An assessment of riparian communities' preparedness to flood risk: the case of Mbire communities in Zimbabwe

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Abstract Flood preparedness involves building capacities of communities for effective disaster response and recovery. Communities that effectively prepare for disasters can save life and minimise injuries, property damage and any psychological pain/stress associated with hazards. In view of this, the present study assessed the preparedness of riparian communities living in Mbire district, Zimbabwe and identified their capacity building needs. It used a weighted 5-point Likert Scale to quantify 11 preparedness indicators: resource availability; emergency and evacuation plans; early warning systems; flood knowledge/awareness/education, and proofing information; post-flood recovery; risk communication and social capital. Using a mixed approach, data came from a questionnaire survey involving 304 respondents who were selected through cluster sampling, and five focus group discussions that were purposively selected among the riparian communities. Descriptive statistics were used to analyse quantitative data and determine the level of community preparedness on each variable and indicator. A factor analysis was also conducted to identify the underlying factors that either hindered or promoted flood preparedness. Results show that riparian communities are unprepared for flood disasters. They need capacity building in terms of resource mobilisation, evacuation plans, early warnings, flood education/training/awareness, flood proofing information, post flood recovery and risk communication. A huge majority of about 82% of the indicators showed incipient levels of development. Likewise, about 71% of the variables were at or below incipient level of development. Poverty, flood awareness, social capital and contigency planning emerged as the major drivers of flood preparedness. The study concludes that measuring flood preparedness of riparian communities require context-specific variables. These findings are useful to national and sub-national governments with the mandate to formulate and implement appropriate flood disaster policies and plans where floods are a problem.

Keywords Flood disaster · Indicator · Riparian communities · Preparedness · Variables

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Introduction

Climate change is amplifying the magnitude and intensity of weather-related extreme events including floods (UNISDR 2018). Consequently, floods have dominated natural hazard damage across the globe (IFRCCS 2019; Kolen and van Gelder 2018; Muhonda et al. 2014). The South-West Indian Ocean basin has

been the source of tropical cyclones that cause floods in the southern African region (Chikoore et al. 2015; Moses and Ramotonto 2018). As a result, flood impact on social, economic and environment systems continues to increase especially among riparian communities (Davis-Reddy and Vincent 2017; Dittrich et al. 2019). The term 'riparian community' refers to a group of people or society living on, or conducting socio-economic activities on floodplains or on land traversed by a water body such as a river, where hydrological, geomorphological, and ecosystem dynamics can develop (Potes et al. 2020). Although riparian communities share both goods and services from their river systems, the communities can be affected adversely by any changes in their environments (Dempsey et al. 2017; Guerra et al. 2016). For example, in the years 2000 and 2017 cyclones Eline and Dineo caused widespread economic and environmental damages in riparian communities of southern Africa (Hartfield, Blunden, & Arndt, 2018; Moses and Ramotonto 2018; Reason and Keibel, 2004). In Zimbabwe alone, the two cyclones directly affected about 2.7 million and 20,600 people respectively (Mhlanga et al. 2019). Riparian communities in the districts of Tsholotsho, Muzarabani and Mbire in Zimbabwe were the worst affected by the two storms partly because of lack of preparedness (Mavhura 2020b). In 2014, floods from incessant rains poured over the Tokwe-Mukorsi river basin in Zimbabwe and displaced more than 29,000 riparian smallholder farmers (Mavhura 2020a). Recently, Cyclone Idai ravaged southern Africa in March 2019. It left over 2.6 million people homeless and caused more than 500 deaths and over a billion dollars in economic damages (African Risk Capacity 2019). In Zimbabwe, lack of disaster preparedness among the cyclone affected communities contributed significantly to the loss of life and property damage (Mavhura 2020b). Likewise, many riparian communities in poor countries are unprepared for flood disasters. In Bangladesh, riparian communities are exposed and vulnerable to flood risk and hazards due to their poor socioeconomic conditions and dependence on flood-based farming (Naz et al. 2018).

The continued increase in flood impacts underscore a serious need for strengthening community preparedness for effective disaster response and recovery. The Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) Priority 4 calls for 'nations to strengthen disaster preparedness across all levels as a way of reducing disaster risk and losses (UN 2015, p. 21). Preparedness is the best defence against disasters (Ngulube et al. 2011). In view of this, the present study critically assessed the preparedness of riparian communities in Mbire district, Zimbabwe. These communities are settled along the lower basin of Hunyani, the largest inland river of Zimbabwe. Floods are a recurring phenomenon among the Mbire communities. Each year, the floods inundate and destroy crops and dwellings, while boreholes and dip tanks are damaged. Some business centres, clinics and schools have been flooded as well, while electricity poles and livestock (goats, sheep and cattle) have been washed away in other places. The flood impact in Mbire communities raises serious questions about flood preparedness among the riparian communities. Therefore, the objectives of this study were to assess the flood preparedness of the riparian communities and identify their capacity building needs in order to enhance community preparedness to flood disasters. The study provides a body of knowledge to reflect on the attainment of the SFDRR priorities for action. The findings are also useful for sub-national governments when formulating and implementing appropriate disaster policies and plans not only in the study area, but also in other countries facing similar challenges.

After this introduction, section two reviews the related literature focusing on the SFDRR and flood disaster preparedness. The third section describes the study area, research approach and design as well as the data collection methods and analyses. Results of the study and their discussion are presented in sections four and five respectively. The last section presents the conclusion of the study and its policy implications for enhanced flood preparedness.

Review of the related literature

Theoretical framework: the Sendai framework for disaster risk reduction

The SFDRR is a global framework for disaster risk reduction (DRR) (Bennett 2020). It was adopted during a Third World Conference on Disaster Risk Reduction in Sendai, Japan in March 2015 to replace the Hyogo Framework for Action (HFA) (Kelman and Glantz 2015). The HFA was a ten-year plan (2005–2015) meant to build resilience of nations and

communities to disasters (Zhou et al. 2014). Building on the HFA, the SFDRR aims to reduce disaster losses in lives, livelihoods, health and in assets of communities and countries (Rahman and Fang 2019). To achieve this, the SFDRR encourages communities and nations to implement socio-economic and institutional measures, which prevent or reduce exposure and human vulnerability to hazards including floods (Maly and Suppasri 2020). In pursuance of its expected outcome, the SFDRR emphasises on four priorities for action: (a) understanding disaster risk, (b) strengthening disaster risk governance to manage risk, (c) investing in DRR for resilience, and (d) enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction (UN 2015; Wahlstrom 2015). Through these priorities for action, the SFDRR marked a paradigm shift from a reactionary to a proactive approach of disaster risk management (Mizutori 2020).

The first priority of the SFDRR calls for full knowledge of disaster risk dimensions including vulnerabilities, capacities, community/asset exposure, and characteristics of the hazard and the environment (Kelman and Glantz 2015; UN 2015). Such knowledge is critical for the design of appropriate preparedness measures at the local level. To achieve this priority, institutions are encouraged to develop capacities, competencies, plans, collaboration or partnership mechanisms across all sectors with the participation of the communities at risk (Rahman and Fang 2019). Once the disaster risk is fully understood, its governance can be strengthened to manage the risk. The management of the risk is crucial during the preparedness phase because it can foster collaborations and partnerships across communities and institutions (Munene et al. 2018). On the other hand, investing in DRR at community level can drive innovation, economic growth and employment creation (Trogrlic et al. 2017). The investment can include structural and non-structural measures that enhance the livelihood assets of the community. This involves ensuring that critical infrastructure such as roads, bridges, schools and clinics are built with the principle of 'building back better' in mind (Munene et al. 2018). Most importantly, the SFDRR prioritises enhancing disaster preparedness for effective response, taking action in anticipation of hazardous events and ensuring that capacities are in place for effective response and recovery (Wahlstrom 2015; UN 2015). Despite these

clear priorities, the SFDRR has four key limitations in reducing disaster losses and risk. First, the framework itself is not legally binding for the member states (Munene et al. 2018). Rather, it is optional for member states to report their progress in attaining the priorities for action. Second, the objectivity of reviews of the SFDRR is questionable since the reviews are voluntary self-assessments by member states. Third, there is no consensus among states on the best way to implement the framework under different socioeconomic, political and ecological environments (Munene et al. 2018). What exists are the guidelines to assess progress on the attainment of the global targets for DRR. Fourth, the emphasis on community participation can become a low-cost way for some governments to off-load their responsibility of protecting citizens onto the at-risk communities themselves (Wisner 2020). This can worsen the vulnerabilities of the threatened people, instead of capacitating them.

Flood disaster preparedness

Disaster preparedness involves developing knowledge and capacities that enable at-risk population groups to anticipate, respond to, and recover from hazardous events (Mabuku et al. 2018). Thus, preparedness in riparian communities in Mbire encompasses pre-disaster activities undertaken within the context of disaster risk management. When communities effectively prepare themselves before a disaster, lives can be saved and injuries, property damage and the psychological pain and stress associated with hazards can be reduced (Schlör et al. 2018). Preparing for disasters at the community level may also provide opportunities to build back better the community infrastructure (Mannakkara and Wilkinson 2013; Wisner 2017). Flood preparedness activities that may enhance safety among the Mbire communities include retrofitting shelter and emergency planning (Shah et al. 2018). However, such preparedness needs sound risk analysis of the hazard(s), which can take a multi-hazard or a single hazard approach. In any case, a critical assessment of the ongoing community preparedness activities in Mbire is required. This may improve constant adjustments in community behaviour to imminent disasters.

The disaster preparedness field is increasingly receiving recognition across the world (Alexander

2015). The United Nations developed practical guidelines for assessing the preparedness capacities and mechanisms during the HFA era (United Nations 2007). Many institutions are shifting their attention from post-disaster responses to a culture of disaster preparedness (Keating et al. 2017; Suryani et al. 2018). One of the reasons behind this shift is the increasing evidence that, in the long run, financial returns from preparedness can offset public expenditure on disaster response and recovery (Tim et al. 2016). Despite this, assessments of disaster preparedness at the community level are still low in many developing countries including Zimbabwe (Alexander 2015). Yet many riparian communities across rural areas of Africa, Asia and Latin America are exposed to floods (Bou et al. 2015; Ntajal et al. 2017; Win et al. 2018). Disaster preparedness knowledge can contribute to building a culture of disaster resilience. However, the disaster preparedness field remains less politically attractive than response, and raising resources for preparedness is still a challenge (Tim et al., 2016). This may be caused by the fact that in some countries major hazardous events are very rare, leading to minimal citizens' demand for investment in disaster preparedness (Kolen and Helsloot 2014). In other countries, governments are preoccupied with issues of national security and sovereignty rather than concerns for threats triggered by nature (Hewitt 2013; Holloway 2003).

Many riparian communities largely depend on natural resources within their river basins, which may be exposed to flooding. In such situations, preparedness may enable communities to mitigate impacts of floods on their livelihood capitals: natural, physical, economic, human and social (Nakanishi and Black 2018; Quandt et al. 2016). In doing so, the communities would be optimizing their resilience to disasters. Scholars and practitioners have proposed a series of indicators for assessing flood preparedness. Key indicators include prepositioning of resources for response and recovery; development of agreed emergency plans; evacuation procedures; early warning systems (EWS); raising flood awareness and knowledge; flood proofing information; disaster education/training; post-flood recovery; risk communication and social capital (Alexander 2015; Mehiriz and Gosselin 2016). Table 1 provides a summary of these indicators along with their relevant references. Each indicator is an element derived from

observed facts, and may have a set of variables (sub-indicators) which represent different dimensions of the indicator under consideration. However, the list of indicators shown in Table 1 has been neither exhaustive nor definitive. Scholars and disaster practitioners have the latitude to use indicators that suit the context of their programmes and studies (Maduz et al. 2019; Rodríguez-Espíndola et al. 2018; Yadav and Barve 2019).

As shown in Table 1, flood preparedness entails prepositioning resources including food and non-food items (NFIs) that enable at-risk communities to quickly bounce back and move forward with their activities (Kanakis and McShane 2016). However, having adequate resources can sometimes lead to overconfidence on the capacities of the community to manage the disasters (Rodríguez-Espíndola et al. 2018). As such, prepositioning of resources alone may not guarantee saving life during flooding in Mbire communities. Explicit and implicit knowledge about flood hazards is also crucial (Liu et al. 2014). While explicit knowledge is largely obtained through formal education, communities acquire implicit knowledge through experiencing flood events and or, oral traditions (Nakanishi and Black 2018). Examples of explicit knowledge include the production of specific hazard maps and guidelines, regular training in evacuation procedures and first aid. The implicit knowledge about floods can be enhanced through active community participation in EWS and evacuation planning (Marchezini et al. 2017). The willingness of communities to participate in flood preparedness can promote high levels of flood awareness and a change in behaviour that minimises negative disaster impacts. In the context of Mbire communities, this behaviour change can include complying with evacuation orders, stockpiling resources and heeding flood alerts. The Mbire communities can draw lessons from Japan where floods, tsunamis and other geophysical hazards continue to strike, but with minimum impact due to high levels of preparedness (Nakanishi and Black 2018).

Risk information and communication are other key factors in minimising flood impacts (Horita et al. 2018). The two can raise high perception of disaster risk. For example, if communities are convinced that high magnitude floods are probably going to occur, they are likely to respond appropriately in time (Nakanishi and Black 2018). Therefore, for flood

Table 1 Summary of community flood preparedness indicators

Indicator(s)	Description	References
1. Resource availability	Stockpiling food and non-food items; financial and materials resources for use during and after disaster	1; 2; 3; 4; 5; 6; 7; 8; 9; 10
2. Emergency plans	Agreed plans describing the means to address a disaster within a specific time frame; detailed mechanisms for operations at the onset of a disaster.	2; 4; 5; 6; 7; 10
3. Evacuation plans	Moving people and assets temporarily to safer places before a hazardous event.	2; 5; 6; 7; 10
4. Early warning system	Set of capacities needed to generate and disseminate timely and meaningful warnings to enable communities to prepare and act appropriately in sufficient time before a disaster.	2; 5; 6; 9; 10
5. Flood knowledge	Scientific and indigenous knowledge about flood risk reduction. Includes how floods are generated and monitored, knowing places prone to flooding and why.	2; 4; 5; 6; 7; 10; 11
6. Flood awareness raising	Raising common knowledge about flood risks, causes and actions that reduce exposure and vulnerability.	2; 4; 5; 6; 7; 10; 11
7. Flood proofing information	Provision of information about designing or retrofitting buildings and their contents to make them more resistant to flood losses.	4; 5; 6; 7; 10; 11
8. Disaster education and training	Culture of training in basic skills and safety	1; 2; 3; 4; 9; 10
9. Post-flood recovery	Restoring or improving the pre-disaster conditions of the stricken community	2; 6; 12
10. Risk communication	Ways in which risk information is formulated, delivered, interpreted and acted upon in disaster preparedness, response and recovery	2; 4; 6; 8; 10; 12
11. Social capital	Connections among people in a community and the norms of reciprocity and trustworthiness that arise from them.	13; 14; 15; 16; 17; 18; 19

Key: 1. Kunz et al. (2014); 2. Alexander (2015); 3. Mehiriz and Gosselin (2016); 4. Farley et al. (2017); 5. Mabuku et al. (2018); 6. Rodríguez-espíndola et al. (2018); 7. Maduz et al. (2019); 8. Parker et al. (2019); 9. Shah et al. (2018); 10. Yadav and Barve (2019); 11. Atreya et al. (2017); 12. Drakaki and Tzionas (2017); 13. Lucini (2013); 14. Minamoto (2010); 15. Sherrieb et al. (2012); 16. Townshend et al. (2015); 17. Bhandari (2014); 18. Murphy (2007)

warnings to be effective among riparian communities of Mbire, the risk perception and capacities of the threatened communities should be increased. This involves improving a chain of elements, processes or events linked to the production and dissemination of flood alerts. Capacities to predict the floods, interpret the forecasts, and relay the message to the flood-risk communities should also be increased in order to trigger appropriate response from the concerned people (Babcicky and Seebauer 2017; Kyne et al. 2018). This is because floods can severely damage land and infrastructure (Andersson-Skold 2016). In order to reduce such impacts, various strategies of flood proofing have been implemented in many countries including the Netherlands, Hong Kong and Singapore (Lendering et al. 2020). Common examples of flood proofing include walls, dykes, elevation of shelters above flood-predictive levels, and other barriers. The flood proofing measures are best implemented at the river basin level, where the need to

reduce flood risk in the short term is great (Brown et al. 2020). However, rising water levels tend to increase the flood risk and can create knock-on effects on riparian communities who depend on farming. On the one hand, they may promote flood recession farming and spate irrigation (Puertas et al. 2015; Traore et al. 2016). On the other hand, they may create room for waterlogging, salinization, leaching and eluviation, which lower down crop productivity (Brown et al. 2020). Therefore, riparian communities need to prepare well for adaptation options.

Many rural communities are endowed with strong social capital—both bonding and bridging capital, which enhance their levels of preparedness to disasters (Mngumi 2020). While bonding capital cements relationships between people of a shared identity (e.g. riparian community), bridging capital connects people with different identities or across social boundaries but with shared interest (Hudson et al. 2020). Social capital can also be a conduit through

which community goals are accomplished via mutual support. For example, the Japanese are well known for a culture of mutual support that emphasises on safety and security (Nakanishi and Black 2018). In Zimbabwe, social capital is also strong among rural communities in Muzarabani district (Mavhura 2019). However, strong social capital also has certain limitations in flood preparedness. Some communities with strong ties may relax in preparing for disasters when they feel that they are not at risk (Babcicky and Seebauer 2017).

Community preparedness therefore, enhances local capacities for prompt responses to disasters (Hudson et al. 2020). By participating in preparedness activities, communities are empowered to put into action/practice their knowledge (Dzialek et al. 2016). They can strengthen their coping and adaptation measures at the local level where the impacts of hazards are first felt. Local knowledge, resources and experiences can be harnessed easily when community members partake in flood preparedness activities (Marchezini et al. 2017). However, inadequate resources, lack of decision-making leaderships among the communities and inadequate legislative support usually hamper disaster preparedness at the community level.

Materials and methods

Study area

This study took place in five riparian communities of Mbire district, Zimbabwe: Ward 3—Kanongo, Ward 9—Mushumbi, Ward 10—Chitsungo, Ward 12—Chikafa and Ward 16—Monozi (Fig. 1). The term 'ward' is often used in Zimbabwe when referring to the lowest administrative unit (county) at the district level (de Visser et al. 2010). The five wards were purposively selected among the 17 wards of the district because of their high flood hazard profile. Table 2 provides the basic demographic statistics of the five riparian communities. Of great concern, is the high percentages of people living below poverty line, without water, sanitation and hygiene facilities and living in pole and dagga houses. These conditions may limit effective flood preparedness of the communities. On average, each community had about 21 villages settled along both sides of the lower basin of Hunyani (also known as Manyame) River. Hunyani is the largest inland river in Zimbabwe that flows in a northeasterly direction through three provinces: Harare Metropolitan, Mashonaland West and Mashonaland Central. It discharges its waters into the Zambezi River in Mozambique.

As shown in Fig. 1, the study area is a flat terrain dissected by a network of rivers key among them are Hunyani, Dande, Bwazi and Kabvumba. A large majority of about 70% of the villagers in the study area are settled along the floodplains of the major rivers and in-between rivers (interfluves) (Mavhura 2019). The river network increases community exposure to riverine floods. Backflows that happen after intense precipitation are also a common feature in the riparian communities. They occur when tributaries fail to empty into the major rivers during floods. Water then piles up at river confluences and flows backwards, inundating the nearby villages, damaging local infrastructure (roads, bridges, houses, clinics, etc.) and disrupting farming. Nevertheless, floods in the study area provide fertile alluvium and residual moisture along floodplains. This has attracted the development of small-scale flood-based farming as a source of livelihood in the communities. Crops grown are maize, small grains, cotton and tobacco, although the yield levels are very low especially during years of severe drought. Livestock production that is practiced on a small-scale level is also affected by the floods (Bola et al. 2014).

The riparian communities are in one of the most remote and poorly developed districts in Zimbabwe. They are also part of the Zambezi Valley, which is characterised by floods, mid-season dry spells, drought and crop pests and diseases. In terms of hazards, Mbire district ranks number 18 out of the 61 rural districts (UNDP 2016). Its mean hazard index is high (0.5901), and floods contribute about 29.32% of this index. The hazard index took into consideration eight hazards, which mostly affect rural livelihoods in Zimbabwe. The hazards include floods, drought, mid-season dry spells, landmines, crop pests and diseases, animal diseases, human immunodeficiency virus and acquired immunodeficiency syndrome (HIV & AIDS) and diarrhoeal diseases (UNDP 2016). Despite the high hazard index, little is known about the riparian communities' preparedness to flood risk. Although disaster policies and legislation have been developed at the national level to support riparian communities, the policies do not effectively strengthen disaster
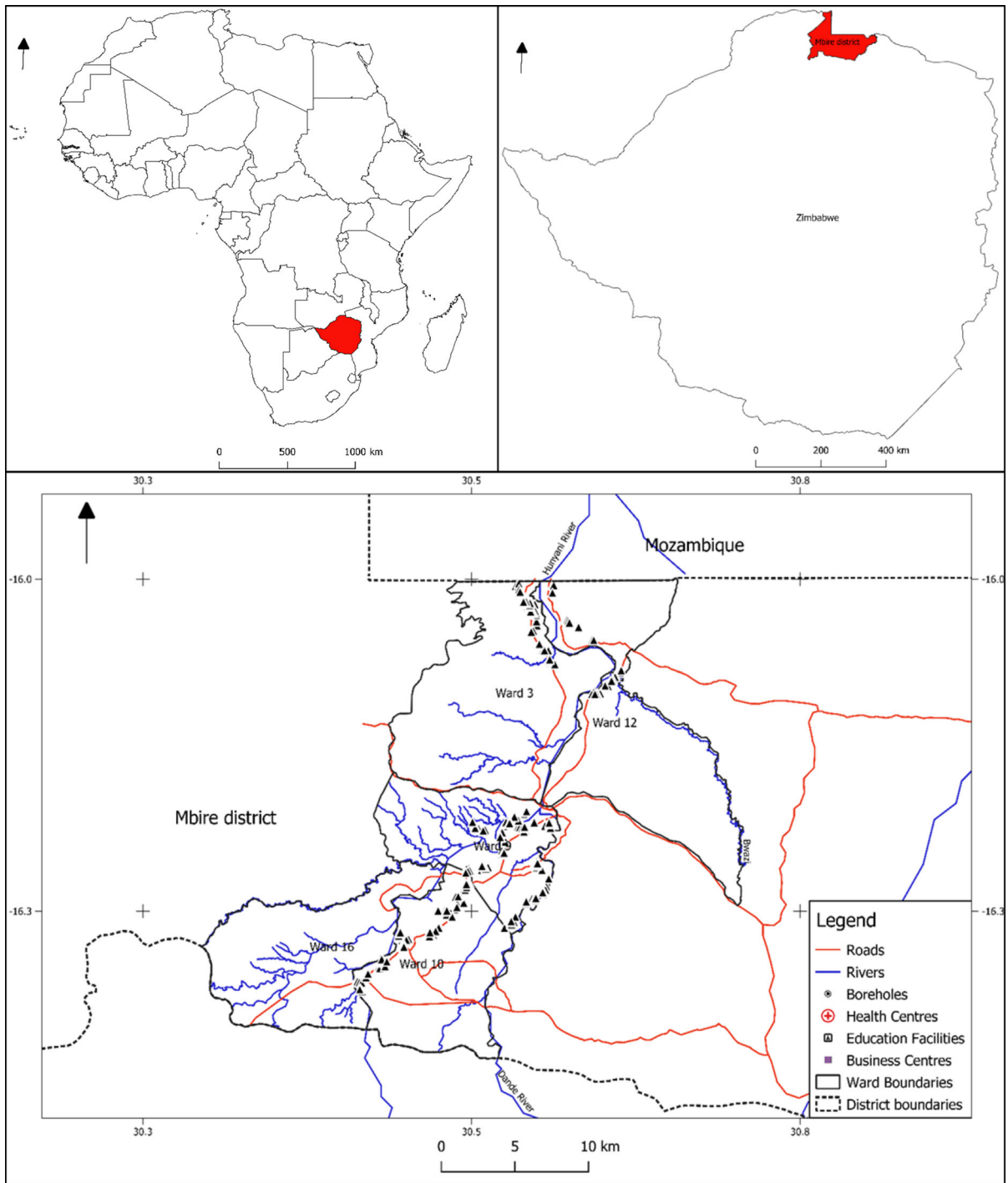
Fig. 1 Study area. *Source*: Authors

preparedness at the local level (Muhonda et al. 2014). This is partly because most of the institutions, agencies and line ministries/departments that house

pieces of DRR legislations are not decentralised at the local level. Therefore, experiences on flood preparedness from this area can inform policy makers about

Table 2 Basic demographic statistics of the riparian communities in Mbire *Source*: ZimStat (2012) and UNDP (2016)

Community	Ward No.	Male pop	Female pop	Total pop	Literacy rate	% below poverty line	% pop without wash facilities	% households in pole and dagga huts
Kanongo	2	3073	3033	6106	86.3	88.2	75.7	75.9
Mushumbi	9	2457	2437	4894	86.2	88.4	69.3	68.8
Chitsungo	10	3414	3503	6917	87.1	88.6	78.4	89.2
Chikafa	12	3292	3493	6785	85.6	89.4	88.2	91.5
Monozi	16	1493	1503	2996	86.4	89.3	86.4	87.7
Total/Av.		13,729	13,969	27,698	86.3 (Av)	88.8 (Av)	79.6 (Av)	82.6 (Av)

Key: Av = Average

informed flood interventions. Furthermore, insights from the riparian communities are essential to similar settings in an effort to reduce flood disaster risks.

Research approach and design

This study used a mixed approach involving both quantitative and qualitative methods of gathering data (Almalki 2016). A questionnaire survey generated quantitative data on the level of community preparedness to floods while focus group discussions yielded both qualitative and quantitative data that complimented the questionnaire survey. The use of more than one source of data was appropriate to a case study design (Yin 2009). As a result, the case study design in this research enabled obtaining detailed answers to both the descriptive and explanatory nature of the riparian communities' preparedness to flood disasters.

Population and sample

The total population of households living in low-lying areas of the five riparian communities was 3028 (about 28,000 people). The study first applied cluster sampling by dividing the population into five ward communities. Then, a simple random sample of 10% was drawn from each ward. As a result, the final sample became 10% (302) of the population of households plus 10% (30) attrition rate to make it 334. However, only 304 questionnaires were valid and this was above the required minimum sample size. Table 3 shows the final distribution of the samples, which were proportional to the household population of each ward. As for the qualitative data from focus

groups, the study used purposive samples to access DRR committee members with in-depth knowledge about community preparedness to floods. The primary concern in this study was to acquire in-depth information from those who were in the position to give it (Cohen et al. 2011).

Data collection methods and analyses

Data for this study came from five focus group discussions (FGD) and a questionnaire survey.

Focus group discussions

Five FGD, one from each community participated in the selection of indicators that were relevant to their context. All the indicators selected were also supported by literature on flood preparedness. After the selection of the indicators, the focus groups also determined the appropriate variables for each indicator. The determination also considered the context of the riparian communities. Councillors, who chair DRR committees, and are gatekeepers in each community, purposively selected the FGD participants. The participants came from the DRR committees depending on their availability, flood experience and willingness to participate. The focus groups were fairly gender balanced (Table 4). Table 4 also shows that all the focus group participants had been directly affected by floods. Flood experiences also qualified them to provide information of the related preparedness measures.

Table 3 Distribution of respondents sampled for the survey

Community	Ward No.	Total households	Sampled respondents
Kanongo	3	671	68
Mushumbi	9	559	56
Chitsungo	10	744	75
Chikafa	12	741	74
Monozi	16	313	31
Total		3028	304

Table 4 Distribution of FGD participants in terms of location, gender and experience of flooding

Focus group	Community	Total participants	Male participants	Female participants	Participants' flood experience
FG1	Kanongo	11	4	7	Crop and dwellings destroyed; boreholes and dip tanks inundated
FG2	Mushumbi	13	6	7	Crop destruction; bridges and houses damaged; river migrating close to business centre; council chalets washed away
FG3	Chitsungo	11	5	6	Schools/houses inundated; crops destroyed; river migration to hospital buildings
FG4	Chikafa	12	5	7	Crop destruction; clinics and schools flooded; villages inundated; dwellings swept away
FG5	Monozi	12	7	5	Crops destroyed; school and houses damaged; electricity poles damaged

Community questionnaire survey

The research team successfully administered 304 questionnaires to adult villagers of the riparian communities. The survey took place between 2018 and 2019. The questionnaires were randomly administered in each community to minimise bias. In order to have a balanced view of responses, those who took part in the survey came from different households. Tablets with Open Data Kit (ODK) and Geographical Positioning System (GPS) were used to collect the data. The ODK and GPS systems supported a wide range of questions and answers, and worked well without network connectivity (Rai et al. 2018). They also enabled recording audios and images and to geo-reference all points of interest including houses, critical infrastructure and safe zones for evacuation purposes. In this way, the tablets provided great ease by automating data compilation.

The questionnaire collected data on 38 variables that measured flood preparedness based on eleven indicators (Table 5). The 11 indicators include resource availability, emergency plans, evacuation plans, EWS, flood knowledge/awareness, flood education/training, flood proofing information, post-flood recovery, risk communication and social capital. Because the indicators and their corresponding variables were subjectively selected, the study applied a five-point Likert Scale to improve their precision in measuring the level of preparedness. Respondents were asked to state the extent to which they agreed with or adopted the variables on a scale of 1–5: 1 = absent; 2 = incipient; 3 = improving but not fully instituted; 4 = satisfactory; and 5 = excellent/fully adopted.

Data analysis

Descriptive statistics were used to determine the level of community preparedness on each variable and indicator. Weights ranging from 1 to 5 were assigned to each response category (Absent, Incipient, Improving, Satisfactory and Excellent respectively). Then, the weighted mean for each variable was calculated using the equation:

$$Weighted\ Variable\ Mean = \frac{\sum n_{rci} w_{rci}}{N}$$

Table 5 Flood preparedness indicators and variables

Indicator	Variables/item
1. Resource availability	Our community has emergency food and water
	Our community has contingency funds in case of flooding
	Each family of our community has a 3-day emergency supply kit
	We have community boats and canoes for crossing flooded rivers
	Community warehouse exist with relief items (blankets, mosquito nets, tents, tarpaulins, blankets, etc.)
2. Emergency plans	The community knows safe places for shelter during floods
	Vital records and documents are always kept at safe places
	Community members have out-of-community contacts in case of flooding
3. Evacuation plans	The community is aware of the evacuation plans and routes
	Our community can relocate from unsafe areas when it is necessary to do so
	Alternative safe and secure shelter is available in case of flooding
4. Early warning system	Our community has access to local hydrological and weather forecasts
	Our community can access flood warnings either through sms, phone calls or WhatsApp
	We monitor flood water levels on our own (including indigenous knowledge)
5. Flood knowledge	Flood maps of the community are available
	Flood monitoring mechanisms are in place and known by the community
	Our community knows when to move out of floodplain during the rainy season
	We avoid staying in low-lying floodplains during the rainy season
	We avoid crossing flooded rivers
6. Flood awareness raising	Our community participates in flood awareness campaigns initiated by government or NGOs
	Flood awareness reaches the most vulnerable community members
	Community members listen to radio or TV messages on flood awareness
	DRR committees are active in our community
7. Flood proofing information	Community houses and granaries are elevated from the ground
	Community constructs embankments, levees and other barriers to protect our houses and fields
	Community builds raised platforms as protective shelters in fields
8. Flood education and training	At least one community member is trained in first aid
	One of the community members receives training in search and rescue
	Community participates in mock drills or simulations for the purpose of flood preparedness
9. Post-flood recovery	Community recovery activities incoporate 'build back better' principle
	Community receives aid from government, Red Cross or NGOs after flood disasters
	Community uses standard building codes when construction their houses
10. Risk communication	Community has a list of civil protection numbers to be called in case of a disaster
	The community has alternative means of communication to send and receive flood alerts and appeals for humanitarian assistance
11. Social capital	Community members help each other during flood response and recovery
	Community members have reliable social networks, connections and relationship of trust for assistance and sharing flood information
	Community has either formal or informal safety nets (including Zunde raMambo)
	A community member subscribed to a Disaster Risk Management WhatsApp group in the districct

where, n_{rci} is the number of respondents in each category (1–5); W_{rci} is the weight value of each category; and N is the total number of respondents.

After having determined the weighted variable mean, the weighted mean value of each indicator was calculated using the equation:

$$Weighted\ Indicator\ Mean = \frac{\sum wnm}{n}$$

where *wvm* is the sum of the weighted variable mean; and *n* is number of number of variables making the indicator.

In this way, the study determined precisely the level of community preparedness at both variable and indicator levels. The final values fell within the 5-point Likert Scale where it was easy to describe the level of community preparedness.

Furthermore, the study used Statistical Package for Social Sciences (SPSS) software—Version 22 to conduct a factor analysis with the aim of identifying the underlying variables that either hindered or promoted flood preparedness. To achieve this aim, the study applied a Kaiser Normalization (KN) and Varimax Rotation (VR) to extract the principal factors (Aksha and Emrich 2020). While the VR enhanced the independence of the factors, the KN enabled the extraction of factors whose eigenvalues were greater than one (Armas et al. 2017). The factor analysis technique condensed the 38 variables down to four by summarising the underlying patterns of correlations and grouping closely related variables. The study assumed variables with high correlations as drivers of each component. This became the basis for naming the extracted factors.

Then, the study thematically analysed qualitative data from FGD (Vaismoradi et al. 2016). The 11 indicators were used as key themes. Differences and similarities from the focus groups' responses under each theme were noted. Finally, the results were triangulated to answer the key question: How prepared are the riparian communities to flood disasters?

Results

Using a five-point Likert Scale, this study quantified the riparian communities' level of preparedness to flood disasters (Table 6). This was determined at both variable and indicator level. As shown in Table 6, the weighted mean values of the 11 indicators ranged from 1.4 to 4.4. A huge majority of the preparedness variables (71%) ranged from 1.0 (absent) to 2.3 (incipient). This shows that the riparian communities are unprepared for flood disasters in many respects. Table 6 also shows that only two indicators—

emergency plans and social capital, emerged with satisfactory levels of preparedness across the five communities. This was confirmed by all focus groups who revealed that the two indicators were exceptional preparedness aspects among the riparian communities. The rest of the indicators—stockpiling emergency resources, evacuation planning, EWS, flood awareness and knowledge, education and training, risk communication, flood proofing information, and post-flood recovery including rehabilitation and reconstruction greatly need improvements for the riparian communities to reduce flood risk and losses. As a result, these indicators became the key capacity needs for flood preparedness among the riparian communities. Figure 2 shows a graphical presentation of the weighted mean values of the 11 preparedness indicators of the riparian communities. Emergency planning received the highest scores on the Likert Scale across the five riparian communities, followed by social capital. Figure 2 also shows that each community has certain strengths and limitations in preparing for floods. For example, the Mushumbi community is the best community in terms of risk communication and post-flood recovery aspects. However, it is among the least prepared communities when it comes to evacuation planning. The focus groups were able to explain and justify these strengths and limitations. For example, they revealed that Mushumbi is the growth point where major services such as mobile network, health, education, transport and communication are provided. As a result, risk communication is better developed in this community than anywhere else is. However, evacuation planning is poor because of fear of business closure and looting. The identified limitations in preparing for floods became the basis for government and non-governmental organisation (NGO) interventions and prioritisation of resource to enhance flood preparedness. For example, the Chikafa community needs assistance in prepositioning of resources, flood proofing information and education/training. Likewise, the Monozi community needs help in resource prepositioning, although its social capital is satisfactory in preparing for floods.

Since the weighted mean of the indicators tended to mask the relative importance of each variable, further analyses of the variables were necessary. The variables constituted the specific flood preparedness needs at the community level. For example, both the survey and FGD revealed that acute shortage of resources

Table 6 Household flood preparedness levels

Indicator/variables	Preparedness level [n = 304 (%)]					Weighted mean
	Absent	Incipient	Improving	Satisfactory	Excellent	
(a) Resource availability						1.6
1. Our community has emergency food and water	290 (95.4)	10 (3.3)	4 (1.3)			1.1
2. Our community has contingency funds in case of flooding	304 (100)					1.0
3. Each family of our community has a 3-day emergency supply kit	290 (95.4)	10 (3.3)	4 (1.3)			1.1
4. We have community boats and canoes for crossing flooded rivers	266 (87.5)	38 (12.5)				1.1
5. Community warehouse exist with relief items (blankets, mosquito nets, tents, tarpaulins, blankets, etc.)		4 (1.3)	29 (9.5)	251 (82.6)	20 (6.6)	3.9
(b) Emergency plans						4.4
6. The community knows safe places for shelter during floods			4 (1.3)	217 (71.4)	83 (27.3)	4.3
7. Vital records and documents are always kept at safe places				8 (2.6)	296 (97.4)	5
8. Community members have an out-of-community contacts in case of flooding		4 (1.3)	27 (8.9)	195 (64.1)	78 (25.7)	4.1
(c) Evacuation plans						2.2
9. The community is aware of the evacuation plans and routes	299 (98.4)	5 (1.6)				1.0
10. Our community can relocate from unsafe areas when it is necessary to do so			4 (1.3)	181 (59.5)	119 (39.1)	4.4
11. Alternative safe and secure shelter is available in case of flooding	221 (72.7)	83 (27.3)				1.3
(d) EWS						1.7
12. Our community has access to local hydrological and weather forecasts	68 (22.4)	236 (77.6)				1.8
13. Our community can access flood warnings either through sms, phone calls or WhatsApp	178 (58.5)	89 (29.3)	37 (12.2)			1.5
14. We monitor flood water levels on our own (including indigenous knowledge)	119 (39.2)	136 (44.7)	49 (16.1)			1.8
(e) Flood knowledge						2.1
15. Flood maps of the community are available	304 (100)					1.0

Table 6 continued

Indicator/variables	Preparedness level [n = 304 (%)]					Weighted mean
	Absent	Incipient	Improving	Satisfactory	Excellent	
16. Flood monitoring mechanisms are in place and known by the community	304 (100)					1.0
17. Our community knows when to move out of floodplain during the rainy season	54 (17.7)	250 (82.2)				1.8
18. We avoid staying in low-lying floodplains during the rainy season	30 (9.9)	243 (79.9)	31 (10.2)			2.0
19. We avoid crossing flooded rivers				44 (14.5)	260 (85.5)	4.9
(f) Flood awareness raising						2.3
20. Our community participates in flood awareness campaigns initiated by government or NGOs	76 (25)	97 (31.9)	103 (33.9)	28 (9.2)		2.3
21. Flood awareness reaches the most vulnerable members of the community	76 (25)	104 (34.2)	116 (38.2)	8 (2.6)		2.2
22. Community members listen to radio or TV messages on flood preparedness	73 (24)	118 (38.8)	101 (33.2)	7 (2.3)	5 (1.7)	2.2
23. DRR committees are active in our community	49 (16.1)	131 (43.1)	74 (24.3)	22 (7.3)	28 (9.2)	2.5
(g) Flood proofing information						1.6
24. Community houses and granaries are elevated from the ground	277 (91.1)	23 (7.6)	4 (1.3)			1.1
25. Community constructs embankments, levees and other barriers to protect houses and fields	289 (95.1)	15 (4.9)				1.0
26. Community builds raised platforms as protective shelters in fields	42 (13.8)	33 (10.9)	198 (65.1)	31 (10.2)		2.7
(h) Flood education and training						1.4
27. At least one community member is trained in first aid	231 (76)	22 (7.2)	17 (5.6)	19 (6.3)	15 (4.9)	1.6
28. One of the community members receives training in search and rescue	231 (76)	22 (7.2)	17 (5.6)	29 (9.5)	5 (1.7)	1.5
29. Community participates in mock drills or simulations for the purpose of flood preparedness	277 (91.1)	13 (4.3)	10 (3.3)	4 (1.3)		1.1
(i) Post-flood recovery						2.2
30. Community recovery activities incorporate 'build back better' principle	276 (90.8)	28 (9.2)				1.1

Table 6 continued

Indicator/variables	Preparedness level [n = 304 (%)]					Weighted mean
	Absent	Incipient	Improving	Satisfactory	Excellent	
31. Community receives aid from government, Red Cross or NGOs after flood disasters	9 (2.9)	13 (4.3)	20 (6.6)	53 (17.4)	209 (68.8)	4.4
32. Community uses standard building codes when construction their houses	276 (90.8)	28 (9.2)				1.1
(j) Risk communication						2.3
33. Community has a list of civil protection members to be called in case of a disaster	55 (18.1)	166 (54.6)	45 (14.8)	23 (7.6)	15 (4.9)	2.3
34. The community has alternative means to send and receive flood alerts and appeals for humanitarian assistance	75 (24.7)	125 (41.1)	65 (21.4)	20 (6.6)	19 (6.2)	2.3
(k) Social capital						3.5
35. Community helps each other during flood response and recovery		3 (1)	25 (8.2)	65 (21.4)	211 (69.4)	4.6
36. Community has reliable social networks, connections and relationship of trust for assistance and sharing flood information		2 (0.7)	23 (7.6)	64 (21)	215 (70.7)	4.6
37. Community has either formal or informal safety nets (including Zunde raMambo)	276 (90.8)	15 (4.9)	13 (4.3)			1.1
38. A community member subscribed to a Disaster Risk Management WhatsApp group in the district	8 (2.6)	4 (1.3)	178 (58.6)	69 (22.7)	45 (14.8)	3.5

Table 7 Kaiser normalization and Varimax rotation results

Rotated component matrix[a]

	Component			
	1	2	3	4
Community emergency food and water	0.990	0.100	−0.007	0.098
Contingency funds in case of flooding	0.992	0.086	−0.030	0.082
3-day emergency supply kit	0.990	0.100	−0.007	0.098
Community boats and canoes for crossing flooded rivers	0.981	0.117	0.104	0.115
Community warehouse with relief items	−0.271	0.219	−0.238	−0.907
Community safe places for shelter during floods	−0.283	−0.137	−0.231	−0.921
Vital records and documents kept safe	−0.186	−0.970	−0.139	0.065
Out-of-community contacts in case of flooding	−0.350	−0.098	−0.300	−0.882
Communities aware of evacuation plans and routes	0.992	0.089	−0.015	0.086
Communities relocate from unsafe areas	−0.312	−0.382	−0.252	−0.833
Alternative safe and secure shelter available	0.917	0.164	0.324	0.165
Communities access hydrological/weather forecasts	0.029	0.230	0.942	0.242
Communities access flood warnings via sms, calls or WhatsApp	0.838	0.297	0.326	0.322
Communities monitor flood water levels	0.456	0.413	0.643	0.456
Flood maps available at every community	0.992	0.086	−0.030	0.082
Flood monitoring mechanisms in place and known	0.992	0.086	−0.030	0.082
Communities know when to move out of floodplain	−0.045	0.223	0.945	0.236
Avoid low-lying floodplains during rainy season	−0.191	0.281	0.889	0.308
Avoid crossing flooded rivers	−0.220	−0.959	−0.166	−0.071
Communities participate in flood awareness campaigns	0.081	0.787	0.211	0.573
Flood awareness reaches most vulnerable community members	0.048	0.680	0.192	0.706
Listens to radio or TV messages on flood awareness	0.032	0.617	0.379	0.689
DRR committees active in communities	−0.211	0.423	0.686	0.552
Community houses and granaries elevated from ground	0.987	0.111	0.038	0.110
Embankments/levees construction	0.991	0.097	0.018	0.094
Raised platforms in fields	−0.248	0.615	−0.536	0.522
Community members trained in first aid	0.992	0.102	−0.009	0.078
Community members trained in search and rescue	0.987	0.158	−0.010	0.029
Communities participates in mock drills/simulations	0.988	0.117	−0.011	0.101
Recovery incoporates 'build back better' principle	0.986	0.108	0.065	0.106
Receives aid from government, NGOs	−0.262	−0.941	−0.194	−0.087
Standard building codes used for construction	0.986	0.108	0.065	0.106
List of civil protection numbers to be called known by communities	−0.085	0.358	0.871	0.325
Alternative means of communication available	0.118	0.478	0.695	0.524
Communities help others during a flood response/recovery	−0.308	−0.905	−0.259	−0.140
Reliable social networks, connections and relationship	−0.299	−0.910	−0.253	−0.137
Formal or informal safety nets	0.985	0.121	−0.009	0.123
Community members subscribed to a DRM WhatsApp group	−0.494	0.347	−0.757	0.251

Extraction method: Principal component analysis

Rotation method: Varimax with Kaiser normalization
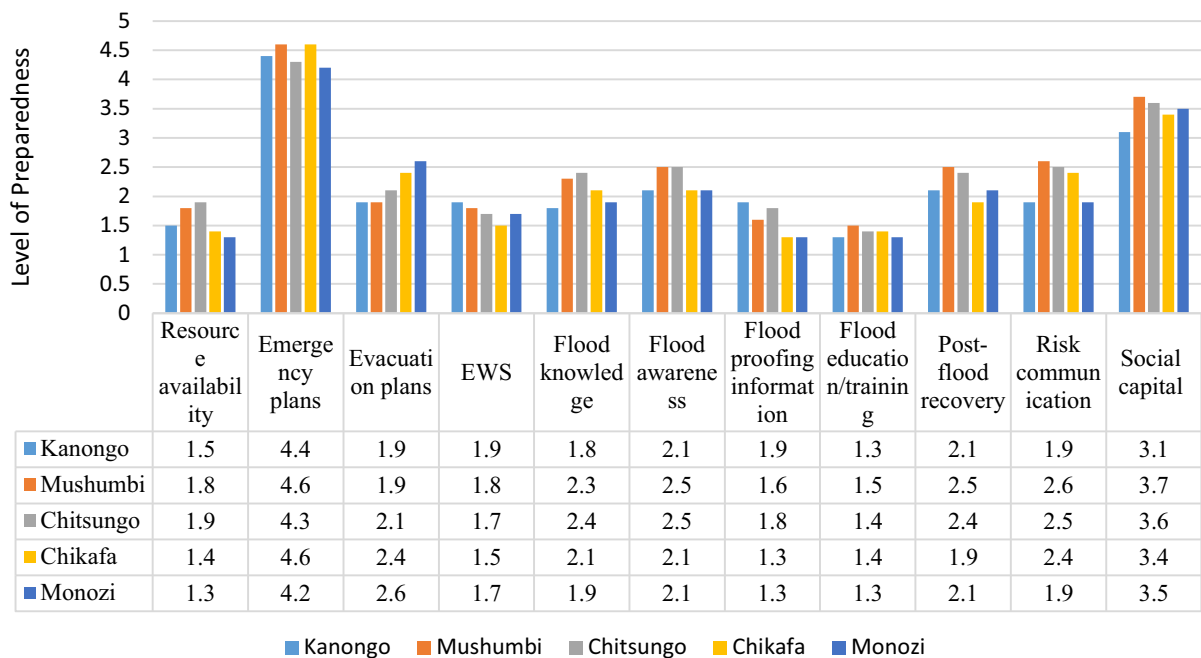
[a]Rotation converged in 8 iterations

Fig. 2 Weighted Mean values of the 11 preparedness indicators of the riparian communities. NB: 1 = absent; 2 = incipient; 3 = improving but not fully instituted; 4 = satisfactory; and 5 = excellent/fully adopted

	Resource availability	Emergency plans	Evacuation plans	EWS	Flood knowledge	Flood awareness	Flood proofing information	Flood education/training	Post-flood recovery	Risk communication	Social capital
■ Kanongo	1.5	4.4	1.9	1.9	1.8	2.1	1.9	1.3	2.1	1.9	3.1
■ Mushumbi	1.8	4.6	1.9	1.8	2.3	2.5	1.6	1.5	2.5	2.6	3.7
■ Chitsungo	1.9	4.3	2.1	1.7	2.4	2.5	1.8	1.4	2.4	2.5	3.6
■ Chikafa	1.4	4.6	2.4	1.5	2.1	2.1	1.3	1.4	1.9	2.4	3.4
■ Monozi	1.3	4.2	2.6	1.7	1.9	2.1	1.3	1.3	2.1	1.9	3.5

including emergency kits, financial and other materials were the major challenge facing riparian communities in Mbire. Another need is the development of safe zones that save as evacuation centres. Focus groups revealed that the communities use isolated open spaces as evacuation centres. Such places are on relatively high ground far away from riverbanks. The major challenge with such zones is the lack of shelter, water, hygiene and sanitation infrastructure. Focus groups also reported that the safe zones pose risk to snake bites, malaria and other gastro-intestinal tract infections. The communities also need assistance in developing proper evacuation plans and routes to established assembly points. The number of community members trained in first aid or search and rescue is also very low. The existing volunteers for flood response need upscalling to strengthen technical capacities to ensure rapid and effective flood response including access to safe shelter, food and NFI.

The EWS variables need improvements so that the riparian communities can access flood alerts in time. FGD explained that the communities have no capacity to monitor flood levels on their own. The absence of flood maps and a general low level of flood knowledge among the communities compound this problem. FGD

identified four factors that lead to low level of flood knowledge. First, there is limited participation of the community in mock drills and flood awareness campaigns initiated by both government and NGOs. Second, the flood awareness campaigns do not reach the most vulnerable population groups such as the elderly, disabled and children. Third, the DRR committees are inactive or invisible in most communities. Fourth, very few community members received training in first aid and search and rescue. These factors contribute to the low levels of flood proofing information among the riparian communities. The construction of embankments, levees and other barriers that protect houses and fields is not fully embraced by the communities. Even the post recovery activities do not incorporate standard building codes that may promote the principle of building back better.

The underlying variables that were driving low levels flood preparedness were established through a factor analysis. Table 7 shows the results of the KN and VR that were used to identify the drivers of low preparedness among the riparian communities. The table also shows that the factor analysis distilled the original set of 38 flood preparedness variables into four components or driving factors. Only those

variables with high correlations were considered as drivers of each flood preparedness. Basing on the results shown in Table 7, four factors emerged as drivers of flood preparedness among the riparian communities: poverty, flood awareness, social capital and contigency planning.

Discussion

This study assessed the flood preparedness of five riparian communities in Mbire, Zimbabwe. The assessment used a weighted five-point Likert Scale to quantify 11 broad preparedness indicators and their 38 corresponding variables. The method involved selecting indicators and variables that were context-specific to the study area, but with the support of preparedness literature. The local communities made the selection. Once the indicators and variables were in place, the survey respondents stated the extent to which they agreed with or adopted the variable measures on a scale of 1–5. In this way, the method improved the precision in measuring the level of preparedness. The involvement of the communities in this assessment revealed the specific capacity needs of riparian communities. Similar assessment were conducted by Henceroth et al. (2015) who found many benefits that helped Asian cities in building disaster resilience. The engagement of locals has also been seen to foster community resilience in European countries and New Zealand (Cretney 2018; Mees et al. 2016). However, the approach has one limitation: it is difficult to determine contextual variables in order to objectively measure flood preparedness.

The findings revealed that the riparian communities are far from contributing to the outcomes of the SFDRR. To be more specific, the four priorities for action (understanding disaster risk; strengthening disaster risk governance to manage risk; investing in DRR for resilience; and enhancing disaster preparedness for effective response) of the SFDRR are yet to be fully embraced at the local level. The riparian communities do not have the full knowledge of the flood risk dimensions including flood mapping and monitoring mechanisms. As a result, they have not fully designed appropriate structural and non-structural flood preparedness measures. Structural measures like sandbags, dykes, diversion of floodwaters and embankments may prevent water from destroying

their dwellings as argued firmly by Vávra et al. (2017). However, this approach requires large capital investment, which is beyond the capacities of riparian communities not only in Mbire, but also in most developing countries. Furthermore, flood defence may not be the best solution for riparian communities because it may shift the problem. Research has shown that flood waters can exceed the defence structures (Henstra et al. 2019). In view of this, many countries including the US, Canada and those in the European Union are emphasising on flood risk management (FRM) instead of flood defence (Vávra et al. 2017). The riparian communities in Mbire can opt for FRM, a strategic framework that involves reducing flood impacts through engaging various stakeholders, coordinating risk reduction efforts across sectors, levels and scales, and implementing a diversity of strategies to reduce and manage the related impacts (Henstra et al. 2019). FRM is anchored on sharing responsibility among the local stakeholders who may include the poor riparian communities and their business people. During the preparedness period, some stakeholders may run programmes that build livelihood assets, improve community production and incomes, and enhance preparedness and risk coping strategies. Therefore, the task of preparing for floods in riparian communities needs a collective approach. Vávra et al. (2017) firmly posit that FRM has two key advantages. First, it may spread the cost of risk reduction measures among the stakeholders. Second, it may create an incentive for communities to prepare for flood risk and recovery.

The riparian communities can also innovate non-structural flood preparedness measures as enshrined in the SFDRR. These include strengthening community-centred flood forecasting and warning systems, flood risk communication and monitoring mechanisms as argued by Ali et al. (2019). Improving EWS includes using improved methods of disseminating warnings as well as increased warning time (Alias et al. 2019). Flood warnings that have a minimum of 3-day lead-time can enable at risk communities to take action well before the arrival of the floods. The warnings need to be simple and of low-cost but with broad release channels. The development and strengthening of such systems require a participatory approach that may enable tailor making the system to the needs and capacities of riparian communities.

Riparian communities in Mbire live in unsafe places and structures. Some of the communities even refuse to evacuate and relocate from the unsafe places. Identifying communities who deny evacuation and relocation orders is important for future flood awareness and training (Alias et al. 2019). However, limiting settlements in flood-prone areas is not only a problem among the riparian communities of Mbire. Rather, the problem even exist in advanced nations (Vávra et al. 2017). The difference is that some authorities ensure that all the buildings adhere to laid down structural designs so that they do not easily succumb to floods. The engineering science has brought in flood resistant designs. Again, this approach may be beyond the capacities of riparian communities in developing countries. In such situations, it may be reasonable to make space for water. This include relocation of communities from flood-prone areas or at least restriction on building in these areas (Ali et al. 2019).

Lack of local hydrological and weather stations make it impossible to forecast accurately the weather conditions as well as the river flow during the rainy seasons. Muhonda et al. (2014) observed many challenges associated with flood forecast in the mid-Zambezi Valley basin. Where forecasts are given through electronic media, some communities fail to access and interpret them. At times, the forecasts either do not reach the communities at risk or reach them in a technical language that leaves the communities with no decision to take. In an effort to deal with flood threats, the riparian communities turn to their social networks and relationships. In cases where accurate forecasts of extreme weather events are impossible, riparian communities tend to rely on local knowledge.

The major underlying factors of flood preparedness among the riparian communities in Mbire emerged as poverty, flood awareness, social capital and contigency planning. High poverty prevalence links closely with scarcity of resources, failure to access EWS and poor flood proofing information. Consequently, this reduces the capacity of riparian communities to undertake flood preparedness effectively. On the other hand, limited participation of the community in flood awareness has contributed to limited flood knowledge and contigency planning, and inability to access flood alerts. On the contrary, high social capital is enabling the communities to live in the low-lying flood plains despite the flood risk. Social capital can influence the

preparedness of place-based communities who suffer impacts of floods (Mcguinness and Johnson 2014). Leveraging social capital can contribute to reaching-out at-risk communities with flood alerts and knowledge. The social capital can have both bonding and bridging effects among the communities. On the one hand, the bonding effect strengthens memories about past flood events and the sharing of experiences of reacting to them. Bridging effect, on the other hand, helps to link different communities with different social backgrounds (Dzialek et al. 2016). Unfortunately, many authorities usually ignore the role of social capital in disaster preparedness.

Conclusion and policy implications

Floods affect the riparian communities with varying magnitudes and frequency every year. Therefore, this study assessed the preparedness of such communities in Mbire district, Zimbabwe. Although levels of preparedness vary from one community to another, this study concluded that all the riparian communities are unprepared for flood disasters in many respects. Key areas that need capacity building in order to improve communities' flood preparedness include the stockpiling of emergency resources, evacuation planning, EWS, flood awareness and knowledge, flood education and training, risk communication, flood proofing information, and post-flood recovery including rehabilitation and reconstruction..

This assessment of flood preparedness is a good step towards flood risk reduction in Mbire district. The methodology used enabled the quantification of flood preparedness on a scale of 1–5 and based on broad indicators and specific variables. In this way, the study established the capacities and limitations of the riparian communities in reducing flood risk and losses. It concludes that measuring flood preparedness of riparian communities require context-specific variables. The assessment was also undertaken as a way of forming a knowledge base for building flood resilience among riparian communities. A thorough understanding of preparedness variables will assist in the design of appropriate context-specific flood risk reduction strategies.

The study therefore suggest four policy recommendations to improve flood preparedness among riparian communties. First, the riaprian communities need to

enhance their capacities for resource mobilisation in orde to improve contigency planning and flood proofing. This will require reducing poverty levels among the communities. Second, access to local hydrological and weather forecasts will enable riparian communties to monitor flood water levels and develop accurate and context-specifc EWS.This may also increase the participation of communities in flood awareness campaigns. Third, there is need to assist reparian communities to develop sustainable community FRM programmes. FRM emphasise on sharing both responsibility and the costs of reducing the flood risk among the locals. Therefore, FRM should be strengthened at the community level. This is because preparing for flood disasters needs a collective approach. The local stakeholders may run different programmes that enhance flood preparedness and risk coping strategies. Fourth, riparian communities need to embrace and strengthen non-structural flood preparedness measures because they are relatively cheap. Most structural flood preparedness measures call for large capital investment, which, most riparian communities cannot afford. Where funding is available, low-cost appropriate structural designs to flood risk reductiom, may be considered.

The study has provided a body of knowledge to reflect on the attainment of SFDRR priorities for action. Apart from the riparian communities under study, the findings are useful for both national and subnational governments who are mandated to formulate and implement appropriate flood disaster policies and plans not only in Mbire district, but also in other countries where floods are a problem.

Compliance with ethical standards

Conflict of interest We hereby declare that there is no conflict of interest whatsoever related to this submitted manuscript.

Human and animal rights There has been no involvement of animals in this research. The human participants involved were requested their consent prior to the research undertaking.

Informed consent The Human participation in this research was in form of responding to household questionnaires and focus group discussions. However the involved participants were aged eighteen years and above and prior their involvement their consent was requested.

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