

Community vulnerability in climate disaster and environmental sustainability: A Botswana perspective

ABSTRACT:

Introduction

Community vulnerability to climate related disasters is a concern for social workers serving in different portfolios of the community. This is even more precarious when the physical and social environments are seriously degraded. Social work is committed to the development of communities under the principles of social justice, human rights, and respect for diversity amongst people and cultures. It advocates for the sustainable development of communities and their protection from climate related environmental hazards and risks. While serving the person in the social and physical environment, it is dedicated to the reduction of community vulnerability to environmental disasters that could jeopardize physical environmental sustainability. The global social and physical environment is burdened by the changing climate and weather patterns, pollutants, and hazards with grave consequences on communities. Climate change and variability has brought about increased flooding, frequent drought episodes, and new health hazards.

Aim

The paper presents findings of an empirical study which was aimed at interrogating community perceptions of environmental hazards, vulnerability, and capacities in the South East District of Botswana. It was meant to assess the community preparedness and disaster risk reduction strategies and to identify the role played by social workers in the community to enhance community resilience to environmental disasters and promote environmental sustainability.

Methodology

The researcher adopted the mixed methods research design which combines both qualitative and quantitative research paradigms for complimentary purposes and triangulation. Data for both phases were collected through face-to-face interviews, questionnaires, and focus group discussions and complemented by the review of country and international disaster policy documents and statutory instruments. A total sample population of 3567 respondents were randomly selected for the quantitative phase of the study which constituted 10 percent of the total population of 37 696 for the three (3) communities in the district which were aggregated as follows; 27 760 for Ramotswa, 7 636 for Otse, and 2 300 for Mogobane. A total of 90 participants were conveniently selected in three (3) wards of each of the three communities for the qualitative phase. This means that for each community, there were 30 participants who were selected.

Findings

It was found that although Botswana has a national disaster management policy and response plans at the national level, these have not sufficiently trickled down to enable local communities to prepare for environmental hazards and risks and have not established disaster management responses systems for various hazards. As such, local communities are vulnerable to diverse to floods, windstorms, drought, torrential rains, and wild fires which negatively impact on their livelihoods and environmental sustenance. The vulnerability to environmental disasters is increasingly becoming more complex due to climate change and variability. The findings further reveal that community vulnerability resonates with the lack of knowledge on climate change and risks, inadequate information on environmental hazards and risks, lack of hazard and risk mapping and appropriate interventions. The paper proposes a community based strategy for adoption at the community level. The main concepts in this paper are: climate change, vulnerability, disaster, hazard and risks, and resilience

Introduction

Communities are important stakeholders in environmental sustainability and climate disaster vulnerability reduction. All actions and/ or efforts taken to address environmentally sustainability without the active involvement of vulnerable communities may be futile and fatalistic. The principle behind community involvement in disaster risk management is premised on the realization that communities are not only victims but they are the solution and active actors in shaping the current state and the future of their environment (1). According to (UNISDR, 2) disaster preparedness defines the critical steps based on the ability of the community and its effectiveness and efficiency to absorb the shocks. In addition, community livelihoods and subsistence are dependent entirely on the geographic-social environment in which they live. The physical and social environment provides communities with various resources. These resources may be food, water, air, and social relations that are important for survival in difficult times. Therefore, social work is committed to the development of communities under the principles of social justice, human rights, and respect for diversity amongst people and cultures. It advocates for the sustainable development of communities and their protection from environmental hazards / risks. While serving the person in the environment, it is dedicated to the reduction of vulnerabilities from climate related hazards (in whatever form) that could jeopardize their environmental sustainability. The global social and physical environment is burdened by the changing climate and weather patterns and other social problems with grave consequences on communities (3). Climate change brought about damaging weather patterns with increased

flooding, frequent drought episodes, and new health hazards. This paper discusses the vulnerability of communities to climate related disasters and suggests the best ways to address the problems and strengthen environmental sustainability. It does this based on the findings of an empirical study which investigated the community perceptions of hazards and vulnerability to risks in the South East District of Botswana and assess community preparedness and identifying the role of social workers in enhancing community resilience and sustainability.

PROBLEM STATEMENT

Botswana, as a developing country, is overwhelmed by windstorms, floods, livestock diseases, and droughts which prove complex to address. The National Disaster Management Office (4: 11) reported that in 2007 and 2008 four districts which are, Chobe, South East, Ngamiland, and Ghanzi, were seriously affected by floods, heavy rains, and wild fires besides common minor hazards, such as road accidents, malaria, and foot and mouth disease. In 2007, 12.7 percent of the total land area in Ngamiland district was burnt and 157 households were affected by floods necessitating evacuation to temporary camps. Other hazards that endanger communities in the district are foot and mouth disease, contagious bovine pleura pneumonia, tsetse fly, locusts, and lethobo flies (5: 5). In the same year, Ghanzi district suffered from floods and wild fires which destroyed more than 5 million out of the 11, 791, 000 hectares of communal and state land. In Chobe the floods and wild fires affected Satau, Parakarungu, and Kachikau villages besides the common animal disease outbreaks, migratory pests, and HIV and AIDS in the areas (4: 8).

The International Federation of Red Cross and Red Crescent Societies (IFRC) (6:127) states that weather related disasters globally have increased from an annual average of 200 in the early 1990s to more than 350 a year since the year 2000. The increase in disasters relates to equally rising numbers of people affected worldwide. These numbers have risen from an average of 190 million per year in the 1990s to 243 million in 2008. IFRC (6: 77) further states that the high number of climate related disasters in 2008 (floods, storms, heat-waves, and droughts) accounted for 60 percent of grants allocated by its Disaster Relief Emergency Fund (DREF), of which Botswana was a beneficiary for Gweta and nearby villages.

Disasters affect all groups of people from the young to the elderly, the sick, women and children, people living with disability, and the economically deprived. These groups are vulnerable to

various hazards because of their age, gender, physical ability and mental deficiencies, and social status. The Asian Development Bank (7: 3) showed that 600 million people worldwide live with physical, sensory (deafness, blindness), intellectual or mental health impairments; significant enough to make them vulnerable to disasters. It is also indicated by the World Bank (8: 1) that 80 percent of the 600 million live in developing countries (Botswana included). Their disability and mental health impairments make them vulnerable to disasters because they are subjected to discrimination during humanitarian interventions and preparedness levels (9, 2007: 87). This is further complicated by the nature of their impairment and whether they have access to the disaster warning information and disaster capacity building programs. Most often than not they are excluded and marginalized.

Literature review

Disaster vulnerability experience in the African continent

Literature shows that 330 million people in sub-Sahara Africa live in extreme poverty and fail to keep pace with the rest of the world in terms of development. Poverty makes people vulnerable to various hazards (including HIV and AIDS) and limits their choices (6). Natural disasters, such as, floods and sudden illness in Africa overwhelm poor households and destroy their ability to cope. They experience crop failure without alternative and sustainable means to provide for their family subsistence (9). It is estimated that 70 percent of the population of sub-Saharan Africa survives on subsistence agriculture which relies heavily on rain and fails when there is no rain. Other problems prevalent in Africa like malaria are influenced greatly by climate change and affect the poor more than other groups (6).

According to Woods and Lusaka (10) droughts have increased in frequency in north and western Uganda. The changing rainfall patterns have led to food insecurity and increased social conflicts between communities for scarce water and pastures. OCHA (11) estimated that in 2008 there were 108 internationally reported disasters 99 percent of which were climate related. The number of people affected by disasters annually has doubled over the last twenty years from 9 million to 16.7 million in 2008. Drought accounts for 75 percent of disasters on the continent and 220 million people are annually exposed. It is stated that the poor and the most vulnerable

communities are the ones who suffer most from the negative effects of climate change (12). OCHA projects that by 2020 rain-fed agriculture will have reduced by half because of shifting rainfall patterns (11).

Regional Africa's perspective on disaster risk management and vulnerability

The South Africa Weather Service (13) states that southern Africa has experienced floods in 2003 that affected more than 500, 000 people and displacing nearly 100 000 in Angola, Botswana, Madagascar, Malawi, Namibia, and Zambia. The floods are said to have washed away 230, 000 hectares of crops and left nearly eight million people food insecure and at heightened vulnerability. The challenges brought about by floods are complicated further by cholera epidemics affecting more than 150,000 people in the nine countries.

In Angola, the 2008 floods killed 60 people, affected 220 000, more than 81 000 were displaced, and 4000 houses were destroyed. The Madagascar Cyclone, Jade, in the same year killed 6 people, affected 60,818 people, left 4000 without shelter, and 5628 houses damaged. The situation was worse in Namibia where 350 000 people were affected, 92 were reported dead, and 54,581 were displaced or left without shelter. This is a sign of the vulnerability of the southern Africa region towards disasters (11).

Disaster risk management and community vulnerability in Botswana

The impact of extreme weather conditions on agriculture and livestock production have been felt heavily in Botswana. The country is semi-arid and characterized by 75 percent of the land being a semi-desert (14). Botswana's major engines of foreign exchange growth besides diamonds are tourism and agriculture which are climate sensitive. The tourism industry in Botswana is based on wetlands, grasslands, forest reserves, and wildlife without which the national economy will decline in its gross domestic product (15).

The effects of climate change negatively impacted community tourism and agriculture due to increased floods and severe drought in Botswana. Climate change is defined as "any change in climate over time, whether due to natural variability or as a result of human activity" (16: 2).

Vulnerability to climate change varies depending on the combined effect of the systems internal coping capacity and the nature and severity of the shock.

Community vulnerability to climate change effects and other vulnerability factors

Communities globally are afflicted by disasters of various types some of which result from natural hazards and human activity. The Asian and African countries appear to be the hardest hit in terms of disaster that range from Tsunamis, windstorms, floods or climate-related problems, and droughts. A number of communities in Kenya, South Africa, Zimbabwe, Zambia, Namibia, and Botswana have suffered from episodes of disasters on an annual basis (6). Communities that suffer severely from the impact of various disasters are poverty stricken, discriminated against, and marginalized (17). The IFRC (9: 1) asserts that the number, severity, and impact of disasters have been increasing dramatically due to climate change, environmental degradation, poverty and inequity, unplanned mass-urbanization, rapid population growth, and conflict.

Extreme climatic events threaten the lives and livelihoods of the poor more than other social groups. Climate change may be characterized by extensive heat, extremely cold winters, flooding, windstorms, prolonged episodes of drought, and heavy rains. The International Federation of the Red Cross and Red Crescent Societies (9) found that 250 million people are affected by natural disasters every year. This is complicated further by the behavior of community members' management of the environment, livestock, agricultural practices, and attitudes towards the changing weather patterns.

It has been established by the Intergovernmental Panel on Climate Change (IPCC) that there are gaps in the utilization of climate change information: integrating climate into policy; integrating climate into practice; climate service; and climate data (18). Red Cross / Red Crescent (19) reported that there is strong increase in climate related disasters in terms of numbers, economic damage, and people affected. It recommends disaster risk management as the best approach (rather than disaster response) and it should include an early warning system, ploughing drought resistant crops, and reforestation to prevent flooding. Africa has been identified as the most vulnerable continent to projected climate change related disasters because of its highest statistics regarding population growth and food insecurity (18).

Cipryk (16: 5) states that the United Nations has identified mitigation and adaptation as the most relevant two broad responses to climate change worldwide. Mitigation refers to an anthropogenic intervention to reduce the source or enhance the sinks of greenhouse gases while adaptation to the impact of climate change refers to adjustments in natural or human systems in response to actual or expected climate stimuli or their effects which moderates harm or exploits beneficial opportunities (20: 750).

Social work practice and disaster risk management in Botswana

Social workers employed by Botswana's District Councils and serve communities are supposedly members of the District Disaster Management Committees (DDMC) and are expected to perform their function in line with the UN priorities for action (21). However, social workers roles and responsibilities are not clearly defined at the district and community level apart from being randomly included in the emergency assessment team during disasters. They are not involved in community hazard assessment and mapping, designing preparedness plans, prevention and mitigation processes, and recovery strategies aligned to the United Nations frameworks.

Botswana Millennium Development Goal Report (22) showed that communities lack adequate preparedness and management capacity to handle climate and environmental disasters. It was further established that the mechanisms to minimize exposure to climate related disasters, such as, ensuring quick and effective response and recovery and better decision making, improved planning, effective risk management, and innovation in development and environmental protection activities were non-existent.

Services rendered by social workers employed by the Central and Local government in Botswana to those affected by climate disasters are temporary relief food ration for three months (23). This intervention does not include risk management based on the changing nature of the hazard. It does not include disaster mitigation and prevention in the event the hazard re occurs after relief provision. Besides, the national disaster policy is silent about their involvement in disaster risk and hazard management. It further implies that the role of social workers will be

more pronounced during disaster emergency phase and wanes immediately after the relief distribution.

Community social work practice in Botswana focuses on mass education and literacy; general social work (including rehabilitative casework, investigating individual cases of indigence or other forms of hardship, such as, physical disability and provision of recreational activities for youth (24). It emphasizes work with village development committees (VDC) and local association responsible for village institutional development activities, including disaster response and management. VDCs were established by a Presidential Directive in 1968 to implement government principles of self-reliance and unity. Their functions are to: identify and discuss local needs; formulate proposals for the development of the community; and raise funds for the general benefit of the village (25; 21). Furthermore, village development committees have not been trained in disaster risk management to effectively discharge their roles.

Methodology

Research methodology implies how social science research should be organized, structured, and conducted. It describes the procedures a researcher uses to study a problem in sufficient detail to enable readers to interpret the findings and conclusions. Methods of research include four important aspects: 1) sources of data, 2) measurement processes used, 3) procedures carried out by the researcher, and 4) analysis of the information collected that was used to answer the research question or test the hypotheses (26: 246; 27: 97). The researcher adopted the mixed methods research design which combines both qualitative and quantitative research paradigms for complimentary purposes and triangulation. Data for both phases were collected through face-to-face interviews, questionnaires, and focus group discussions and complemented by the review of country and international disaster policy documents and statutory instruments.

Sampling

A total sample population of 3567 respondents were randomly selected for the quantitative phase of the study which constituted 10 percent of the total population of 37 696 for the three (3)

communities in the district which were aggregated as follows; 27 760 for Ramotswa, 7 636 for Otse, and 2 300 for Mogobane (28: 296). The multistage or multilevel sampling was used to select the respondent for the second phase of the study (survey). The multistage or multilevel sampling involved the use of two or more sets of samples that are extracted at different levels of the study (28: 292). It is a procedure in which the final units to include in the sample are obtained by first sampling among larger units called clusters, in which the small sampling units are contained (29: 134).

The sampling design enabled the researcher to conduct both one to one interviews and administer the questionnaires to obtain the respondents' perspectives on community resilience to disasters. The qualitative phase of the study enabled the researcher to identify a population of survivors, leaders, vulnerable groups, and active players in the disaster arena where samples were drawn for the second phase of the study. A total of 90 participants were conveniently selected in three (3) wards of each of the three communities for the qualitative phase. This means that for each community, there were 30 participants selected following the simple random sampling procedure. It was used to select a different subset of respondents from disaster survivors, community leaders, social workers, members of district disaster committees, and the police. Thereafter, the data from the qualitative phase were used to develop a survey questionnaire for the quantitative phase.

Data analysis Thereafter, the researcher together with the research assistants studied the details of the data to obtain the whole picture described in the data before breaking it into parts. The researcher wrote memos in the margins which were key phrases, ideas, and concepts occurring to him during the individual interviews. The classifications were drawn based on the major themes and main concepts characterizing the study (disaster experiences, hazards, risks, vulnerabilities, capacities, and resilience). The use of descriptive and explanatory details was based on the disaster terminology related to community resilience studies, that is, to describe the social, physical, and geographic environmental hazards and associated risks. The researcher classified data taking it apart in order to isolate it in relevant categories and themes.

The quantitative data analysis followed a sequence of stages that are stated as follows: step 1: The researcher reported by tabulating the number of returns and non-returns of the survey

instrument based on the number of respondents and non-respondents; step 2: Response bias was determined by following non-respondents by phone to assess whether their responses differ substantially from those of respondents; step 3: A descriptive analysis was made of all independent and dependent variables including the means, standard deviations, and range of scores for the variables (30: 122:).

Document analysis

The analysis of documents took into account four aspects which are; authenticity, representativeness, credibility, and meaning (31: 208; 32). The researcher made reference to the national, regional, and international disaster policies and programmes, national legislation (statutory acts and regulations), and strategic frameworks from social workers, stakeholders (UNDP, Red Cross Movement, and SADC), disaster committees, and community leaders in the analysis.

Findings of study

The findings have established that Botswana has a national disaster management policy and national response plan which seeks to enable local communities to participate in disaster risk management. These local communities are vulnerable to diverse disasters (floods, windstorms, drought, torrential rains, and pollution) which impact negatively on their livelihoods and sustenance. Community vulnerability to disasters is increasingly complicated by climate change and variability. The findings reveal that their vulnerability resonates with the lack of knowledge in disaster risk management, inadequate information on environmental hazards and risks, and appropriate intervention.

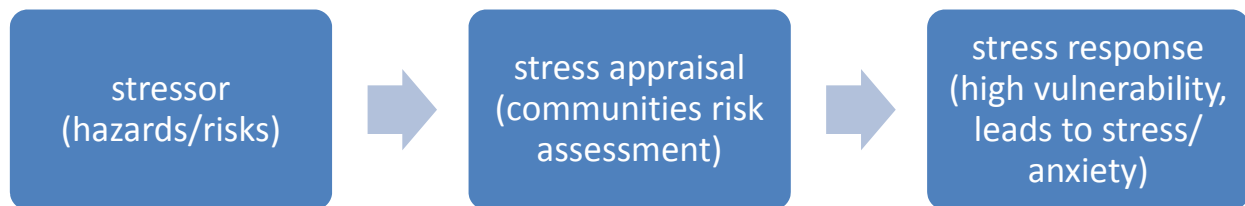
Climate related hazards, such as, floods, torrential rains, windstorms (hurricanes and cyclones), droughts, and lightening fires are increasingly becoming complex and a threat to environmental sustainability in Botswana. These hazards and associated risks do not only kill people and livestock but destroy housing, infrastructure, the physical environment, from which communities derive their livelihood. Red Cross and Red Crescent Movement(19) shows that climate change

leads to more weather extremes including increased floods, heatwaves, droughts, intense hurricanes, and typhoons. These climate hazards and related risks negatively affect the most vulnerable people, that is, the elderly, the sick, and the poorest of the poor in communities. These group of people dependent more on subsistence crops, livestock, and fishing which are climate sensitive by nature and environmentally specific too (33).

As such, the increase in floods, heatwaves, droughts, intense hurricanes, and typhoons subject households, communities, and the physical environment under pressure and increased vulnerability. According to UNISDR (2) a hazard is “a 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. Climate change hazards includes latent conditions that may represent future threats and can have different origins: natural (geological, hydro-meteorological, and biological) or induced by human processes (environmental degradation and technological hazards). This shows that climate change is pregnant with destructive power that households and communities should prepare, prevent, and mitigate against. As such, the community history of climate change related hazards associated with the disastrous impact on human life and the physical environment must be used to develop measures to protect communities and promote environmental sustainability.

Climate change related hazards are aversive circumstances that threaten the well-being and functioning of individuals, households, communities and /or society in general (6: 127). The hazards with associated risks place an inconsiderate demand on households and communities to respond with limited social, economic, and psychological resources. When the resources demanded to contain the risks associated with a hazard exceed ability and capacity of households and / or communities to meet strong needs, stress results and it increases the vulnerability and destroy the ability to recover from disaster losses (34: 191). It was established that the negative appraisal of environmental hazard threats and the lack of adequate resources to manage the risks increases stress and anxiety amongst poor households in communities, hence high vulnerability. Morris and Maisto (35: 477) argue that stress is an environmental demand that creates a state of tension or threat and requires positive change or adaptation. The positive change or adaptation will depend on the availability of social capital accessible to households and communities to

contain and recover from the impact of the hazard. As such, the vulnerability related stress results from the characteristics of the stressor, appraisal of the stressor, the response to effects of the stressor, and the various conditions that influence the relations between the factors (36).



The torrential rains, floods, droughts, and heatwaves affect the physical environment in many ways and changes the adaptation patterns of species and human beings. The mere observation of dark clouds showing the likelihood of heavy rains may activate the remembrance of past bad flood or heavy rain loss experiences, hence anxiety reactions to the perceived threat (37).

Community vulnerability to climate related hazards

The South East District communities are vulnerable to climate related hazard and risks that adversely affect their physical and social environment. Climate change risk management requires pre-planning and defining roles and responsibilities of households in the community. This follows their active participation in the identification of hazards and risks and prioritizing or ranking threats based on their vulnerability to the most threatening hazards. As such, the social environment influences people to develop routines and habits that may promote and sustain their vulnerability or enhance their capacity to disasters. The social practices of institutions based on disaster sensitive interactions and negotiations between relevant social groups will produce needed knowledge, increase resilience, and reduce vulnerability to climate change risks (38).

Community vulnerability to climate change related hazard and risks in the South East District is a concern and there is need for strong community involvement for purposes of environmental sustainability and risk management. The prevailing community habits and routines are more inclined to lack of community preparedness, weak response, and vulnerability to hazards. It was further established that respondents' knowledge on climate related risk is low and that they suffered from weather disasters, thus complicating their vulnerability. Morrow (39: 2) argues that

the roots of local disaster vulnerability are increasingly recognized to be the pre-existing patterns of community settlements and development. Therefore, it is necessary for communities to acquire cultural habits and routines that will enable them to efficiently and effectively develop safety and resilience knowledge and safety oriented social actions ethos. The impact of natural event is determined by everyday patterns of social interaction and organization, particularly the community members and the social structures which determine who has access to resources. Data showed that 52% of the respondents as compared to 48% were not familiar with disaster terminology, and that they were not prepared for the following climate change related hazards shown below.

- No Floods response	63% (2241)
- No Windstorms response	59% (2107)
- No Torrential rains response	56% (2007)
- No Overflowing dams response	63% (2240)
- No Wild veld fires response	58% (2071)
- No Drought response	63% (2241)
- No Climate change response	72% (2576)
- NO Earthquake response	84% (3012)

Vulnerability to floods

The flood vulnerability assessment is an important means of keeping the community safe. In Botswana, communities on a yearly basis suffer the loss of crops, livestock, and property from floods. Historical trends show that in 1995, 2000, 2005 and 2009 several communities in Botswana were affected severely by floods and these were Palapye, Serowe, Mahalapye, Chobe, Maun, Tutume, Bobirwa, Ramotswa, and Boteti and losses were enormous. Families lost 26 cattle, 1139 goats, 20 sheep, 90 donkeys, and 3535 chickens (33; 10). Despite the losses experienced by these communities, appropriate preparedness and response measures have not been developed. Floods are rapid onset disasters that must be conceptualized based on their pattern of occurrence and frequency in the community. Floods may result from heavy torrential rains; water flowing from high areas to low areas, flash floods, overflowing rivers, and dams. The Dartmouth Flood Observatory (41) and EM-DAT (42) showed that severe floods have increased, restrained economic development, and exerted enormous pressure on affected communities. It may also flood simply because the floodplains have been blocked by new settlements, and building homes without considering water ways. In terms of floods

vulnerability, amongst a total of 3457 (97%) respondents, 2241 (63%) indicated that they were vulnerable while 1216 (34%) said they were not. In addition, 110 (3%) could not evaluate their status and thus becoming even more vulnerable. It may demonstrate that, in the event of floods, 66% will be vulnerable and may complicate response measures. See Table 1: below:

Table 1: Vulnerability to flood / flash floods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1216	34	35	35
	no	2241	63	65	100
	Total	3457	97	100	
Missing	System	110	3		
Total		3567	100.0		

Vulnerability to windstorms

Windstorms pose a serious risk to communities in the South East and other districts in the country. UNDP (43) states that 220 million people in Africa are exposed annually to natural disasters and have the highest vulnerability to windstorms. Therefore, communities should identify their vulnerability levels to windstorms and develop preparedness and response systems to protect their property and livelihoods. Government of Botswana (44) identified droughts, floods, windstorms, and veld fires as prevalent natural hazards in the country. Section 12 of the national policy on disasters states that each agency (government and non-governmental) is responsible for developing its own internal disaster plan detailing the responsibilities at national, district, and local levels. This means building and positioning houses based on knowledge about the direction of strong winds and their speed, and frequency, and vulnerability to loss. Failure to utilize the knowledge when building houses and other structures, may lead to weak preparedness measures for windstorms. In this regard, 2107(59%) said they were vulnerable to windstorms while 1245 (37%) said they were not, and 215 (6%) could not evaluate their risk status. Table 2 below shows vulnerability to windstorms;

Table 2: Preparedness against windstorm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1245	35	37	37
	no	2107	59	63	100
	Total	3352	94	100	
Missing	System	215	6		
Total		3567	100.0		

Vulnerability to windstorms by gender

Gender and vulnerability is a serious concern for vulnerable groups, especially women, the elderly, and children. Measures to reduce vulnerability have not been sensitive to gender needs and differences. It is crucial to acknowledge that vulnerability, and associated factors manifest themselves and are viewed differently, by women and men. Both genders are affected differently by disasters and women coping capacity may be weakened further by their low socio-economic status (9). It was ascertained that amongst the respondents, 774 (58%) men were vulnerable as compared to 556 (42%) who were not; and 1333(66%) females were vulnerable compared to 689 (34%) who were not. There are large numbers for both males and females who are vulnerable to windstorms. Therefore, gender sensitive programmes are needed to strengthen community resilience to climate related disasters in the South East District.

Vulnerability to torrential rains

The occurrence of heavy rains in the central region of Botswana in June 2009 caused seven districts to flood and affected a total of 620 families or 3 100 individuals. The afflicted households were in mud dwellings that collapse in the heavy rain, leaving families in need of emergency shelter, blankets, and food. Rains are common experience in the summer seasons and communities are rarely prepared for the season (45). It was found that 2007 (56%) of the respondents were not prepared and vulnerable while 1350 (38%) reported that they were not, and the status of the 210 (6%) was volatile. The lack of preparedness plan for households in communities complicates disaster response and evacuation. Table 3 below shows the percentages of vulnerable people.

446

Table 3: Status of preparedness to torrential rains

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1350	38	40	40
	no	2007	56	60	100
	Total	3357	94	100	
Missing	System	210	6		
Total		3567	100.0		

447

448

449 Preparedness to overflowing dams

450 The response plan to overflowing dam is crucial and should form part of the dam construction
 451 plans, practised during the dam construction in partnership with communities, and continued
 452 after the completion of the project. This must strengthen preparedness by ensuring that
 453 community simulation exercises include risk assessment knowledge and skills in their daily
 454 living activities. Overall, it was found that 2240 (63%) lacked important information on risk and
 455 vulnerability assessment of overflowing dams while 1093 (31%) say they had information. The
 456 table 4 below shows vulnerable to overflowing dams.

457

Table 4: vulnerability to overflowing dams'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1093	31	33	33
	No	2240	63	67	100.0
	Total	3333	93	100	
Missing	System	234	7		
Total		3567	100.0		

458

459 Vulnerability to overflowing dams by age of respondents'

460 Dams in Botswana are built in the major rivers across the country and these dams overflow
 461 during heavy rains. Communities have been flooded from overflowing dams. Despite threats
 462 from overflowing dams, the preparedness of communities to adapt to risks is not satisfactory.

The findings show that age distribution regarding vulnerability to overflowing dams is that 106 respondents aged 20 and below were vulnerable while 49 were not. For those aged 21-30, 972 were vulnerable while 494 were not; 589 of those aged 31-40 years were vulnerable while 323 were not; 238 of those aged 41-50 years were vulnerable while 117 were not; and 332 of those aged 51 and above were while 109 were not. All age groups have to be targeted for hazard and risk management education to minimize the threats and dangers associated with the overflowing dams.

Vulnerability to overflowing dams by gender of respondents

The findings show high numbers of both women and men who are vulnerable to overflowing dams. It was established that (472) of the males had some understanding of what to do when dams overflow while 846 did not and 621 of the females also reported to be knowledgeable of what to do while 1394 did not. The high numbers show that communities' lack capacity to manage overflowing dams which may contribute to high level of vulnerability to drowning and death.

Vulnerability to wild land fire

Wild land fires (veldt fires) are frequent in Botswana in spring, summer and winter when the grass has dried and harvesters are in the field (4). Although the government has strengthened its fire-fighting systems, communal lands are still vulnerable to wild land fires. It was established that amongst the 3321 respondents, 2071(58%) were vulnerable to wild land fires while 1250 (35%) were not; and concern is for the (7%) 246 that could not ascertain their status. Table 5 below shows the vulnerability to wildland fires;

Table 5: preparedness to wild land fires

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1250	35	38	38
	no	2071	58	62	100
	Total	3321	93	100	
Missing	System	246	7		
Total		3567	100		

Vulnerability to

wild-land fire by age of respondents'

The age distribution indicates that, of those aged 20 and below, 87 were vulnerable while 68 were not. Of the 21-30 year age group, 879 were vulnerable while 581 were not; of the 31-40 year group 579 were vulnerable while 338 were not; 225 of those aged 41-50 were vulnerable while 124 were not exposed; and 318 of those aged 51 and above were vulnerable while 118 were not at risk .

Vulnerability to drought

Drought is one of the major vulnerability factor affecting food security and livelihoods of more than 2 billion people who reside in dry areas which constitute 41 percent of the global land surface. Drought is defined as “a deficiency of precipitation over an extended period of time resulting in water scarcity” (16). The 1983/84 drought cost the Botswana Government US\$ M51 939 to mitigate (17). Many Batswana still dependent on agriculture (commercial and subsistence) for both food and income. But rainfall deficiency in the country affects crop and livestock production negatively. During the 1985 drought, there was a reduction of 87% in crop production (40). Drought is defined as a period in which moisture availability falls below the current requirements of some or all of an area’s resident communities and below their ability to sustain the deficit without damage, disruption or excessive costs (38). A total of 3305 (93%) of the respondents answered a question on drought and 1064 (30%) knew what to do while 2241 (63%) did not, and 262 (7%) responses were missing. Table 6 below displays the numbers of those who are vulnerable to drought .

Table 6: Preparedness to drought

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1064	30	32	32
	No	2241	63	68	100
	Total	3305	93	100	
Missing	System	262	7		
Total		3567	100.0		

Vulnerability to drought by age of respondents

The age distribution shows that vulnerability to drought affects all age groups. Ninety-one (91) of those aged 20 and below were vulnerable while 65 were not; of those aged 21 – 30 years, 947 were vulnerable while 509 were not; of the 31 – 40 year age group, 628 were vulnerable while 282 were not; of those aged 41-50 year, were vulnerable while 112 were not in this regard; and for those aged 51 years and above, 339 were vulnerable while 93 had systems in place to survive drought period. There is need therefore for community based interventions to address vulnerability to climate related disasters and risks. These interventions should include community education and awareness on hazards and risks and best ways to avert them.

Community interventions to promote environmental sustainability

Community interventions are needed to promote environmental sustainability and preservation of herbage and livelihoods. Community daily survival activities, settlement patterns, and social interactions may degrade and/ or increase the environmental damage caused by natural events. Unless their actions, habits, and attitudes are changed and geared towards environmental sustainability and minimization of risks, vulnerability to climate change related hazards will continue and be fatalistic. Communities that deliberately engage in disaster risk management enjoy the greater benefits of preparedness than those who remain passive and reactive. Rock and Corbin (499: 383) argue that recovery from disaster for unprepared communities and households can take many agonizing years and complicated further by vulnerability and lack of resources. Guyana which was still recovering in 2007 from the 2005 flood and Grenada, from 2004 Hurricane Ivan which killed 28 people are good examples. As such, recovery from disasters for unprepared communities may constitute an additional burden to already weak economies. The social structures may crumble and development resources may have to be diverted to pay for reconstruction costs that could have been avoided.

- **Community hazard and Risk mapping**

Communities must deliberately act towards identifying and assessing hazards and risks, and isolate areas according the level of risks within their physical environment. IFRC (50) urges communities to rely on local knowledge to identify the dangers they face, assess their capacities,

vulnerabilities, and formulate solutions. The areas of high, moderate, and low risks should be clearly marked in a map by the communities for purpose of mobilizing appropriate resources for response. Red Cross and Red Crescent Movement (19) asserts that communities experience impacts of climate change first hand, with crops dying because of seasonal wind patterns, fish poisoning, and storm surges.

- **Community risk management plans**

The district commissioner, social workers, tribal authorities, and communities should develop climate change risk management plans to guide actions towards protecting community members against adverse impacts of climate disasters. As such, a community risk management plan is an important document that identifies the dangers and defines roles and responsibilities for stakeholders in the community before, during, and after disaster. It is a framework that outlines essential activities for the development of a preparedness strategy (51: 11). These include community and household preparedness towards climate change related hazards, prevention / mitigation, response, recovery, and reconstruction measures. The preparedness plan will detail the early warnings, the evacuation plan and processes, response activation, and the recovery strategy.

Early warning systems are fundamental to disaster resilience and safety for communities and families. IFRC (52: 17) argues that early warning and early action can save thousands of lives and livelihoods, reduce vulnerability, and strengthen resilience. The selected communities do not have structured early warning systems and / or traditional systems. They rely heavily on Radio Botswana and Botswana television weather broadcast which gives only an overview of the weather and nothing beyond. The radio and television weather forecast focus more on prediction of the weather than on response and expected behaviour. Furthermore, the messages do not communicate in simple and understandable terms the information about risks to vulnerable members of the community. This may affect the evacuation of people during disasters particularly those who live in high and moderate risk areas.

Evacuating people from a disaster scene is a complex temporary relocation process. It requires extensive preparation that cannot be taken for granted. Without proper evacuation systems and preparation, it may turn out to be a frustrating and very stressful exercise for survivors and the

rescue teams. According to Perry (53: 25) evacuation which is instituted before disaster impact can result in the preservation of life, reduction of personal injuries, and the protection of property.” The study indicated that the selected communities do not have disaster evacuation processes and plans. They rely heavily on the police, the army (BDF), and the Fire Brigade service for evacuation during disasters.

The communities should have clearly marked evacuation routes, evacuation sites, and evacuation protocols that have been rehearsed and are known to members by heart and would be followed with little effort before, during, and after disasters. The lack of evacuation processes is extremely precarious and can cause the loss of lives in communities, as it did in Ramotswa in 2006. The failure to develop an evacuation plan is rather choosing a reactive stance with its negative consequences than a proactive position with its benefits. Drabek (54: 76) argues that thousands who perished or suffered injury because of the three extreme windstorms in the United States (hurricane Georges, Mitch, and torrential rains) are testimony to both the hazardous of the place and the potential represented by ineffective disaster warning and evacuation systems.

- **Community education and awareness;**

Community education on climate change and environmental sustainability is central to survival of people and their resilience. Community knowledge of global warming and its effects on agriculture and daily subsistence is inadequate and including preparedness, and in particular positive lifestyle adaptations (8). The education and awareness should be driven by community volunteers in schools, clubs, churches, and traditional gatherings. This will ensure that appropriate information on hazards and related risks and ways to reduce vulnerability is shared adequately. The teams should address hazard and risk monitoring, early warnings, and related protocols as well as information on who to contact in the event of disaster.

- **Community capacity building (climate change and environment)**

Communities need to build internal capacity to adapt and adjust to climate change related risks for sustainable environments. Already, communities have fundamental resources to absorb the shocks and leverage until external support is provided in the event of disasters. These resources constitute the social capital needed for preparedness, response, reconstruction, and recovery from

disaster within a short time. In Otse **for example**, they have hills, culverts for water drainage, supplementary cattle feed provided by government during drought, school buildings, church buildings, clinic, and water catchment tanks, and tarred roads to build as capacities. Mogobane has farms, culverts, roads, bridges, clinics, and police offices as resources **to use in the vent of** disasters. These must be constantly assessed to keep an up to date inventory and resource mobilization **for emergencies**.

- **Community monitoring and evaluation**

The community must establish and consistently maintain the hazard and risk monitoring and evaluation systems at the locality level. This will provide timely information in a language and culture of the people and following the agreed protocols. **Disaster related** information is vital for activating the early warning systems, evacuation systems, and response system for any particular threat (12). Communities will not have to wait for the national radio announcements and other related processes to know what is prevailing in their socio-environment. As such, the team responsible for monitoring and evaluating risks will know where to send the information and make appropriate follow up.

Conclusion

Although communities in Botswana are vulnerable to environmental hazards and related risks, they can work to build their capacity to respond and contain the shock. It has been established that the vulnerability is accentuated by the failure to prepare against hazards and risks. These hazards are windstorms, floods, torrential rains, overflowing dams, wild land fires, and drought which are climate related hazards. Furthermore, these hazards / related risks complicate the community recovery and reconstruction processes because there are no established systems to focus on these activities. So the impact of successive hazards becomes even more complex and depletes already weak response capacities. Therefore, communities must deliberately engage in community hazard and risk mapping, develop community risk management plans, early warning systems, identify volunteers who will carry out the community education and awareness campaigns, build capacity by training teams, and monitor the changing patterns of hazards and risks. These activities must be continuous not only during emergencies but throughout the year to ensure that communities are kept ready for any eventualities.

Community development practitioners with their knowledge, competencies, and skills are well equipped to help communities organize. They are the key players in community mobilization and organizing which are fundamental to drive the preparedness process and identifying teams for capacity building. They are familiar with the community leadership structure, situations and complexities in communities and possess practice knowledge that is essential for the preparedness and response phases. They can also work with volunteers to stockpile relief material and coordinate the recovery process. As such, communities have the potential to prepare and build resilience against disasters, thus reducing their vulnerability and sustaining their physical and economic environment.

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