

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

ABSTRACT:

Introduction

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 (in whatever form) that could jeopardize environmental sustainability. The global social and physical environment is burdened with the changing climate and weather patterns and other social pollutants with grave consequences on communities. Climate change and variability has brought about damaging weather patterns with increased flooding, frequent drought episodes, and new health hazards.

Aims / Objectives

The paper presents findings of an empirical study which aimed to interrogate community perceptions of hazards, vulnerability, and disaster risks in the South East District of Botswana; determine community preparedness systems, measures and disaster risk reduction strategies; and identify the role of social workers in enhancing community resilience to disasters.

Methodology

The research employed the mixed methods research design which combines both qualitative and quantitative research paradigms for complimentary purposes. Data were collected through face-to-face interviews, questionnaires, and focus group discussions that were complemented by the review of disaster policy documents and statutory instruments. A total population from which the sample was drawn was 37 696 for the three (3) localities aggregated as follows; 27 760 for Ramotswa, 7 636 for Otse and 2 300 for Mogobane. It was from this that a sample population of 3567 respondents were selected for the quantitative phase of the study. A total of 90 community members participated in the qualitative phase.

Discussion of findings / expected outcomes

Botswana has a national disaster management policy and response systems which enable local communities to participate in disaster management responses. 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 becoming more complicated due to climate change and variability. The findings reveal that vulnerability resonates with the lack of knowledge in the communities, inadequate information on environmental hazards and risks peculiar to the community, and unwillingness to

36 assess the threats and risks posed by the hazards and adoption of appropriate intervention. The
37 paper proposes a community based strategy for adoption at the community level.

39 **Introduction**

40 Communities are important stakeholders in environmental sustainability and climate disaster
41 vulnerability reduction globally. All actions and/ or efforts taken to address environmentally
42 sustainability without the active involvement of vulnerable communities are futile and fatalistic.
43 The life of communities and their subsistence are dependent entirely on the geo-social
44 environment within which they live. The geophysical environment provides communities with
45 various resources, food, water, and dependable social relations for survival. Therefore, social
46 work is committed to the development of communities under the principles of social justice,
47 human rights, and respect for diversity amongst people and cultures. It advocates for the
48 sustainable development of communities and their protection from environmental hazards / risks.
49 While serving the person in the environment, it is dedicated to the reduction of vulnerabilities
50 from climate related hazards (in whatever form) that could jeopardize their environmental
51 sustainability. The global social and physical environment is burdened with the changing climate
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Findings / expected outcomes

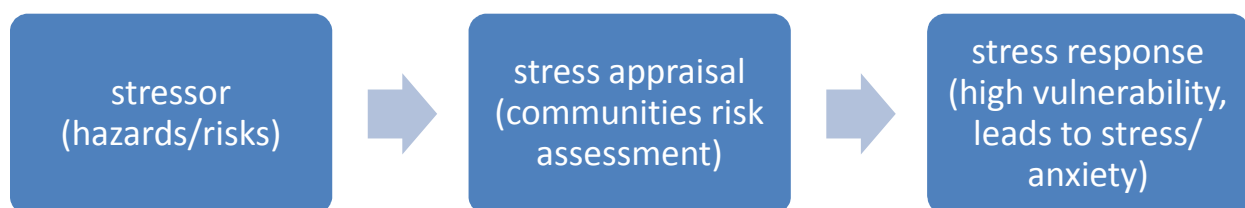
Botswana has a national disaster management policy and response systems which enable local communities to participate in disaster management responses. Local communities are vulnerable to diverse disasters (floods, windstorms, drought, torrential rains, and pollution) which impact negatively on their livelihoods and sustenance. Community vulnerability to disasters is increasingly complicated by climate change and variability. The findings reveal that vulnerability resonates with the lack of knowledge in the communities, inadequate information on environmental hazards and risks peculiar to the community, and unwillingness to assess the threats and risks posed by the hazards and adoption of appropriate intervention.

Climate related hazards and environmental sustainability

Climate related hazards like floods, torrential rains, windstorms (hurricanes and cyclones), droughts, and lightening fires are increasingly complex and a threat to global economies. These hazards and associated risks do not only kill people but destroy housing, settlements, the environment, and livestock from which communities derive their livelihood. Red Cross and Red Crescent Movement(1) 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 (2). As such, the increase in floods, heatwaves, droughts, intense hurricanes, and typhoons subject households, communities, the physical and the social environment under pressure and increased vulnerability. According to UNISDR (3) 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 a climate change hazard is pregnant with destructive power that households and communities should prepare for, prevent, and mitigate against to reduce the impact. 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 protect communities and promote environmental sustainability.

The appraisal of increased vulnerability to hazard threats and the lack of adequate resources to manage the risks leads to stress and / anxiety amongst poor households in communities. Morris and Maisto (4: 477) argue that stress is an environmental demand that creates a state of tension or threat and requires change or adaptation. The change or adaptation, depends on the availability of social capital accessible to households and communities to contain and / recover from the impact of the hazard. The environmental hazards with its associated risks places an inconsiderate demand on households and/ or community to respond with limited social, economic, and psychological resources. When demand resulting from hazard risks exceeds ability and capacity of households and / or communities to meet strong needs, stress results and increases the vulnerability and delay or hinder recovery from disaster losses (5: 191). As such, climate hazards become aversive circumstances that threaten the well-being and functioning of individuals, households, communities and /or society in general (6: 127). 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 stressor, stress appraisal, and stress response (6).



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 anxious reactions to the perceived threat (7).

122 **Community vulnerability to climate related hazards/ risks**

123 The South east district communities are vulnerable to various climate related hazard risks that
 124 adversely affect their physical and social environment. Climate change risk management requires
 125 pre-planning and defining roles and responsibilities of households and the communities. This
 126 follow the active participation of communities in the identification of hazards and risks and
 127 prioritizing or ranking threats based on vulnerability to the most threatening hazards. As such,
 128 the social world influences people to develop routines and habits that may promote and sustain
 129 their vulnerability or enhance their capacity to disasters. The social practices and institutions
 130 together with the disaster sensitive interactions and negotiations between relevant social groups
 131 will produce needed disaster knowledge which will increase resilience and reduce the
 132 vulnerability of communities to climate change risks (8).

133 Community vulnerability to climate change related hazard and / or risks in the South East
 134 District is and there is great need for increased community involvement in environmental
 135 sustainability and risk management. The prevailing community habits and routines ascertain the
 136 lack of community preparedness, response, and resilience to the impact of hazards. It was further
 137 established that respondents' knowledge of climate related risk is low and that they suffered from
 138 the impact of weather disasters, thus complicating their vulnerability further (7). Therefore, it is
 139 necessary for communities to acquire habits and routines that will enable efficient and effective
 140 disaster risk management and the development safety and resilience knowledge and social
 141 actions ethos. Morrow (9: 2) argues that the roots of local disaster vulnerability are increasingly
 142 recognized to be the pre-existing patterns of community settlements and development. The
 143 impact of natural event is determined by everyday patterns of social interaction and organization,
 144 particularly the stratification which determine access to resources. According to (UNISDR, 3)
 145 disaster preparedness defines the critical steps based on the ability of the community and its
 146 effectiveness and efficiency to absorb the shocks. Data showed that 52% of the respondents as
 147 compared to 48% were unable to differentiate a hazard from a disaster, and that they were not
 148 prepared to contain various climate change related hazards/ risks as shown below (7).

149	- No Floods response	63% (2241)
150	- No Windstorms response	59% (2107)
151	- No Torrential rains response	56% (2007)
152	- No Overflowing dams response	63% (2240)

- 153 - No Wild veld fires response 58% (2071)
- 154 - No Drought response 63% (2241)
- 155 - No Climate change response 72% (2576)
- 156 - NO Earthquake response 84% (3012)
- 157

158 **Vulnerability to floods**

159 The flood knowledge and vulnerability assessment is an important means of keeping the
 160 community safe. In Botswana, communities on a yearly basis suffer from floods and the losses
 161 are in crops, livestock, and property. Historical trends show that in 1995, 2000, 2005 and 2009
 162 several communities in Botswana were affected severely by floods and these were Palapye,
 163 Serowe, Mahalapye, Chobe, Maun, Tutume, Bobirwa, Ramotswa, and Boteti and losses were
 164 enormous. Families lost 26 cattle, 1139 goats, 20 sheep, 90 donkeys, and 3535 chickens (2; 10).
 165 Despite the loss experienced appropriate preparedness and response measures have not been
 166 developed (7). Floods are classified as rapid onset disasters but must be conceptualized based on
 167 their pattern each time they manifest. Floods may result from the heavy torrential rains; the water
 168 may flow from the high areas to low areas, or overflowing rivers and dams beyond the bank. The
 169 Dartmouth Flood Observatory (11) and EM-DAT (12) showed that severe floods have increased,
 170 restrained economic development, and exerted enormous pressure on affected countries. It may
 171 flood simply when the water follows its normal flow pathways into areas where people have
 172 built their homes without assessing historical flow of flood waters. In terms of floods
 173 vulnerability, amongst a total of 3457 (97%) respondents, 2241 (63%) were vulnerable while
 174 1216 (34%) perceived that they were not. In addition to the 63%, 110 (3%) could not evaluate
 175 their status and thus becoming even more vulnerable. It demonstrates that, in the event of floods,
 176 66% are vulnerable and may complicated response systems. Table 1: below shows the responses:
 177

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

UNDP (13) states that 220 million people in Africa are exposed annually to natural disasters and have the highest vulnerability to windstorms. Windstorms pose a serious risk to communities in the South East and other districts in the country. Therefore, communities should develop windstorm identify their vulnerability levels versus their preparedness and response, and protection of their property and livelihoods. Government of Botswana (14) identifies droughts, floods, windstorms, and veld fires as prevalent natural hazards in the country. Section 12 of the policy states that each agency (government and non-governmental) is responsible for developing its own internal disaster plan detailing internal mechanisms necessary for the definition of ministerial responsibilities at national, district, and local levels. This means designing and positioning houses based on knowledge of the direction of winds and their speed, strength, and frequency, and people vulnerability to loss. Failure to utilize the knowledge in erection of houses and other structures, the latter will be built without relevant preparedness measures for windstorms (7). In this regard, 2107(59%) were vulnerable to windstorms, 1245 (37%) were not, and 215 (6%) could not evaluate their status, therefore a high risk group. Table 2 below shows that 65% are vulnerable to windstorms;

Table 2: Vulnerability to 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. Maripe (7) ascertained that amongst the respondents, 774 (58%) men were vulnerable as compared to 556 (42%) who were not; and 1333(66%) were vulnerable compared to 689 (34%) females who were not. There are large numbers for both males and females who are vulnerable during windstorms. Therefore, gender sensitive programmes are necessary to strengthen community resilience and safety to 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 (15). It was found that 2007 (56%) were not prepared and vulnerable while 1350 (38%) were not, and the status of the 210 (6%) was volatile. The lack of appropriate preparedness plan for households and families in communities complicates disaster response and evacuation. Table 3 below shows the percentages of vulnerable people.

Table 3: Vulnerability 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 knowledge to respond to overflowing is crucial and should form part of the dam construction plans, applied during the dam construction, and continued after completion of the project in partnership with communities. This must be strengthened by several community simulation exercises to ensure that risk assessment knowledge and skills developed and included in the daily living activities. Overall 2240 (63%) lacked important information on risk assessment and vulnerability to overflowing dams while 1093 (31%) did not (7). The table 4 below shows vulnerable to overflowing dams.

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		

Vulnerability to overflowing dams by age of respondents'

Dams in Botswana are built in the major rivers across the country and these dams overflow during heavy rains. Communities have been flooded from overflowing dams. Despite threats 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. For those aged 21-30, 972 were vulnerable while 494 were not; 589 of those aged 31-40 years were vulnerable while 323 did; 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 pre-exposed (7). All age groups have to be targeted for hazard and risk management education to minimize the threats and dangers associated with the situation.

Vulnerability to overflowing dams by gender of respondents

The community shows high numbers of both women and men without adequate response knowledge on overflowing dams. It was found in the study that (472) of the males had

information while 846 did not and 621 of the females had information while 1394 did not (7). The numbers shows that the lack of response knowledge contributes to high level of vulnerability to drowning and death from floods.

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. Although the government has strengthened its fire-fighting systems, communal lands are vulnerable to wild land fires. It was established that amongst the 3321 respondents, 2071(58%) were vulnerable while 1250 (35%) were not; and concern goes to the (7%) 246 that could not locate themselves. Table 5 below shows the vulnerability to wildland fires (7).

Table 5: vulnerability 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 knew what to do while 68 did 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 not vulnerable while 124 were exposed; and 318 of those aged 51 and above were not vulnerable while 118were at risk (7).

Vulnerability to drought

Drought is one of the major international constraints 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). Most Batswana still depend on agriculture (commercial and subsistence) for both food and income and rainfall deficiency affects crop and livestock production. During the 1985 drought, there was a reduction of 87% in crop production (10). 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 (18). 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%) could not answer the question. Table 6 below displays the numbers of those who are vulnerable to drought (7).

Table 6: Vulnerability 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		

283

284

285 **Vulnerability to drought by age of respondents**

286 The age distribution regarding vulnerability to drought shows that all age groups lack appropriate
 287 preparedness skills. Ninety-one (91) of those aged 20 and below were vulnerable while 65 were
 288 not; of those aged 21 – 30 years, 947 were vulnerable while 509 were not; of the 31 – 40 year
 289 age group, 628 were vulnerable while 282 were not; of those aged 41-50 year, were vulnerable
 290 while 112 were not in this regard; and for those aged 51 years and above, 339 were vulnerable
 291 while 93 had systems in place (7).

292

293 **Community interventions to promote environmental sustainability**

Community interventions are necessary for environmental sustainability and preservation of livelihoods. It is communities' daily survival actions, settlement patterns, and social interactions that degrade and increase the environmental damage caused by natural events. Unless these actions, habits, and attitudes are geared towards environmental sustainability and minimization of hazard risks, vulnerability to climate change related hazards will continue to be fatalistic. Communities and/ or households that deliberately engage in disaster risk management continue to enjoy greater benefits than those who remain passive and reactive. Rock and Corbin (19: 383) argue that recovery from disaster for unprepared communities and households can take many agonizing years and complicated by vulnerability and lack of resources. They give an example of Guyana which was still recovering in 2007 from the 2005 flood and Grenada, from 2004 Hurricane Ivan which killed 28 people. As such, recovery from disasters for unprepared individuals, communities, and countries may constitute an additional burden to already weak economies and social structures and divert development resources to pay for reconstruction costs that could have been avoided.

- **Community hazard and Risk mapping**

Communities and households must deliberately act towards identifying and assessing hazards and risks, and isolate areas according the level of risks within their social and physical environment. IFRC (20) urges communities to rely on local knowledge to identify the dangers they face, assess their capacities and vulnerabilities, and formulate solutions. The areas of high, moderate, and low risks are clearly marked in a map by the communities and households. Red Cross and Red Crescent Movement (1) 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 before, during, and after disaster event. It is a framework that outlines essential activities for the development of a preparedness strategy (21: 11). These include community and

household preparedness, prevention / mitigation, response, recovery, and reconstruction activities towards climate change related hazards. The preparedness plan will detail the early warnings, the evacuation plan and processes, response activation, and recovery strategy.

Early warning systems are fundamental to disaster resilience and safety for communities and families. IFRC (22: 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 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.

Evacuating people from a disaster scene is a complex temporary relocation process that should not be taken for granted as it requires extensive prior preparation. Without proper evacuation systems and preparation, it may turn out to be a frustrating and very stressful exercise for survivors. According to Perry (23: 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 qualitative data in the present study indicate that the selected communities do not have disaster evacuation plans. They rely heavily on the police, the army (BDF), and the Fire Brigade service for evacuation during disasters without developing pre and post community evacuation activities.

The communities should have clearly marked evacuation routes, evacuation sites, and evacuation protocols that community members know by heart and would follow before, during, and after disasters. The lack of evacuation plans 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 to save lives and sustain the environment. Drabek (24: 76) argues that thousands who perished or suffered injury because of the three extreme in the United States (hurricane Georges, Mitch, and torrential

rains) events are testimony to both the hazardous of the place and the positive 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 and resilience. Community knowledge on global warming and its effects on agriculture and daily subsistence is inadequate and including preparedness measures, and in particular lifestyle adaptations. The education and awareness should be driven by community volunteers in schools, clubs, churches, and traditional gatherings. This will ensure that appropriate information is on hazards and related risks and ways to reduce vulnerability. 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 (7).

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

Communities need to build internal capacity to adapt and adjust to climate change related risks. Already, communities have fundamental resources to absorb the shocks and leverage until external support is provided in the event of disasters. These resources are the social capital needed for preparedness, response, reconstruction, and recovery from disaster impacts within short time. In Otse, 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 as capacities. Mogobane participants identified farms, culverts, roads, bridges, clinics, and police offices as resources to deal with disasters. These must be constantly assessed to keep up to date inventory and resource mobilization process ongoing for readiness to respond (7).

- **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 upon protocols. The information is vital for activating the early warning systems, evacuation systems, and response system for any particular threat. 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 the monitoring and evaluation knows who to send the information to and make appropriate follow up (7).

Conclusion

Although communities in Botswana are vulnerable to environmental hazards and related risks, they can work on building 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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