

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

ABSTRACT:

Community vulnerability to climate related disasters and environmental degradation are a concern for social workers. This is even more serious when the physical environments from which they derive livelihoods are degraded. Social work profession is committed to the development of communities following the principles of social justice, human rights, and respect for diversity amongst people and cultures. It advocates for sustainable development in communities and protection from environmental hazards and risks. While serving the person in the social environment, it seeks to reduce vulnerability to disasters that could jeopardize sustainable developments in the locality. Currently, the global social and physical environment is burdened by the changing weather patterns, environmental pollutants, and hazards with grave consequences for communities. Climate change has brought about increased flooding, frequent drought episodes, and new health hazards. Therefore, the researcher adopted the mixed methods research design to assess the community preparedness and disaster risk reduction strategies and to identify the role of social workers in enhancing community resilience to disasters and promoting environmental sustainability. Data were collected through face-to-face interviews, questionnaires, and focus group discussions and review of secondary sources. A total sample population of 3567 respondents were randomly selected for the quantitative phase while 90 participants were conveniently selected for the qualitative phase. The paper, therefore, 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 found that local communities are vulnerable to floods, windstorms, drought, torrential rains, and wildfires which negatively impact their livelihoods and environment. The vulnerability resonates with the lack of knowledge on climate change and risks, hazards and risks, lack of hazard and capacity maps, and zones. The paper proposes that there is need for a community-based strategy for disaster resilience and risk management. 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. A decision must be taken by governments and community leaders to address disasters and promote environmental sustainability. But without the active involvement of vulnerable communities, those actions may be fatalistic. The principle behind community involvement in disaster risk management is premised on human rights and the realization that communities are the solution in shaping the future of their environment (1). In addition,

communities derive their livelihoods from 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 protection from disasters. Disasters result from combination of hazards, vulnerability and inability to reduce the potential negative consequences of risk. While social work serves the person in the environment, it seeks to reduce vulnerability to hazards (in whatever form) that could jeopardize their sustainable livelihoods. Therefore there is need for community disaster preparedness to respond effectively in the event of an emergency. 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. Currently, the global social and physical environment is burdened by the changing weather patterns, environmental pollutants, and other social problems with grave consequences for communities, hence need for preparedness (3). In addition, climate change has brought about damaging weather patterns with increased flooding, frequent drought episodes, and new health hazards. As such, the vulnerability of communities to climate related disasters suggests the need for best ways to address disasters and strengthen environmental sustainability. Therefore, this paper proposes community based interventions to reduce vulnerability to various environmental hazards that negatively affect livelihoods and sustainability. The need for community-based strategy for building disaster resilience capacity and risk management systems is high in the South East District of Botswana. It discusses the need based on the findings of an empirical study which investigated the community perceptions of hazards vulnerability, community preparedness, and identified the role of social workers in enhancing community resilience and sustainability. The main concepts in this paper are: climate change, vulnerability, disaster, hazard and risks, and resilience

PROBLEM STATEMENT

Botswana is overwhelmed by windstorms, floods, livestock diseases, and droughts which are proving complex to address. The National Disaster Management Office (4: pp11) reported that in 2007 and 2008 four districts; Chobe, South East, Ngamiland, and Ghanzi districts, were seriously affected by floods, heavy rains, and wild fires besides 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 forcing them to evacuate 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 hit by floods and wild fires which destroyed more than 5 million out of the 11, 791, 000 hectares of land. In Chobe, the following communities of Satau, Parakarungu, and Kachikau villages were affected by floods and wild fires and migratory pests and HIV and AIDS in the areas (4: 8).

The International Federation of Red Cross and Red Crescent Societies (IFRC) (6: pp127) 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: pp77) further stated 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: pp3) 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: pp1) 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 (9: pp87). 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 literature shows that 330 million people in sub-Saharan Africa live in extreme poverty and fail to keep pace with the rest of the world in terms of sustainable 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 face up to crop failure without alternative sustainable means to provide for their family (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 are malaria and food insecurity which is influenced greatly by climate change and affect the poor more than other groups (6). 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: pp1) 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.

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).

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. This is a sign of community vulnerability to disasters in the Southern Africa region (11).

The impact of extreme weather conditions on agriculture and livestock production are felt heavily by subsistence farmers 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 (15). The effects of climate change negatively impacted community tourism and agriculture due to increased floods and severe drought. Climate change is defined as "any change in climate over time, whether due to natural variability or as a result of human activity" (16: pp2). Vulnerability to climate change varies depending on the combined effect of the systems internal coping capacity and the nature and severity of the shock.

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: pp5) 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: pp750).

Social work practice and disaster risk management in Botswana

Social workers in Botswana's District Councils serve communities affected by disasters and are members of the District Disaster Management Committees (DDMC). They are expected to perform their function in line with the United Nation Sendai 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 assessment team during disaster emergencies. They are hardly involved in community hazard assessment and mapping, designing preparedness plans, prevention and mitigation processes, and recovery strategies in line with 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 measures 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 to communities are temporary relief food ration for three months (23). This intervention does not include risk assessment and management based on the changing nature of the hazard. It does not include disaster mitigation and prevention of the re-occurrence of the

hazard after relief. 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 is more pronounced during the emergency phase and wanes off immediately after the relief distribution. Community social work practice in Botswana should not only focus on mass education and literacy; general social work (24), It must emphasizes work with village development committees (VDC) and other local association responsible for village institutional development activities and disaster risk management. VDCs were established by a Presidential Directive of 1968 to promote the principles of self-reliance and unity amongst communities which are critical ingredients for resilience. The VDC 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 including risk management (25; 21).

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: pp246; 27: pp97). 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. The simple random sampling was used to select the respondent for the study (survey included). The sampling involved the use of two or more sets of samples that are extracted at different levels of the study (28: pp292). The final units were included in the sample

obtained by first sampling among larger units called clusters, in which the small sampling units are contained (29: pp134).

The sampling designs enabled the researcher to conduct both one on one interviews and administer the questionnaires to obtain the respondents' perspectives on community resilience to disasters. A total of 90 participants were conveniently selected in three (3) randomly selected wards of each of the three communities for the qualitative phase. The simple random sampling design was used to select a different subset of respondents from disaster survivors, community leaders, social workers, and members of district disaster committees. Thereafter, the researcher studied the details of the data and wrote memos from which were key phrases, ideas, and concepts were generated. The classifications were drawn 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 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: pp122). The analysis of documents took into account four aspects which are; authenticity, representativeness, credibility, and meaning (31: pp208; 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.

Findings of study

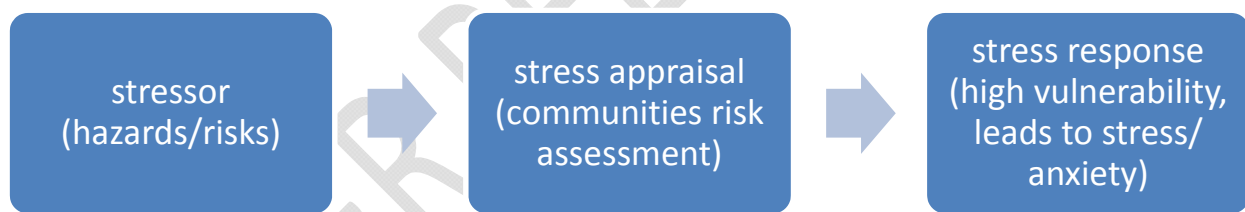
The findings established that Botswana has a national disaster management policy and national response plan which seeks to enable local communities to participate in disaster risk management. Yet these local communities are vulnerable to diverse disasters (floods,

windstorms, drought, torrential rains, and pollution) which impact negatively on their livelihoods. Community vulnerability to disasters is increasingly complicated by climate change and variability. It was further established 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: pp127). 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: pp191). It was established that the negative appraisal of environmental 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: pp477) 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 experiences hence increased anxiety reactions to the perceived threat (37).

The South East District communities are vulnerable to climate related hazard that requires pre-planning to define the roles and responsibilities of households in risk management. This must follow their active participation in hazards identification, and risk prioritization based on their vulnerability to the most threatening hazards. As such, the social environment must influence

people to develop routines and habits that promote and sustain and enhance their capacity against disasters. The social practices of institutions must be based on disaster sensitive interactions and negotiations between relevant social groups to produce resilience knowledge and reduce vulnerability to climate change risks (38).

The current community habits and routines are more inclined to community ignorance, unpreparedness, weak response, and vulnerability to hazards. It was further established that respondents' knowledge of climate related risk is low and that they have suffered from weather disasters, thus complicating their vulnerability. Morrow (39: pp2) 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 are 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. The 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 vulnerability is a serious concern for communities in the south east district, especially women, the elderly, and children. Community measures to reduce vulnerability have to be sensitive to gender differences. Vulnerability and associated factors manifest differently in women and men. Both genders are affected differently by disasters and women coping capacity may be weakened further by 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 of both vulnerable males and females 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 occupied mud dwellings that collapse easily because of heavy rain, leaving families

in need of emergency shelter, blankets, and food. Rains are common experience in Botswana around the summer season and communities are rarely prepared for the rains (45). It was found that 2007 (56%) of the respondents were not prepared and vulnerable while 1350 (38%) reported that they were not. The lack of preparedness for heavy rains in communities complicates disaster response and evacuation. Table 3 below shows the percentages of vulnerable people.

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		

Vulnerability to overflowing dams

The communities are vulnerable to overflowing dams. Therefore, there is a need for a response plan to overflowing dam which should form part of the dam construction agreement or contract. During the dam construction, the company should simulate with the response plan with communities and ensure that they continue even after the completion of the project. This will strengthen community preparedness knowledge and skills in their daily living activities. Overall, it was found that 2240 (63%) lacked knowledge on risk and vulnerability assessment while 1093 (31%) say they had knowledge. The table 4 below shows vulnerable to overflowing dams.

Table 4: preparedness level 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		
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Dams in Botswana are built in the major rivers and these dams have flooded communities. Despite threats from overflowing dams, community preparedness level 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. 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.

Vulnerability to wild land fire

Wild land fires (veldt fires) in Botswana are common in spring, summer and winter when the grass is dry 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. Table 5 below shows the vulnerability to wildland fires;

Table 5: preparedness for 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		

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 hazards affecting food security for more than 2 billion people who reside in dry areas. 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 2241 (63%) were vulnerable. Table 6 below displays the numbers of those 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		

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 of hazards and risks and best ways to avert them.

Way forward and recommended Community interventions for social workers

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 (1999: pp383) 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 (2000) 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 (1999) 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: pp11). 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: pp17) 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. **The lack of clear communication strategy and systems may affect the evacuation of people from a disaster a zone to safety** particularly, those who live in high risk areas..

Evacuating people from a disaster scene is a complex process. **It requires extensive preparation before disaster emergencies to avoid unnecessary delays and it must not** 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: pp25) 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: pp76) 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 are 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, wildland fires, and drought which are climate related hazards. Furthermore, these hazards complicate the community recovery and reconstruction processes because there are no established systems to focus on reconstruction 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 not only be done during emergencies but must continue throughout the year to ensure that communities are kept ready for any eventualities.

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

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