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Socio-economic impacts of climate change on indigenous communities in the save valley area of Chipinge district, Zimbabwe

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In recent years, climate change has fast become a reality that warrants concerted action from stakeholders across fields. Communities in the Save Valley Area of Chipinge District of Manicaland Province in Zimbabwe, for example, report high incidences of socio-economic disruptions caused by climate change. These include loss of livelihoods, livestock, crops, food stocks and infrastructure damage. This study investigated the coping mechanisms adopted by communities in the Save Valley Area in their attempt to mitigate the socio-economic vagaries of climate change. In order to understand community perceptions regarding the possible link between climate change and the increased frequency and intensity of flooding incidences and to evaluate the evolution of community disaster risk management and resilience building as a function of changing climatic realities, the study employed the mixed method research design. Resettled farming households in the Middle Sabi, communal farming households in Chibuwe and Tongogara areas and members of the Chipinge District Development Committee were sampled for this study. Questionnaires, transact walks, structured interviews and focus group discussions were the main data collection methods utilized. Quantitative data entry was done via the Statistical Package for Social Sciences (SPSS) software. Qualitative data was coded and analyzed thematically. Findings revealed that climate change has heightened community vulnerability, weakened their adaptive capacities, as well as disrupting the community resilience-building initiatives. In turn, communities have made attempts to respond to the challenges arising from climate change by modifying their socio-economic activities, organizing themselves internally and reverting to the use of indigenous knowledge based interventions.

KEYWORDS

build back better, climate change, coping mechanism/strategies, disaster risk reduction, flood, resilience, save valley, vulnerability

1. Introduction

Climate change poses threats and dangers to the survival of indigenous communities worldwide, even though indigenous peoples contribute the least to greenhouse emissions. Indigenous peoples are vital to, and active in, the many ecosystems that inhabit their lands and territories and may therefore help enhance the resilience of these ecosystems. In addition, indigenous peoples interpret and react to the impacts of climate change in

creative ways, drawing on traditional knowledge and other technologies to find solutions, which may help society to cope with impending changes (United Nations Department of Economic Affairs, 2008). Climate change, in the sense of altered long-term changes in the average state of the atmosphere, is already occurring in Zimbabwe (Brazier, 2015). Across much of Zimbabwe, increases in average temperatures of 0.5–1 degrees Celsius have been recorded over the last century (Zimbabwe Climate Smart Agriculture Framework, 2018–2028). The total amount of rainfall received during a rainy season has decreased by about 5% since 1900. October, the first month of the rainy season is receiving more rainfall than average while, January and March, are receiving less than average rainfall.

Droughts and floods have increased in frequency—and intensity—since 1990, often occurring back to back with a flood year immediately following a drought year (Brazier, 2015). More than 70% of Zimbabwe's population lives in rural areas where crop and livestock farming are the dominant economic activities (UNDP, 2017; Zimbabwe Climate Smart Agriculture Framework, 2018–2028). The sector is characterized by low inputs—low output, climate sensitive rain-fed systems, particularly among the smallholder farmers (Zimbabwe Climate Smart Agriculture Framework, 2018–2028) in which bracket the vast majority of Zimbabwe's indigenous population falls. Climate change is already inducing alterations in rainfall patterns, and more severe and frequent extreme weather events such as droughts and flooding that threaten to deepen the challenges already faced by millions of farming households across the country (Zimbabwe Climate Smart Agriculture Framework, 2018–2028).

Zimbabwe is ranked ninth out of sixteen countries categorized as being extremely vulnerable to climate change and characterized by high levels of poverty, dense populations, exposure to climate related events, and reliance on flood and drought prone agricultural land (UNDP, 2017). The implication is that Zimbabwe should prioritize climate change and introduce mitigation and adaptation programs in order to build resilience across all sectors (UNDP, 2017). The foregoing is a priority issue for most of the country's indigenous communities, living within the delicate balance between maintaining consistent livelihoods and falling into poverty. Often a shift in any of the components that make up their economies -such as climate- may lead to widespread loss of livelihoods and compromise community resilience. In this regard, adaptation and resilience building are crucial in stabilizing affected indigenous economies and climate proofing them.

This study makes use of resilience theory and hinges on an integrated systems approach toward holistic climate action in indigenous communities. It builds on the disaster risk reduction experiences of the indigenous communities in the Save Valley area of Chipinge District as they grapple with the challenge of climate change induced flooding. It seeks to highlight the socio-economic impacts of climate change in their communities, and the evolution of their roles in climate change action over time. This study is a contribution to the national climate change mainstreaming process. It was informed by the fact that while Zimbabwe has been active in climate actions at international and local level and is signatory to international instruments supporting the rights of indigenous peoples; the voices of indigenous communities who make up the bulk of the population most affected by climate change have often been neglected in formulating climate policies and developing interventions. Their roles have hitherto been mostly limited to those of passive recipients of top-down climate policy initiatives, rather than active collaborators.

While studies have previously been conducted on the impacts of climate change and its associated phenomena on indigenous communities in Zimbabwe and their responses (Bosongo, 2011; Mavhura et al., 2013; Chanza, 2015; Jiri et al., 2015; Mugambiwa, 2018; Mavhura and Mushure, 2019; Manyangadze et al., 2022), the high-priority nature of the national climate change mainstreaming programme, meant that this study was unique in a number of ways. It directly influenced the on-boarding and prioritization of indigenous knowledge systems within the climate change domain at national policy level and directly opened pathways by which the role of indigenous communities can be enhanced from being passive victims of climate change to active initiators of impactful national level climate actions[1]. In addition, it provided a pragmatic vehicle for the appreciation of the role of indigenous communities in climate actions that was devoid of the often rose-tinted framing of indigenous methods as being the elixir of all modern evils. Instead, the study sought to provide a balanced perspective between the struggles that indigenous communities face due to climate change and the victories that they have gained through their responses and actions. The use of floods as the central entry-point in interrogating the effects of climate change in the Save Valley was important in three ways. Floods are among the most destructive, climate change related disasters. They are the primary source of risk to agriculture in terms of production loss and food shortage (Mondal, 2019) of which these communities heavily rely on agriculture for their livelihoods. They are one of the foremost risks faced by communities in the Save Valley and their frequency and intensity has increased in recent years. Consequently, post disaster recovery actions in these communities can give important insights regarding their adaptive capacities and ability to build back better in the wake of such extreme climate change related phenomena. This knowledge provides critical data driven entry-points for effective future interventions.

2. Climate change, disaster risk reduction, and indigenous livelihoods

Inasmuch as there has been some reluctance, with good reason to concretize a single definition of what constitutes indigenous peoples; the United Nations Commission on Human Rights (1971) working definition of indigenous communities, peoples and nations is that they are those which,

> *…having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now*

1 The study led to the incorporation of community inputs and the onboarding of indigenous knowledge systems into the Manicaland Provincial Climate Change Plan 2021-2025 as well as into the Provincial National Development Strategy (NDS1) 2021-2025.

prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system (United Nations Commission on Human Rights, 1971, as cited by Tabrlzi, 2021).

While aspects of the above definition apply to indigenous communities in Zimbabwe, it is not entirely in keeping with the Zimbabwean understanding and definition of indigenous communities. Chibememe et al. (2014) write that the term "indigenous" does not have the same definition in Zimbabwe as it does in international law as the country considers all people of southern African descent whose predecessors were in the country prior to 1890 as indigenous Zimbabweans. They note that while the Constitution of Zimbabwe does not provide a definition in its use of the term "indigenous"; Statutory Instrument 61 of 2009 defines indigenous peoples as "a community of persons that has inhabited Zimbabwe continuously since before the year 1890 and whose members share the same language or dialect or the same cultural values, traditions or customs." This study adopts the aforementioned Zimbabwean definition of indigenous communities. The predominant indigenous group in the study area are the Ndau people; but other indigenous groups of people have also settled in the area.

In recent years, a wealth of data on how indigenous peoples have been affected by climate change and its related phenomena has been generated globally. Bayrak et al. (2020), present a bibliometric analysis and literature review of both domestic and international studies on Taiwan's Indigenous peoples in relation to resilience, climate change, and climate shocks in the 10-year period after Typhoon Morakot that took place in the year 2009. They identified 111 domestic and international peer-reviewed articles and analyzed their presentation of the current state of knowledge, geographical and temporal characteristics, and Indigenous representation. They noted that most studies focused on post-disaster recovery, particularly within the context of Typhoon Morakot, as well as Indigenous cultures, ecological wisdom, and community development. Their study found out that relatively few studies investigated how "traditional ecological knowledge systems can be integrated into climate change adaptation…" and that there was relatively limited engagement with contemporary studies on Indigenous peoples and climate change.

Lee and Chen (2021) also write about disaster recovery and explore how the Tayal people in the Wulai tribes located in the typhoon disaster areas along the Nanshi river use their indigenous knowledge to build resilience. They apply empirical analysis from secondary data on disaster relief and in-depth interviews, to demonstrate how indigenous people's endogenous actions helped during post-disaster reconstructing. Tabrlzi (2021) writes that most indigenous people living in geographically high-risk areas suffer vulnerabilities to the risks of climate change and that climate events contribute to the occurrence of disasters, and the combination of environmental hazard and vulnerability exposes indigenous (people) to potentially dangerous settings. The risk is not only in terms of vulnerability to disasters but for indigenous communities, climate change can result in loss of cultural identity through loss of place and ways of life. For many indigenous communities, culture and cultural identity are emergent from landscape and based on relationships of reciprocity with animals, plants, fungi, and ecosystems (Norton-Smith et al., 2016).

Norton-Smith et al. (2016) write that the impacts of climate change occur within a web of historical and contemporary oppressions, diverse political and legal statuses, and limited economic resources. They argue that Indigenous vulnerability and resilience to climate change cannot be detached from the context of colonialism, which created both the economic conditions for anthropogenic climate change and the social conditions that limit indigenous resistance and resilience capacity. The Intergovernmental Panel for Climate Change – IPCC (2022) supports this assertion, noting that; "Present development challenges causing high vulnerability are influenced by historical and ongoing patterns of inequity such as colonialism, especially for many indigenous peoples and local communities. Officials and scientists from around the globe now recognize the significant role colonialism has played in heating our planet and destroying its many gifts." Understanding how indigenous communities respond to climate change and its associated phenomena within the context of colonial legacies, climate imperialism, and climate justice is therefore crucial.

With climate change comes an increase in associated extreme weather phenomena and disasters. Globally, disasters are increasing in frequency and intensity resulting in loss of life, damage to property, affecting the functioning of ecological natural systems, altering the distributions of flora and fauna, negatively affecting food security, and contributing to high levels of poverty (Altizer et al., 2013; IPCC, 2014). The number of people at risk has been growing each year and the majority are in developing countries with high poverty levels making them more vulnerable to disasters (Living with Risk 2006, p. 6; Pecl et al., 2017). Floods are amongst the most devastating natural disasters in the world, and in Zimbabwe, they are often unforeseen and serious, causing massive damage, and may bring injury and death in the worst cases. This is of major humanitarian concern and poses a threat to the achievement of Sustainable Development Goals (Pecl et al., 2017). Global indicators show that the number of losses and deaths from flooding has increased in many parts of the world. From 1995 to 2015, floods killed more than 157,000 people and affected over 2.3 billion worldwide (UNISDR C., 2015; Gotham et al., 2018). The socio-economic losses caused by floods are also increasing. Exacerbating matters is the fact that floods are the primary source of risk to agriculture in terms of production loss and food shortage (Mondal, 2019). This is of particular significance for Zimbabwe where 70% of the population lives in the rural sector and primarily depend on agriculture for their livelihoods (UNDP, 2017).

Post disaster recovery is defined by the International Strategy for Disaster Reduction (ISDR) as: "decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community while

encouraging and facilitating necessary adjustments to reduce disaster risk" (UNISDR U., 2015). In a post disaster period, households adopt different coping strategies including temporary migration, sale of assets, livestock, or labor, living on charity, and receiving emergency support from the government and well-wishers (Mavhura et al., 2013). It is important to note that there is no single defined standard for coping strategies. It varies depending on socio-cultural factors. Coping strategies vary by region, community, social group, household, gender, age, situation, season and time period. Previous experiences also deeply influence these strategies (Blaikie, 1994; Davis, 1996). Coping strategies do not lessen vulnerability; however, understanding the rationale behind coping behaviors might help in the effective targeting of those who are at their greatest risk. Successful coping may assist households to recover from the impact of a disaster.

Apart from that, when coping strategies turn ineffective, households face difficulties in recovering from a disaster. That said, impact severity may vary across households and most often poor people, who have limited coping capacities, bear the greatest risks (Shoji, 2008). Studies reveal that the adoption of a particular set of coping strategies depends on several factors, including socio-economic factors, types of shocks, severity of the event, physical location, ability to recover and information on opportunities (Davis, 1996; Balgah et al., 2019). Nevertheless, flood risk not only depends on the hazard, exposure and current level of vulnerability but also the capacity of a household to recover from the flood's impact (Mavhura et al., 2013). An understanding of why a community chooses particular coping strategies and whether these strategies help them recover from the disaster can guide policymakers in promoting effective flood risk management. Over and above this, it allows for vital pathways toward inculcating an understanding of the economics of climate change at the local level and the importance of community participation in the conception and implementation of integrated approaches in combatting climate change.

3. Theoretical framework

This study employs resilience theory as its primary analytical framework. The theory gained traction in the late 1980s having its roots in the study of adversity and an interest in how adverse life experiences impact harmfully on people. It concerns itself with the mediating processes that enable systems to achieve better-than-expected outcomes in the face or wake of adversity (Van Breda, 2018). Resilience theory categorizes resilience as a multisystemic phenomenon that can occur across the life span in addition to being a complex, dynamic biopsychosocial/spiritual process dependent on life context (Stewart et al., 1997 as cited in Greene et al., 2004). It celebrates indigenous knowledge, and, is useful in acquiring data on local knowledge, and practices vital in aiding communities to withstand adverse occurrences such as climate change induced phenomena. Van Breda (2018) contends that resilience theory is well placed to guide researchers in identifying a full spectrum of resilience resources that contribute to human flourishing. Resilience is a critical component of climate action and is particularly important in discourses addressing its impacts on indigenous peoples and their role in the implementation of effective climate actions.

4. Materials and methods

4.1. Background to study area

Save Valley is a low lying area with a general altitude of about 400 m above sea level which is located from the Birchenough Bridge up the confluence with Runde River to the border with Mozambique. It is located on Tanganda Halt 2032A2, Rupise 2032A4, Chibunje 2032C2 and Chisumbanje 2032C3 on the 1:5000 Surveyor General Maps series. In the Save Valley are Middle Sabi Irrigation Scheme, Tongogara Refugee Camp, Chibuwe Irrigation Scheme, Checheche Growth Point and Chisumbanje Irrigation Scheme.

It is important to note that the Middle Sabi, Tongogara and Chibuwe Irrigation Scheme are extremely prone to flood hazards and lie on the flood hazard red belt. The area also lies within the cyclone and windstorm corridor. Additionally, the Chipinge District Development Committee and Civil Protection Units have reported increases in the frequency of earth tremors in the District adding new dimensions to existing challenges. Figure 1 shows the location of the research area in the map of Chipinge District.

4.2. Soils and climate

The valley generally has alluvial soils with deep grayish-brown sandy loams and clay loams over brown sandy clay loams or sandy clays. The climatic conditions in the Save Valley are classified as tropical continental with mean average temperatures of over 21 degrees celsius. The summers are very hot and winters are cool with rainfall averaging ~508 mm per annum. Frosts are rare, although in winter months very wide diurnal ranges of temperatures occur. The climate is suited to the production of a very wide range of food and fiber crops (Government of Rhodesia, 1974). The rainfall season of the catchment, as is of the country, stretches from October to April with most of the rainfall being received in February. The period from May to September is typically dry with very little or no rainfall being received (River System Outline Plan, 2005). Due to shifts in the climate, there has been notable delays in the onset of the rain season, intra-season variabilities and intra-seasonal dry spells (Zimbabwe Meteorological Services Department, 2021).

4.3. Hydrology

The Save Valley lies in the Lower Save East Sub-Catchment which is in the lower parts of the Save Catchment. The primary source of water for the Save Valley area is underground water and

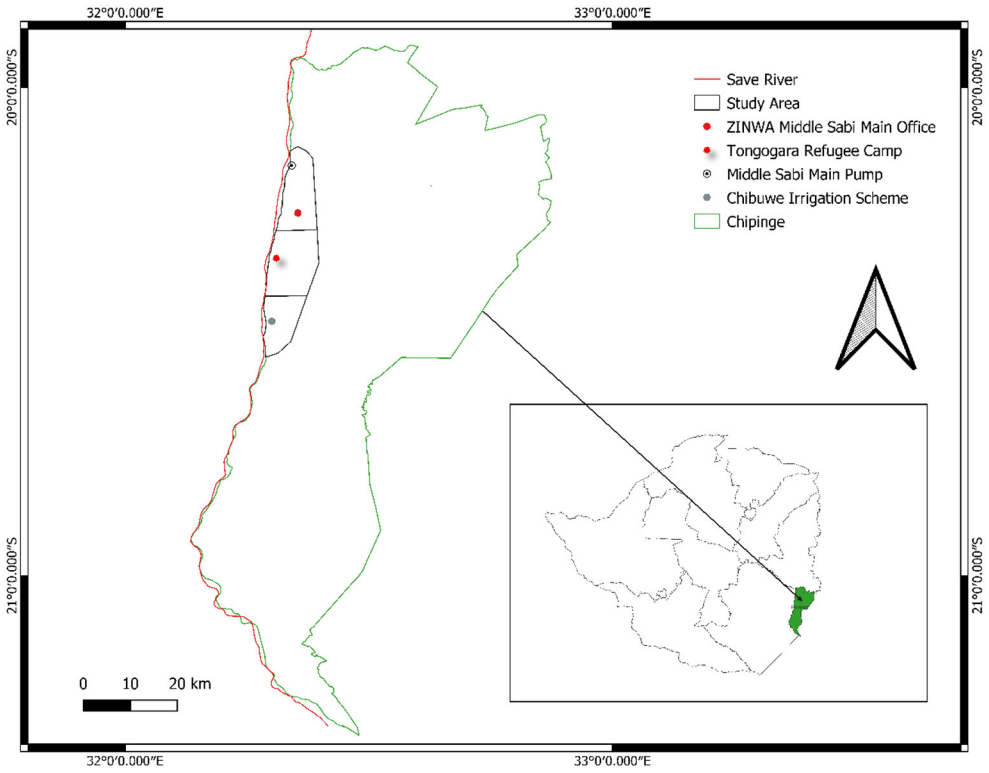

FIGURE 1
Map showing location of Middle Sabi, Tongogara and Chibuwe: courtesy of the authors.

the Save River and its tributaries. The Save River emerges near Featherstone, about 65 km South-West of Marondera, at an altitude of ~1,450 m above sea level in a 600 mm to 700 mm rainfall area.

The Save river flows South-Eastwards for approximately half of its 400 km length and then Southwards before it joins the Runde River at an altitude of about 160 m above sea level, and enters Mozambique. Up to its confluence with the Runde River, the Save drains a catchment area of some 43,494 square km in which the average rainfall varies from over 1,200 mm per annum at the headwaters of the Odzi and Odzani Rivers to 300–400 mm in the lower Save area.

The main tributaries of the Save River are:

(i) In its upper reaches, the Ruzawi river which drains a catchment area of 2,137 square kilometers;
(ii) In its middle reaches, the Macheke and Mwerihari rivers which drain catchment areas of 4,316 and 2,587 square kilometres, respectively;
(iii) The Odzi and Devure rivers, which join the main river above the mid and lower Save plain, and which drain catchment areas of 7,333 and 8,224 square kilometres, respectively;

All the major tributaries have dams on their upstream, which are Ruti, Osborne, Siya, Marovanyati, Muchekeranwa and Rusape. Apart from adding to the Save Valley's water security, these dams serve as reservoirs for capturing flood waters thereby reducing flood intensity and impacts.

Chipinge District in which the study area is situated is located in the highly flood prone Province of Manicaland. Nearly half of the losses incurred in Zimbabwe after cyclone Idai in 2019 were in Chipinge and Chimanimani Districts. Up to 90% of the losses were in the transport (USD163.8 million)-—634 kilometers of road infrastructure was damaged—agriculture (USD155.3 million) and housing (USD131.5 million) sectors (Impact, 2019).

Out of 17,000 households that were displaced, 3,000 were in Chipinge, 25,300 refugees and host community persons surrounding Tongogara Refugee Camp were equally affected. Forty-nine percentage of the structures of the camp were destroyed. Twenty-four thousand hectares of food and cash crops were damaged in Chipinge resulting in 37% of the rural households in the District requiring urgent food relief. Seventeen percentage of a herd of 257,309 livestock in Chipinge was decimated (Impact, 2019). This was all on the backdrop of several livelihood losses in the region due to El Nino induced droughts. The toll on the livelihoods of indigenous communities is very high; affecting their economic wellbeing, family unity and community cohesion.

5. Methodological approach, sampling and data collection

Conducted in May 2021, the study employed the mixed method research design. Resettled farming households in Middle Sabi and communal farming households in Chibuwe and Tongogara as well as members of the Chipinge District Development Committee

and Civil Protection Unit, were sampled for this study. These were drawn from the same socio-economic stratum located in the same geographical area of Save Valley, and occupying the same agro-climatic environment to best maximize comparability across the different land tenure conditions. Questionnaires, transact walks, structured interviews, and focus groups were the main data collection methods utilized. Quantitative data entry and analysis was done via the Statistical Package for Social Sciences (SPSS) software while qualitative data was coded and analyzed thematically.

Seventy-five (75) households from the study area were randomly sampled and interviewed. Of these, 47 were communal farmers with the remaining 28 representing resettled farmers. Time limitations and other logistical complications influenced the number of households selected for the study. Triangulation, in the form of key-informant interviews (KII) as well as focus groups (FGDs) was done to augment the household questionnaires. Thirty-four (34) experts- and officials from the District Development Committee and Civil Protection Unit were selected for structured key informant interviews. In addition to a structured questionnaire survey, four focus groups of twelve individuals each (12) were organized allowing individuals from diverse backgrounds to participate and share their flood-related experiences, coping mechanisms, and the economic implications thereof in light of climate change. Care was taken to ensure as much inclusivity as possible in the discussions. Transact walks provided a clearer understanding of the flooding situation vis a vis land use planning, environmental management, and the effects of climate change, the challenges faced by affected communities, what informs their coping mechanisms, and the available opportunities for strengthening community adaptive capacities and resilience building. Heads of households and principal farmers were the primary respondents with 56% of them being female persons ranging from the ages of 30 to 58 years. There was a 100% return on questionnaires and responses from key informants and focus groups. To ensure optimum participation where necessary, as was the case at Chibuwe Village, male and female participants were interviewed in different focus groups to foster openness and full participation. The approach proved to be very effective as it allowed women to express themselves fully without fear of male censure. Comparisons of findings from both male and female respondents showed a high level of similarities in the information availed.

Of the 75 respondents, 56% were female and 44% male. Study findings helped to situate and contextualize the higher female-to-male participation ratio, showing that the brunt of climate change induced disasters such as flooding and the immediate and long-term post disaster recovery especially in terms of family cohesion and economic wellbeing is largely shouldered by women.

Twenty-one percentage of respondents were <29 years old, 26% were between the ages of 30–39 years old, 13% were 40–49 years old and 40% were 50 years old and above. The majority of the respondents fell in the above 50 years age bracket allowing for higher quality returns on requested data based on their experiences. Age composition was vital in ensuring that participants were old enough to understand the relationship between climate change, flooding, and their local economies.

The duration of time each participant had been domiciled in the Save Valley was used in order to determine their suitability for the study. 66.7% of the respondents had spent over 16 years in Save Valley, 13.3% had spent between 11 and 15 years, 13.3% between 5 and 10 years and 6.7% < 5 years in the area. Most of the participants had lived long enough in the Save Valley area to provide credible data in line with the focus of the study. Table 1 shows a summary of the key guiding questions that were used in this research.

6. Results

6.1. Community perceptions of climate change and its link to flooding

Respondents at all study sites held a unified consensus that climate change was a challenge of note in the Save Valley. They reported noticeable increases in average seasonal temperatures, delays in the onset of the rain season, alterations in the intra-season rainfall distribution and intensity and increasing intra-season dry spells. They cited losses in biodiversity over time because of perceived increasing aridity due to climate change and anthropogenic activities. They attributed the increased frequency and intensity of extreme weather events such as cyclones and violent windstorms to climate change averring that the frequency and intensity of flooding incidences in their localities was partly due to climate change and its extreme weather phenomena. Respondents at Tongogara revealed that between the year 2000 when Cyclone Eline hit and 2021, they had experienced six major flood related incidences of varying magnitudes in the years 2000, 2008, 2015, 2019, 2020, and 2021. In Middle Sabi and Chibuwe Irrigation Scheme, respondents noted that in the last 5 years three major flood incidences had occurred in addition to smaller ones. Ninety-six percentage of respondents reported having experienced flooding, whereas the remaining 4% of the respondents indicated that they had not experienced any flooding. The responses corresponded with information in the Manicaland Province Disaster Risk Reduction Plan (2020), which indicates that 70% of the provincial population is under the risk of flooding compared to all other disasters threatening the province.

Respondents cited location and terrain as key contributors to flood risk in all the target communities. Middle Sabi Station is located within the Save River Basin as is Tongogara. Chibuwe Irrigation Scheme and its surrounding territory is on flat terrain, which does not allow floodwater to flow but to rise rapidly. The only floodwater outlet in the area is the Dakati river which drains into the Save river and has a narrow relatively shallow channel. Community members in Middle Sabi reported that unplanned and unauthorized settlements were contributory factors to the problem of flooding as some of the newly resettled families and their livestock tended to destroy contour ridges and dykes built by the communities to channel some of the floodwaters. Deforestation and stream bank cultivation featured as top contributors to the worsening of the flood situation in Middle Sabi and at Tongogara through their contribution to uncontrolled run-off, soil erosion and siltation of rivers. In Chibuwe, soil erosion and silt deposition in the Save River due to the activities of communities upstream were some of the factors exacerbating the problem of flooding. At Tongogara, charcoal-making initiatives initially learnt from nationals from the Great Lakes Region who are domiciled in the Refugee Camp

TABLE 1 Key guiding questions.

Research component	Key guiding questions	Target group	Number of participants
Focus Group discussions	What are the main sources of income and types of livelihoods in your community? How has climate variability influenced the frequency and intensity of floods in your community and what is the impact on the livelihoods in your community? Which demographic groups in the community are affected the most by the impacts of climate change induced flooding hazards? Why are they the most affected and how? How do community members cope with the social and economic impacts of floods? Are the mechanisms that they use to cope with these impacts effective? Do you think the community has the necessary information and/ or resources to be ready for flooding? If not, what additional information and/resources do you feel the community needs? What disaster risk reduction projects if any are being implemented in your community and who are the primary initiators, funders and implementers?	Community leaders and key selected people	48 (4 groups × 12 participants each)
Structured interviews	What are the main sources of income and types of livelihoods in the district/community? How has climate variability influenced the frequency and intensity of floods in the Save Valley? What is the impact on the livelihoods of communities living in the area? Which demographic groups in the community are affected the most by the impacts of climate change induced flooding hazards? Why are they the most affected and how? Is there a disaster management plan (or equivalent) in your district? If yes, do the community members know about it and are they engaged in implementing it? What activities does the DRM Committee engage in during flooding disasters? Does the Disaster management committee manage a budget? If yes, how is this budget used? Does the committee engage in disaster risk reduction projects? If yes, what disaster risk reduction mitigation projects are currently planned, ongoing or have been completed over the last 2 years. Does our District/community have any of the following? If yes how efficient or effective are they? a. A response team for disaster emergencies: { }yes { } no { } don't know b. A system to alert in the event of an disaster emergency (siren, flags, whistles): { } yes { } no { } don't know c. A ward disaster coordination committee: { } yes { } no { } don't know d. Evacuation centers and routes marked: { } yes { } no { } don't know e. Meeting point / safe area identified as such: { } yes { } no { } don't know f. A shelter for emergencies: { } yes { } no { } don't know Has anyone from your committee/community participated in any of the following activities? a. First Aid training: { } yes { } no { } don't know b. Disaster simulation drill or Evacuation exercise: { } yes { } no { } don't know c. Disaster preparedness meeting: { } yes { } no { } don't know d. Community event focused on disaster preparedness: { } yes { } no { } don't know e. Household visit of a volunteer on disaster preparedness: { } yes { } no { } don't know Who is most likely to provide you with assistance in the event of a disaster? { } Government agencies { } Private sector / businesses { } Religious groups { } NGOs { } The Red Cross { } Neighbors { } Community committee / response team { } Others – please indicate { } No one What is your organization doing to assist people to strengthen and facilitate community adaptation/coping processes? How is the Government facilitating the strengthening of community adaptation/coping processes?	District Development Committee members inclusive of Agricultural Extension Officers and Meteorological Services Department, District Civil Protection Unit, Development Partners and NGO's Conducting climate change and Disaster Risk Reduction activities in the study areas	34
Questionnaires	Have you ever experienced flooding during your stay in your current community? If yes please indicate when these floods occurred and how often? Did you incur any loss to your crops/gardens? If yes which of these crops did you lose? { } maize { } pineapples { } bananas { } vegetables { } other – please indicate Did you incur any loss of livestock? If yes which of these livestock did you lose? { } Donkeys { } Cattle { } Goats { } Pigeons { } Chickens { }Turkeys { }Other – please indicate Did your livestock or crop suffer from any disease? If yes please name the diseases that affected your crops or livestock. How did the losses of crops and livestock affect your livelihood and how did you deal with this challenge? Where the measures you took to deal with these losses effective? If not why was this the case? Are you aware of any damage to infrastructure including homes/buildings/schools/roads? Do you ever get warnings prior to the occurrence of floods? If yes from whom and by what means? Have you ever received any form of assistance from organizations such as local government or NGOs after flooding has occurred? If yes which of these organizations have provided assistance in the past? { } Government agencies { } Private sector /businesses { } Religious groups { } NGOs { } The Red Cross { } Neighbors { } Community committee/response team { } Others – please indicate { } No one	Communal and Resettled farmers. Heads of Households	75

(Continued)

TABLE 1 (Continued)

Research component	Key guiding questions	Target group	Number of participants
	Do you think the community has the necessary information and/or resources to be ready for flooding? If not, what additional information and/resources do you feel the community needs? Do you have a ward disaster coordination committee and is it effective? Do you have evacuation centers and marked evacuation routes? Do you have a meeting point or an area identified as a safe place? Has anyone from the community participated in first aid training? Has anyone from the community participated in disaster simulation drill or evacuation exercise? Has anyone from the community participated in disaster preparedness meetings? Has anyone from the community participated in a community event focused on disaster preparedness? Would you relocate to an area less prone to flooding if given the option? If not why?		
Total participants			157

Source: Field Work (May 2021).

while functioning as an alternative revenue stream for the locals worsens deforestation.

6.2. Socio-economic impacts of climate change

The study revealed that floods damaged a substantial number of productive and non-productive assets in the study area. Eighty percentage of respondents reported incurring losses because of flooding while 10% did not incur any losses. Major losses incurred included maize crops, vegetable gardens, poultry, goats and cattle. 94.7% of the respondents reported incurring crop losses while 81.3% incurred livestock losses. Ninety-two percentage of respondents indicated that they were aware of significant infrastructure losses due to floods citing damaged homes, roads, irrigation infrastructure, public buildings such as clinics and schools, livestock pens and household food storage facilities as the major infrastructure losses.

In Chibuwe, respondents revealed that heavy silt depositions due to successive floods had diverted the Save River at irrigation blocks A, B, and C cutting off irrigation water. No viable short-term alternatives were available as the boreholes were also damaged. They advised that graders were required to desilt and redirect the river to resuscitate irrigation but the community was already struggling with the negative economic impact of the floods and were unable to hire one. Silt deposition from upstream anthropogenic activities compounds the situation. Respondents at Chibuwe reported that irrigation pumping equipment is always damaged due to floods and is often unreplaced over long periods due to the expensive nature of the required repairs.

At the time of this study, the communities were reeling from the effects of flooding and the burden of the COVID-19 pandemic. In addition to this, communal farmers in Chibuwe had their electricity supply disconnected for defaulting payment at a time when their bean and tomato crops were at delicate stages requiring optimum water supply. Given such dire circumstances, respondents reported facing considerable difficulties in trying to climate proof their local economies and bounce back from the associated disaster of flooding.

Respondents indicated that, the losses of maize crops, vegetable gardens and livestock assets such as cattle, goats, and pigeons had a detrimental impact on income, food security and nutrition, thus eroding community and household income and increasing their vulnerability. Destruction of infrastructure such as roads further hindered access to primary produce markets such as Chipinge Town and the City of Mutare. Women in Chibuwe cited road untrafficability as one of the major challenges they faced during and after flooding incidences. This had resulted in their failure to establish reliable clients for their produce due to their compromised reliability as suppliers. Moreover, they reported that their inability to directly deal with bulk buyers of their produce due to the exorbitant costs of transporting perishable goods on largely untrafficable roads had left them at the mercy of unscrupulous intermediaries who would buy their produce at very paltry prices knowing the women had no alternatives.

The majority of respondents in the study reported that they had not recovered from the flood-induced crop, livestock and asset losses and that it would take years to do so. This is because the recovery involves restocking which requires time and is difficult without adequate capital. Focus group discussants indicated that the communities needed assistance from the government and other development partners to create a proper framework and foundation to build back better, climate proof their local economies and become resilient.

The study revealed that climate change and related shocks like floods affect women and children significantly. During flooding incidences, children miss classes, as they often cannot access their schools until the floods subside. The 2020/2021 floods were particularly difficult for the community as they occurred during the COVID-19 pandemic with its attendant socio-economic implications. Children could not attend classes because their schools were functioning as evacuation centers. In Chibuwe respondents noted that children's livelihoods were negatively affected as their living conditions would not be conducive, nutrition compromised and school facilities not safe and secure. Citing the case of a child who was injured by a falling corrugated iron roofing sheet at school, respondents reiterated that floods heavily

compromised child safety, which was compounded by poor health services in the area, as the local clinic was itself another risk zone.

Female respondents at Chibuwe cited gender based violence as an immediate problem linked to flooding. They especially tagged it as a serious issue that is often unspoken but of concern. They reported that most of the menfolk tended to leave the immediate post-disaster recovery responsibilities such as sourcing of food, to the women, or migrated to various Zimbabwean urban centers or to South Africa where they would possibly start new families and not return. One of the older women expressed the predicament of women in the target communities as follows;

> *"We cannot talk about good family relations when there is no food and the man is just sitting there doing nothing. Obviously, there is gender-based violence. There is a lot of hidden gender based violence. Some of the men are useful for drinking alcohol and lounging around only. Sometimes they go to South Africa and start new families. They never come back or if they do they will likely be sick and penniless." Female respondent at Chibuwe (57)*

Male participants in the focus group discussions in Middle Sabi, noted that floods in the area affect women in far more diverse and severe ways than men, pointing out that the burden of ensuring family comfort, nutrition, cohesion and children's welfare falls on women even during the actual flood emergencies. They concurred with the women that some of the men do not assist in any way and others have deserted their families and migrated to South Africa. The concurrence was that gender based violence cases have become common as the vagaries of climate change and disasters such as flooding have ravaged the local socio-economic structures but remain largely unspoken due to the cumulative stresses faced by households.

The cumulative psychological strain on women is high. In Middle Sabi, the women revealed that they live in fear and are never secure while in Chibuwe female respondents expressed resentment at the heavy burden they bear to ensure that family life and economic survival continues as much as possible as it did before the floods.

While male respondents reported that the primary burden of post-disaster economic recovery, family and social cohesion was borne by women, they indicated that the frustrations arising from the seemingly unending disaster-recovery cycles and their resultant economic implications left them feeling emasculated. They reported going through hidden psychological stresses that in some instances expressed itself through the drinking of alcohol in higher than usual quantities or outright neglect of family responsibilities.

6.3. Diseases and deaths

Respondents in all three research areas noted that post flood illnesses such as colds, coughs, diarrhea and malaria were common. Respondents in Chibuwe and Middle Sabi particularly pointed out that post flooding malaria control was critical. In Chibuwe respondents bemoaned the deplorable state of the local clinic which they said was not only heavily damaged by floods but also lacked adequate resources and medicines. Dirty ablution facilities at the evacuation sites were also cited as health risks especially by Middle Sabi respondents. Women were most likely to feel the worst effects of poor sanitation facilities than men as they are often the primary hygienists in their families. The added complexities of dealing with menstrual hygiene during such times increased the challenge. Respondents also reported illnesses in the surviving livestock, such as foot-rot in cattle and goats, and flu in poultry.

Respondents in Middle Sabi and at Tongogara did not cite any flood related deaths but respondents in Chibuwe advised that at least three people had been killed by crocodiles as a direct result of floods and that one of the deaths had occurred in 2021. Respondents in Middle Sabi, noted that sometimes during flooding incidents, wild animals in the nearby Save Conservancy would stray into human territories, resulting in human and wildlife conflicts. They also added that the risk of encountering crocodiles brought inland by the floods was high at this time.

6.4. Community responses

According to Danso and Addo (2017), reactive strategies are the immediate responses, and actions taken to reduce the effects of flooding, while recovery strategies are the rebuilding, and re-establishment efforts. The preventive phase involves steps taken to avoid future flooding. In the reactive phase, respondents in Save Valley reported focusing primarily on immediate actions aimed at minimizing the harm caused by floods. These actions included rallying family members for immediate evacuation to designated centers and packing as many basic necessities as possible within the limited evacuation timeframe. In keeping with Iravani and Parast's (2014) assertion, priority actions at this stage were primarily directed toward saving lives, reducing the number of casualties and protecting assets which actions the communities fulfilled. However, notwithstanding that floods are a regular occurrence in these communities, poverty has greatly militated against meaningful adaptation and resilience building. Respondents reported that regardless of the existence of early warning systems in the form of short message texts from the Civil Protection Unit and in Chibuwe's case traditional communications via the Village Headman, they were often unprepared when the floods came and were barely able to carry the most basic necessities during evacuation as the floods tended to occur rapidly. Moreover, they reported that many families were not keen on evacuating to designated centers as affected families received little to no relief aid at the evacuation centers.

In a bid to meet the challenge *in situ*, some respondents in Chibuwe indicated that they construct their houses on the highest possible place within their homesteads and elevate the entrances. In Middle Sabi, families dig trenches and mini-canals around their compounds to divert floodwater. Respondents reported planting vertiva grass, trees and sisal fences around their homesteads to break or reduce the flow of the floodwaters and to prevent erosion. The use of mud or sand bags as dykes to divert the flow of water was also prevalent. Some households had reverted to building traditional rondavels *(mbatso dzedenderekedzwa)* as they deemed them safer during flooding. They noted that while the classic square shaped brick and corrugated iron roof dwellings are considered

modern and better than traditional structures, building them for resilience required quality materials that they could not access given their financial circumstances. They asserted that traditional structures were easier to construct, and because of the circular shape, withstood the violent windstorms and floods better than modern structures and were less likely to cause injuries to people in the event that they collapsed. They also constructed raised traditional storage granaries to prevent flooding related food losses.

Communities reported reducing the number of meals per day and engaging in barter trading among themselves and with the residents at Tongogara Refugee Camp who usually receive well-coordinated relief assistance during flooding incidences, as a coping mechanism in the wake of floods. As one respondent observed, "*If we don't do it ourselves, no one will do it for us.*" Households earning income from non-agriculture sources reported selling assets while poorer households advised that they were unlikely to sell any assets as they had few valuables. Remittances, and assistance or support from children and relatives were cited as important in alleviating the worst effects of floods and other climate change related vagaries.

6.5. DRR plans, budgets, preparedness, community participation, and projects

Responding to climate change and its associated phenomena requires structured approaches. This involves, planning, budgetary allocations, early warning systems and post-disaster assistance mechanisms buttressed by community participation and buy-in. While the District made use of climate change policies and plans defined at national level, local communities reported that they had no community specific climate change response plans. The majority (85%) of respondents however indicated that Flood and Disaster Management Plans were in existence, in their communities, 6% responded in the negative and 9% advised that they did not know if such plans were in existence. At Chibuwe, most respondents while aware of the existence of disaster management plans were unaware that a Disaster Risk Management Committee chaired by Headman Chibuwe was in place indicating poor community communication in this regard and limited community involvement in some aspects of local disaster risk reduction. Committee members however advised that the committee was functional and gender balanced having an almost equal number of male and female members. Middle Sabi respondents reported that while they did not have a structured disaster risk committee they did have standing evacuation plans though they were not always effectively coordinated. They indicated that provision of an additional tractor and trailer would make evacuation easier.

Fifty percentage of key informant respondents highlighted that there is no specific budgetary allocation for disaster management in the District while 35% responded in the affirmative with the remaining 15% highlighting that they did not know if there was a specific budget allocation in this area. Notwithstanding the existence of disaster management plans in the District as unanimously reported by respondents, they cited resource constraints as the major hindrances to their implementation. The Office of the District Development Coordinator advised that the District had no specific budget allocation for climate change or disaster risk management and recovery. At the community level, respondents reported that building community reserves to finance climate action and a disaster risk budget had proven difficult as the combination of climate variability, floods, critical infrastructure and asset losses, destruction of livelihoods and generally, low household incomes had left families unable to contribute meaningfully to such an undertaking.

In terms of early warning systems, 89.3% of respondents acknowledged receiving early warning flood messages and reported getting them mainly through short message service and from community leaders. On the other hand, 10.7% of respondents reported that they had not received any warnings prior to the onset of floods. Respondents from all study sites revealed that the Civil Protection Unit sent most communications and flood warnings via short message service and community leaders would relay the messages through phone calls or texts of their own. Middle Sabi respondents also advised that work group WhatsApp communications were used and at times people alerted each other via door-to-door communications. All respondents concurred that dedicated early warning systems were critical. Respondents from Chibuwe indicated that in spite of evident shortcomings they still preferred receiving communications the traditional way, via the Village Headman. Notwithstanding the foregoing, they expressed satisfaction with the short message service communications from the Civil Protection Unit. Ultimately, the consensus in Chibuwe was for the implementation of a hybrid early warning system incorporating modern and traditional elements. Respondents felt that a hybrid early warning system would be essential in making sure that no families were left out of the disaster warning communication loop especially as not all members of the community had access to mobile phones or communication devices.

Figures 2, 3 show the summary of responses regarding community participation and disaster risk preparedness. The majority of respondents reported a high level of community participation in disaster risk reduction and preparedness activities. The communities exhibited willingness to fully participate in

FIGURE 2
Community disaster preparedness: all respondents.

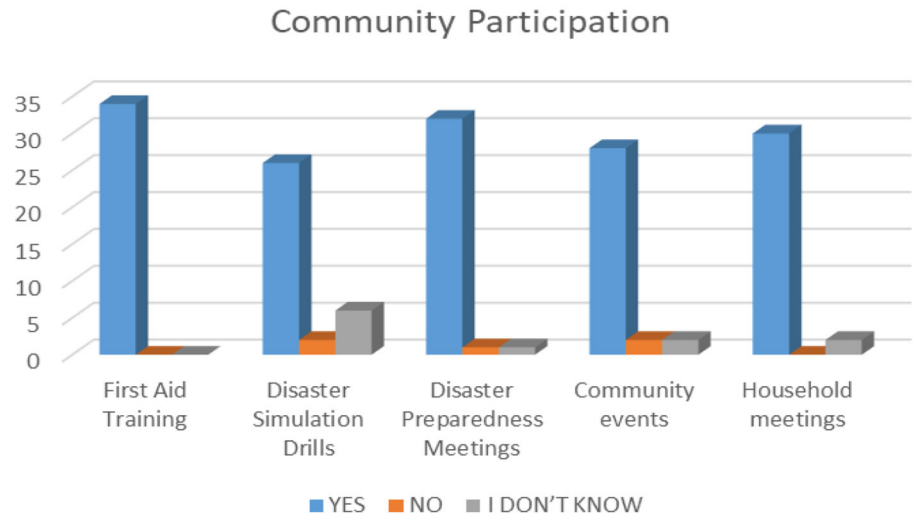

FIGURE 3
Community participation in DRR activities: all respondents.

disaster risk management and resilience building activities, showing a strong understanding of the relationship between sustainable and thriving local economies and effective climate change adaptation and disaster risk reduction. They were however vocal regarding the challenges they faced in trying to implement community initiated environmental management and climate change adaptation initiatives. They advised that inasmuch as they desired to be proactive in determining the resilience of their local economies and environments, mismatches between policy initiatives, land-use planning and environmental protection priorities at national and local level had at times served to disrupt local initiatives and heighten local vulnerabilities to climate change related hazards and their crippling impacts.

Respondents at Chibuwe noted that while there were designated evacuation centers such as schools; the same were also high-risk zones as their structural integrity had been compromised by floods over the years. They pointed out that while several homes were also structurally unsound because of the slow recovery cycle in between flooding events, leading to neglected renovations, affected families mostly had no choice but to continue dwelling in the same. This also applied to Middle Sabi where respondents noted that the slow economic recovery cycle and the general lack of resources compelled them to continue living in houses whose foundations and structural integrity were unsound. Respondents at Chibuwe advised that they had resorted to constructing thatched roof dwellings to minimize the risk of injury or death arising from corrugated iron roofed dwellings during storms and floods as some injuries from corrugated iron sheets blown off roofs had occurred in the past. They indicated that they felt safer using traditional building methods and materials such as those applied in the construction of rondavel huts, as there was a lesser likelihood of significant injuries as compared to brick structures.

Focus group discussants indicated a lack of meaningful humanitarian support during post disaster phase in the study communities. Respondents advised that disaster relief though available, was often allocated along political lines leaving many of the most vulnerable and needy families without any assistance. In Chibuwe respondents reported that most of the community, had last received meaningful relief aid after the Cyclone Eline disaster in the year 2000. Government assistance was the most expected, however stakeholders like the Red Cross Society, religious groups and Non-Governmental Organizations were key in availing humanitarian support to the communities though respondents observed that the support given was not adequate. Figure 4 below provides a summary of the findings on post disaster assistance.

The District Development Committee reported that several multi-stakeholder resilience projects were planned inclusive of irrigation rehabilitation, construction of weirs, water, sanitation and hygiene (WASH) facilities at evacuation centers, relocation of people in high flood risk areas and conducting of disaster risk reduction. While community members expressed willingness to engage in resilience building projects they cited poverty as a major constraint.

6.6. Relocation

Relocation is one of the possible options available to communities in high flood risk zones. However, community members are not always willing to be relocated. When given the option between relocation and staying in an extreme flood risk zone, 76% of respondents were reluctant to permanently move from the flood zones, while 24% were willing to do so. Among the major reasons given for staying were attachment to ancestral land, fear of the long established social set up breaking, acclimatization to living in a flood prone area and preservation of accumulated wealth. In addition, respondents reported that from past experience, they were aware that most relocations were implemented without proper planning posing the risk of communities being relocated to territories lacking proper infrastructure and amenities and thereby worsening their economic condition. While respondents at Middle

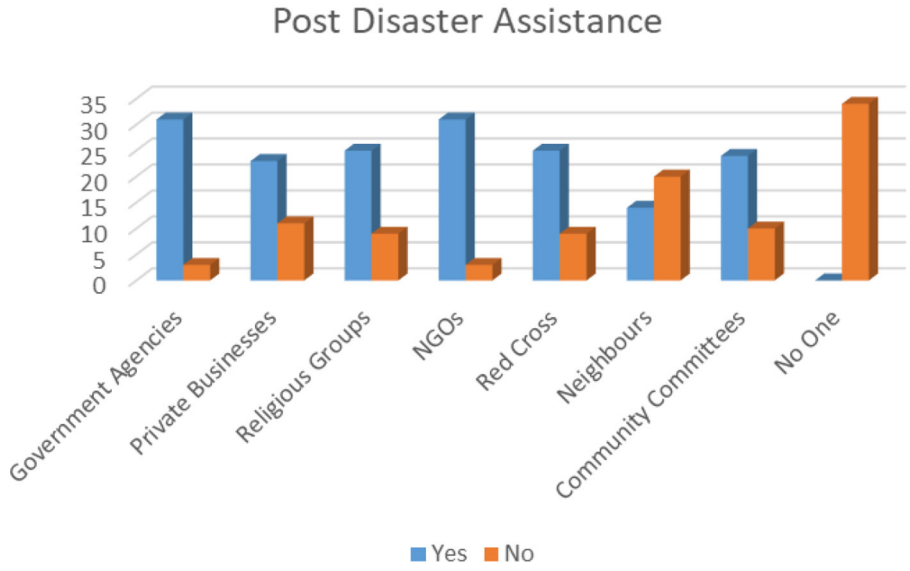

FIGURE 4
Post Disaster assistance: all respondents.

Sabi expressed interest in relocating given proper amenities noting that they had never been given that option, those in Chibuwe indicated that they would consider a seasonal relocation allowing them to return to their ancestral lands whenever they wish to do so. They unanimously preferred to build back better *in situ* expressing concern that promises made prior to relocation were not always honored.

7. Discussion

Building on the disaster risk reduction experiences of the indigenous communities in the Save Valley area of Chipinge District, this study set out to highlight the socio-economic impacts of climate change in these communities as they grapple with the challenge of climate change induced flooding and attempt to build resilience in their communities. It further sought to show how their roles in climate change action had evolved over time.

The results show that there is a complex relationship between climate change, disaster risk reduction and the socio-economic wellbeing of communities. While climate variability has heightened the frequency and intensity of shocks such as floods, the socio-economic disruptions obtaining from these shocks and the slow recovery cycles in affected communities in turn worsen their vulnerability to climate change. The negative effects on natural, human, produced, social and financial capital call for holistic systematic approaches in addressing climate variability and its attendant extreme weather phenomena like flooding, as espoused by Mavhura (2017). It shows that poverty is at the heart of vulnerability (Cutter et al., 2009; Buhrich, 2010; Spear et al., 2015; Mavhura, 2017; Mavhura and Mucherera, 2020) and eradicating it should be at the core of climate actions and disaster risk management initiatives.

The findings show that if mishandled climate change related shocks and indeed any other shocks of a similar magnitude, have the capacity to disrupt family and societal cohesion by worsening gender based violence, widening gender disparities, deepening the vulnerabilities of traditionally marginalized members of the community such as women, children, people living with disabilities and the aged. Studies support the finding that women, children and the elderly are often the most vulnerable and further that women carry a disproportionately large responsibility in maintaining family and social cohesion throughout all the stages of disasters compared to men (Ciampi et al., 2011; Lee and Vink, 2015; Mavhura and Mucherera, 2020). Cutter et al. (2009) write that women are also more vulnerable to disasters because of their roles as mothers and caregivers as their ability to seek safety when disaster is about to strike becomes restricted by their responsibilities to the very young and the very old, both of whom require help and supervision. While men often have the leeway to migrate in search of better opportunities and sometimes, as per the findings of this study, to abandon their families and start new lives elsewhere, women often do not have such alternatives. In addition, as noted by Brazier (2015) while urban drift and cross-border migration may increase the range of families' sources of income, they also remove the most economically and physically productive family members from the home, leaving female-, grandparent- and child-headed families to cope with rural hardships.

The results suggest that climate change and its related phenomena undermine resilience among individuals and in communities and are particularly insidious in their creation of poverty traps more so, in communities already largely marginalized. For example, energy poverty in the study communities has worsened environmental degradation through deforestation linked to both wood usage and charcoal making as an economic activity creating a vicious cause and effect cycle feeding into their wider climate change problem. As climate variability has

heightened the energy crisis in Zimbabwe and the region (Brazier, 2015; Zambezi River Authority, 2022) the cost of electricity, which is critical in running irrigation pumps in the absence of alternative energy sources, is mostly too high for communities in the Save Valley especially at Chibuwe. As they grapple with the destruction of their livelihoods by floods and the slow recovery cycle they are faced with hard choices where they either choose to pay their utility bills and forego other basic necessities or to default on the utility bills and risk power disconnections that will affect their irrigation activities and by extension their economic resilience.

Agriculture is one of the most dominant economic activities in Chipinge providing both full time and part time or seasonal employment. In the Save Valley, agriculture is the bedrock of the local economy. However, due to its largely subsistence nature, the socio-economic toll of flooding is high. Most flooding incidents occur during the farming season leading to crop damage. The repeat flooding results in degradation of arable and grazing lands leading to low crop and animal yields, respectively. Furthermore, floods exacerbate damage to road infrastructure making markets inaccessible thereby cutting of rural producers such as those in Tongogara, Chibuwe and Middle Sabi from important sources of income. This is in line with findings by the United Nations Development Programme (2017) showing that floods particularly affect those who grow perishable products (horticulture), by destroying roads and bridges during flooding episodes, making them unable to send products to market in a timely manner.

While the communities have been proactive in making use of disaster management plans and committees, lack of budgetary support and an integrated approach toward both climate action and disaster risk reduction means that the potential benefits of the same are miniscule. Ultimately as previously stated, at the core of the agenda to combat climate change should lie concerted efforts to address the poverty factor, which is the major hindrance to achieving meaningful climate action in impoverished and marginalized communities. As early as 2015, 76% of rural people in Zimbabwe were living in poverty with climate change considered as one of the major contributors due its disruption of agricultural activities which form the core of rural livelihoods (Brazier, 2015). Climate change has the potential to deepen inherited or intergenerational poverty. Households that continually live on the cusp of disaster and are perennially engaged in the disaster vs. slow recovery cycle often find it difficult to prioritize building intergenerational wealth. Manicaland Province, where the study area is located, is home to the largest proportion of poor children (80.4% of children in the province live in poverty) of any province in Zimbabwe. While 15.5% of all children live in this province, more than 18.6% of Zimbabwe's poor children live there. Chipinge District has 18.5% of all poor children in the province (Zimbabwe Statistics Agency UNICEF, 2019). These statistics are in keeping with the findings from the study, which show that poverty is both the primary driver of climate vulnerability and major effect of climate change and its associated phenomena.

The findings align with the assertion that floods are among the most destructive, climate change related disasters and the primary source of risk to agriculture in terms of production loss and food shortage (Mondal, 2019). It supports observations that high poverty levels increase vulnerability to disasters (Living with Risk 2006; Pecl et al., 2017). In addition to showing that coping strategies do not always necessarily lead to the lessening of vulnerability it affirms observations that while impact severity may vary across households and communities, most often poor people, who have limited coping capacities, bear the greatest risks (Shoji, 2008). The results tally with observations that enhancing and supporting the adaptive capacity of indigenous peoples will only be successful if integrated with other strategies such as disaster preparation, land-use planning, environmental conservation and national plans for sustainable development (United Nations Department of Economic Affairs, 2008).

From the findings, it appears that the contribution of indigenous communities in the Save Valley to climate actions may be seriously curtailed by the far more pressing and immediate struggles deriving from the long flood disaster-recovery cycles and overall weakened resilience. This notwithstanding, their efforts in ensuring the continuity of their local economies in the wake of climate variability and its associated phenomena underpins the longstanding argument that indigenous communities are an important and powerful force in climate change action (Garcia-Alix, 2008; Brazier, 2015; International Labour Organization, 2017; Pörtner et al., 2022). The use of indigenous knowledge and local innovation as coping mechanisms and the introduction of the batter trade economy to counteract the challenges arising from the deepening of the poverty cycles in the immediate post-disaster period show a determination that is a critical variable in the quest for resilience. It shows that Indigenous peoples possess incredible resiliency and innovation (Ford et al., 2020 cited by Status of Tribes Climate Change Working Group, 2021). At the same time, it reveals as succinctly put by the Status of Tribes Climate Change Working Group (2021) how climate change impacts for these communities are already severe and the challenges they face in responding to said impacts daunting.

Garcia-Alix (2008) notes that climate change has a harmful effect on biological diversity and the related knowledge, innovations and practices of indigenous and local communities and posits that traditional knowledge is an inseparable part of indigenous and local communities' culture, social structures, economy, livelihoods, beliefs, traditions, customs, customary law, health and their relationship to the local environment. Garcia-Alix (2008) further argues that the totality of these elements makes their knowledge, innovations and practices vital in relation to biological diversity and sustainable development. These assertions are valuable. The study findings show that climate variability and its associated extreme weather phenomena in the Save Valley has built upon the negative legacies left by colonialism and greatly undermined the traditional socio-economic cohesion and nature stewardship that is often a key characteristic of indigenous communities. They present a strong affirmation of the Intergovernmental Panel for Climate Change–IPCC (2022) position on the links between high climate vulnerability in indigenous communities and historical injustices like colonialism.

The rights of all individuals to an environment that is not harmful to their health or wellbeing, to secure ecologically sustainable development and use of natural resources while promoting economic and social development, to be heard and to acquire information are entrenched within the Constitution

of Zimbabwe (Government of Zimbabwe, 2013). This notwithstanding, the voices of indigenous communities are often passively heard and their inclusion in critical discourses affecting their livelihoods and overall wellbeing is usually as subjects of diverse research endeavors or development programs that either offer no transformative feedback afterwards or create a cycle of dependency. Their agency is often negated. As much as possible this study sought to adhere to research practices that fully acknowledged the agency of the local communities in the process. As Garcia-Alix (2008) writes;

> *Indigenous and local communities' traditional knowledge should be an integral part of any process, study and analysis aimed at elaborating on such communities' ability to adapt to changing environmental conditions. In addition, it is desirable the research be conducted in a way that recognizes and continues to support and develop the capacities of indigenous and local communities. Parties are urged to ensure full and effective participation of indigenous and local communities in the entire research process and in the development of adaptation strategies which affect them.*

Part of the foregoing was met through the incorporation of some of the findings from this research into the Manicaland Province Climate Change Policy (2021–2025) where section (35) on Climate Action calls for the promotion of indigenous technology and knowledge systems in climate management and the Manicaland Province National Development Strategy (2021–2025) which is the Provincial economic development blueprint. This marked an important turning point for the communities in terms of influencing climate policy at the governance level. There however, remains a need for wider research encompassing a larger sample of respondents as well as research and development (R and D) oriented studies with a focus on developing innovative climate technologies derived from indigenous knowledge systems. In addition studies on how the intellectual and proprietary rights of indigenous communities in Zimbabwe can be protected as they share their knowledge with researchers will be important.

8. Conclusion

The impacts of climate change on indigenous communities in the Save Valley area of Chipinge is both a cause for concern and an opportunity for innovative climate responses. Integrated approaches to climate action backed by beneficiary participation and cooperation is key to building climate resilience. While climate change has proven to be a largely negative phenomenon; it is possible to unlock hidden opportunities for local communities by tapping into their hitherto under-researched, under-utilized and under-valued knowledge and innovation capacities.

The results of this study are in keeping with the findings of other studies conducted so far regarding the impacts of climate change on indigenous communities. It buttresses the fact that effective climate action and resilience building requires an integrated and holistic systems approach. It underscores the importance of multidisciplinary approaches to research especially on the socio-economic aspects of climate change as it affects indigenous communities in Zimbabwe and beyond.

Technical awareness of the risk and damage owing to climate change and its associated phenomena needs to be buttressed by genuine pro-community resilience initiatives. Identification of the underlying causes of vulnerability and the factors influencing the continued vulnerability of individuals and communities notwithstanding prolonged experience and therefore knowledge of the flood risks faced is important. Budgetary prioritization toward capacitating communities to be wholly resilient is critical. Beneficiary participation in all aspects of disaster risk reduction and response and resilience building is vital. It is imperative to address the negative political perceptions inherent in vulnerable communities by removing the politics from disaster risk reduction and effecting egalitarian and inclusive processes that strengthen cooperation and leave no one behind. Trust building is a critical component of effective climate action and disaster risk reduction and resilience building. Going forward, deliberate incorporation of indigenous knowledge systems and practices in climate resilience and disaster risk reduction policies and actions will be fundamental in developing sustainable actions that not only foster enhanced and practical community involvement but also help in preserving indigenous knowledge and firmly situating it as an important factor in local and national economic development.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Great Zimbabwe University and Ministry of Environment, Climate, Tourism and Hospitality Industry. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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