capacity to respond to floods. It was forced to set up and administer relocation camps, provide food, non-food items like tents, tarpaulins, blankets, water-purification tablets, mosquito nets for the displaced communities. On 17 March 2009, the Namibian President declared a state of emergency and immediately mobilised resources to assist the local Government to deal with the flood. Some of the N$109 million allocated for flood emergency was used in the Kabbe

Constituency to set up camps, mobilise logistics, airlifting capacity, vehicles and motor boats (NPC, 2009).

Socio-economic environment of the Kabbe Constituency

Historically, the Kabbe Constituency developed from the Barotse Kingdom and, later in the 19th century, under the Munitenge Royal Establishment (Biewenga, 2008). "From then it became part of the British Bechuanaland Protectorate, falling under the British rule in Botswana" (Biewenga, 2008, p.41). In 1914, this region came under the South African administration, and was used mainly as a military base against neighbouring countries and SWAPO fighters from the 1960s to the 1980s. The notorious 32 Battalion of the South African Defence Force (SADF) were stationed in the Kabbe Constituency and negatively affected the lives of the residents.

Table 4: Demography per constituency in the Zambezi Region.

No.	**Constituency**	**Sex**		**Total**
		Female	**Male**	
1.	Katima Mulilo Urban	12 164	10 540	22 704
2.	Kabbe	7 131	7 831	14 962
3.	Katima Mulilo Rural	7 235	7 331	14 566
4.	Sibinda	4 648	4 542	9 190
5.	Kongola	2 237	2 182	4 419
6.	Linyanti	7 334	6 651	13 985

Source: NPC (2003).

In 1990, the Zambezi Region and the rest of Namibia became independent from South African rule. However, since independence, the Kabbe Constituency has seen little infrastructure except improved schools. Although having the second largest population (Table 4) of about 15 000 inhabitants in the Zambezi Region (NPC, 2003), there are no tarred roads; electricity is available to very few villages like Lisikili, Kalimbeza and Isize.

The Kabbe Constituency has an area of about 211 600 ha (Turpie, Smith, Emerton & Barnes, 1999) and is occupied by the Masubia and Mafwe tribes, but predominantly the former, who settled here in the 1800s (Parsons, 1993). These two tribes belong to the Lozi indigenous group of the Upper Zambezi Bulozi Floodplain. All three indigenous groups share the same traditions and cultures. The Masubia and Mafwe use the Silozi language as a medium for reading, writing and communicating. It can therefore be said that Silozi is a unifying language in the Zambezi Region. Based on the 2001 National Population Census, 52% of the population in the KC is between 15-19 years of age and only 7% are over 60 years. Forty-one percent (41%) of the population is under 15 years of age.

Many households have an average of about 3.8 people per room (Table 5). This makes the housing conditions in the Kabbe Constituency a serious concern considering that the area is flood prone. A large area of the Kabbe Constituency is not built up because of subsequent flooding and as a result most residents live in naturally raised areas called *mutunda* or *mazulu.* They are simply termite hills, mounds or terraces that rise above

flood waters and often in wooded areas of the floodplain. Many are anthropogenic, of 1-2 hectares in extent (Turpie, Smith, Emerton & Barnes, 1999).

Table 5: Rooming per constituency.

No.	Constituency	Percentage of Traditional Dwelling	Average No. of Persons Per Room
1.	Katima Mulilo Urban	38.7	2.0
2.	Kabbe	87.2	3.8
3.	Katima Mulilo Rural	88.9	3.0
4.	Sibinda	86.0	3.2
5.	Kongola	86.0	2.9
6.	Linyanti	89.8	2.5

Source: NPC (2003).

The largest mounds are Impalila Island, Kasika, Itomba, Mbalasinte and Schuckmannsburg respectively. The Kabbe Constituency plays a pivotal role in the political, cultural and economic development of the Zambezi Region. Politically, it has been a stronghold for the ruling SWAPO party's regional and national elections since 1990. The most important economic activities are mixed farming, tourism and fishing, although some people commute to Katima Mulilo town for formal employment. Fishing and mixed farming are heavily dependent on in the *mulapo* (small flood channels) that still hold water during the dry-season. They provide fertile soils and fresh pasture to the residents (Table 6 & Figure 7).

Table 6: Fish output from the Zambezi wetlands.

No.	**Zambezi Basin Wetland**	**Area km2**	**Inland-Fishery Catch(tons)**
1.	Barotse	----	7 500
2.	Eastern Zambezi	4 000	1 500
3.	Lukanga Swamp		1 421
4.	Kafue Flats	6 500	7 063
5.	Lake Kariba	5 100	2 578
6.	Itezhi-tezhi Lake	370	641

Source: Chenje (2000).

Figure 7: Tilapia fish sale at Katima Mulilo open market (April 2011).

At a constituency level, 48% of households are involved in non-farming business activities in Kabbe Constituency, well ahead of other constituencies in the Zambezi Region (Table 7). These non-farming activities include fishing, selling mats made from reeds and papyrus.

Table 7: Source of household income per constituency.

No.	Constituency	Farming	Non Farming Activities	Wages & Salaries	Pension	Cash Remittance
1.	Kabbe	20.7	47.6	13.3	12.1	4.9
2.	Katima Mulilo Rural	32.8	22.5	23.1	11.4	7.0
3.	Katima Mulilo Urban	2.1	18.0	64.0	2.8	11.6
4.	Kongola	36.3	17.6	14.6	16.1	13.3
5.	Linyanti	56.3	14.1	13.0	10.5	4.7
6.	Sibinda	44.2	19.4	11.5	10.9	10.0

Source: NPC (2000).

Crop farming includes maize, rice, sorghum, millet, pumpkins and squash, which are planted in the *dambo*, a grassy and seasonally waterlogged area common in moist savannahs along headwater zones of streams and rivers (Chenje and Johnson, 1994). In other local languages, *dambos* are known as *mulapo*, *mbuga*, *vlei*, *sitapa* or *naka*. They are used as alternatives for moist soil, and hence local people plant a mixture of crops for food security during the dry season. The natural vegetation provides many other economic resources for the local people. Wild fruits and water lily bulbs are used for food and sold for income. Palm leaves are cut and weaved into baskets; fruits are harvested and sold to tourists and locals. Livestock farming is dominated by cattle which are a source of wealth. Half of the cattle in the Zambezi Region are counted in the Kabbe Constituency's Zambezi-Chobe floodplain with its fresh pastures that regenerate after floods.

1.2. **Problem formation**

In the Kabbe Constituency, floods cut-off roads and settlements, kill people and destroy property every year. Animals such as crocodiles, hippos, snakes and elephants leave flooded territories to occupy dry and forested shelter in the floodplains. Their mobility generates an additional threat to particular indigenous residents living within and along the floodplain. Recurrent floods in the Kabbe Constituency present one of the most challenging regional and national hazards. Surprisingly, it is less studied in Namibia. Environmental research has neglected flood risk perceptions and coping strategies. Flood-prone residents often hold an untapped body of indigenous flood knowledge coupled with coping strategies inherited from ancestral generations.

The consideration of indigenous flood knowledge and risk perceptions is indispensable in flood risk management' more especially in countries economically challenged like Namibia. The exclusion of indigenous knowledge and lack of information on how residents perceive hazards may result in failure of external support. However, if documented and modified as part of the disaster risk management framework, this can yield lasting solutions and encourage residents of such areas to heed hazard warnings, adapt and live with floods. With the increase in the intensity of floods in recent years, both the National Disaster Risk Management (NDRM) and non-governmental organisations (NGOs) provide contingent mitigation measures, and to a lesser extent permanent relocation sites. Flood relief items like food, blankets and tents are also supplied to ameliorate the disastrous impacts of floods. At the same time, ferry evacuation, collective resettlement, large scale projects like dams and canals have been

proposed and reported by the media. Such contingent measures seemingly better the immediate disastrous impacts of the floods.

Disaster management experience and evaluation reports around the world show that such unsustainable strategies create a dependency syndrome on Government relief aid and in the long-term may accelerate the loss of indigenous flood knowledge (O' Keefe & Wisner, 1975, as cited in Blaikie, Cannon, Davis & Wisner, 1994). Further, research publicised demonstrates that the construction of dams and canals may "induce a false sense of security" (Blaikie, Cannon, Davis & Wisner, 1994 p.137), and increase a developing country's debt significantly, a serious consequence to subsequent development (Cuny, 1991; Blaikie, Cannon, Davis & Wisner, 1994).

1.3. **Research objectives**

This research has investigated flood RPs and coping strategies of indigenous people in the Kabbe Constituency. The research aimed at understanding and anticipating public responses to flood hazards in the Kabbe Constituency to enhance the disaster risk reduction level through improved communication and policy. This research fills the gap existing in the lack of indigenous hazard knowledge in Namibia by investigating risk perceptions and indigenous coping strategies of floodplain residents in the Kabbe Constituency.

1.4. **Research questions**

Five research questions were addressed to achieve the research objectives, namely:

1. How do floodplain residents perceive the floods?
2. How do floodplain residents respond to the floods?
3. What strategies do floodplain residents use to cope with recurrent floods?
4. How does the local Government coordinate flood relief in the constituency?
5. To what extent has the Namibian Government incorporated indigenous flood knowledge in disaster risk reduction (DRR) policies and programmes in relation to the Hyogo Framework for Action 2005-2015?

Against this regional geographic backdrop, the problematic flood risk perceptions and possible coping strategies require a close analysis of the problem formation and research objectives for possible mitigation of unforeseeable impacts, following material and human-made disasters.

1.5. **Research conceptual framework**

The conceptual framework (Figure 8) of this research describes the general concepts of the research. There are four main components discussed in Chapter 2 respectively: Types of hazards (I), Risk perception and coping strategies (II), the Namibian DRR policies, the HFA (III) and lessons from the Asia Pacific Region, Tanzania and Barotseland (IV).

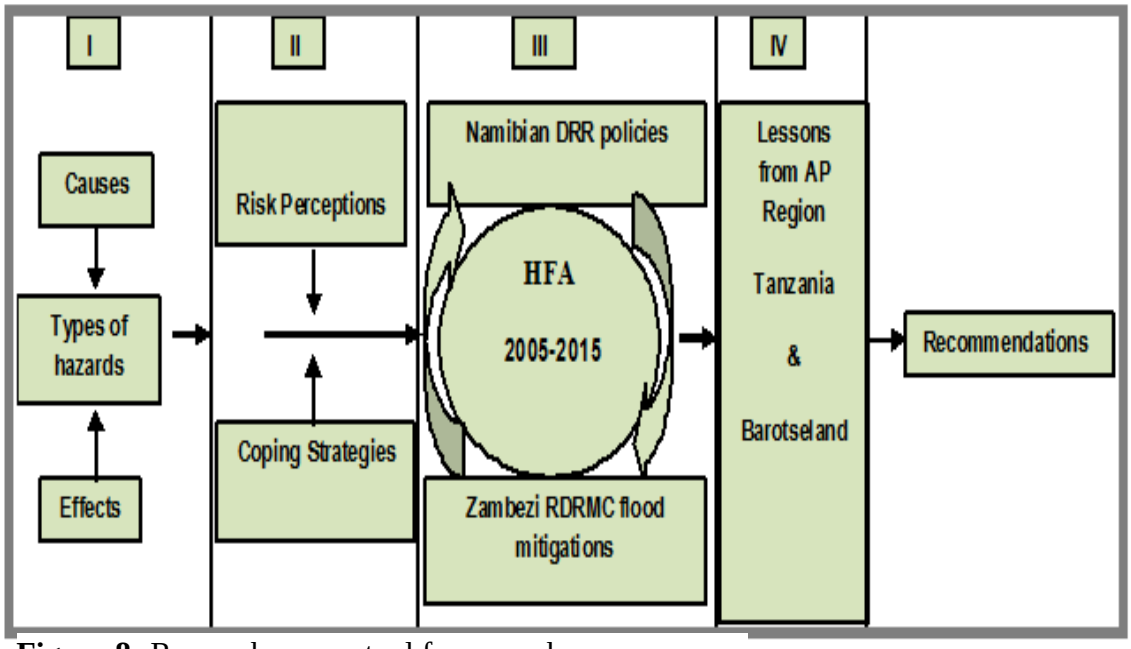


Figure 8: Research conceptual framework

CHAPTER 2: LITERATURE REVIEW

2.1. Key concepts in hazard management and disaster risk reduction

Internationally, a hazard is any potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation (UNISDR, 2004b; UNISDR, 2004b). Table 9 presents the two main classes of hazards. Natural hazards are the most common type of hazards worldwide because they affect more people than any other hazard (Twigg, 2004). The most common natural hazard in Namibia are floods, ranked number one in the top 10 natural causes of disasters from 1990 to 2014 (Table.8).In the Namibian context, a disaster occurs when the hazards exceed the management capacity of one Office, Ministry, Local Authority or Region (Directorate Disaster Risk Management, 2009, p.39), and it follows that a community at national, regional or international level may be required to help reduce the adverse effects of the hazard. To distinguish ‘disaster’ from ‘everyday disasters’ that do not require humanitarian assistance, the EM-DAT database requires at least one of the following four criteria be met for an event to be recorded as a disaster namely 10 or more people reported killed, one hundred or more people affected, a call for international assistance, and or a declaration of a state of emergency (Twigg, 2004, p.12).

Table 8: Top 10 Natural disasters in Namibia from 1990 to 2014.

Type of Disaster	Date of Occurrence	Total Number Affected
1. Flood	2011	500 000
2. Flood	2009	350 000
3. Drought	2002	345 000
4. Drought	2013	331 000
5. Drought	1991	250 000
6. Drought	1995	163 200
7. Flood	2010	110 000
8. Flood	2008	65 000
9. Drought	1998	25 000
10. Flood	2004	20 000

Source: CRED (2014).

Disasters result from a combination of risk, hazard and vulnerability. The concept of vulnerability refers to the condition of susceptibility to the impacts of the hazard. It "refers only to people and not buildings, economies nor unstable slopes or regions of the earth's surface" (Wisner, Blaikie, Cannon & Davis, 2004, p.15). If a community is vulnerable and lacks the capacity to cope with the hazard, then it is at risk because of the high probability of harmful consequence or expected losses in terms of injuries, property, livelihoods, economic activity disruption or environmental damage. Conventionally, the interactive relationship between the three elements- risk (disaster), vulnerability and hazard is expressed by the schematic pseudo-equation: R=H x V (Wisner, Blaikie, Cannon & Davis, 2004).

Table 9: Types of hazards.

HAZARD TYPE	DESCRIPTION AND EXAMPLES
1. Natural	
Natural processes or phenomena occurring in the biosphere that may constitute a damaging event. They are classified by origin (*geological, hydrometeorological or biological*)	
***Geological hazards*:** These are natural earth processes or phenomena, which include geological, neotectonic, geophysical, geomorphological, geotechnical and hydrogeological in nature.	• Earthquakes, tsunamis; • Volcanic activity and emissions; • Mass movements i.e.: landslides, rockslides, rock falls, liquefaction, submarine slides; • Subsidence, surface collapse, geological fault activity.
Hydrometeorological hazards: These are processes or phenomena of atmospheric, hydrological or oceanographic nature.	• Floods, debris and mud flows; • Tropical cyclones, storm surges, thunder/hailstorms, rain and wind storms, blizzards and other severe storms; • Drought, desertification, woodland fires, heat waves, and or dust storms; • Permafrost, snow avalanches.
Biological hazards: They are of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and	• Outbreaks of epidemic diseases, plant or animal contagion and extensive infestations.

bioactive substances.	
2. Anthropogenic (human-made) hazards originate from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause loss of life or injury, property damage, social and economic disruption or environmental degradation**.**	
Technological:	• Industrial pollution; • Nuclear activities and radioactivity; • Toxic wastes; transport, industrial or technological accidents (explosions, fires, spills).
Environmental: Induced by human behaviour and activities (sometimes combined with natural hazards), that damage the natural resource base or adversely alter natural processes or ecosystems.	• Land degradation, deforestation, desertification, wild land fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise, ozone depletion.

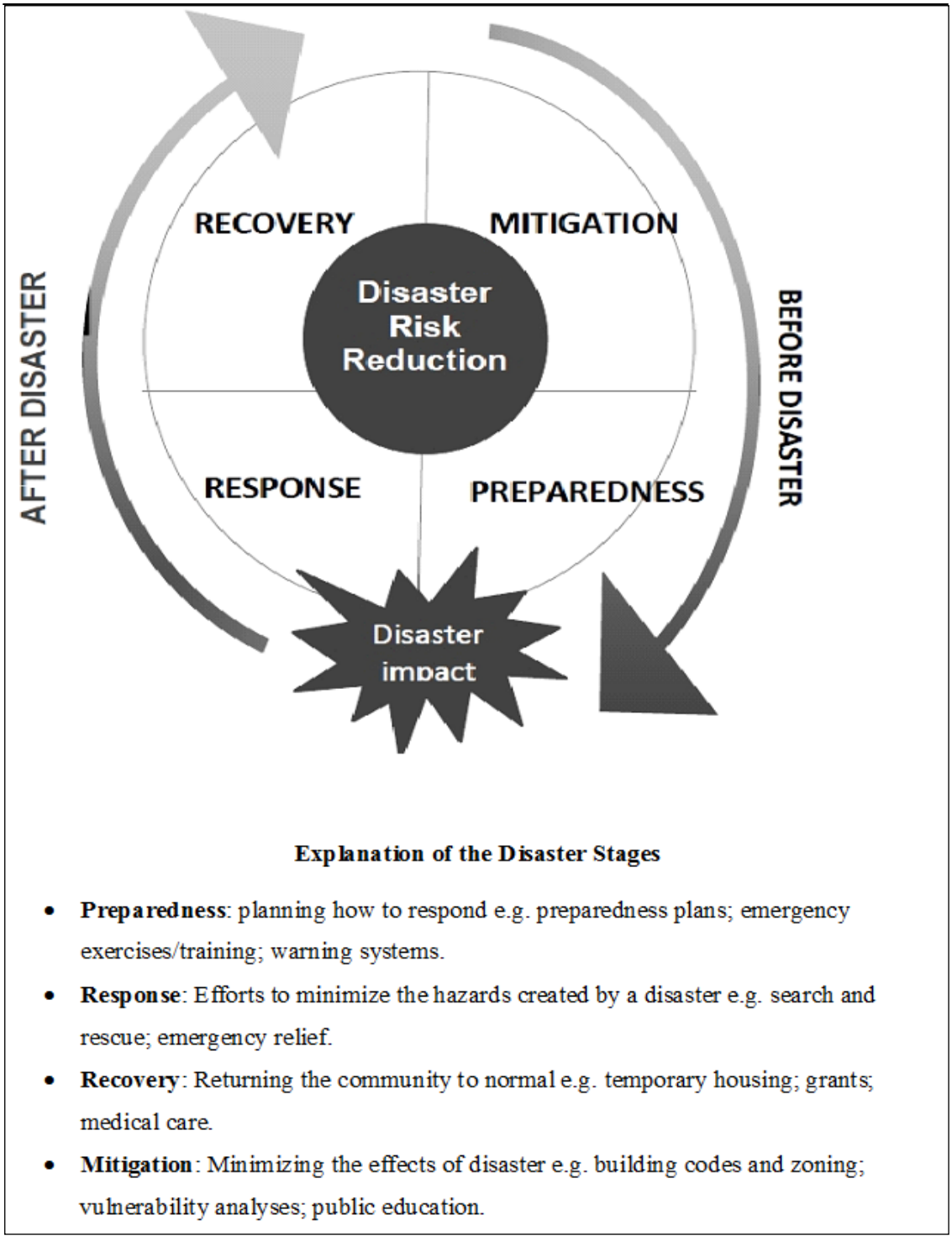
Source: Twigg (2004).

2.2. Evolution of hazard and disaster studies

The earliest hazard and disaster researcher in the 20th Century was Harlan Barrows who recognised that for a situation to turn into a disaster, a vulnerable human population had to be present (Wright, 2000). In time, Harlan Barrow's student, Gilbert F. White, analysed "water and water related issues which included flooding and floodplain management, human adjustments, risk perception and the process of decision making" (Romanowski, 2007, p.30).

Gilbert F. White's work became the basis for other academics such as Paul Slovic, Baruch Fischhoff, Ian Burton and Enrico Quarantelli (Olczyk, 2004). Until recently, decision makers and academics alike viewed hazards and disasters as preventable and one-off events. Olczyk (2004) concluded that decisions were done under the techno-scientific ethos and top-down command-and-control approach whereby the government alone made decisions. Only the government and relief agencies responded to disasters without taking into consideration the social human factor in disasters such as perceptions, culture and values.

Technocratic paradigms also ruled that the only way to deal with disasters was by public policy application of geophysical and engineering knowledge (Yodmani, 2001). Ever since "the global initiative of the International Decade for Natural Disaster Reduction (IDNDR), and its predecessor, the International Strategy for Disaster Reduction (ISDR), there has been a slow, but significant shift in the approach to managing disasters" (Asian Disaster Preparedness Center [ADPC], 2005, p.15).



Explanation of the Disaster Stages

- **Preparedness**: planning how to respond e.g. preparedness plans; emergency exercises/training; warning systems.
- **Response**: Efforts to minimize the hazards created by a disaster e.g. search and rescue; emergency relief.
- **Recovery**: Returning the community to normal e.g. temporary housing; grants; medical care.
- **Mitigation**: Minimizing the effects of disaster e.g. building codes and zoning; vulnerability analyses; public education.

Figure 9: Disaster cycle [*Source:* Twigg, 2004].

We have now come to understand that disasters are not preventable but their risks and impacts can be reduced through a comprehensive process based on risk assessments, then developing and applying strategies to treat risks. There has been emphasis on community involvement, IK recognition and coping strategies application. People living in floodplains and other hazardous areas are encouraged to live and adapt to the hazards. This is promoted, for example, in Bangladesh, Indonesia, Papua New Guinea and Philippines.

This shift from techno-scientific notion and top-down command-and-control approach, gave rise to a rather complex, yet integrated hazard and disaster management approach called Disaster Risk Reduction and Management (DRRM). The new approach requires a framework, such as the one illustrated in Figure 10 which takes into account the socio-economic and environment impacts on the affected area. It is the duty of any government to systematically reduce disasters by deliberately implementing mitigation, preparation, response and relief, and recovery strategies (Figure 9) while following a disaster risk reduction framework (Figure 10).

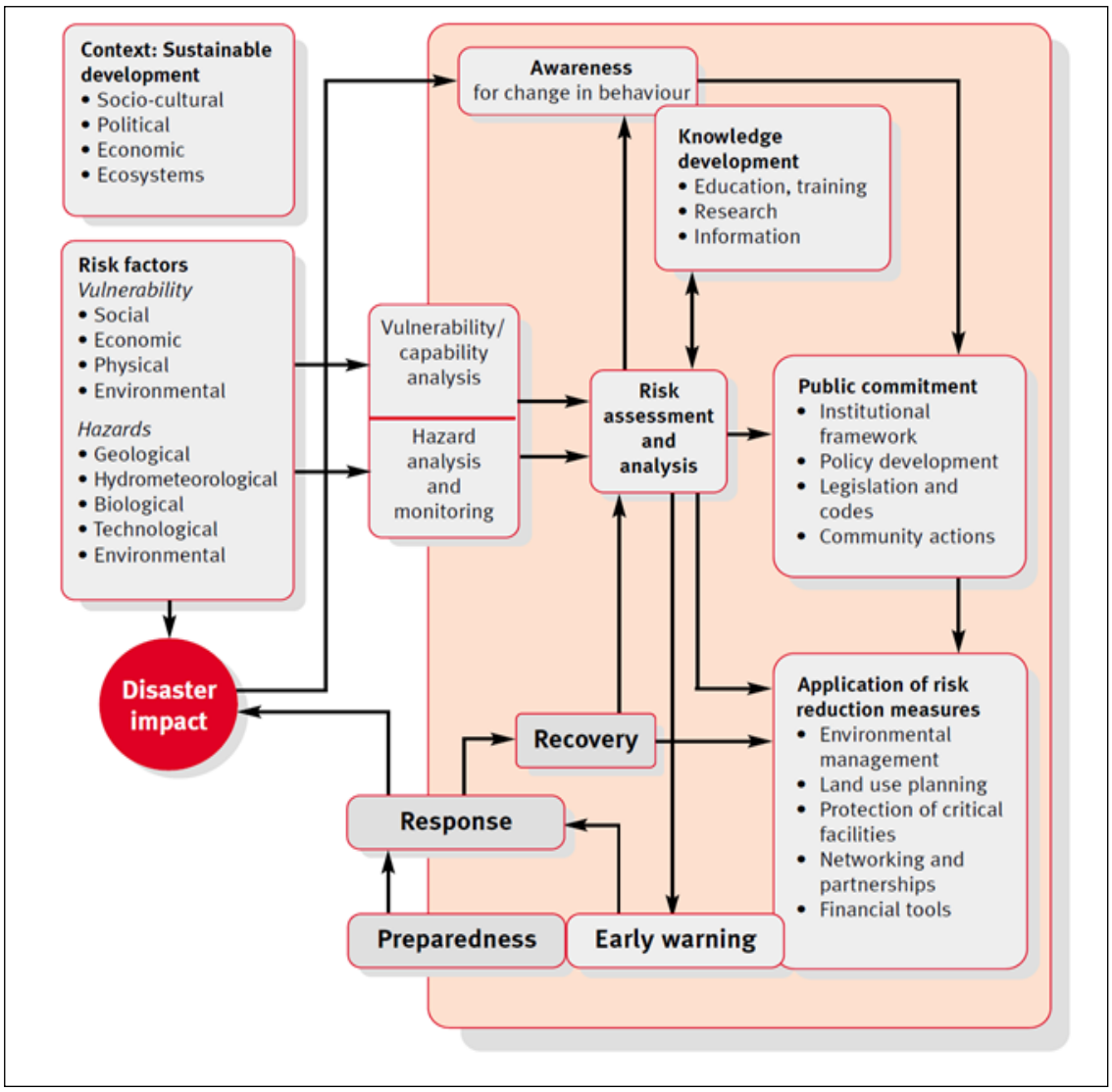


Figure 10: Framework for DRR. [*Source*: Twigg, 2004, p.4].

2.3. Types of floods and flood risk reduction

Floods are the most common natural hazards that have affected people since time immemorial. According to Dewi (2007, p.12), "floods account for approximately 40% of natural disasters and may become more frequent and severe due to global warming". For example, between 1982 and 1991, more than 20 000 people died and 73 000 000

suffered from flood effects (Febrianti, 2010). From the year 1990 to 2000, the death toll rose to 170 000 people around the world per year (Birkmann, 2006). Floods are classified and named in a number of distinct ways, as summarised in Table 10.

Table 10: Classification of floods.

Geography
Riverine, coastal, urban, delta and groundwater flooding
Speed
Flash and slow flooding
Cause
Storm, heavy rainfall, snow or ice melting and structural failure

Source: Flood-site project (2008)

Riverine flooding occurs when a river bursts its banks and floods the area immediately around it. It is caused by heavy and prolonged rainfall at the source and catchment area of the river. The size of the channel, melt-water from snow or ice and obstacles in the river channels contribute to riverine flooding. “Riverine floods are the most common types of floods and are ecologically and economically essential” (Cuny, 1991, p.64).

Coastal flooding occurs when storms such as hurricanes, high tides and other extreme weather conditions cause the sea level to rise above its normal level. This is common in areas of Asia-Pacific and the Gulf of Mexico where tropical storms are most frequent.

Flash floods happen unexpectedly due to heavy rains, lack of drainage systems and an oversaturated ground (groundwater flooding). It is a major cause of urban flooding (ADPC, 2005). Sewer flooding is a result of structural or system failure. It may happen because of blockages or the sewerage system does not have the capacity to carry both rain water, household and industrial waste. It occurs mostly in urban areas including shanty towns.

Like any hazard, floods cannot be prevented, but their impacts can be reduced. This requires an understanding of the flood environment itself as a state of constant flux and the intricate relationship between the human, natural and flood risk environment whereby each influences the other resulting in either negative or positive impacts (ADPC, 2005). To address the dynamics in disaster risk reduction, all stakeholders (government agencies and line ministries, humanitarian agencies and the community) must be involved; and emphasis should be placed more on mitigation, preparedness, relief and recovery; with the ultimate goal of reducing flood risks (ADPC, 2005).

2.4. Risk perception and its relevance in hazard studies

Risk perception is multidimensional and interdisciplinary rooted within psychology, geography, sociology, anthropology and decision-making (Olczyk, 2004). In essence it is difficult to define it in one standard way. It appeared in both government policies and academic literature in the 1960s and 1970s, when technological hazards (such as nuclear hazard) threatened nations (Sjöberg, Moen & Rundmo, 2004). According to Febrianti (2010, p.7), risk perception refers to "subjective opinions of people about the risk, its characteristics, and its severity including multiple factors: individual's knowledge, of the

objective risk, the individual's expectations about his or her own experience to the risk, and his or her ability to mitigate or cope with the adverse events if they occur". Loosely explained, risk perception refers to how people 'decide' what to fear and how to fear. It includes people's awareness, worry or concern and preparedness of the elements (hazards) in the environment that have the potential to harm (Sénchez & Hernandez, 1995; Raaijmakers, Krywkow & van der Veen, 2008). This awareness, worry and preparedness are a result of people making subjective judgements of their situation and previous experiences of hazards.

Risk perception is very important in hazard studies because it "provides the basis for understanding and anticipating public responses to hazards and improving the communication of risk information among laypeople, technical experts and policy makers" (Slovic, Fischhoff& Lichtenstein, 1982, p.83). It shapes their coping strategies in the face of a hazard and helps risk managers in assessing how people might respond to hazard information (Coles, 2009). Since people respond to hazards according to their perceptions, the perception of risks and influencing factors should be known; so that risk information and effective communication strategies can be developed (Plapp & Werner, 2006). Further, risk perception is a first step in a democratic process of formulating a flood protection policy backed by the public (Krasovskaia, Gottschalk, Sælthun & Berg, 2001). Hazard control measures (structural or non-structural) that are applied before investigating public perception of the hazard can be resisted by the public (Nascimento, Guimaráes, Mingoti, Moura & Faleiro, 2007). Therefore, the people's perception of hazards is crucial for the success of hazard management and risk reduction.

2.4.1. People and risk judgements

Early studies in risk perception were based on principles of statistical inferences only (Olczyk, 2004). In the 1970s, researchers recognised that people in general did not evaluate risks using principles of statistical theory or apply laws of chance. Rather, they replaced probability laws with intuitive heuristics, mental strategies, short-cuts or rules based on their experiences, observations, memory, and risk comments from family groups (Romanowski, 2010). There are four main types of heuristics: availability, anchoring-and-adjustment, representativeness and affect.

'Availability heuristics' are used to reduce probability estimates that influence decision making by imagining recent events that are easy to recall and judging them as more imperative and frequent. The availability heuristics assume that "any factor that makes a hazard highly memorable or imaginable, such as a recent disaster or film or lecture-could considerably increase the perceived risk of the hazard" (Slovic, Kunreuther & White, 1974, p.195) and other insignificant events will be blotted out.

'Anchoring-and-adjustment' heuristics involves using a normal starting point in assessing a hazard (anchor) followed by adjusting the first estimate based on any other additional information which in most cases is disregarded. For example, an individual's intuitive estimate of the size of a flood that would be exceeded only one time in one hundred will be conservative, and he/she will thus allow too small a margin of safety in his protective adjustments (Slovic, Fischhoff & Lichtenstein, 1982).

'Representativeness heuristics' involves noticing the common and typical characteristics of a hazard during the first encounter. Based on familiar experiences, a person can make

a general inference about the characteristic of that encounter that may not be readily perceptible, and compare the observable characteristics with different labels in their mind. While this generates some accurate judgements most of the time, it is also a source of misleading and cognitive distortion (Olczyk, 2004).

'Affect heuristics' assumes that people mark the images they see with positive and negative feelings like good, nice, bad, ugly; and then they access this affective or pool of memory to guide them in decision making (Finucane, Alhakami, Slovic & Johnson, 2000). Affect are feelings that orient people's dispositions in difficult and uncertain situations. 'Affect heuristics' explain why people in general create inverse relationships when judging between the costs and benefits of a certain risk (Olczyk, 2004). In situations where time is limited and thinking is difficult, 'affect heuristics' will influence decision-makers to make quick judgements.

The advantage of heuristic judgements is that laypeople can make quick and simple decisions instead of using difficult statistical estimates of the risk. Nonetheless, heuristic estimates have their limitations too. Heuristics may lead to large and persistent biases with serious implications on decision-making, "limit what information people take in, which may provide a false sense of security and overconfidence while in reality, people know little of what they say they know" (Romanowski, 2010, p.33).

2.4.2. Traits and factors influencing risk perception

Many factors govern how an individual or a community of people perceive risks. Bouyer, Bagdassarian, Chaabanne and Mullet (2001) speak of two factors that influence perception of risk, one linked to the 'hazard' and the other to the 'individual'. The 'hazard factor' includes dread, the unknown characteristic of the hazard and the number of people possibly affected. Dread refers to the worst thing that could happen to us, people we love and what has the greatest potential to cause death or suffering or fear. For example, being eaten alive by a huge crocodile, shark or python causes more anxiety than dying from a heart attack. This fear reveals people's innermost intuitive feelings and mental process called heuristics (Bouyer, Bagdassarian, Chaabanne and Mullet 2001). If the hazard effects are unknown (e.g. food preservatives), people are less concerned. Yet if a hazard has a potential to kill many people in one place at one time, people will be more afraid.

The second factor linked to the individual (personality) includes age, gender, scientific education and training in risk expertise. Personality factor studies by academics include anxiety, affective reaction/personal valuation and worldviews. Early results in these researches were "inconsistent with regard to the relation between enduring anxiety levels and risk evaluation" (Bouyer, Bagdassarian, Chaabanne & Mullet, 2001, p.458). The number of hazard factors used in these early studies was inadequate. Romanowski (2010, p.33) cited Fischhoff, Slovic, Lichtenstein, Read and Combs (1978) emphasizing eight factors influencing risk perception, namely "voluntariness of risk; the immediacy of effect; knowledge about risk (of both the people who would be exposed as well as

scientific experts); ability to control risk; the newness of the risk (new and novel or old and familiar); whether the consequences are chronic vs. catastrophic; a risk that is common and people have learnt to function normally in spite of it, versus one where the risk elicits feelings of emotional dread; and the severity of the consequences". People accept the risk and perceive it as less threatening if they themselves have exposed themselves to the risk voluntarily, if they know and can control the risk and to what extent the risk of death is immediate (Romanowski, 2010).

Parker, Priest and Tapsell (2009) categorise the factors influencing flood risk perception and response into socio-economic and socio-psychological factors. Socio-economic factors include land tenure or ownership, age and gender. Land ownership usually influences householders' and businesspersons' warning responses. The elderly also respond less adaptively to warnings because of lack of mobility and difficulties in understanding warnings (Parker, Priest & Tapsell, 2009). Men and women also perceive hazards differently. Men usually judge risks lower than women.

If a hazard brings economic benefits (jobs, income and food), and economic benefits outweigh the negative consequences of a hazard, then people will dismiss the hazard risk or its warning. This cost-benefit ratio is deemed as a principal determinant by analysts in people's perception of risks. Socio-psychological research reveals that when a person perceives a hazard or its warning, he/she will first inform his or her relatives who will discuss it before he or she can respond (Parker, Priest & Tapsell, 2009). Those with previous and most recent hazard experiences will most likely respond quickly to any warning in comparison to those without experience.

Another complex factor influencing risk perception is place attachment. Under different names, it is known as “sense of place, rootedness and refers to affective or attitudinal bonding to specific places, that develops over time, through experiences and frequent contact with a given location” (Hunka, 2008, p.1). Sayings such as ‘home is where the heart is’ reveals people’s attachment to places they know and have experienced.

Table 11: Summary of factors influencing risk perception.

Factor	Conditions associated with increased perception	Conditions associated with decreased perception
1. Catastrophic potential	Fatalities and injuries grouped in time and space	Fatalities and injuries scattered and random
2. Familiarity	Unfamiliar	Familiar
3. Understanding	Mechanisms or process not understood	Mechanisms or process understood
4. Uncertainty	Risks scientifically unknown or uncertain	Risks known to science
5. Controllability (Personal)	Uncontrollable	Controllable
6. Voluntariness of exposure	Involuntary	Voluntary
7. Effects on children	Children specifically at risk	Children not specifically at risk
8. Effects manifestation	Delayed Effects	Immediate effects
9. Effects on future generations	Risk to future generations	No risk to future generations
10. Victim identity	Identifiable victims	Statistical victims
11. Dread	Effects Dreaded	Effects not dreaded
12. Trust in institutions	Lack of trust in responsible institutions	Trust in responsible institutions
13. Media attention	Much media attention	Little media attention
14. Accident history	Major and sometimes minor accidents	No major or minor accidents
15. Equity	Inequitable distribution of risks and benefits	Equitable distribution of risks and benefits
16. Benefits	Unclear benefits	Clear benefits
17. Reversibility	Effects irreversible	Effects reversible
18. Origin	Caused by human actions or failures	Caused by acts of nature or God

Source: Covello, Sandman & Slovic (1988).

2.4.3. Theories used in risk perception studies and their limitations

The psychometric and 'grid-group 'cultural theories are the two major families of theories developed to explain risk perception. The psychometric theory is regarded as the "leading approach in the field of risk perception" (Terpstra, Gutteling, Geldof & Kappe, 2005, p.3). The method implies the use of a questionnaire to elicit responses about risk characteristics (awareness, worry and preparedness) for data to be quantified. If the results of factor analysis reveal a higher score on the dread factor, then the risk is perceived as high. According to critics, the psychometric paradigm "neglects individual differences in risk perception because of using aggregate data analysed using principal component analysis, and the explanatory power of the model is largely due to the inclusion of the dread items" (Sjöberg, Moen & Rundmo, 2004, p.25). The dread factor is indeed a consequence of perceived risk and not a cause of it, and should not be used as an explanatory variable. Despite the critics, the psychometric theory provides answers that are close to common sense, supported by policy makers.

The 'grid-group' cultural theory was initiated by anthropologists Mary Douglas, Michael Thompson, Richard Ellis and the political scientist Aaron Wildavsky in response to the 'quantitative' psychometric theory and individual notions of risk perception. According to Olczyk (2004, p. 46) the tenet of the cultural theory is that "human attitudes towards risk perception are not homogenous but vary systematically according to cultural biases". The 'grid-group' cultural theory explores how people communicate hazard experiences from generation to generation. It assumes that different cultures prefer different kinds of hazards and this is understood to be governed by values and beliefs which are controlled by the social

context or relations (Coles, 2009). The cultural theory offers three main domains. Cultural biases, social relations, and way of life. Social relations are patterns of interpersonal relations which can be captured by group and 'grid' sociality dimensions (Shen, 2010). The 'group' sociality dimension refers to the "outside boundary that people have erected between themselves and the outside world" (Douglas & Wildavsky, 1983, p.138). It describes how people are bonded together regardless of differences in cohesiveness and individualism. The 'group' sociality dimension measures how much of peoples' lives are controlled by the social group they live in. The more the lives (houses, work, resources or recreation) of people in a certain group are linked, the higher the group dimension (Thompson, Ellis& Wildavsky, 1990). This means that it will be difficult to be admitted to that group or, for an outsider to influence their values and beliefs even in face of a risk.

The grid sociality dimension describes the different social roles and positions people in a group play, and exercise to limit how people behave to one another (Douglas & Wildavsky, 1983). The cultural theory specifies five types of people, groups or patterns of social relations in a modern society related to the perception of risk, namely: hierarchists, egalitarians, individualists, fatalists and hermits (Sjöberg, 2000a; Sjöberg, 2000b). Hierarchists or collectivists prefer command and obedience flowing in a hierarchy from members having authority and experience in the same social group. People prefer that decisions should be left to the expert (Olczyk, 2004; Shen, 2010)

Egalitarians or sectarians do not tolerate any inequality but prefer a world where power and wealth are shared and people are equal (Douglas & Wildavsky, 1983).

The values and beliefs that the group share makes the bond between the people stronger and helps to prevent clashes.

Individualists or market social relations prefer limited interference from anybody including the government (Thompson, Ellis& Wildavsky, 1990). They believe that if you have the ability, then you can gain more. To them, risks go hand in hand (interrelated) with the opportunity. Such social relations form weak bonds between people. Fatalists believe that risks are inevitable and any action will not change anything. So people have no control of the situation; they just tolerate it (Thompson, Ellis& Wildavsky, 1990). Hermits reclusively retreat from any social cohesiveness and the only time they interact with others is when it is really necessary. Rohrmann and Renn (2000) similarly described the five groups of people in the 'group-grid' cultural theory and how they choose to be concerned with different types of hazards. One of the several short comings of cultural theory is that "it explains only a minor share of the variance of perceived risk and it adds even less to what is explained by different approaches" (Wilkinson, 2001, p.11). Cultural theory also misrepresents social reality of risk perception by rigidly conforming it to the categories of cultural biases (Wilkinson, 2001). It is also ambiguous, narrow and presumptuous to classify complex social units into only four to five groups when in reality, behaviours or attitudes between the groups may overlap (Olczyk, 2004).

Since culture is the lens to study risk perception, the cultural theory may offer a general framework for investigating risk perception, because it clearly identifies "some very important features of the social fabric at risk, contributing to an enhanced comprehension of risk perception and tolerance, and raises several critical issues for future research" (Olczyk, 2004, p.50).

2.4.4. Linking socio-psychological and cultural theories

In 1988, Roger E. Kasperson, Ortwin Renn, Paul Slovic, Halina S. Brown, Jacque Emel, Robert Goble, Jeanne X. Kasperson and Samuel Ratick presented the Social Amplification of Risk Framework (SARF) to link communications theory, psychological, sociological, anthropological and cultural approaches to risk perception. The concept of the framework is that "risk and hazard events interact with psychological, social, institutional and cultural processes in ways that can heighten or attenuate individual and social perceptions of risk and shape risk behaviour. Behaviour patterns, in turn, generate secondary social or economic consequences that extend far beyond direct harms too human health or the environment" (Rohrmann & Renn, 2000, p. 178-179). Beginning with the hazard event, the SARF explains how risk events are communicated, amplified (receive the public's attention) or attenuated (receive less public attention) from the sender to the public. It also explains that risk response causes rippling of secondary consequences. "There is an intensification or attenuation of certain risk aspects by each station [i.e. scientists groups, mass media, government agencies, politicians, community activist groups and so forth] that is predictable in accordance with its social characteristics; these expected transformations serve as a rationale for differences in signal value reception" (Olczyk, 2004, p.52).

The amplification of risk cause rippling of secondary consequences like loss of sales, litigation, investor flight or even social disorder. These secondary changes are perceived and reacted again by individuals and groups resulting in tertiary-order impacts that may spread or ripple to other parties or locations (Olczyk, 2004). It is important that these ripple effects are recognised. Failure to recognise them can

cause adverse effects from certain risk events. The 1992 Royal Society study group criticised the Social Amplification of Risk Framework that it was too narrow in scope because of its one-way communication (The Royal Society, 1992). Renn (1991) and Kasperson et al. (1988) acknowledged the importance of the Social Amplification of Risk Framework in hazard communication and recommended that feedback from the receiver to the source needs to be addressed in the framework.

2.5. Indigenous knowledge and coping strategies

Indigenous knowledge refers to the "methods and practices developed by a group of people from an advanced understanding of the local environment, which has formed over numerous generations of habitation" (Shaw, Uy & Baumwoll, 2008, p. vii). Indigenous knowledge is distinguishable from other types of knowledge, because it originates "within the community, maintaining a non-formal means of dissemination, collectively owned, developed over several generations and subject to adaptation, and imbedded in a community's way of life as a means of survival" (Shaw, Uy & Baumwoll, 2008, p. vii).

Indigenous knowledge is indispensable to both people living with hazard risks and to hazard experts (Twigg, 2004). It is the basis for coping with hazard and is always executed first by the local people before any external support from the government, international community or humanitarian organisations like the Red Cross Society or the UN. As alluded by Shaw, Uy and Baumwoll (2008) and the World Bank (1998) indigenous knowledge can be transferred and adapted to other communities in similar situations. If indigenous knowledge is incorporated in existing practices and policies of disaster risk reduction (DRR) it may even encourage the participation of

the affected community as it "empowers its members to take the leading role in all disaster risk reduction activities" (Shaw, Uy & Baumwoll, 2008 p. vii).

2.5.1 Types of coping strategies

Indigenous knowledge applied in the face of a hazard can be alternatively referred to as coping mechanism or strategy (Twigg, 2004). There are countless ways different groups of communities cope with hazards and resultant disasters. Categorising these strategies can result in a complex system of interconnections. Twigg (2004) categorises them into economic, technological, social and cultural strategies. These strategies are applied before, during and after the disaster. 'Preventative strategies', aimed at reducing the severity, are applied before disaster impacts (Wisner, Blaikie, Cannon & Davis, 2004). During the disaster, communities at risk apply 'response strategies' that may include relocating some property and people from high risk areas to more manageable risk areas. At the same time indigenous people might access stores of food or find alternative food from fields or forests, seek income from extended family and sell stocks (Wisner, Blaikie, Cannon & Davis, 2004). Floodplain dwellers may even take advantage of the floods through fishing, lily tuber harvesting or reed crafts. After disaster strategies, on the other hand, can be termed 'recovery' strategies. They include cleaning, renovations, developing new social networks, diversifying agricultural production, building food and saleable assets (Wisner, Blaikie, Cannon & Davis, 2004; Jabeen, Johnson & Allen, 2010; Twigg, 2004). The following are best practice examples of indigenous communities' from the Asian-Pacific Region and Barotseland.

Examples from the Asian-Pacific Region

The first example is from Gifu Prefecture, one of the most flood-prone provinces in Japan. Gifu Prefecture is situated on the low Noubi floodplain at the confluence of three rivers: Kiso, Nagara and Ibi Rivers (Shaw & Takeuchi, 2007). For over 600 years, the local people have accepted floods as natural events and lived with them. Indigenous flood coping strategies include Goninggumi, Waju, Hijiri-Ushi and Mizuya as shown in Figure 11.

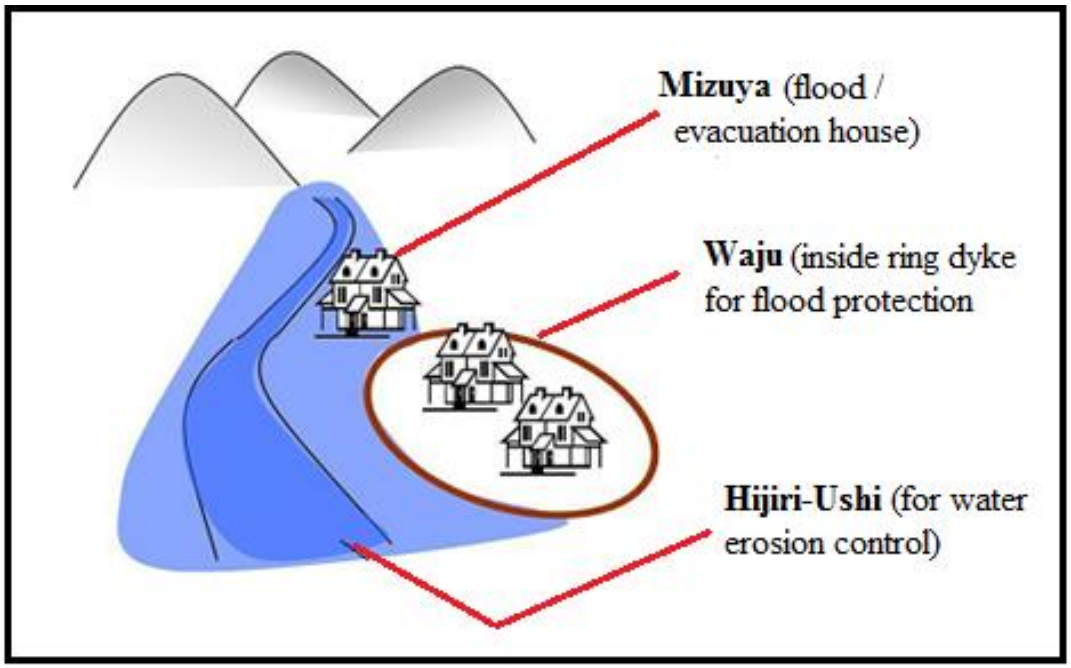


Figure 11: Types of Japanese indigenous flood coping strategies [*Source*: Shaw & Takeuchi, 2007].

Goninggumi was mandated in the 19th century during the Edo Era (1603-1867) and it consisted of five families mutually cooperating and assisting each other when a hazard strikes (Shaw, Uy & Baumwoll, 2008). There were several programmes to prepare for and fight floods. Some included sand bank enclosures and bamboo planting.

Hijiri-Ushi (Figure 12 & Figure 13**)** is a Japanese traditional flood prevention strategy aimed at reducing the erosional force of the river. Traditionally the structure may be built from wood and stones. Up to today these structures are still used with slight modification (Siyanee, Piyapong, Toyoda, Mizuta & Kanegae, 2009**)**.

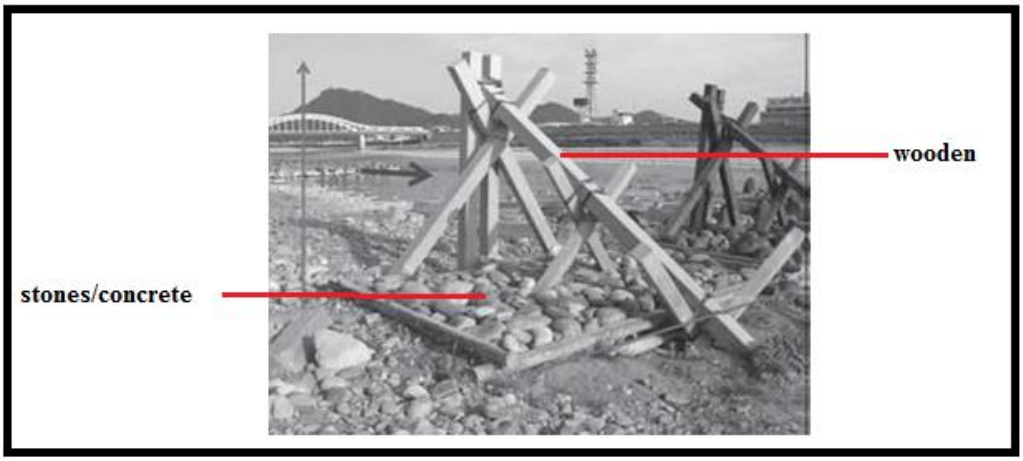


Figure 12: Hijiri-Ushi [*Source*: Shaw & Takeuchi, 2007].

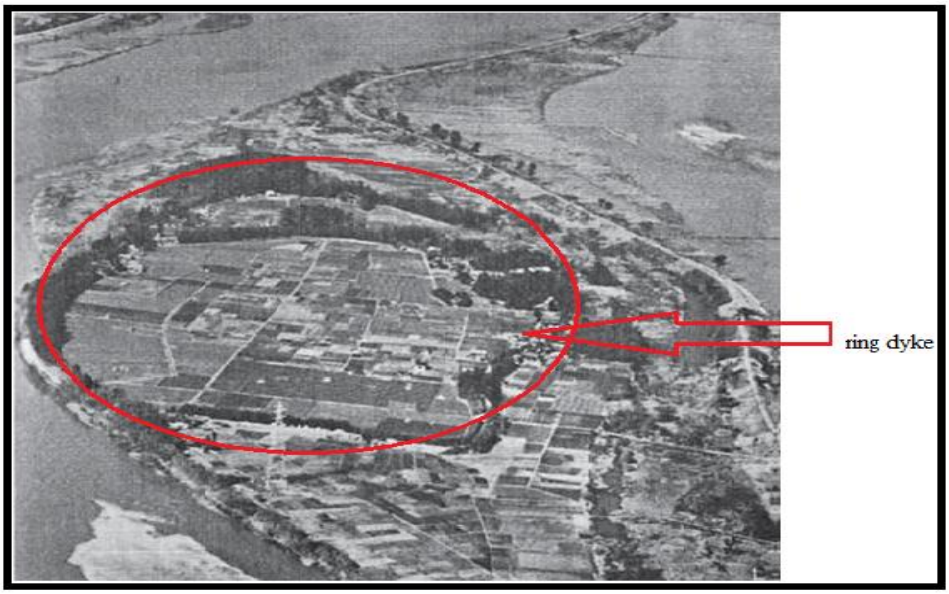


Figure 13: Waju [*Source*: Siyanee, Piyapong, Toyoda, Mizuta & Kanegae, 2009].

The Waju strategy involves the building of ring dykes around a community (Figure 13) and connecting with other communities in the floodplain to protect the people

from flood risks (Siyanee, Piyapong, Toyoda, Mizuta & Kanegae, 2009). Ring dykes were looked after by the community's special committees and, in a way; this contributed to village self-esteem and strengthened community ties (Shaw, Uy & Baumwoll, 2008).

Mizuya are flood houses whose height or plinth is raised in case of flooding. Well-off people in general have two houses; the main house and the Mizuya with at least two bedrooms, a storage room, a toilet and emergency supplies including a boat (Siyanee, Piyapong, Toyoda, Mizuta & Kanegae, 2009).

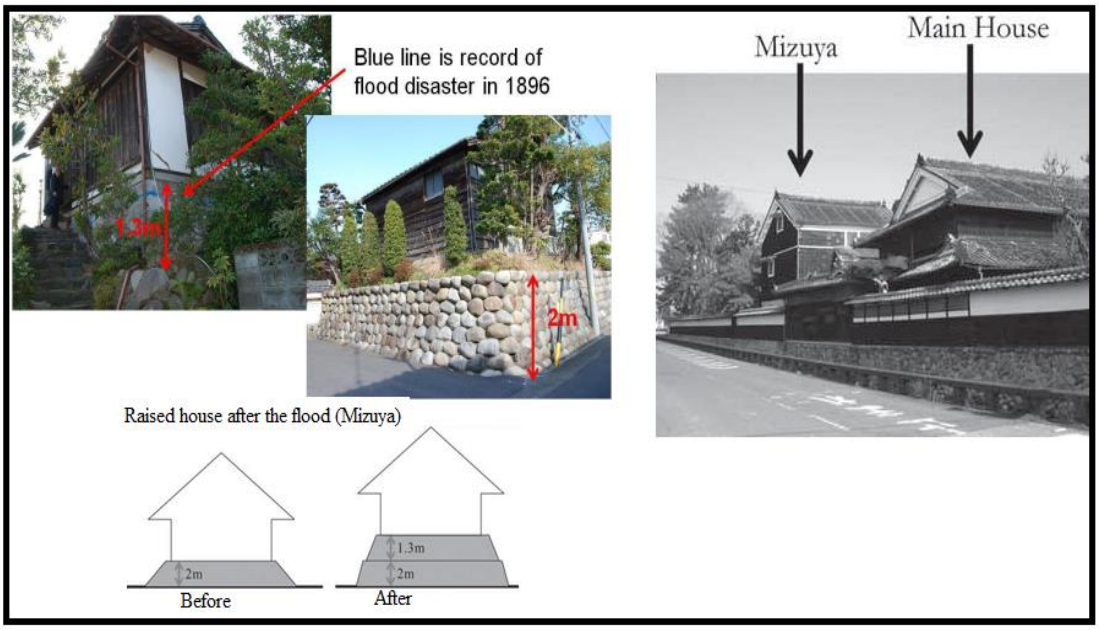


Figure 14: The Mizuya [*Source*: Shaw, Uy & Baumwoll, 2008].

The following example refers to the enclave village of Singas situated along the Markham River in the Morobe Province, Papua New Guinea.

Singas experiences recurrent floods and above normal rainfall. In 1998 and 2002, the flood water rose above the stilts and went into people's houses (Mercer & Kelman, 2008, as cited in Shaw, Uy & Baumwoll, 2008). The authorities told the community

to move away from their homes but people did not move. According to Mercer and Kelman (2008, as cited in Shaw, Uy & Baumwoll, 2008, p. 47), the reasons for not moving were:

1. The river was valuable for their livelihood in terms of fishing, agriculture, water supply and clay to make cooking pots;
2. They were close to amenities (the main provincial buildings and medical facilities were located on the other side of the river); and
3. They had resided there for years, coping with floods and using only indigenous knowledge to build flood-proof houses as well as other traditional forms of surviving with floods.

Figure 15: Raised house in Papua New Guinea [*Source*: Mercer, 2006].

These methods have been developed over years of habitation in the Markham River area. Singas community build their houses on stilts (Figure 15) on high strong ground found close to the river. Underneath these houses are mounds used to halt

rising flood water. The height of the stilts has been raised over the years with increase in the flood level. The Singas have clearly marked sites where people can relocate to or where houses can be built safely away from flood. During floods when resources are scarce, a social linkage method similar to the barter system is practiced among the Singas people (Mercer & Kelman, 2008). Food strategies include the use of hazard resistant crops like bananas, yams and taro. Fishing is done by hand, and adults limit their food intake so children can have surplus to eat and women tie belts tightly around their waists to restrict hunger pains (Mercer & Kelman, 2008). The Singas study the amount of rainfall in the hills, flood markers or river level 'spotters' in order to store food and prepare for evacuation well ahead of the flood (Shaw, Uy & Baumwoll, 2008). Oral history also saves as an important tool for guidance when a disaster strikes in the Singas community.

A third example from the Asian-Pacific Region focuses on Nabouciwa village situated in a low lying area on the Rewa plains on the main Island of Viti Levu (Fiji). The indigenous community living use both indigenous flood-proofing methods with modern engineering mitigations (Eliki, 2005). Before engineering mitigations, the Nabouciwa village frequently experienced flooding from heavy rain and high tides causing serious health threats and disruption to the villager life (ADPC, 2005). It took 10 years of deliberation with the indigenous community to implement modern engineering mitigations, including the raising of houses with the use of piers and footings; and minor drainage work. The entire community participated fully carrying out activities such as clearing the areas, and once they had learnt skills from experts, were able to lay footpaths and drainage (Eliki, 2005). The Canadian Government provided funding and earth moving machines for major drainage works while minor

drainage works are done by the community themselves. Internalizing the project led to community commitment and support (ADPC, 2005). The implementation of grants, engineering mitigations, rising of houses and minor drainage work has resulted in better health conditions and living standards.

The following example illustrates how the Lozi people, who share the same culture and language with the residents of the Kabbe Constituency, continue surviving with floods using only indigenous structural engineering, customs and experiences in the largest floodplain of the Zambezi River Basin.

Example from Barotseland, Zambia

Barotseland, Barotse floodplain, is a broad wetland area of the Zambezi River Basin in western Zambia and home to the Lozi people. The Lozi people are also referred to as plains or water people (Turpie, Smith, Emerton & Barnes, 1999), because their livelihoods and culture revolves around the seasonal flows of the Zambezi River and subsequent floodplains. Inhabitants of the Barotse floodplain (locally called *Lyondo or Bulozi* in Silozi language) have been living with floods for over 200 years. Through time, the Lozi people have developed an understanding of the Zambezi River regime and formed traditions, customs, designs and features that are still a part of their lifestyles today (UNESCO, 2009). With the seasonal flooding, the Lozi people and their King *Litunga* (meaning 'keeper of the earth') relocate to the uplands (*Maongo* or *Matongo*) and its fringes using dug-out canoes (locally called *Mukolo* in Silozi language). This annual seasonal transhumance is called *Kuomboka* (meaning 'emerging from the waters') and is highly celebrated with an orchestra of traditional music and dance all the way to the highlands in Limulunga, where a similar capital to the traditional Lealui in the plain stands established (UNESCO, 2009). Whilst

Kuomboka ceremony refers to the relocation from Lealui to Limulunga, the reverse exodus to Lealui is another ceremony known as *Kufuluhela* (meaning 'rowing for'). The latter ceremony is not publicised.

Cattle and other properties are also moved upland ahead of the flood time while residents wait for the Prime Minister (*Ngambela)* of the *Litunga*, to issue the commencement of seasonal relocation and the *Kuomboka* ceremony (Turpie, Smith, Emerton & Barnes, 1999). It is also forbidden among the Lozi people for any villager to leave the flooded valley for higher ground (*Matongo* or *Maongo* in Silozi and Subia language) before the *Litunga*. Only after the *Litunga* has left can the villagers leave their flooded villages, load their possessions into dug-out canoes and row behind the king's flotilla to higher ground on the edges of the floodplain (*Kuta* senior headman: pers. comm.).

During and immediately after the flood, the Lozi people catch fish using modern fishing nets and traditional traps (i.e. *Lukuko* and *Katamba* in Silozi language) and weirs (*Malelo*) to hold fish back when the water recedes (*Kuta* senior headman: pers. comm.). As the water retreats, maize, pumpkin and squash seeds are planted in the moist *dambos* along the river. Early planting ensures good harvests and safeguards crops from being submerged when the flood season starts. Houses in the floodplain are built on high man-made mounds and renovated after the flood season.

The Lozi King, Litunga Lewanika (1878 to 1916) introduced a successful policy of carving out deep channels or canals (*maabwa*) across the Barotse Floodplain for navigation, farming and draining the plain. "The longest canal is called *musiyamo* and stretches from beyond Limulunga and ends at the Mongu harbour. Another such canal was the *mwayowamo* constructed between 1887 and 1889 to link Lealui to

Limulunga and also supply water to Lealui" (UNESCO, 2009, par. 32). Others include *Lyabwa la twelufu, Lyabwa la Sikolongo, Lubitameyi, Sanjali* and its tributaries as well as *Nonge* at *Ngonye-Sioma Falls*, all constructed for navigation in the plain.

The whole system which encompasses mound and canal construction, flood level timing, transhumance and fishing techniques demonstrate the ingenious ways the Lozi people have adapted with floods with little or no external support system.

2.5.2 Challenges with the use of indigenous knowledge

The challenges with indigenous knowledge are the same as any other knowledge system. Before it is used, it must be systematically tested and documented. Policies must be set at different levels; either in disaster risk reduction, education or research to support its use (Shaw & Takeuchi, 2007). Documentation includes four main steps, namely:

1. Collection of basic information;
2. Verification of strengths and weaknesses;
3. Examination of applicability in different contexts (physical, social, culture and economic); and
4. Classification of the technology based on certain criteria.

Disasters that occur in people's lives force them to develop coping strategies in case the crisis happens again in the near future. Since they expect the hazard and disasters to happen or follow the same pattern as before, they use earlier actions as reasonable guides for similar events. They setup mechanisms to transfer these 'earlier actions' to other people, the younger generation so they may use them as a guide in dealing with

similar hazards and disasters. This has proved advantageous in many cases where disaster had a similar pattern. However, the problem with some hazards is that they can be unpredictable and have such a long return period that people forget or become uncertain (Wisner, Blaikie, Cannon & Davis, 2004).

The term ‘coping’ as used in academic literature may hide situations in which people are in destitute or even dying state (Wisner, Blaikie, Cannon & Davis, 2004). The jargon “Africans do not starve, they cope” (Seaman, Holt & Allen, 1993, p. 27) draws attention to this misconception. Coping therefore must not be viewed only in terms of surviving difficult situations but also as a “gradual rack of dearth, difficulty, destitute and maybe ultimately, death” (Wisner, Blaikie, Cannon & Davis, 2004, p.120).

2.6. Previous research on flood risk perception and coping strategies

One way in which risk perception has been studied is by looking at the conditions that have the greatest influence on the way risks are perceived. The conditions are: whether the risk evokes dread and fear, is the risk controllable, is it natural or man-made, are people aware of the dangers, is there a possibility of personal impact, what are the cost-benefit ratios, trust in professionals, effects on property and previous experience. In order to determine the influencing factors on risk perception and develop effective risk communication strategies, Plapp and Werner (2006) combined a psychometric and cultural theory. Using an open-ended questionnaire with nine risk characteristics, of which respondents were rated, the results of risk perception from floods, windstorms and earthquake in six affected areas in Germany “showed that disasters are conceived as inevitable events in spite of the understanding of disaster as a consequence of inappropriate land use planning and human-made

climate change" (Plapp & Werner, 2006, p. 107). Further, they discovered that demographic variables (e.g. age, education) played a minor role. They recommended a risk communication strategy that emphasises preparedness and offer information about possible preventative measures.

Hung, Shaw and Kobayashi's (2007) study investigated reasons for unusual over-development in floodplain areas, outside river dykes, to provide insight into community risk perception of catastrophic flood in the riverside urban area (RUA) of Hanoi, Vietnam. Using a questionnaire survey with a mixture of open-ended and closed questions, their research reveals that people continue to settle in the floodplain areas outside river dykes because of low perception of catastrophic flood risk. People trust their homes as prominent protective solutions to any catastrophic flood event (Hung, Shaw & Kobayashi, 2007).

Terpstra, Gutteling, Geldof and Kappe (2005) studied flood risk perception and water nuisance to gain insight in the determinants of flood risk perception. Using elements of the psychometric paradigm, they constructed a questionnaire by developing 38 statements about flooding and 12 about water nuisance. These were rated by the respondents and the conclusion was that residents viewed the flooding risk as unimportant compared to the benefits of their residence. In addition, the authors used a focus group discussion to explain these findings. Their results reveal that the respondents viewed the risks of flooding not weightier against the benefits of their residence situation.

Romanowski (2007) examined how residents of Tsawwassen in British Colombia perceived and coped with a storm surge flooding. Using a qualitative research design and semi-structured interviews, her findings show that many residents had a low risk

perception and were not motivated to take any precautionary and protective action although having full knowledge and experience about the previous flooding. However, the author discovered that the newer residents with little or no experience of storm surge flooding identified flooding as a higher risk. The main factors influencing risk perception and coping strategies in the study were "government interventions, family, friends, and neighbours, benefits of living in the area, experience and financial support" (Romanowski, 2007, p.99). The author concluded that government intervention hindered people's ability to deal with flood, while family, neighbours and friends were a source of knowledge and support when responding to flooding.

Febrianti (2010) investigated the community risk perceptions and coping mechanism of people living in flood-prone areas in Surakarta City (Central Java Province, Indonesia) using a participatory qualitative research approach. The 150 respondents together with focus group discussions revealed that flood risk perception among the community varied. Some recognised the need to move to safer areas but others did not want to move to safety although they were fully aware of the flood risks. Three main coping mechanisms, namely: economical, physical and social cultural were identified (Febrianti, 2010).

Before the flood, people moved their belongings like television and radio sets and clothes to a safe area or to relatives. Physically, they also rebuilt or renovated their houses by raising the floor from 0.3m to about 1m above the ground and made emergency or escape rooftops. From a social cultural coping strategy, the local people worked together either to clean the neighbourhood drains, canals or houses. Hourly, people used sticks to watch any changes in the level of the flood water.

During the flood, people evacuated their belongings and themselves to safe areas. Houses were locked or men stayed behind guarding their homes. After the flood, people cleaned and renovated their homes.

2.7. Permanent relocation policies: The Tanzanian experience

In Tanzania, during the 1960s, two relocation policies, Villagization and collectivisation, were coined by President Julius Nyerere (President from 1961 to 1985). These socialist policies involved consorting people into planned villages and farms in order to reduce the costs of providing basic services like communication, drinking water, education and health services (Mnenuka, n.d). Villagization and collectivisation began as voluntary programmes and promised social services in the new villages, collective farms and attracted thousands of people. With reference to the unseasonal floods in 1969, Lorgen (1999) noted that the Tanzanian Government took advantage of the natural disaster to persuade people to move. Nonetheless, the majority of Tanzanians responded slowly because of (i) poor village planning, (ii) insufficient services in the new villages and collective farms, and (iii) farmlands and fuel-wood were far from the new villages.

By 1973, President Julius Nyerere declared living in villages [and collective farms] an order. Employing military force against those who would not obey voluntarily and to make sure that peasants did not move back, houses were destroyed (Lorgen, 1999; Mnenuka, n.d). Villagization and collectivisation policies were justified by Nyerere as a socialist way of facilitating large-scale farming and modernise agricultural production. The Villagization programme brought benefits of services such as communication, education and improvement in the quality of life. Unfortunately, it caused negative effects like animal diseases, soil exhaustion, land conflict and

urbanisation. Ultimately forced relocation wholly disrupted Tanzania's agricultural efficiency and output, and by 1980 the Villagization and collectivisation programmes failed.

2.8. International framework for disaster risk reduction

The Hyogo Framework for Action 2005-2015 (HFA) is a fundamental framework for disaster risk reduction (DRR) and an important guide to the African Regional Strategy for Disaster Risk Reduction, the Southern African Development Community (SADC) Disaster Risk Reduction Strategic Plan and the Namibian National Disaster Risk Reduction Policy. It evolved from the World Conference on Disaster Reduction held from 18-22 January 2005 in Japan. The HFA was adopted by the international community to promote strategic and systematic approaches to reducing risks and vulnerability to disasters by building resilience of nations and communities prone to disasters (UNISDR, 2005).

In order to reduce hazard risks and vulnerability to disasters, the HFA concerns Namibia with factoring integrated, multi-hazard approach to disaster risk reduction into policies, planning and programming related to sustainable development, relief, rehabilitation, and recovery activities in post-disaster situations (UNISDR, 2005). This includes considering gender perspectives, cultural diversity, age, and vulnerability of certain groups to disasters.

HFA encourages governments to empower both communities and local authorities to manage and reduce disaster risks. This means providing the communities and local authorities with access to the necessary information, resources and authority to implement actions for disaster risk reduction. Warranting particular attention are the communities living with hazards like floods in the north and north-eastern parts of

Namibia in view of their higher vulnerability and risk levels, which often greatly exceed their capacity to respond to and recover from disasters (NPC, 2009). Sufficient resources for disaster risk reduction need to be mobilised in advance. Resources such as risk assessment and early warning systems are essential investments for the future and promote a culture of disaster prevention by protecting and saving lives, properties and livelihoods (NPC, 2009; UNISDR, 2005). They contribute to a cost-effective sustainable development and strengthen coping mechanisms that are a primary reliant on post-disaster response and recovery. The HFA emboldens governments to be proactive and not reactive in the face of hazards. They must use the window of opportunity (relief, rehabilitation and reconstruction following a disaster) to rebuild livelihoods, plan and reconstruct physical and socio-economic structures of the affected community (UNISDR, 2005).

Since livelihoods are dependent on agriculture (agriculture-based livelihoods), food security becomes a critical factor in ensuring the resilience of communities to hazards (UNISDR, 2005). Important public amenities and physical infrastructures such as schools, clinics, hospitals, water and power plants, communications and transport lifelines, disaster warnings and management centres, and culturally important lands and structures need to be protected and strengthened to reduce the effects of disasters.

HFA emphasises the promotion of research and training in disaster risk reduction in all sectors. Additionally, the promotion of inclusive disaster risk reduction education in relevant sections of school curricula at all levels is fundamentally emphasised by the framework. As part of SADC, African and the General Assembly of countries present during the said World Conference on Disaster Reduction, Namibia agreed to

adhere to the terms and conditions of the HFA, the African Regional Strategy for Disaster Risk Reduction and the SADC Disaster Risk Reduction Strategic Plan (NPC, 2009). The African Regional Strategy for Disaster Risk Reduction and the SADC Disaster Risk Reduction Strategic Plan are also guided by the HFA. They solicit governments to create a facilitating environment in which people can be empowered to reduce natural disaster risks at continent and regional level.

2.9. Disaster risk reduction in Namibia

In Namibia, disasters are a peril to achieving sustainable development in line with Vision 2030 and MDGs. The legislative frameworks that Namibia was using before 2011 were obsolete in the face of current global trends in DRR (DDRM, 2011). In 2011, the Disaster Risk Management Act, Act 10 of 2012 was passed and became law to provide for the establishment and operationalise institutions for disaster risk management in Namibia.

2.9.1. The National Disaster Risk Management System

The Office of the Prime Minister (OPM) in Namibia manages disasters. Figure 16 shows the different institutions for the National Disaster Risk Management System (NDRMS). It was established with a sole mandate to reduce disaster risks in Namibia. This means consenting government ministries, the private sector, other non-state actors and development partners at national, regional, constituency, local authority and settlement levels in Namibia have to take best possible actions and philosophies to ameliorate disasters in line with other national and inter-regional policies (NPC, 2009).

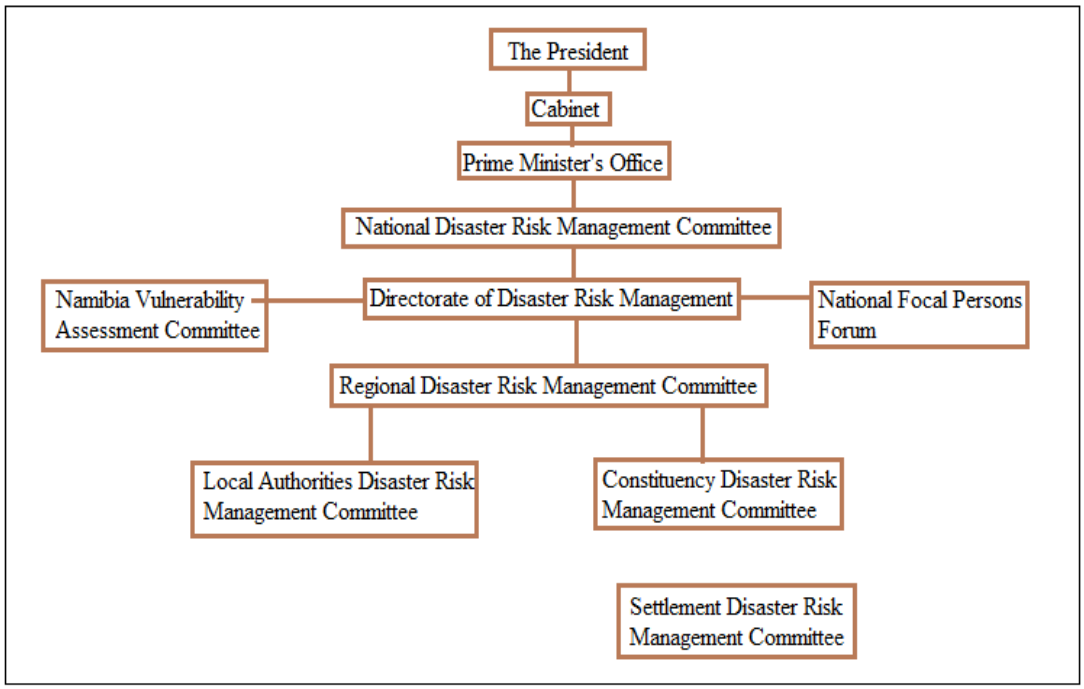


Figure 16: Disaster risk management institutional framework in Namibia [*Source*: DDRM, 2011].

The President of the Republic of Namibia has the constitutional responsibility in respect of disasters and the threats that they pose to the good of the people of Namibia. The Head of State is vested with the power in terms of Article 26 (1) of the Namibia Constitution to declare a state of emergency when a disaster threatens the welfare and life of the nation (NPC, 2009). Under the leadership of the President are the Cabinet, the National Assembly and the OPM assisting with disaster risk reduction. The OPM has the overall responsibility for the operation of the NDRMS, the maintenance of the Directorate for Disaster Risk Management (DDRM), coordinating disaster risk management and for executing the National Disaster Risk Management (NDRM) Policy in Namibia (NPC, 2009; GRN, 2012). The Office executes the decisions of the National Disaster Risk Management Committee (NDRMC) and facilitates the establishment of an integrated and coordinated system

of disaster risk management in Namibia. The NDRMC is a multi-stakeholder platform. Its responsibility in the NDRMS is to marshal resources necessary in managing and reducing disasters in Namibia. The NDRMC "periodically review policy issues regarding international appeals, soliciting, the acceptance and the use of international assistance, including international personnel" (NPC, 2009, p.10).

The DDRM in the OPM coordinates disaster risk management in Namibia. Among other many responsibilities are "the development and testing of contingency plans; align and consolidate national early warning systems; provide support to regional and local authorities disaster risk management committees to implement awareness programmes for the purpose of disaster risk reduction in vulnerable communities at risk to disasters; make provision for a national education, training and research strategy; facilitate the training of regional staff in disaster risk reduction" (NPC, 2009, p.50).

Under the DDRM are the National Focal Persons Forum (NFPF) and the Namibia Vulnerability Assessment Committee (NamVAC). The NFPF facilitates pertinent offices, ministries and agencies on disaster risk management arrangements, contingency planning and deployment of resources (GRN, 2012). Members of the NFPF are appointed by the various offices, ministries and agencies involved in disaster risk management. The NamVAC conducts vulnerability assessments to identify vulnerable groups, the prevalence and degree of any given risk, and their causes using agreed indicators and assessment tools (NPC, 2009).The Regional Disaster Risk Management Committee (RDRMC) coordinates disaster risk management among sector ministries, municipalities, statutory organisations, communities and other role-players involved in disaster risk management at regional

level. It is under the headship of the Regional Governor (GRN, 2012) who advises the government on disasters and disaster risk management matters affecting the region. The RDRMC is chaired by the Chief Regional Officer. In addition to the Chief Regional Officer are the technical committee members, who facilitate the integration of disaster risk reduction into the development planning of relevant regional offices, ministries and agencies (GRN, 2012). The Constituency Disaster Risk Management Committee (CDRMC) coordinates disaster risk management activities in the constituency. It acts as a primary responding and mitigation agent within the existing capacities of the community; channelling any information related to disaster risk management. Settlement Disaster Risk Management Committee (SDRMC) develops a village disaster contingency plan including early warning systems and the activation of emergency response. Further, it establishes Settlement Emergency Teams that respond to emergencies and disasters (GRN, 2012).

2.9.2. The National Disaster Risk Management Policy

The National Disaster Risk Management Policy **(**NDRMP) was established to guide and define the parameters for the application of the concepts of DRR within the established NDRMS. The goal of the Policy is to contribute to the realisation of sustainable development in line with Namibia's Vision 2030. There are five main objectives of the NDRMP that are consistent with the HFA 2005-2015 priorities (DDRM, 2009; DDRM, 2011) in implementing disaster prevention, preparedness, response and recovery, namely:

1. Make disaster risk reduction a priority at all levels in Namibia by establishing sound, integrated, and functional legal and institutional capacity within the

established National Disaster Risk Management System; enabling effective application of the concept of total disaster risk management;

2. To improve risk identification, assessment and monitoring mechanisms in Namibia;
3. To reduce the underlying risk and vulnerability factors by improving disaster risk management applications at all levels;
4. To strengthen disaster preparedness for effective response and recovery practices at all levels; and
5. Enhance information and knowledge management for disaster risk management.

CHAPTER 3: METHODOLOGY

3.1. Research design

Since RP and coping strategies are founded in IK and influenced by the local culture, this empirical study is qualitative in nature. Qualitative research design allowed the researcher to investigate the subjective experiences of the indigenous people, enabling an in-depth understanding of risk perception and coping strategies (Shen, 2010; Romanowski, 2007). A descriptive ethnographic study was selected as an avenue to qualitative research. This method focuses on social systems and cultural heritage of communities in their naturalistic setting. The researcher can describe the life and culture of the people after spending a significant amount of time with the community (Babbie & Mouton, 2001). A key feature of qualitative ethnographic research is the naturalistic paradigm, "leaving natural phenomenon alone" (Maree, 2007, p. 77). According to Maree (2007), the researcher unobtrusively avoids tempering with the phenomenon although aware that research subjects can also exert an influence on the researcher. Later, the influence the researcher and research subjects have on each other will be discussed as 'reflexivity'.

Namibian National Disaster Risk Management (NDRM) documents and policy papers on DRR were analysed to evaluate the extent to which indigenous coping strategies have been incorporated in the disaster management policies. Literature review of coping strategies from Asian-Pacific Region, Tanzania and Barotseland provided insights into best practices that the Namibian Government could adapt and modify to enhance their responses to flood hazards and encourage vulnerable communities in the floodplains to 'live with floods' amid increasing flood intensity.

3.2. Research activities

Pre-field work

The pre-field activities involved secondary data collection through library and desk reading of related literature on flood hazards, risk perceptions, coping strategies and government documents. The goal was to build a foundation for the formulation of the research problem, research objectives and research questions. The primary data and availability were identified following a visit to the study area. The visit allowed the researcher to identify any possible limiting factors and the best time to carry out the research. After the visit to the Zambezi Region's Kabbe Constituency, information on the research topic was collected; tools and materials including maps were arranged. The research proposal was submitted and defended before academics from the Faculty of Humanity and Social Sciences.

Field work and the selection of research subjects

This phase involved data collection of primary and additional secondary data. The data were collected from February 2011 to October 2011. This covers the periods before (January to February), during (March to June) and after (July to December) the flood in 2011. Secondary data include statistics of people who relocated to flood camps, local government expenditures for the year 2009 to year 2011. Demographic information of the residents living in the Kabbe Constituency was collected using the 2001 National Population and Housing Census. Primary data were obtained through first hand in-depth interviews administered per household, focus group discussions and interviews with key informants.

The population for this research, from which the sample was selected, is the Kabbe Constituency in the Zambezi Region, the key informants from Zambezi RDRMC

technical committee and the Munitenge Tribal Court elders. Participants who were interviewed were drawn from more than ten villages in the Kabbe Constituency. Most were sampled from Isize, Sifuha, Malindi, Schuckmannsburg, Itomba, Mbalasinte, Impalila, Lusese, Kabbe, Muzii and Kasika. These villages are located in close proximity to the channels that subsequently flood.

Sampling refers to the process of selecting a portion of the population for study (Maree et al, 2007). Qualitative research applies non-probability sampling techniques to obtain "the richest possible sources of information to answer the research questions" (Maree et al, 2007, p. 5). It is significant to note that in qualitative research, there is no fixed sample size (Kumar, 2005). What guides sampling is theoretical saturation and crystallization of data, when no "new themes and insights emerge from the data collection" (Maree et al., 2007, p. 5). In qualitative studies, the sample size ranges from 6-8 people or events (Bineham, 2006). A sample size of more than 10 is introduced for validity purposes only or else to uncover many possible problems. Mason (2010) also supports a small sized sample in qualitative studies. He states that "more data does not necessarily lead to more information because one occurrence of a piece of data or code is all that is necessary to ensure that it becomes part of the analysis framework" (Mason, 2010, p. 1).

This study sampled one hundred and fifty (N=150) participants over the ages of 30 years snowball sampling. Snow ball sampling involves asking participants to suggest other people with the potential to contribute to the study. Village headmen referred the researcher to other elders of the same generation in the same and nearby villages, who knew about their 'historic life' in the floodplain. Gender in the focus group discussions varied. However, some groups comprised entirely of one gender as well

as of mixed gender. The sizes were kept to a minimum of eight participants. Combining gender contributed greatly to the study, and the researcher could observe, how people communicate and make decisions that affect the community.

Data collection instruments and procedures

Permission to conduct interviews in the Kabbe Constituency was granted by the Zambezi Regional Disaster Risk Management Committee, Kabbe Constituency Counsellor, Munitenge Tribal Court elders and the village chiefs. Primary data were collected using an interview schedule, observation schedule and digital camera for field photographs, while MP3 recorder was used for the different interviews in the Kabbe Constituency. The researcher used a GPS to locate the different positions of channels, villages and crop fields.

Interviews were predominantly conducted in Silozi language (n=148) and English (n=2). All interviews were semi-structured to give an in-depth description of the residents' experiences in the floodplain, and how the RDRMC manages floods. To have individual responses of all the members of the group, the procedures of engaging in a focus group were discussed prior to the interviews. The household interviews were conducted with an adult present and followed by a short tour of the household's home and crop fields. Buildings and crop fields were then photographed to enhance the interviews and data collection processes. Later, desk-top research complemented the empirical field data by assessing flood management policies and programmes of Namibia in comparison to HFA 2005-2015.

Data sorting and analysis

The data analysis included manually sorting of the data from interview sheets. Data sorting reduced the thick narrative responses, to quality and manageable narratives

that could be analysed and themes that could be identified. Data sorting and analysis of qualitative data involved many exhausting steps, including activities such as:

1. **Transcribing**. Transcription verbatim served as initial data analysis. During this step, the audio data was played several times, traditionally by play – stop - rewind, to get to know it, and important contributions were recorded to serve as reflexive notes. During transcription, a new paragraph was created each time a new person spoke. A binomial naming system was used to label each individual interview and response. This naming system consisted of four components (i) participant number, (ii) gender, (iii) village and (iv) flood period.
2. **Focusing the analysis**. The purpose and questions of the research were revisited. How each individual or group responded to each question was noted. The data were then arranged according to each question. This enabled the researcher to identify consistencies and contrasts. All data from each question were put together using tables sorted by respondent identity, key question, code and category as well as response.
3. **Coding and categorising**: This meant identifying meaningful segments of the text and assigning a descriptive word that summarises and brings meaning to the text. Two levels of coding were used:

   Level 1 coding or pre-set coding: required formulating codes before examining the data to provide direction for analysis. These pre-set themes came from literature review and were searched within the existing data.

   Level 2 coding or inductive coding: these codes emerged while organising and studying the data.

   These two coding approaches were combined to allow an iterative process.

4. **Identifying patterns and relationships between categories**: required summarizing information pertaining to each theme, while capturing the key ideas expressed as well as similarities and differences between respondents. Important themes that appeared more often were counted. This revealed patterns within the data. A relationship was identified when two or more themes appeared consistently in the data.
5. **Interpretation and summarizing data**: involved moving away from simple descriptive summaries to a more analytical understanding in context with existing academic literature, and adding new understanding to the existing body of knowledge. Data analysis also involved the examination of photographs taken during field work, the two phases, during and after the flood.

3.3. Research ethics

In each village, the researcher introduced himself and requested to see the Village Chief. If he was not present, the next in such a position was seen. When permission was granted to carry out the research, the researcher issued a consent form with an information letter about the purpose of the visit to all participants before any interview or discussion started. The researcher's contact details and that of the research supervisor were in the information letter. The interviewer explained to the participants the length of the interview and that it will be conducted in the presence of others and will be recorded. Participation was voluntary and the information gathered remains confidential. Confidentiality was maintained by giving each transcript a corresponding binomial name instead of using directly the personal identity of the respondent. The research supervisor examined the transcripts to guide

the researcher during data analysis. Participants were free not to answer any questions that they felt was personal.

3.4. Reflexivity

Reflexivity refers to the role of the researcher and, possibly, how the researcher may have influenced the credibility of the results presented (Mansvelt & Berg, 2005). This research topic was chosen because of the researcher's profession as a Geography and Environmental Studies teacher. The researcher has a passion for teaching these subjects and is well acquainted with the culture and way of life around the Upper Zambezi River Basin. From early years, the researcher lived with floods in the Upper Zambezi River. His family practiced indigenous flood knowledge by migrating to higher ground (*Kuomboka*) during floods and planted crops along the river banks early enough before floods. Such a life no doubt influenced the researcher to investigate indigenous flood knowledge and how it can be applied in modern flood mitigation strategies. As an academic student, the researcher read extensively on the problematic of flood hazards in Namibia and around the world. Since the year 2004, there have been reports that the residents in the Kabbe Constituency, who have resided there almost to 200 year, are seemingly failing to live with floods and have to be relocated annually. Consequently, enormous amounts of money are spent annually because of increasing demands of government flood aid in the Kabbe Constituency. Flood indigenous knowledge invested in the residents is not encouraged in the Kabbe Constituency. The local government has carried no comprehensive research to better understand the current floods.

Seeing the current state of affairs, the researcher concluded this research to determine the perception of floods and indigenous coping strategies of residents in the Kabbe

Constituency and to examine to what extent the Namibian Government has incorporated indigenous flood knowledge in the policies of DRR.

3.5. Limitations and scope of the study

Although the Linyanti, Katima Mulilo Rural and Kongola Constituencies in the Zambezi Region also experience annual flooding, this study confines itself to the area of the Kabbe Constituency because it carries the second largest population in the Zambezi Region and is most at risk. For example, in 2008/2009, the "proportion of affected people was estimated to be as high as 90%" (NPC, 2009, p. 21) in the Kabbe Constituency alone. Lack of financial assistance, the vastness of the constituencies, distances between villages and the ever changing flood terrain during the year limited the study area to the Kabbe Constituency. Further, some respondents were not cooperative during research. Verification of data collected was through focus group discussion and information provided by headmen and Indunas from the Munitenge Tribal Court. The researcher spent a substantial period of time in the field to ensure data corroboration, validity and reliability; during and after the floods.

The scope of this research covered the identification of flood risk perceptions and coping strategies of residents in the Kabbe Constituency, predominantly during and after the flood season of 2011 year.

CHAPTER4: EMPIRICAL FINDINGS

The following qualitative and quantitative findings are drawn both from field studies and desk-top research. The analysis focuses on flood risk perceptions, indigenous flood knowledge and government mitigation measures.

4.1.Flood risk perception

4.1.1. Residents number of years and reasons for living in the floodplain

The majority of the residents interviewed (89 %) had been living in the floodplain for over 40 years, experiencing one major flood after another (Table 12 & Fig. 17).

Table 12: Residents number of years living in the floodplain.

Number of Years	**Frequency** (=n)	**Percentage (%)**
Less than 10 years	6	4
10 to 30 years	11	7
40 to 50 years	58	39
Over 60 years	75	50
Total (=N)	**150**	**100**

Some who were interviewed could not recall how long they had been living in the floodplain but could recount the many floods that occurred within the floodplains in their lifetime.

"We have been here a long time even when the 1948 and 1958 floods came" ***(94mIMP-bf).***

"Because I cannot read and write, I can only say it has been a long time. I am the oldest here in this village" ***(55mLU-bf)***.

Figure 17: Interview responses to the number of years in the floodplain.

Only about 11% of the residents had been living in the floodplain for less than 10 years. They moved into the areas despite knowing the risks of living in a floodplain.

4.1.2. **Reasons for building and living in the floodplain**

Water and food is one of the main reasons for building and living in the floodplain (Table 13 & 14). Over 50% of the people indicated that that was the main reason they still lived in the floodplain.

Table 13: Reasons for building and living in the floodplain.

Reasons	**Frequency** (=n)	**Percentage (%)**
Parents & place brought-up	42	28
Marriage	8	6
Availability of water & livelihoods	78	52
Schools and clinics	11	7
Floods	3	2
Work	6	4
Cannot recall	3	2
Total (=N)	**150**	**100**

Table 14: Pros of living in the floodplain.

Responses	**Frequency** (=n)	**Percentage (%)**
Fishing and other livelihoods	95	64
Water availability	9	6
Electricity	3	2
Transportation	5	3
Schools	3	2
Clinic	3	2
Riverside cultivation	20	14
Land ownership	5	3
Near family support	5	3
Total (=N)	**150**	**100**

Other than food and water, the place where a person or parents were raised (28%) is the second most imperative reason followed by services like school and clinic (7%) together with marriage (6%). Work and the annual floods (6%) do drive people to move into the floodplain as well.

*"Our parents were born here and we were also born here" (**121mKZ-af**).*

*"I was born here. And my brother was buried here a long time ago. So I had no choice but to live here too" (**135mLI-af**).*

*"There are very few problems here especially this time of the year when we can catch more fish. We farm maize and pumpkins in the floodplain" (**141mLU-af**).*

Figure 18: Interview responses to why interviewees chose to settle in the floodplain.

There are many indigenous food stuffs that attract and hold people from moving out of the floodplain. Lily tubers and their flower heads (Figure 19) are prepared in a variety of nutritional dishes. When asked to state the advantages of living in the floodplain, over (60%) said fishing was their greatest benefit (Figure 20). Close to 15% of the interviewees felt that livestock and crop farming attracted them to the floodplains because of the moist and fertile soil as well as fresh grazing grass. Some people (6%) see water as a pulling factor.

Figure 19: Lily tubers and fruits (July, 2011).

Fish and green vegetable (Figure 20) provide additional income for residents as they are sold in Katima Mulilo's open market. Reeds and papyrus are also harvested along the river channels (Figure 20) and sold as mats on the local market.

Figure 20: Livelihood activities in the floodplain (June, 2011).

4.1.3. Causes of floods

Different perceptions on the causes of floods appeared among the respondents in the study area. One of the main causes of rainfall highlighted by the respondents is God (Table 15). About 75 (50%) attributed God as the causer and said only he alone can change things; a common conception with indigenous communities.

Table 15: Causes of floods.

Reasons	**Frequency** (=n)	**Percentage (%)**
Too much rainfall	25	17
Small culverts and roads	50	33
God	75	50
Total (=N)	**150**	**100**

The second (n=50, 33%) and third (17%) cause for flooding is 'too much rainfall' and 'the culverts' (Figure 22 & 22) built along the gravel roads in the floodplain.

*"There is too much rain starting Christmas time. By January it is already flooding" (**4fKB-df**).*

*"The earth has changed. It is not as it was in the past. But God is in charge and only he knows. Maybe his Son is ruling now and things have turned around. People are changing and so is the world we live in" (**28fKB-df**).*

*"Only God can explain it. This world is perishing. Water is rising and hunger is increasing. Floods are God's dealings. God is changing things as he likes" (**110mS-df**).*

*"It is God's dealings and we cannot change that" (**47fLU-df**).*

*"Long ago it never flooded. Now I do not know whether it is these small culverts. The water was less in the past but since these culverts were built, it started to flood. They are blocking the water" **(131fLI-af).***

*"Before the road was built, the water went straight to the forest. But now, it is blocked by the road. The road is not properly engineered. You find small culverts that cannot handle the water coming from the river. So the water comes back into our homes" **(135mLI-af).***

Figure 21: Interview responses to the causes of floods.

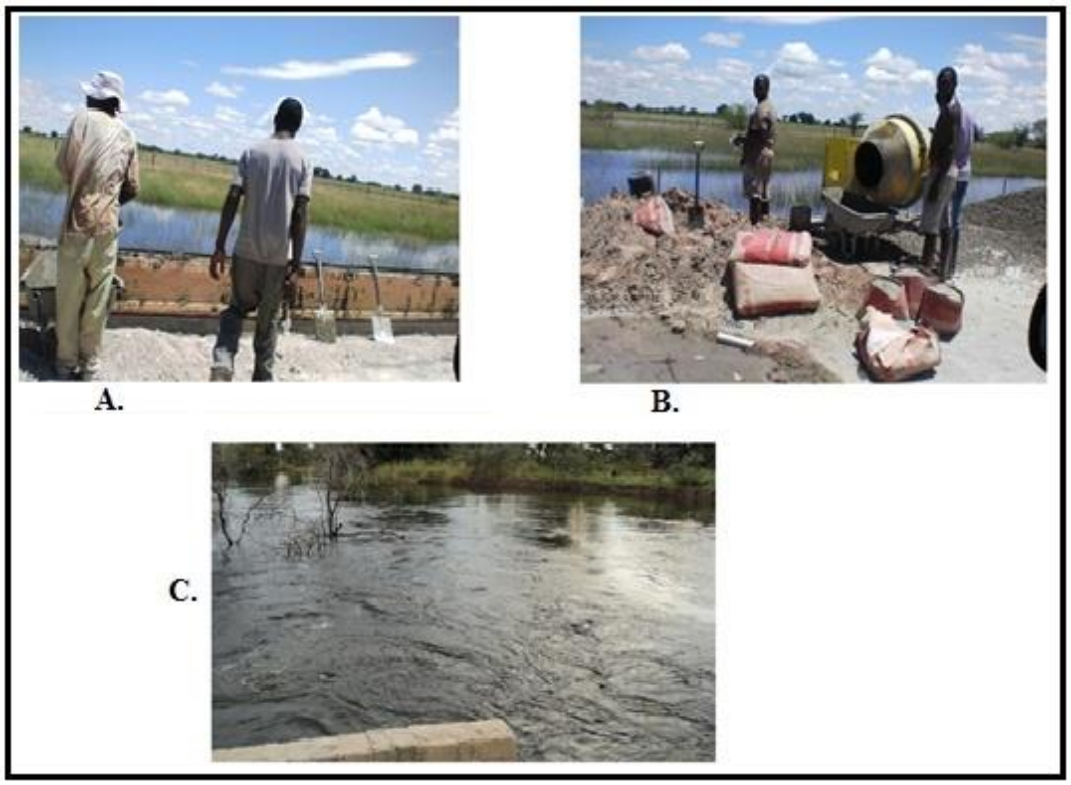


Figure 22: Gravel roads and small culverts under construction (March, 2011).

The Government is seen to be causing the floods since 1990 because of starting to build roads higher than the elevation of the land. At the same time, the roads have culverts that cannot accommodate the high water flow (Figure 22). As a result water continues to accumulate and flows backward into the villages. Respondents were fully aware that it does not have to rain in the floodplain to cause the flood. But rather the water comes from rainfall in the catchment areas of northwest Zambia and Angola.

4.1.4. Knowledge & experience of major floods

Eighty seven (58%) of the respondents experienced the major floods of 1948 and 1958 respectively (Table 16 & Figure 23). They related that these floods caused the

displacement of many people and that they had to relocate in Macenje (Zambia) and Kasani (Botswana).

Table 16: Knowledge and experience of major floods.

Responses	**Frequency** (=n)	**Percentage (%)**
Experienced floods before 1980s	87	58
Only heard of the 1980s floods	16	11
Experience only since 2004	47	31
Total (=N)	**150**	**100**

The flood water cut through the Zambezi Region via Malindi channel, Bukalo and joined with the Chobe stream and Lake Liambezi. Record losses included cattle which had to be relocated by the assistance of the South African Defence Force (SADF) pontoons. Others managed to relocate to Impalila, Mbalasinte and Itomba mounds (*Mutunda)* where space was also limited. People used dug-out canoes to transport themselves and their belongings.

*"In 1958 there was a major flood. People had to relocate to Kasani in Botswana. We lost livestock. Again the 1968 flood was vast. Major floods would come for two consecutive years after which there would be a prolonged break. Major floods were in 1948, 58, 68, 78 and 89. There were intervals between floods and not every year. We called this 'Siendabanji'. But since 2004 floods became troublesome. First we thought there was going to be an interval from 2004 yet in 2005 and 2006 we had severe floods" (**130fLI-af**).*

*"In 1958 this whole place was flooded. Only these termite mounds in Itomba were left. In 1978 we also experienced a major flood. From then onwards there was no major flood until 2004. All other floods after 2004 have been troublesome" (**151fIT-af**).*

*"1958 and 1978.The 1958 was the biggest of all. We stayed on mounds only surrounded by the water" (**154fIT-af**).*

*"I remember the 1948, 1958, 1978, 2004 and 2009" (**54mLU-df**).*

*"Yes, I saw the 1948 and 1958 floods. The 1948 flood connected Liambezi Lake, Zambezi and Linyanti-Chobe streams" (**59fLI-af**).*

*"The big flood of 1958 forced us to relocate here temporary. In 1968 again there was a major flood more than that one the 1958. It cut through this village. When you step like this, it was just soaked wet. In 1971 we decided to move here finally. The 1958 flood was the biggest flood ever. It affected many people. People just stayed on mounds" (**4mI-bf**).*

Figure 23: Interview responses to knowledge and experience of major floods (a).

There were 16 (11%) respondents who only heard about the floods prior to the 1980s, and 47 (31%) had never heard of such floods, except the floods since 2004 (Table 16 & Figure 24). The reason for this could be loss of eldership in some communities, who would be the source of flood knowledge and its transfer to the

younger generation. Alternatively, it could be that the young generation underestimates the value of traditional flood knowledge and coping strategies. Since 2004 and 2009 floods were vividly described by most respondents in the study to have surpassed all other floods after 1958. This was perhaps because most recent disasters tend to be more memorable than older disasters or the floods caused serious losses to property (Figure 24).

*"In 2004 we were forced to relocate to Lusese because of the flood" (**44fKB-df**).*

*"2004 The water was deep and forced people out of their villages and homes. Our crops- maize were submerged. Then 2007 and 2009" (**62fLI-af**).*

*"Floods are not the same anymore. When we were still young our parent had told us that there used to be big floods. So the current floods are minor. In some years, floods were minor and in other years floods were major in proportions. Like this year, the water is less" (**106fIMP-df**).*

*"The flood of 2009 forced us to relocate to Mubiza within 24 hours. That flood was very fast. We slept in the road. All fragile belonging like beds, radios, TV's etc. broke. Our houses collapsed and we suffered to renovate them all. That one as vast. It destroyed this road and many people ran to live in the area of Mubiza" (**137mLI-af**).*

Figure 24: Interview responses to knowledge and experience of major floods (b).

4.1.5. Perception of the magnitude of floods since the 1950s

There were four distinct groups of perceptions about the magnitude of floods since the 1950s. About 14 (10%) interviewees did not know for sure whether the level of floods was increasing or decreasing each year (Table 17, Figure 25).

Table 17: Perception of the magnitude of floods since the 1950s.

Responses	**Frequency** (=n)	**Percentage (%)**
Increasing since the 1950s	99	66
Decreasing since the 1950s	29	19
Same since the 1950s	8	5
Do not know	14	10
Total (=N)	**150**	**100**

A set of 8 (5%) proud survivors felt that the floods had been normal since the 1950s and that actually the floods seemed to be minor in magnitude (Figure 25). They blamed the Government for blowing the flood magnitude out of proportion and creating woe among the villages in the floodplain.

*"Not increasing. Our parents used to tell us that floods covered all these places but since I was born I did not see such floods" (**117fIK-af.**)*

*"The current floods are not vast" (**57mLU-af**.*

*"The current floods are not a problem. The government made a mistake by giving people food, tents and relocating them whenever they are surrounded by water. If they could have left them from the start instead of bringing them to the Kabbe and Lusese relocation camps there would not have been any problem" (**1mI-bf).***

Figure 25: Interview responses to the perception of the magnitude of floods since the 1950s (a).

About 29 interviewees (19%) perceived that the floods are decreasing in magnitude since the 1950s. The reasons they gave for the decrease was based on a comparison between the 2004 and 2009 floods against the 2010 and 2011 which they said were minor floods (Figure 26 & 27).

"In 2010 and this year (2011), the water was a bit less although here in my yard there was water. Last year (2009) the water went into the school but it was not more than the flood of 2009" ***(61fLI-bf).***

*"This year's flood looks small. Let me say it is decreasing. I think there will be minor floods in the future" (****70mMB-bf).***

*"When I was born, the floods were greater and vast. It forced us to relocate to Zambia and Botswana. Now the flood is decreasing. But funny, the life is difficult with these minor floods. There is no peace with floods" (****73fMB-df).***

Figure 26: Interview responses to the perception of the magnitude of floods since the 1950s (b).

*"When we were young it took years before a major flood would come to cover areas. Now in our days, it is continuous without a break" (****59fLI-af****).*

*"It looks like that is the way the Lord is changing time. It is surprising because it's every year. In the past, it took two years that's when it comes. Another year then when flood comes. Now it is every year" (****69fIM-df****).*

*"Now it is becoming too much. In the past, floods were rare and we were confined to channels and never relocated" (****93fIMP-df****).*

"The flood is increasing because since I was young, the floods never seeped through the villages. The flood was confined only in the lakes/streams. Now the

Figure 27: Interview responses to the perception of the magnitude of floods since the 1950s (c).

The majority of the respondents (66%) had a very high perception about the flood level since the 1950s (Table 17). They perceived that floods had changed from the time they were young; that every year it flooded extensively; that floods exceed their channels and flow in places they never flowed before (Figure 27). They also noticed

that the flood channels and ox-bow lakes did not dry completely as they used to in the past.

4.1.6. Risks of living in the floodplain

Many residents indicated that they were aware of the flood risks in the floodplain and identified the many risks (Table 18).

Table 18: Risks and disadvantages of living in the floodplain.

Responses	**Frequency** (=n)	**Percentage (%)**
Recurrent floods are a nuisance	25	17
Submerging of cultivation	28	18
Fatal accidents	39	26
Sickness	9	6
Lack of transportation	12	8
Collapse of houses & breaking of household property	30	20
Lack of clinics	2	2
Lack of space	5	3
Total (=N)	**150**	**100**

The four most pronounced risks were (i) fatal (26%), (ii) property damage (20%), (iii) submerging of crops and farmland (18%), and (iv) recurrent floods being a nuisance (17%) (Figure 28 to Figure 31).

*"Floods bring disaster. Floods sometime come unexpected and while we are unprepared. When it comes there is nothing like I am an old lady or a young person. All of us are on the same level. Transport for school children and pensioners are a big problem sometimes because of strong winds the canoe can capsize. There is destruction of crops and houses collapse because of too much moisture from underground" (**6mK-df**).*

*"You cannot just move from here to there except maybe by a speed boat. Again with a dug-out canoe from here to Ihaha, it's frightening. You should see the waves when the wind is blowing and you are in a small canoe. There are many hippos and crocs here too" (**83fMB-df**).*

Figure 28: Interview responses to risks in the floodplain (a).

Other risks mentioned were sicknesses (6%), lack of transport during the floods (8%), lack of clinic (2%) and cramped space (3%) (Table 18).

*"These days we don't farm crops anymore. What we sow gets submerged by the water" (**144fLU-af**).*

*"Disadvantages are personal belongings breaking and also it takes a long time before we can move. The advantage is that it is close to town but here transport is expensive. You have to pay at least N$150 for someone to paddle you in a canoe to where you can get on a vehicle. On your way back it costs another N$150. I do not know. Every time the flood comes, teachers are not excited. It is too risky for them. We do not have boats to take us to the other side. So for these other people, for them it is good because they have dug-out canoes to take them to the other side. For us aah... it is difficult. The children struggle when it floods here. They have to go in a canoe for about one hour just to find a toilet. There are no toilets here" (**149mIT-af**).*

*"The only disadvantages are increase in water-borne illnesses and death cases because people delay to relocate or paddling distance" **(103fIMP-bf).***

"There are a lot of illnesses and deaths. We have come from Kasika. There is no clinic there. The closest clinic is in Impalila or Mbalasinte" ***(143mLU-af).***

Figure 29: Interview responses to risks in the floodplain (b).

Figure 30: Effects of floods on people **(**June, 2011).

Figure 31: House built in the floodplain (April, 2011).

4.1.7. Do floods frighten?

There was a high degree of perceived risks associated with floods among many respondents. One hundred and six people (70%) were afraid of the floods and 44 (30%) were very positive and had no fear of the floods (Table 19; Figure 32).

Table 19: Do floods frighten you?

Responses of 150 interviewees					
	Yes		**No**		**Total** (=N)
	Male	Female	Male	Female	
Frequency (=n)	29	77	23	21	**150**
Percentage (%)	19	51	15	14	**100**

*"Yes, because some canoes are not well curved and safe. There is even a shortage of canoes these days. Maybe because we have cut down large trees. So we sometimes have to walk by foot through chest high water. That's why we relocated there" (**60mLI-af**).*

*"It frightens because it brings death" (**69fIM-df**).*

*"Haa! Yes, they can kill. It is frightening. It kills because that is where crocodiles and hippos move. And even the flooded houses can collapse" (**10fKz-df**).*

*"The current floods are frightening because in the olden days it was not like this. That is why we could relocate on our own onto our Mutunda. Now we cannot" (**29fKB-df**).*

*"Me it is even worse because I do not know how to paddle a canoe. Maybe the elders here know, but I do not, unless the water is shallow and I can cross on foot. You see also that crocodiles run in shallow water as well. That is where they catch fish also. So I do not like water" (**46fLU-df**).*

Figure 32: Interview responses to whether floods frighten (a).

Fear is associated with the negative experiences that floods bring. These include crocodiles and hippos which attack livestock and villagers or fishermen. Some fear floods because they cannot paddle or swim. Women have high risk perception because of concern for young children who might drown or be attacked by crocodiles.

Of the 106 (70%) respondents who feared floods, 77 (51%) are women and only 29(19%) are men (Table 19 & Figure 32). Captivatingly, of the 44 (30%) people who do not fear floods, 21(14%) are women and 23(16%) are men. This indicates that women share the same values about the flood with men. Many professed that if it

was not because of the school children and subsequent coercion by the local government they would ‘stay in the water’.

Also the respondents claimed that the actual flood does not frighten, rather it is the elements in the water that frighten (Figure 33). Since they have been living with the floods, they are accustomed to as part of their lives, now. Being river people, they further claimed that floods are not the only cause for death in the country. Essentially, there are more people that die from other factors than floods. And floods, according to them, do not claim more than five victims. To them floods only become a disaster if 30 or 70 people die as a result.

*"Frightening! It does not frighten what frightens are the animals in the water" (**34fKB-df**).*

*"No because we would stay in the water if it was not for the school getting flooded and the children being relocated, we would have stayed in the water. Because that is what we are used to. Here we are not used to this" (**35fKB-df**).*

*"I am not afraid because I am used to it. Nowadays, we do not play by the water as there are crocodiles" (**36fKB-df**).*

*"What frighten us are the crocodiles. The crocodiles are the biggest threat as they can come up on land and catch even a chicken" (**38fKB-df**).*

*"Crocodiles are always there my lad, even in the past. But there is no crocodile that can come out of the water to catch a person on dry land or in the yard. In those days they built a fence of reeds around the houses. In this fence the dogs and chickens were protected and the canoes blocked the entrance. At night you would hear crocodiles or hippos fighting in the nearby streams/channels" (**56mLU-df).***

*"Even now if kids were around here you would see them playing with canoes. It is where you were born. In your villages its home. [But]Again with a dugout canoe from here to Ihaha, it's frightening, should the wind blow" (**83fMB-df).***

*"No, it does not. It's water. It is water. It comes with food" (**84mMB-df).***

*"That is how floods were since we were young. We are not forest people but floodplain dwellers. Our life revolved around floods, relocating to higher ground during flood and back again in the floodplain after the floods" (**94mIMP-df).***

*"It does not frighten us as much even though they are reptiles like crocodiles. We have adapted. If we count the number of deaths caused by crocodile attacks per year, they never go above 5, 6 or 7.Uh, huh. Yes. Otherwise what would scare us is if the government told us there were 30, 40 or 50 deaths per year" (**22mKB-df).***

Figure 33: Interview responses to whether floods frighten (b).

4.1.8. Floodplain attachment

The majority of floodplain residents, (83%), have an affective attachment to their places and their benefits (Table 20 & Figure 34). They feel comfortable and safe to some degree.

Table 20: Importance of floods and floodplain proximity.

Responses	**Frequency** (=n)	**Percentage (%)**
Very important	124	83
It depends	14	9
Not important anymore	12	8
Total (=N)	**150**	**100**

*"My feelings, living by the river…it is pleasant because we find things nearer and also edibles are easily available. We cultivate in dambos along the river. We cut reeds and harvest water lilies" (**120fKG-af).***

*"Yes. So much (laughs), because that is where we get relish. Here we have problems. If we stay away from the river we have problems. Last year we moved about 10 kilometres from here to the camp. We had to move back here to find relish. So we want to be next to the river" **(135mLI-af).***

*"I was born like this. We are river people. We have come to know the life near a river. Fish is life here. I will never move. Even if I move, I will come back here" (**IMP94**).*

Figure 34: Interview responses to floodplain attachment (a).

Some, who were moved in flood relocation camps, felt miserable and lonely because they were far away from the water (Figure 35). They compared their situation in the camps like dry-land animals. They claimed that life away from the floodplain was tough, unbearable and they would become squirrels or start eating squirrels in the

forested areas. A squirrel is an animal floodplain dwellers considered unclean and inedible.

"Right now I am miserable. All I see now are roads. I am suffering. I am walking on dry land. Back home my feet are cool because there is water everywhere. So in my life I have lived by the river and I yearn to go back there after the flood. I did not come here on my own. It is the government. I Know my place of birth and that is where I want to go. It is miserable here in the bush. I am not used to it". ***(17mKB-df)****.*

*"Ah, we feel good because we cannot live in the forest area. We cannot be tree squirrel or eat tree squirrel. We live on fish" (****89Fks-bf****).*

*"Everything has a place it is adapted to. There is the crocodile and the springhare. A springhare knows its surroundings, the bush. While a crocodile knows about the river and it's Mutunda. I know the river and not the bush" (****20mKB-df)****.*

Figure 35: Interview responses to floodplain attachment (b).

A small percentage, 9% (14) described their attachment to the area as dependent on what they could get from it and questioned if the flood did not bring any ruin (Figure 36).

*"There are advantages and disadvantages. If it did not disturb us, it is fine" (****121mKZ-af****).*

*"Umm, it is just advantageous because of availability of relish but flooding makes it bad. If it did not flood it would be nice" (****145fLU-af****).*

Figure 36: Interview responses to floodplain attachment (c).

Meanwhile, about 12 (8%) of interviewees felt that the floodplain has no meaning anymore for them due to its nuisance and effects on life and property (Table 20).

4.1.9. Missing the floodplain

One hundred and fifty (N=150) respondents were asked whether they miss the floodplain when they visit none flooding areas of the Zambezi Region (Table 21 & Figure 37).

Table 21: Do you miss this place when you are away?

Responses of 150 interviewees				
	Yes		**No**	
	Male	Female	Male	Female
Frequency (=n)	50	50	17	33
Percentage (%)	33	33	12	22

A group of 100 (66%) respondents missed their homes in the floodplain. These were equal numbers of males (33%) and females (33%).

*"Yes, for real. A person from here cannot go stay in Ngweze. Life is expensive there. Here you can get things for free. Like fish and vegetables, you can get it yourself easily" (**85fMB-df**).*

*"We miss our home a lot because we only came here to get to high ground and it is only bush here" (**34fKB-df**).*

*"Yes I do. This is the life I grow up with. Even when I am in Katima" (**89mKS-af**).*

*"Hey, a person's home is where his heart is. When I am away, I worry about my home that maybe something has happened" (**152mIT-af**).*

Figure 37: Interview responses to missing the floodplain (a).

Meanwhile, 50 (34%) respondents said 'no' (Table 21 & Figure 38). They did not miss the floodplain when they were away. Some of the reasons were fear of floodwater, effect on property and a feeling of being disadvantaged. The feeling of being disadvantaged came from teachers working in the floodplain, who felt that

other teachers working away from the floodplain were better off than them. They claimed that their form of employment was not dependent on the floodplain but rather the floods were affecting their working conditions. Thirty three (22%) females felt they did not miss the floodplain in comparison to only 17 (12%) males (Table 21). This shows that males and females weigh risks differently.

*"I do not miss the floods because I fear water" (**145fLU-af**).*

*"Ugh No!" (**149mIT-af**).*

*"No, I do not miss this place. I get nothing from it" (**150fIT-af**).*

*"If it was me I would move because we suffer a lot during the flood. If there was land available now, I would move out completely" (**123fKZ-af**).*

Figure 38: Interview responses to missing the floodplain (b).

4.1.10. Preference: to continue living or relocate permanently from the floodplain

When floodplain residents were asked whether they want to relocate permanently or continue living in the floodplain, only 43(29%) opted to permanently relocate out of the floodplain to newly designated locations by the local Government (Table 22 & Figure 39).

Table 22: Relocating or continue living in the floodplain.

Reasons	**Frequency** (=n)	**Percentage (%)**
Continue living in the floodplain and seasonally migrating	107	71
Relocate permanently out of the floodplain	43	29
Total (=N)	**150**	**100**

Reasons for wanting to relocate permanently are incessant damage to property, fatal accidents, floods being a nuisance, the angst of seasonal relocation and poor harvests attributed to floods. Their feelings are expressed in the following quotations.

"That life of relocating seasonally has become difficult" ***(108mIMP-df)***.

"I will get used in the forest where the Government is saying we must move to permanently. What will make me move there is exhaustion from moving around. Once you have built there it is permanent. Here houses give in to water until they collapse. Some of us don't have children who work in cities to send us money. We have to look for money to pay somebody to build for you. So it's very difficult" ***(134fLI-af)***.

"Yes I would like to move from here permanently because these days we don't farm crops anymore. What we sow gets submerged by the water" ***(144fLU-af)***.

Figure 39: Interview responses to living or relocating permanently out of the floodplain (a).

Following an old traditional practice, 107 (71%) respondents opted to continue living in the floodplain on the mounds and seasonally migrating upland (Table 22). The reasons why they opt for this is because it is ancestral land, and they are attached to the floodplain rivers and channels. They benefit a lot from what the flood water brings such as fish and the lily produces they harvest. Also some residents in the floodplain have schools, clinics and some electricity. Some even fear forested areas were others want to be relocated due to lack of water, elephants and the fact that it is too far from the floodplain (Figure 40).

"Umm, that will not be possible. Ñumbi [Lozi name for Otter*] cannot stay in the forest. It will die" (**59fLI-df**).*

*"Others want to move but some of us we are comfortable and we cannot live far from the river. We are accustomed. The life in the forest is different from this one. We will complain there" (**91mKS-af**).*

*"Yes I will continue moving seasonally between the forests and the floodplain. Permanent relocation to Impalila won't work" (**93fIMP-df**).*

*"It will be difficult to leave this school here" (**115fLI-af**).*

"I will not feel good [to relocate permanently] *because by the river we find fish and means to survive" (**117fIK-af**).*

*"It will not be possible because there is no water. That is why people move back quickly because the water is a problem" (**126fLB-af**).*

*"Hmmm, to relocate permanently! It will not be possible because the forest is too far from our riverside gardens and this is where we find a lot of food. That is why we also move back quickly when the water subsides. We also have electricity here. So if we go to the forest areas, where will we find electricity there?" **(133fLI-af).***

*"Huh, we are floodplain dwellers. We can relocate for a few months in the camps but by July we return here" (**151fIT-af**).*

Figure 40: Interview responses to living or relocating permanently out of the floodplain (b).

4.2.Indigenous knowledge and coping strategies employed in the Kabbe Constituency

When residents anticipated above normal floods, they employed several preparatory and coping strategies through various stages; before, during and after the flood. These strategies have helped the residents to live with recurrent floods. They include flood forecasting, communication, farming strategies and construction methods.

According to village chiefs, floodplain residents had two homes *Matongo* and the *Mutunda*. *Matongo* are homes in the forest areas high above and away from the floodplain. For example, Lusese, Ngoma, Impalila and Kabbe are forests and high above floodwater areas.

Table 23: Indigenous methods of flood forecasting.

Reasons	**Frequency** (=n)	**Percentage (%)**
Red ants (Siuluwi)	28	19
Too many geese, ducks, pelicans	15	10
Many frogs	7	5
Trees blossom early	6	4
Heavy lighting and thunder over the river	2	1
Continuous rainfall	38	25
Flood channels still with previous flood water	24	16
River birds build nest high up on reeds and trees	16	11
Fast flowing and rising flood water	14	9
Total (=N)	**150**	**100**

Before the flood appeared, residents living in the floodplain noticed signs of the flood in the river, the sky, the birds, insects and plants.

Figure 41: River birds build nests high up on trees (August, 2011).

These signs helped them forecast the level of the flood each year (Table 23). The most significant signs were continuous rainfall (25%) that fell in the Upper Zambezi catchment, red ants moving away from the river (19%), birds building nests high up in the tree canopy (Figure 41) and flood channels still having floodwater from the previous year (16%).

Immediately when these flood signs became evident, the main tribal court (*Kuta*) sent *Musha* (a court messenger) to all villages in the floodplain to warn the people of the upcoming floods (Figure 42). Interestingly, some information came as far as Barotseland where the Zambezi River starts to flood.

*"We had Musha. We had a very good connection with people in Barotseland where the flood comes from. Tribal courts received information that was passed to villages to prepare relocation" (**Natamoyo,** Kuta headman).*

"The village chiefs took responsibility to inform their community. These days I do not understand why people do not prepare. Maybe it is because they know that the

Figure 42: Interview response to indigenous flood communication.

Some of the activities done before the flood include reinforcing houses, preparing for evacuation sites, harvesting crops along the flood channels, storing some food stuff high in the house roof and building a dyke at the entrance of the house using mud (Table 24).

Table 24: Flood coping strategies.

Flood period	Activities
Before	Prepare canoes and relocation sites Store food seed banks; Reinforce homes; adding sand bags around houses; Move livestock; Women and children up land; Harvesting, fishing , selling fish and other hand craft products
During	Relocate up land, men continue fishing, men guard houses in the floodplain, smoke/dry fish
After	Extensive fishing and smoke/dry fish, cleaning debris from yards and homes, sowing seeds, renovation, selling fish, vegetables and other hand craft products

The tribal courts instructed people to first relocate the livestock upland. And whoever left livestock in the flood would be fined. If cattle were found stranded on mounds in

the floodplain, it was taken away from the owners. Each family had to have a dug-out canoe for evacuation, transport or fishing. It is still a primary necessity for every floodplain dweller (Figure 43).

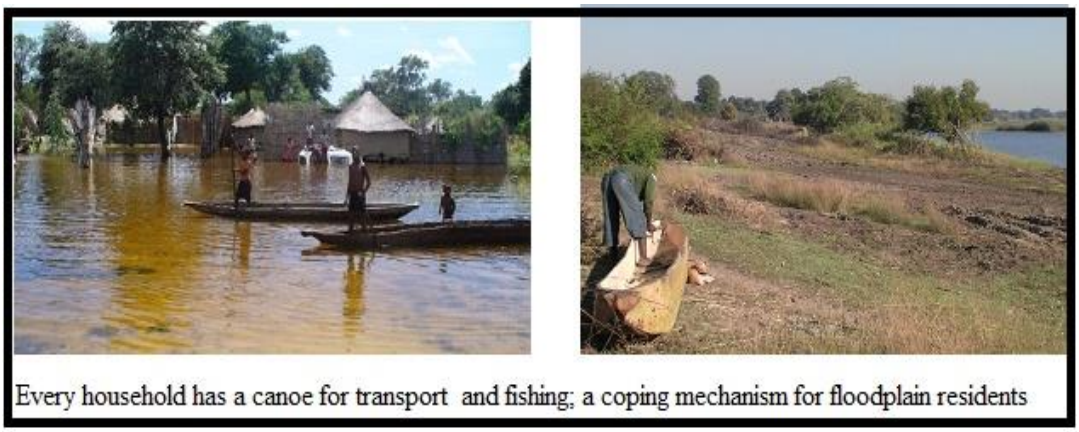


Figure 43: Dug-out canoes (2011).

After the relocation of livestock, women and young children followed. Men usually either stayed behind or they were the last to relocate. When floods were minor, people generally relocated in nearby mounds, especially in Itomba and Mbalasinte (Figure 44).

*"People stayed awkwardly on those mounds surrounded by water. People who were a bit comfortable were those who moved to Mbalasinte or Schuckmannsburg where there was enough space" (***Natamoyo,** Kuta headman*)*

*"When the water levels rose we divided ourselves into groups, one group went to Mbalasinte, while the others went to Itomba. We moved with our big canoes. There we used to eat Makwangala, Lisefwe, Maoma and Lindowa. All those were foods we used to eat" (**24fKB-df**).*

Figure 44: Interview response to how people lived with floods in the past (a).

During the flood of 1958, for example, some people did not relocate to look for up higher ground. But rather, they stayed on their mounds surrounded by flood water. Others escaped to *Kapani kaMasubia* and *Macenje*. People left their belongings behind and carried only a few goods they needed in the *Matongo* or fields that were often on highland (Figure 45 & 46). People stayed in these areas until the floods subsided around the July each year. They returned altogether with their cattle into the floodplain.

*"They had to depend on themselves. We would leave our stuff here in the houses no one would steal or vandalise those stuff. All goods were left here until May or June when we come back" (**1mI-bf**).*

*"Whenever the flood approached houses, they relocated. There was nothing like reinforcing houses. They simply carried the roof of huts and set them on higher ground in their farm fields. They hang around there until the water had dried that's when they moved back into their homes. It is our culture. We just used to roll our reed mats and go into the fields. We would pick our children. No nailed houses. The way we made the wall of our houses is not like today" (**2mM-df**).*

"It frightened us but we lived on hills. That is the way we used to live even though the floods frightens us. We tied our canoes on the banks of the hills and we cut down the hills and built huts on top. We stayed there until the water subsided" (***53 mLU-df**).*

Figure 45: Interview response to how they lived with floods in the past (b).

Figure 46: House on stilts, Muzii area (February, 2011).

After the flood people had to renovate their houses by patching parts of the mud house that was washed by floodwater. They did this every year.

> *"It was fun time. Even now that we have grown old, we still remember it was fun time. We did not struggle too much. Why would one struggle, if all one needed to do was cast their net out in the surrounding water and catch a fish for relish?" (**35fKB-df**).*

Figure 47: Interview response to how they lived with floods in the past (c).

At the end of June or July floods subsided and people moved back to start cultivating maize and millet. By March, just before the floods start, the crops were ready for harvesting. Vegetables like tomatoes and cabbages were planted in October. Indigenous construction methods included the use of reeds for fencing, elephant grass for roofing and solid wood poles for roofing and foundation. Mud was added to the wall. Houses were reinforced enough to resist floods. Renovations followed each year after the flood season (Figure 48).

Figure 48: House fence renovation after the flood (September, 2011).

4.3.Local Government mitigations

The Zambezi Regional Council is the highest local institution that has the mandate to coordinate and implement the Zambezi Regional Flood Contingency Plan through RDRMC. Critically, the local government coordinates the following information required before, during and after a flood emergency:

1. Forecast and early warning information;
2. Quantify the number of people affected and those likely to be most affected due to age and gender;
3. Assess the nature and extent of flood emergency; and
4. Provide immediate needs like food, shelter, medicines, clean water and sanitation.

When devastating floods are imminent, the local Government appeals to the OPM to mobilise resources. The Regional Council also draws on the assistance of all

stakeholders in the region. The biggest problem at a local level is lack of available funds to respond immediately to hazards. The local Government has to rely on well-wishers like the Namibian Red Cross Society (NRCS). Often it has to send quotations to the OPM about purchases and other needs for mitigating floods. Feedback is never timely and this does affect disaster risk responses and mitigation in the Kabbe Constituency. The local Government is also sometimes too reactive rather than proactive in the Region. People are relocated without full consideration of their indigenous flood coping capacities. The local Government is very critical of indigenous people who defy relocation. The indigenous flood knowledge is regarded as out-dated, risky and without value in enhancing the flood mitigation.

What the community requests is assistance with temporary relocation from the floodplain to higher ground. This is in harmony with their indigenous flood knowledge they been practicing for many decades. Further they ask for embankments around villages, cleaning and widening of flood channels and the construction of higher and bigger storm culverts that will allow fast flow of flood water; unlike the current small culverts that cannot withstand the force of water (Figure 49).

*"It will help a lot if the government would put an embankment around the school. Then we will not need to relocate to those ugly camps. What makes us relocate is this school that gets surrounded by water such that our children are virtually stuck. We come here because of these alternative tented schools supplied by the government" (**30fKB-bf).***

*"If they could build an embankment so the children could still stay at the schools then we would not move. Some of those channels need to be closed or deepened so that water from there does not come into our homes and schools" (**37fKB-bf).***

*"The money they use to shift us from our villages, they can just use to get a caterpillar to put an embankment around the school and homes." (**45fKB-bf).***

*"The current floods I do not understand. But when I look very closely, I think its roads. They do not have proper bridges. They are small and block the water. As a result the water moves back into the villages" (**4mI-bf).***

Figure 49: Interviewees requests to the Government.

4.4.Implementation of Hyogo Framework for Action in disaster management policies of Namibia

Without doubt, Namibia has made significant progress with the implementation of many areas of international frameworks, including the HFA. The main achievements include the establishment of a National Disaster Risk Management (NDRM) policy with a Disaster and Emergency Fund that receives a regular budget allocation as well as a multi-stakeholder disaster risk management institution with structures at national, regional, local authority and constituency level (DDRM, 2010). However,

as indicated in Figure 50, there are no direct budget allocations to local Governments for DRR activities from the consolidated revenue; as a result emergency responses are not on time. "Various institutions (Namibia Vulnerability and Assessment Committee, Agricultural Early Warning, Geological Survey of Namibia, Hydrology and Meteorological Services) have been established to monitor hazards and to advise the Government on interventions to reduce losses" (DDRM, 2010, p.3). However, DRR has not yet been incorporated into National Development Plans (NDPs). Although it is implied in some sectors like Meteorology and Agriculture, it needs to be mainstreamed into the National Development Plan (DDRM, 2010).

With regards to the development and strengthening of communities in disaster preparedness and response, more attention is required. Indigenous flood knowledge needs to be accepted, modified and incorporated in NDRMS. A village training programme on DRR with financial support from RDRMC needs to be established, perhaps under the oversight of UNISDR. This might help, not only in the mitigation of hazards but also reduce the undermining of local indigenous knowledge in the Kabbe Constituency.

"*There is no direct budget allocation for local governments for DRR activities from the consolidated revenue. The NDRM Policy (Section 6 page 39 and sub-section 6.6 pages 42-43) however has provision for local Governments to financially contribute disaster preparedness, response and recovery through the establishment of regional and Local Authority disaster funds. The local Governments can access the National disaster fund through requests to national level if there is need" (**DDRM, 2010 p.7**).*

Figure 50: Lack of DRR funds.

Substantial achievement has been attained in early warnings, yet it is discovered that flood prone residents do not heed the flood warnings perhaps because of their trust in indigenous flood knowledge and previous experiences. Another attribute to the community's failure to respond to early warnings could be lack of integration between indigenous knowledge and NDRMS. There are no mechanisms that facilitate the receipt and processing of early warning systems at community and national level. Communities have "mistrust for conventional early warning information resulting in delays in taking appropriate action at community levels" (DDRM, 2010, p.11). A need to translate awareness materials into local languages for risk communication to be effective will help reduce the gap existing between the floodplain residents and policy makers.

Proposals made by the Government such as permanent relocation of floodplain communities to higher ground are not supported by 71% of people living in the floodplain (Table 22 & Figure 39). The indigenous community recommendations are structural embankments around their villages and enlarging culverts (Figure 49). This will allow them to continue living with floods. There are no attempts in the inclusion of disaster risk reduction and recovery concepts in the school curricula and other relevant trainings institutions. Professional training in disaster risk reduction is offered outside the country. There is an urgent need to introduce disaster risk reduction programmes at tertiary institutions like the Polytechnic and University of Namibia. The implementation of social development policies and plans to reduce the vulnerability of people most at risk in the floodplain is not yet considered seriously due to unavailable resources.

CHAPTER 5: DISCUSSION

Flood risk perception was one of the main research objectives of this empirical study. It may be concluded that most residents have a high perception of flood risk. This is attributed to the fact that over 80% of the residents wish to continue living in the floodplain. The benefits they derive from the floods outweigh the risks. This is observation supported by Terpstra, Gutteling, Geldof and Kappe (2005) study. Similarly, the residents have become attached to the floodplain that they miss the floods when they are relocated; they want to continue living in the floodplain.

As many as 107 (71%) respondents opted to continue living in the floodplain on the mounds and seasonally migrating upland, a traditional practice residents are accustomed to for years. Their perception was identified as high because they are aware of the causes of floods like too much rainfall and the inadequately constructed roads and culverts. They could all identify each individual risk and explain how they averted each risk. Residents feared the threats of crocodile and hippo attacks more than the actual flood water. Women were identified as having a higher risk perception than men. Women weighed risks by assessing threats to household property, crop fields and safety of life, while men focused on the benefit chains derived from intensive fishing and farming.

The majority of the respondents (66%) had a very high perception about the flood level since the 1950s (Table16 & 17). They perceived that floods had changed from the time they were young and that every year, water flooded extensively.

In essence, the conclusion on flood risk perception is that the residents of Kabbe Constituency are optimistic, feel safe and in control. The main factors identified and influencing their heuristic risk judgements were decades of experiencing floods,

socio-economic benefits of floods and place attachment. The residents use heuristic judgements to weigh the risks and benefits associate with floods (Slovic, Kunreuther & White, 1974).

With reference to indigenous flood knowledge, the residents employ several preparatory and coping strategies through various stages - before, during and after the flood (Table 24). There are three main categories of coping with floods, namely: economic, social and cultural strategies (Wisner, Blaikie, Cannon & Davis, 2004). Economic strategies include making and selling handcrafts, building materials like grass for thatching, selling surplus grain, fish, lily tubers and vegetables or sometimes cattle. Socially when a family is destitute, people borrow grain or maize meal from their neighbours with surplus, and return it when they have offset their debt. Communities also share responsibility in ploughing or relocating during floods. The residents of the Kabbe Constituency are God fearing people. Believing in God as the causer of good and bad things is one of the many ways of coping with floods.

Culturally, the people in the Kabbe Constituency carry out preventative measures such as relocation to higher ground. Their knowledge of the flood cycle allows them to farm immediately after the floods while the soil is still moist, hoping to ensure early harvest and reduce loss to floods. Such strategies have enabled the residents to live with recurrent floods. Their indigenous knowledge on flood forecasting includes observing signs of the flood in the river, observation of the sky, the birds, insects and plants. People living immediately along the main rivers are the early warning and key informants about any upswing in the river and relay their observations to villages throughout the floodplain.

Conspicuously, the Kabbe residents have developed complex and traditionally reliable ways of coping with floods. This knowledge is vital for the residents and needs to be garnered and protected from the external influence that usually comes from experts who are aliens to the area. Coping strategies though need to be carefully supplemented with external aid in case hazards exceed the community's coping capacity only. Careless provision of external aid can lead to a dependency syndrome and loss of indigenous flood knowledge invested over centuries (Wisner, Blaikie, Cannon & Davis, 2004).

Mitigation approaches and interventions of the local Government aimed at reducing the disastrous impacts of floods seemingly hinder the residents' indigenous flood knowledge application. Residents are directed to the relocation camps to receive flood relief. Those who decide to stay behind, are spurned as primitive, risky and sometimes denied flood relief items. In line with Blaikie, Cannon, Davis and Wisner (1994), such experiences reveal that unsustainable strategies may create a dependency syndrome following government relief aid and, in the long-term, may accelerate the loss of indigenous flood knowledge.

The question that arises is: what kind of mitigation would be feasible and sustainable in KC? Encouraging residents to move permanently from the floodplain is not in harmony with international frameworks on flood disaster risk reduction. A permanent relocation policy in the KC may likely have many negative consequences. The Tanzanian permanent relocation policies intended to solve a country's socio-economic problems. The lesson learnt is that any envisaged success of such policies requires greater entrepreneurial emphasis on holistic planning with a view to the KC. Permanent relocation should involve local people's participation, rigorous cost-

benefit analyses while addressing agricultural issues, socio-economic matters, the environment, land use, and the proposed governance of villages. And as Lorgen (1999) pointed out, policy makers are to be sensitive to the needs of the people being relocated, taking into account their geographical, regional and traditional structures. Failure to do so may result in resistance from the community in mind.

Ideal disaster risk reduction measures that incorporate a balanced mix of modern technology and indigenous knowledge can be observed in Japan. Their focus on developing disaster reduction technologies is enhanced by the hub of indigenous disaster knowledge. As Shaw, Uy and Baumwoll (2008) accentuate, indigenous knowledge's direct link to the communities at risk bridges the gap between theory and practice.

In Papua New Guinea, the Singas' village provide practical and successful ways of using indigenous knowledge to minimise the risks whilst continuing using the river as a valuable source of livelihood. Therefore, if the local Government were to document and promote indigenous flood knowledge within culturally compatible scientific strategies, it would contribute to the indigenous communities' resilience in the KC.

Internalizing of disaster projects in Fiji's Nabouciwa community contributed to added solutions to the flooding problems, prompting the community to take further action towards risk reduction, while using indigenous flood knowledge (ADPC, 2005). In the KC, the local Government could provide structural and engineering technology together with grants in support of the indigenous flood knowledge and, strengthening residents' resilience to flood disasters.

Last but not list, in Barotseland, the Lozi people have been surviving with floods of the Upper Zambezi River for over 200 years, using only indigenous flood knowledge. This knowledge has not been tempered with by the Zambian Government or influenced by any external support system. Rather, the Zambian Government has allowed and promoted the culture and ceremonious relocations called *Kuomboka* and *Kufuluhela*. As a result, the application of indigenous flood knowledge in the face of adverse seasonal floods continued to be successful in western Zambia. Against this backdrop, the local Government should encourage people in the KC to use their indigenous flood knowledge in addition to modern mitigation measures.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

The results from this empirical research demonstrate that indigenous flood knowledge does exist in the study area and is a trusted source of information for the Kabbe Constituency residents. The residents in the floodplain have significantly higher levels of risk perception, and their use of indigenous flood knowledge indicates some ability to be resilient. These findings explain why the Kabbe Constituency residents continue to live in the floodplain and appear better prepared for recurrent floods, although to some extent they are becoming dependent on external flood relief. In the absence of an appropriate framework for the integration of indigenous knowledge in Namibia's DRR policies, deficiencies such as delayed support evolve from local Government disaster institutions exclusively favouring modern mitigation approaches of DRR.

The significant findings of this empirical study could facilitate flood relief efforts just in time and encourage adjustment to the increasing frequency of floods. The insights might assist policy makers in decision-making and in rural development provided that indigenous flood knowledge is cost effective, easy to implement and environmentally friendly. In conclusion, the thesis recommends:

1. Development and strengthening of community- based disaster preparedness, responses and recovery;
2. Empowering villages through training programmes on DRR with financial support from RDRMC;
3. Developing a policy framework to document and integrate indigenous knowledge in NDRMS;

4. Introducing DRR programmes at institutions like the Polytechnic of Namibia and UNAM;
5. Direct a local budget to the local Government to respond timely;
6. Deter from relying on well-wishers like the Namibian Red Cross and make requests through the OPM's DDRR;
7. Encouraging people to live with floods in the KC, by adopting and modifying construction methods practiced in the Asian-Pacific Region for example;
8. Introduce structural defences like embankments, canals and levees along homes and schools in the floodplain; and
9. Introduce compensation schemes to people living in the floodplain to enhance their resilience in preparation for the next flood event.

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APPENDIX 1: KEY INTERVIEW QUESTIONS

A. Flood risk perception:

1. How long have been living in the floodplain?
2. What drew you here?
3. Name and describe the floods that occurred here in the past up until now.
4. Will such floods (if greater) occur again in the future?
5. Do floods frighten (scare) or cause anxiety to you? Why?
6. Is the magnitude of the floods increasing or decreasing? Explain.
7. Have you considered relocating permanently from here? Why?
8. How important is the proximity of the river to you?
9. Do you miss this place when you are away, for example in Katima or Windhoek?
10. Do you have any childhood memories associated with floods? Tell us please.
11. What are the pros of living here?
12. What are the cons of living here?
13. What is causing the floods?
14. Why did you come here to stay in the relocation camp?

B. Indigenous knowledge and coping strategies

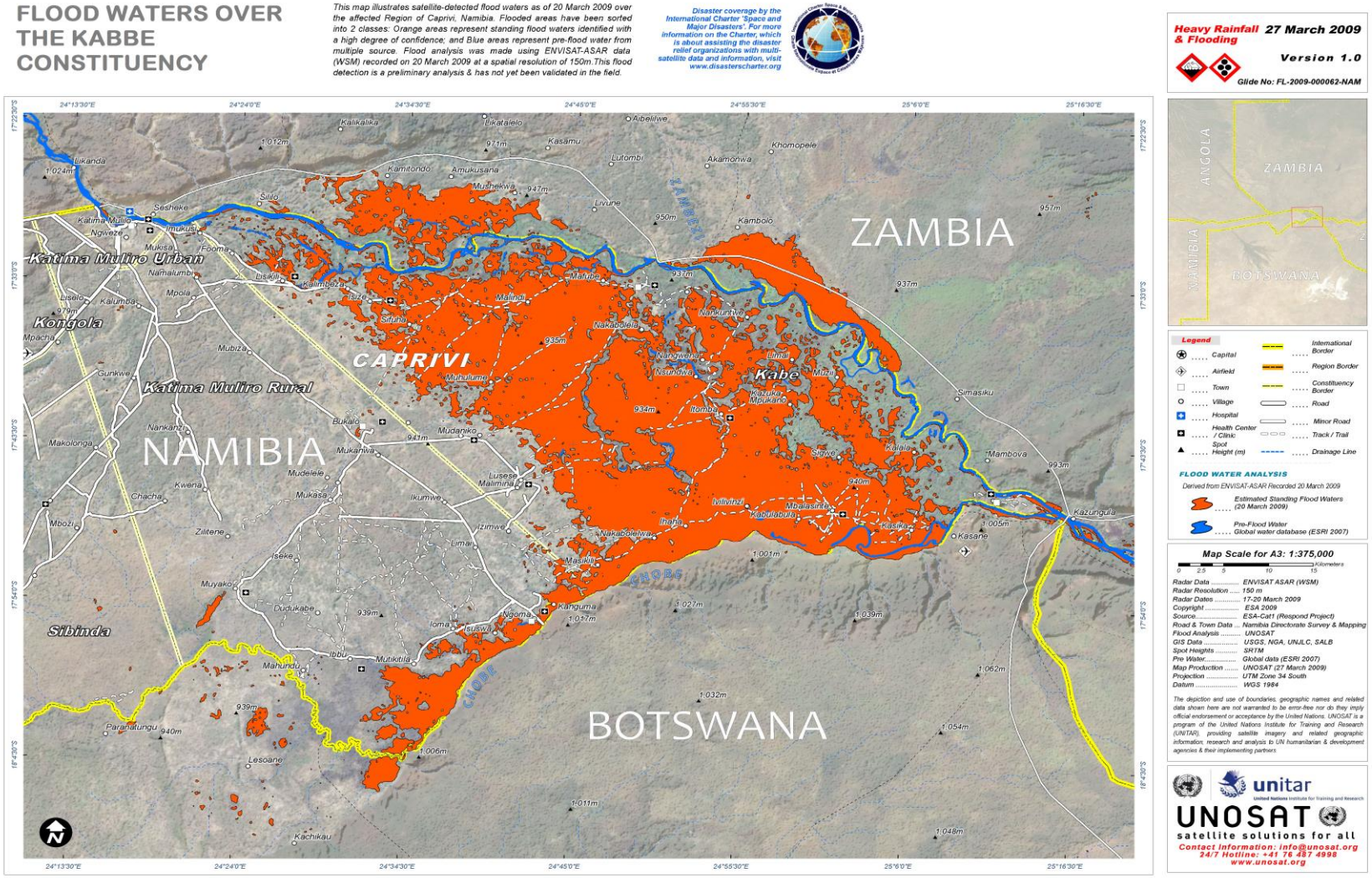
1. How have you been living with floods in the past?
2. What signs in the environment would tell you that there was going to be a major or minor flood?
3. How did you communicate flood warning in the past?
4. How did you manage farming in the floodplain and avoid crops being submerged?
5. How did you build and protect your homesteads from floods?

C. Key informants: Munitenge Tribal Court and RDRMC technical personnel

1. How have people in the KC been living with floods over the years before Government intervention?
2. Are people still using any IK in flood management or are they becoming dependent on Government disaster aid?
3. Do you allow the community in the KC to use their own flood IK?
4. Describe your role before, during and after the flood.
5. What problems do you experience when preparing for floods?
6. How do you disseminate flood warnings?
7. Any areas of concern?
8. Are there any flood schemes/compensation you offer to the KC residents for losses due to floods?
9. What structural measure are you planning for the mitigation of floods?
10. Any research carried out to find durable solutions to the flood problem?

D. Observation (field) schedule

Items	**Check**
• Houses (site, foundation and building material)	
• Fencing	
• Dug-out Canoes	
• Crop Fields	
• Domestic animals (cattle, goats, chickens)	



Flood Analysis with ENVISAT-ASAR (WSM) Recorded on 20 March 2009