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# Community perceptions of climate change and variability impacts in Oshana and Ohangwena Regions

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## Abstract

The links between climate change, social and economic development, health, and environmental sustainability have become a dominant and urgent global concern. Understanding community perceptions leads to successful adaptation to climate change. This paper analyses community perceptions of climate change in selected Namibian regions. The study applied the qualitative research approach using the focus group discussion method. The data collection was conducted within a Socio-economic and Gender Analysis framework. The study has revealed that the communities are aware that the climate is changing due to changes observed in the past three to four decades. However, the study concluded that the communities do not have an adaptive capacity to respond to catastrophic natural disaster events such as the recurrent floods of 2009, 2010 & 2011. The study recommends a programme on community awareness regarding climate variability and change and its implications. The government in collaboration with communities and other relevant stakeholders should set up a long-term adaptation strategy for Namibia.

## 1. Introduction

Current climate change and variability debate focused the discussions on the understanding of the phenomena. These discussions highlight the situation at global and continental scale. However this understanding is still insufficient for national and local level projections. Even though Namibia has just completed its second national communication to United Nations Framework Convention on Climate Change (UNFCCC), it is still silent on how this will affect Namibia specifically for each region.

Namibia is a semi-arid country characterised by highly variable, fragile and unpredictable climatic conditions (Seely, Hines & Marsh, 1995; Byers, 1997; Mendelsohn, Jarvis & Robert, 2002). Furthermore, the International Institute for Environment and Development (Reid, Sahlén, MacGregor & Stage, 2007) suggests that climate change is likely to exacerbate the dry conditions experienced in Southern Africa. This also implies that, when rain does come, it is likely to be in greater intensity leading to erosion and flood damage. This prediction may be true for the current climatic variability that resulted in concurrent floods (2007-2011) experienced in North-central Namibia.

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Namibia relies on climate dependent sectors for its national economy. In addition, 70% of the rural population are subsistence farmers (DFRN, 2008 and Mendelsohn et al., 2002). The subsistence farmers in North-Central Namibia rely on rain-fed crop and livestock production for their livelihood. Therefore, these changes affect them most, thus increasing their vulnerability. The Intergovernmental Panel on Climate Change (IPCC, 2007), fourth assessment stresses that developing countries in Africa are highly vulnerable to the impact of climate change and therefore are required to strengthen their climate change adaptation strategies. Studies carried out among rural communities in North-central Namibia have noted that there is inadequate adaptive capacity that is required to cope with climate change impacts.

Climate change is undoubtedly a developmental and not just a scientific issue. As such, social scientist has recognized the significance of climate change effect on societies. It is therefore imperative to conduct a study on community perceptions of current climatic conditions and responses to associated impacts in rural Namibia. The understanding of community perceptions and current responses to climate change impacts will contribute to the development of community based disaster management strategies. This will assist Government and disaster risk management agencies to develop risk management strategies based on a community participation approach.

## 2. Climate variability and change in Namibia

### 2.1 Definition of concepts

The UNFCCC defines **climate change** as change of climate that is observed over long periods of time, attributed directly or indirectly to human activity, above that caused by natural climate variability (UNFCCC, 1992). However, according to IPCC (2001) climate change refers to any change in climate over time, whether as a result of human activity or due to natural variability. The IPCC, the World Health Organisation (WHO), World Metrological Organization (WMO), United Nations Educational, Scientific and Cultural Organization (UNESCO) and United Nations Environment Programme (UNEP) have published papers analysing the impacts of climate change.

**Climate change impact** is defined as a specific change in a system caused by its exposure to climate change (Scheider et al., 2007). The exposure may be judged as harmful or beneficial. The degree to which these systems are susceptible to and unable to cope with adverse impacts of climate change is referred to as **vulnerability** (Schneider et al., 2007). As a result, UNFCCC has identified two responses to climate change: (a) **mitigation** of climate change by reducing green-house gases and enhancing sinks and (b) **adaptation** to impacts of climate change, by making communities engage in coping mechanisms that assist in preparedness measures (Klein et al., 2007). The relationship of these concepts is illustrated in Figure 2.1 below.

This paper focuses on the vulnerability concept in the context of disasters. This concept reveals the “asymmetry of impact” of disasters on different members of the community (Tamtomo, 2007). Another concept that is closely linked to vulnerability is “social security”. According to Tamtomo (2007), social security refers to the idea of systems of social relations that are created to mitigate or share risks. These mitigation or risks sharing can be in the form of traditional social security mechanisms or modern social welfare systems (Tamtomo, 2007, Scheider et al., 2007).

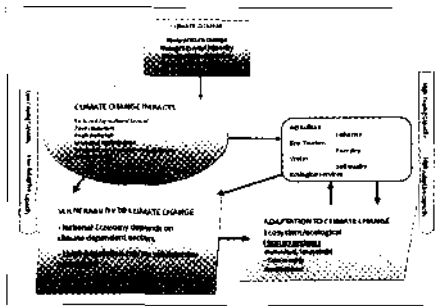


Figure 2.1: Relationships among climate change concepts

## 2.2 Climate variability and climate change projections for Namibia

Namibia is an arid to semi-arid with highly variable climatic conditions. As such, reoccurring droughts, seasonal floods, episodes of higher temperatures and unpredictable and variable rainfall are considered normal weather conditions in Namibia (GRN, 2002). The country experiences early low intensity rainy season commencing in September and October, and the main rainy season usually lasting from January to March and occasionally up to May (Zeidler et al., 2010). In addition, Namibia experiences large scale variability, notably the El Nino and La Nina events. These events may result in severe droughts and heavy rainfall causing severe floods in Namibia.

Climate change projections are reported in the third and fourth assessments (IPCC, 2001 & 2007) reports. Furthermore, latest projections for Namibia are based on the Vulnerability and Adaptation (V&A) study conducted by Desert Research Foundation of Namibia (DRFN) in 2008. The subsequent summary based on DRFN (2008) study presents projected climate changes for Namibia.

Maximum temperatures have been rising over the past 40 years, as observed in the frequency of days exceeding 35°C. Equally, the frequencies of days with temperatures below 5°C have been getting less. Overall, DRFN (2008) suggests that Namibia is getting hotter. The rainy seasons are expected to be shorter and rainfall is likely to increase over much of the country. An increase of wind speeds is predicted, as both the thermal and mid-Atlantic drivers are expected to become more pronounced. These projections suggest that key sectors that support Namibia's economy and food security are at risk.

Impacts resulting from changes in the climate system of Namibia were also assessed by DRFN (2008). Consequent studies have also confirmed that subsistence farmers are also experiencing projected impacts resulting from frequent droughts and floods experienced for the past 20 to 25 years (Angula, 2010; Zeidler et al, 2010; Kuvare, Ogunmokun & Maharero, 2008). Some of these impacts are:

- Water scarcity
- Biodiversity loss/shift of habitats
- Outbreaks of pests and diseases
- Low crop yields
- Reduced livestock production
- Reduced rangelands
- Reduced land productivity

- Low soil fertility
- Increased cases of water-borne diseases and malaria

Response strategies require financial and human capacity to respond and minimise the risks associated with these impacts.

### 2.3 Vulnerability and adaptation to climate change impacts

Namibian economy's high dependency on the climate sensitive sectors of rain-fed agriculture, fisheries, and eco-tourism amplified its vulnerability to climate change. Furthermore, 70% of the Namibian population relies heavily on subsistence-agriculture for their livelihood and food security. Coupled with the country's low adaptive capacity to deal with climate change due to inadequate financial and human capacity, Namibia is considered highly vulnerable to impacts of climate change and associated effects (DRFN, 2008).

To date, Namibia has ratified the UNFCCC and accordingly has completed its initial and second national communications reports highlighting projected climate changes. Additionally, Namibia has completed its National Climate Change Policy and the Disaster Risk Management Policy to provide legal framework and strategies on how to deal with climate change impacts and responses to natural disasters respectively. The national climate change committee advises the Government on responsibilities and UNFCCC obligations. Finally, the Namibia Africa Adaptation Programme (funded by the government of Japan) strategically enhances the capacity of Namibians to respond and be prepared for climate change. This institutional set-up guides current and on-going preparation for a national adaptation strategy. However, studies have shown that households and communities are coping with the current climatic changes and disasters experienced over the years (Kuvare et al., 2008 & Angula, 2010). The capacity to respond to mid- and long-term impacts of climate related risks is very low. It is also clear that men and women, minority groups and youth are affected differently by the impacts of climate variability and change, thereby making them more vulnerable to such impacts (IECN, 2011 & Angula, 2010).

Adaptation to impacts of climate change requires a set of actions from individuals, communities, organisations, government institutions and international agencies to introduce required policies and strategies. In order for Namibia to reduce vulnerability, a strategy that enhances people and the country's adaptive capacity is required (IECN, 2011).

## 3. Research Methods

### 3.1 The research sites

The study was conducted among selected communities in two of the north-central regions, namely, Oshana and Ohangwena located in the extreme northern parts of Namibia bordering with Angola (Figure 3.1). The North-central regions are Ohangwena, Omusati, Oshana, Oshikoto. These regions host the Owambo ethnic groups who comprise the majority (41%) of the Namibia population (CBS, 2006:9). Although the region constitutes both urban and rural structures, the majority of the population are rural subsistence farmers.

The rationale for selecting the study areas were the following factors: (i) climate vulnerability of the community; (ii) population size; (iii) socio-economic factor of poverty. Both Ohangwena and Oshana regions are part of the Cuvelai basin that drains the southern Angola and brings water to Namibia, and that gradually converge into Etosha Pan. Although these regions generally receive relatively high rainfall ( $\pm 350-550\text{mm}$ ), it is more seasonal



framework (Wilde, 2001). The general objective of the SEAGA framework is to close the gap between what people need and what development delivers. This framework can best define the link between community perceptions and scientific fact on climate change. The SEAGA framework is a participatory approach based on three guiding principles.

- Gender roles are key
- Disadvantaged people are more vulnerable and should be given a priority
- Participatory is essential

The fieldwork was carried out with homogenous groups of men and women. The selection of the focus group discussions were based on the fact that it is important to understand whether the perceptions and responses of climate change impacts differ by gender and other socio-economic groupings (age, economic activities and residential areas). The division of the population into various focus groups took into consideration the differential in the levels of literacy and education especially between middle aged men, women and the youth. Table 3.1 summarises the composition of FGD participants. Appointments were made for both male and female FGDs from Eenhana town but, only women turned up.

**Table 3.1 Composition of focus group discussion**

Informal settlements	Rural communities:
<b>1. Ekuku Evacuation Camp</b> <ul style="list-style-type: none"> <li>• Six (6) women (40-59 years)</li> <li>• Six (6) men (20-39 years)</li> </ul>	<b>1. Ondobe village</b> <ul style="list-style-type: none"> <li>• Three (3) men (20-29 years)</li> <li>• Three (3) men (30-39 years)</li> <li>• Three (3) women (50-59 years)</li> <li>• Five (5) women (30-39 years)</li> </ul>
<b>2. Oshoopala Evacuation Camp</b> <ul style="list-style-type: none"> <li>• Six (6) women (20-39 years)</li> <li>• Six (6) men (40-59 years)</li> </ul>	<b>Urban- Eenhana town</b> Three (3) women (30-39 years)
<b>Urban- Ondangwa town</b> <ul style="list-style-type: none"> <li>• Three (3) women (40-59 years)</li> <li>• Three (3) men (20-39 years)</li> </ul>	
<b>Oshuulo village (15km from Oshakati)</b> <ul style="list-style-type: none"> <li>• Six (6) women (20-39 years)</li> <li>• Six (6) women (40-59 years)</li> <li>• Six (6) men (20-39 years)</li> <li>• Six (6) women (40-59)</li> </ul>	

## 4. Results

### 4.1 Precipitation changes

The data on precipitation for different sites in Namibia are available from the Metrological Service, although for most of the sites the data are not consistently recorded. Ondangwa is the only site in the vicinity of the study area that has uninterrupted data from 1917-2010. However, there is a gap for the period 1994-2002.

Data in Figure 4.1 below display the difference in rainfall over 64 years (1920-2010) and were subdivided in 8-year intervals. The 8-year interval was chosen to facilitate comparison because there is a gap in data records for the period 1994-2002. The 8-year interval corresponds with the latest available data, 2003-2010. The prominent pattern from the graph shows that there has been frequent occurrence of drought in the following year intervals: 1929-1932, 1960-1962 and 1980-1992. Apart from dry seasons, wet seasons were also observed in the following years: 1934-1937, 1950, 1963, 1974, 2009-2010 (Figure 4.1).



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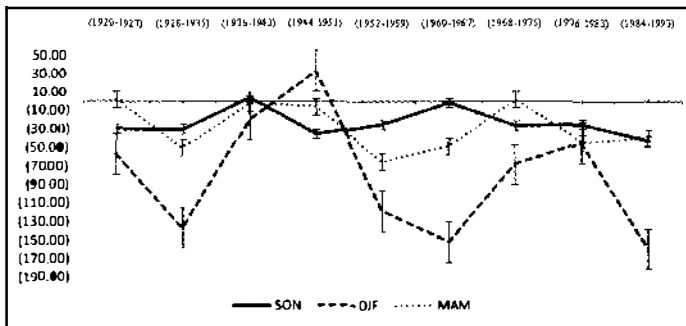


Figure 4.1: Average rainfall change based on 2003-2010 records

There is a clear indication that on average, the recorded rainfall between 2003 and 2010 was well above average except 1944-1957 periods where the December-February rainfall exceeded with 30 mm. This is evidence that rainfall in the last 8 years was relatively high. However, there is less variation among early rainfall (September-November) (Figure 4.1).

#### 4.2 Community perceptions of climate change impacts

This section presents the empirical findings and the community awareness of climate change concept and its meaning. It also describes the local community's perceptions of climate change and associated risks. Finally, it sketches out the coping strategies and response mechanisms applied by local communities when dealing with climate change related impacts.

##### 4.2.1 Awareness of climate change

The community was probed about the meaning of the climate change phenomenon and whether it is evident in Namibia. Women across all age groups and men aged 40-59 from the informal settlements and villages in Oshana Region were less informed about this concept. Respondents that participated in focus group discussion at Ekuku evacuation camp revealed that they have never heard about the concept of climate change and variability. Similarly, men and women of all age groups from Ohangwena region have heard about climate change but when probed about its meaning it transpired that they were also less informed. The two concepts also seem to be non-existent in the local language spoken both in Ohangwena and Oshana regions, thus making translation challenging. In essence, the experience of climate change and variability as well as its associated impacts are foreign issues that have not yet been integrated into the indigenous vocabulary.

All focus group discussion participants from both regions have observed changes in the local climate systems. The observed changes reported included changes in rainfall patterns, temperature, humidity and other extreme events. These perceived changes were closely linked to the recent climate events experienced in the past 3-4 years, with particular emphasis on droughts and the recurrent floods. In contrast, the middle-aged respondents (40-59 years) from both regions reported changes observed over the past 3-4 decades.

Although women (20-30 years) in Oshoopala evacuation camp affirmed that the observed changes such as droughts, heavy rains and strong winds might be caused by climate change, one woman in this focus group strongly disagreed. Her reasons are based on reports she heard over the radio that the water flooding into Namibia have been released from neighbouring Angola when they opened flood gates of major reservoir dams. On

the contrary, the rest of women believe that 2008-2011 floods are a punishment from God and pointed to biblical manifestations "Climate change is a punishment from God. God is angry with us, what we are doing on earth is very bad, people are out of control" (Ekuku evacuation camp, middle age woman). This view was also affirmed by middle-aged men 40-59 interviewed in a village from Ohangwena region. Therefore they suggested that the solutions should be sought through prayer. "Climate change is a natural disaster, which only God can change. God can change this through our prayers" (Ondobe village, middle age man).

Young men in the 20-39 age group from Ondangwa town in Oshana region stated that the adverse impacts of natural disasters such as flooding should not be blamed on God. They perceive that much of the flood impacts experienced during heavy rains are anthropogenic. These anthropogenic impacts are attributed to poor town planning and inadequate storm water channels in towns.

The majority of young men and women (20-39) who attended school reported that they were aware of climate change from subjects such as Geography. They also identified media as another source of information on climate change. This age group comprehends the concept because they cited scientifically proven causes of climate change and variability such industrial pollution and deforestation. Notably, one middle-aged man from Ekuku evacuation camp mentioned that there has been an increase in technology after Namibia's independence in 1990 which seems to have increased gas emissions, leading to changes in climate patterns.

#### 4.2.2 Perceptions of change

As discussed in the preceding section, respondents from Oshana and Ohangwena regions confirmed changes in local climates that are consistent with climate change projections. They reported the following observed changes in the local climate system:

- Changes in rainfall: low rainfall associated with droughts and heavy rainfall associated with floods.
- Temperature changes: during wet years the winter seasons are prolonged and colder, whereas summer days are getting hotter.
- Changes in wind intensity: from moderate to strong or occasionally associated with wind storms.
- Humidity: summer season is becoming drier.

A similar study conducted by Angula (2010) in Oshana and Erongo regions reported that the rainfall seasons have decreased in duration but increased in intensity. However, local communities interviewed during this study suggested that the 2010/11 rainfall season had been extended in duration and increased in intensity. Box 4.1 below summarises local community's perception of changes in rainfall.

##### Box 4.1

###### **Changes in rainfall for the past 60 years: Oshana Region**

*The respondents from the informal settlements indicate that though it has been raining in the past decade, there was never a need for relocation. They only experienced the process of relocation in the past four years. There is also a general agreement that today's climate is different from the past 50 years. Many of the respondents indicate that they have never experience the type of severe floods in their life time until 2008. Nevertheless information from the elderly in the villages indicate that the last report of severe floods were in the 1950s. The respondents also indicate that the changing conditions are worsening annually. For example the 2011 flood is more devastating than those experienced in the last three years. The respondents from both Ekuku and Oshoopala evacuation camp anticipate that this year (2011) their houses will be submerged until August. In the past four years they were able to return to their houses by April.*

The Ondobe men focus group discussion (20-29 years) observed that the current winter season (2011) is colder and extended. *“Winter starts too early in some years and too late in others. In the past winter used to start consistently about same time all the years. It is weird that nowadays we receive rain in winter”* (Ondobe village, young man). Moreover, respondents felt that summer days are getting hotter (noted an increase in average temperatures). Communities from Ondobe village in Ohangwena region reported incidences of wind storms combined with heavy rainfall that had damaged indigenous fruit trees and crop fields. Likewise, respondents from informal settlements in Oshana region reported strong winds that were threatening to damage their evacuation camps.

The changes explained above, have effects on the natural environment and ecological services that local communities rely on. As such, respondents from all study sites reported that observed changes threatened food security because of low livestock and crop production. Respondents from Oshuulo village in Oshana region reported frequent droughts and recurring floods that caused declines in pastures and shortened the growing and cultivation periods.

#### **4.2.3 Perception of risk**

There is a general concern about the risk and consequent impacts of climate change. Respondents raised their concerns regarding unpredictable development in climate conditions in their regions. However, these concerns varied from one social group to another based on how climate change impacts affect their livelihoods. For example both men and women from the informal settlements believe that their risk and vulnerability is more amplified by precarious location of their houses and high levels of poverty associated with low living standards in informal settlements.

They reported that many informal settlements are located in the oshana basins and hence get submerged by water during heavy rains. The floods also affect sources of income for most households in the informal settlements. In addition these floods affect industries that offer formal employment to informal settlement residents. Women in informal settlements derive their main income from informal businesses. Disruptions caused by flooding negatively affect their business operations as vending sites are submerged in water and goods suppliers are equally affected. The climate risks impacts on the rural subsistence sector are also felt in informal settlements. This is due to the fact that food supplements from rural areas to urban informal settlements are also disrupted. Similarly, respondents from rural villages are concerned about climate change and variability effects on crops and livestock. The respondents experienced crop and livestock losses due water-logging and reduced grazing capacity. Rural communities also suffer as they are disconnected from key services such as road networks, schools, health facilities and cemeteries.

By focusing on risks, the vulnerability analysis reveals that socio-economic inequalities and disparities in access to services differentiate risks and capacities of households to deal with disasters (drought and floods). It also transpired that ownership of assets and personal capacity (technical skills) can also increase the ability to mitigate risks, thereby reducing vulnerability. Box 4.2 below (copied from Angula, 2010) illustrates the importance of social relations and structures as well as ownership of assets in reduction of vulnerability. The case study in Box 4.2 also affirms that the social relations and structures in rural communities are breaking down. Indeed this explains the varied vulnerability levels highlighted by different communities in the study areas.

Box 4.2

**Life history of Mr Bonaventura Ipinge**



Mr Beneventura Ipinge migrated from another village and settled in Epyeshona in 1960. He remembers that Epyeshona's natural environment has been more or less similar as it looks today. It was never a forested area and has always been characterised by sparse trees and shrubs vegetation cover. He also says that the rangeland was very good and there has always been abundant grazing for livestock. He has observed that there have been changes in weather and he perceives that September is much hotter than it used to be in the 1960s. Drought phenomena were less frequent and he has noted that they are experiencing more droughts than in the past. Furthermore people coped better in the past because livestock and crop farming complimented each other well. He says that impacts of climate variability were not severe because there were few people around sharing grazing and available natural resources; there was enough grazing; and livestock provided sufficient manure for fertilising the land. He mentions that those who settled in the village first got better quality land for cultivation. He has observed over the years that social structures, cultural norms and values are breaking down. He fears that poor and vulnerable members of the community will find it hard to cope during famine because social relations and a culture of helping each other are no longer exist.

Source: Angula (2010:29)

## 5. Responding to impacts of climate change

### 5.1 Coping strategies

The study revealed that community members are coping and have a capacity to respond to short-term risks. However, all communities in study areas indicated insufficient coping or adaptive capacity to deal with major disasters and long-term climate risks. Some of the strategies currently in practice are not sustainable and may lead to further vulnerability. For instance, the evacuation of informal settlements may lead to (i) community dependency on government relief, (ii) health risks associated with overcrowding, (iii) loss of economic and business exchange of goods, (iv) disruption of social relations and structures and (v) lack of privacy and human dignity.

As such, local communities find it difficult to adapt to climate change, and therefore feel that there is a need to:

- Build awareness of climate change, enhance coping strategies and support the social mobilization of community members to help themselves,
- Ensure water provision during flood periods and emphasize on rain water harvesting for agricultural irrigation, livestock and fish farming,
- Build earth dams for water harvesting,
- For engineers to design adaptive drainage systems.

Furthermore, village communities feel that they rely heavily on government to provide enough food during periods of flooding. "The government should assist us rebuilding our houses and provide us with food because we are poor" (Ondobe village, young man). The most vulnerable group of people in the community (the elderly and children) find it difficult to cross flooded *iishanas*. Hence there is a need for speed boats to transport children across flooded areas to schools and pensioners to pension pay-points, hospitals, church, etc. There is also a feeling that the headmen should play an important role in advising the communities on measures pertaining to floods. On the other hand, the community feels that everyone is responsible for disaster response.

The informal settlement communities oppose current responsive strategy of temporarily moving people into evacuation camps. However, they feel that the authorities should consider relocating settlements to a permanent higher ground. The community

recommends the restructuring of towns located in the Cuvelai basin. This results from the fact that current town planning and layout did not take into consideration disasters posed by flooding. The community believes that proper planning and restructuring of the town will solve problems of waterways blockages.

The vulnerability analysis focused on assessing the communities' preparedness to face risks as well as their resilience to cope with recurrent floods and droughts. In fact, the absence of local level disasters and risk management and adaptation strategies undermine the communities' preparedness and adaptive capacities.

## **5.2 Responses**

Balancing vulnerability and coping capacity associated with disasters in rural villages is usually determined by social relations and structures that are created to mitigate or share risks. Therefore communities should invest in establishing or strengthening social structures aimed at disaster preparedness and management. This should be part of Early Warning System from the Ministry of Agriculture, Water and Forestry. The main climate change response for Namibia should focus on developing long-term adaptation strategies. Furthermore, the community feels that the Government should make a substantial investment in making the natural and human environment less vulnerable and more resilient to the effects of climate change. When planning for future adaptation responses, the community feels that it is important to know about the policies and institutions guiding adaptation framework and existing coping strategies.

## **6. Conclusion**

The study has revealed that communities are aware that the climate is changing due to changes observed in the past 3-4 decades. However, most respondents did not provide any scientifically defined cause of climate variability and change. There were a few respondents who mentioned that global warming is causing climate change. These changes have threatened food security because of low livestock and crop production. Reduced food security and access to public services amplified household vulnerability. Finally, the study concluded that the communities do not have an adaptive capacity to respond to catastrophic natural disaster events such as recurrent floods of 2009, 2010 & 2011. In conclusion, respondents suggested that the government should put a long-term adaptation strategy for Namibia.

The community perceptions of the older respondents on climate variability were in line with rainfall data records of 1950. While the younger people perception were in line with recent records of 2003-2010 interval. Based on the observation from 1916-2010, it shows that the recent observed rainfall increase is temporal variation but overall rainfall has gradually decreased.

This study recommends a programme on community awareness regarding climate variability and change and its implications. Furthermore, research is required to assess climate change and variability at local level in order to inform early warning systems. Finally this study suggests further research to understand the level and capacity of community participation in disaster preparedness and mitigation.

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