Chapter Three

Holistic Planning and Adaptive Approaches: Towards Better Responses to Climate-Induced Disasters in Southern Africa

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Abstract

Southern Africa is becoming more prone to multiple climate-induced disasters. Reoccurring droughts, heatwaves, and floods triggered by cyclones have affected countries like Mozambique,

Malawi, Zimbabwe, and South Africa. The impact of climate-induced disasters, especially in urban areas, is detrimental and results in loss of life, social disruption, and economic hardships. Despite this realisation, mainstreaming innovative strategies to curb climate-induced disasters in development plans across Southern Africa has yet to catch up. This chapter discusses the importance of holistic planning and adaptive approaches in improving responses to climate-induced disasters, facilitating regional integration in Southern Africa and addressing the security and development nexus. The chapter reveals that climate change has increased the frequency and severity of regional disasters, making adopting strategies to mitigate the negative impacts imperative. Holistic planning and adaptive approaches recognise the interconnectedness of social, economic, and environmental systems and seek to address their vulnerabilities in a coordinated and integrated manner. This approach requires stakeholder collaboration, including communities, government agencies, non-governmental organisations, and academia. Adaptive techniques can help build resilience to climate-induced disasters by incorporating local knowledge and understanding of the region's complexities. The chapter highlights the need for continued efforts to build capacity and enhance coordination to effectively implement holistic planning and adaptive approaches in Southern Africa. The chapter also demonstrates how holistic planning and adaptive approaches mitigate the adverse effects of climate-induced disasters through collaborative, cross-border efforts that enhance regional stability and sustainable development.

Introduction

In recent years, Southern Africa has experienced increased climate-induced disasters, including floods, droughts, and cyclones (Kamara *et al.*, 2018). Climate-induced disasters are catastrophes triggered by climate change changes that result in significant environmental, social, and economic damages. These disasters are caused by natural phenomena such as floods, droughts, heatwaves, hurricanes, cyclones, landslides, and wildfires exacerbated by climate change (Chagutah, 2013;

Putsoane, Bhanye & Matamanda, 2024). The disasters have devastated the region's economies, societies, and ecosystems, with vulnerable communities bearing the brunt of the damage, including displacement, food insecurity, loss of livelihoods, and health risks (Füssel & Klein, 2006). The frequency and intensity of these disasters are expected to increase in the coming years due to the impacts of climate change, environmental degradation, and socioeconomic vulnerabilities (Xie *et al.*, 2023). This significantly impacts the region's progress towards achieving the Sustainable Development Goals (SDGs). The increased frequency and intensity of extreme weather events such as droughts, floods, and cyclones, for example, undermine efforts to eradicate poverty (SDG 1) and ensure food security (SDG 2). These disasters result in widespread crop failures, livestock deaths, and displacement of communities, exacerbating hunger and malnutrition. Additionally, the destruction of infrastructure and disruption of essential services due to climate disasters have hindered progress in achieving SDGs related to health (SDG 3), education (SDG 4), and access to clean water and sanitation (SDG 6). The region's vulnerability to climate change demonstrates the urgent need for climate adaptation and resilience measures to safeguard the progress towards the SDGs and promote sustainable development in Southern Africa.

Traditional disaster management approaches, which focus primarily on reactive response and relief efforts, are insufficient to address the complex and dynamic nature of the region's climate-induced disasters (Van Niekerk, 2014). The failure to take a more proactive approach to disaster management has resulted in increased losses and damages, exacerbating poverty and inequality in the region, making it obvious that there is a need for appropriate institutional arrangements for disaster risk management (Shaw, 2012). Therefore, there is an urgent need for new and innovative approaches that can address the underlying causes of vulnerability and enhance the resilience of communities and ecosystems. This chapter argues that holistic planning and adaptive systems are necessary to develop more effective responses to climate-induced disasters at a regional

level in Southern Africa. This approach involves integrating disaster risk reduction and climate change adaptation into development planning processes, incorporating local knowledge and participation, and promoting flexible and adaptive strategies that respond to changing conditions and uncertainties (IPCC, 2012). Through holistic planning and adaptive approaches, decision-makers can better understand the complex and interconnected nature of climate-induced disasters and develop more effective and sustainable strategies to reduce the risks and impacts of such disasters (Niekerk & Wentink, 2017).

Further and in connection to the theme of this book, the increase in frequency and intensity of climate-induced disasters in Southern Africa also poses unique challenges to regional security and development, necessitating innovative responses. This chapter posits that holistic planning and adaptive approaches are crucial in fostering regional integration and cooperation, which are vital for addressing these challenges. Through enhancing collaborative mechanisms across borders, these approaches not only mitigate the direct impact of disasters but also strengthen the resilience of socio-economic systems, contributing to both regional security and sustainable development. This dual focus aligns with the security-development nexus, which highlights the interdependence of a stable security environment and socio-economic development in achieving long-term resilience against climate change. Overall, the chapter demonstrates the potential of holistic planning and adaptive approaches as responses to climate-induced disasters in Southern Africa. The critical presentation supported by various case studies reflects the potential of these approaches to enhance resilience, reduce vulnerability, and promote sustainable development in the face of climate-induced disasters in the region.

Definition of key concepts

Climate-induced disasters

Climate-induced disasters refer to extreme weather events and natural disasters caused or exacerbated by climate change (IPCC, 2012). These disasters include droughts, floods, cyclones, wildfires, heatwaves, and landslides, which can devastate human populations, infrastructure, and ecosystems (Kamara *et al.*, 2018). Climate-induced disasters are becoming more frequent, omnipresent, and severe due to the impacts of global warming, including rising temperatures, sea-level rise, changes in precipitation patterns, and more frequent and intense extreme weather events (Mpandeli *et al.*, 2020; Putsoane, Bhanye & Matamanda, 2024). Furthermore, climate-induced disasters significantly threaten achieving sustainable development goals, particularly in vulnerable regions such as Southern Africa. These disasters can have far-reaching impacts on the social, economic, and environmental dimensions of development, exacerbating poverty and inequality, undermining food security, loss of life, and increasing the burden of disease (Bhanye, 2024; Nhamo, 2014). Therefore, there is an urgent need for effective responses to climate-induced disasters that can reduce their impacts and enhance the resilience of communities and ecosystems (Putsoane, Bhanye & Matamanda, 2024). Adopting holistic planning and adaptive approaches is essential to develop such reactions, as it considers the interconnected and dynamic nature of climate-induced disasters and promotes sustainable and resilient strategies that can adapt to changing conditions and uncertainties (Vermaak & Van Niekerk, 2004).

Holistic planning

Holistic planning is an approach to planning that considers the interconnected and dynamic nature of complex systems (Juhasz-Nagy *et al.*, 2017). It recognises that the different components of a system are interdependent and that changes in one part can have far-reaching impacts on other components. Therefore, holistic planning aims to integrate various elements into a coherent and coordinated approach to achieve sustainable and

resilient outcomes (Djalante, 2012). In disaster management, holistic planning is essential for effective responses to climate-induced disasters. It requires considering the social, economic, and environmental dimensions of disaster risks and integrating disaster risk reduction and climate change adaptation into development planning processes (Becker *et al.*, 2021). This approach recognises that disaster risks are determined by natural hazards and underlying vulnerabilities, such as poverty, inequality, and environmental degradation (Nemakonde *et al.*, 2021). Holistic planning also recognises the importance of local knowledge and participation in developing context-specific and culturally appropriate disaster management strategies. It promotes collaboration across sectors and borders to create regional disaster management and enable flexible, adaptive systems that respond to changing conditions and uncertainties.

Adaptive approaches

Adaptive approaches refer to strategies and processes that respond to changing conditions and uncertainties (Zschau & Küppers, 2013). In the context of climate-induced disasters, adaptive approaches are essential to develop effective responses that can cope with the impacts of climate change and reduce disaster risks. Adaptive techniques are based on flexibility, learning, and collaboration (Nhamo *et al.*, 2019). They recognise that the impacts of climate change are uncertain and that it is impossible to predict the exact nature and timing of future disasters. Adaptive approaches aim to develop flexible strategies that respond to changing conditions and uncertainties. They also emphasise the importance of learning from past experiences and continuously improving disaster management strategies based on new knowledge and insights (Pasquini & Cowling, 2015). Adaptive approaches also promote collaboration and partnerships across different sectors and levels of governance to develop context-specific and culturally appropriate disaster management strategies (Aderinto, 2023). They recognise the importance of local knowledge and participation in developing practical responses to climate-induced disasters.

Climate-induced disasters in Southern Africa

Southern Africa is highly vulnerable to climate-induced disasters due to geographical location and socio-economic conditions (Kamara *et al.*, 2018). The region is characterised by a high incidence of extreme weather events such as droughts, floods, cyclones, and heatwaves, which are becoming more frequent and severe due to the impact of climate change (Owusu-Sekyere *et al.*, 2021). These disasters devastate human populations, infrastructure, and ecosystems and pose significant threats to achieving sustainable development goals in the region. Table 3.1 summarises climate-induced disasters in Southern Africa from 1991-2023.

Table 3.1: Southern African Climate Induced Disasters from 1991-2023

Year	Explanation
1991-1992	The worst drought in living memory was experienced in Southern Africa, excluding Namibia.
1994-1995	Many countries in the SADC were hit by a severe drought, surpassing the impacts of the 1991 to 1992 drought in some regions.
1999-2000	Cyclone Eline hit the region, and widespread floods devastated large parts of the Limpopo basin (Southern and Central Mozambique, Southeastern Mozambique, parts of South Africa and Botswana).
2001-2002	Southern Africa experienced abnormally high rainfall and disastrous floods causing damage to infrastructure and loss of life and property.
2005-2006	Parts of Southern Africa received heavy rains resulting in flooding, causing considerable structural damage, destroying schools, crops, telecommunications, and roads.
2007	Cyclone Favio hit Madagascar and Mozambique, affecting parts of Zimbabwe. The floods killed about 40 people and affected more than 120,00 people in Mozambique. Nearly 90,000 people had to be evacuated. More than 700 cases of waterborne diseases like cholera, leptospirosis and typhoid fever were reported among flood victims. Devastating floods in early 2007 also struck parts of Angola, Namibia and Zambia.

Year	Explanation
2007–2008	Early-season floods were recorded in Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe, affecting more than 190,000 people by January 2008.
2009	Southern Africa experienced severe drought conditions, particularly in Zimbabwe, Lesotho, and Swaziland. These droughts resulted in crop failures, water shortages, and food insecurity.
2010–2011	In early 2010, Mozambique was hit by severe flooding caused by heavy rains. The flooding affected over 250,000 people, displacing many and damaging infrastructure and crops. Zimbabwe experienced widespread flooding in early 2011, displacing thousands of people.
2012	In 2012, a severe drought struck southern parts of Africa, including Botswana, Namibia, and South Africa. The depletion resulted in water scarcity, crop failures, and livestock losses, leading to food insecurity and economic challenges. In 2013 heavy rains and flooding affected several countries in Southern Africa, including Malawi, Mozambique, and Zimbabwe.
2014–2016	Malawi experienced severe flooding in early 2014 due to heavy rainfall. The floods affected over a million people, causing displacement, damaging infrastructure, and disrupting agriculture. In 2015 Southern Africa faced one of the worst droughts in decades affecting Zimbabwe, South Africa, Malawi, and Zambia. The drought led to widespread crop failures, water shortages, and food insecurity. In 2016 Zimbabwe and South Africa experienced another year of severe drought, exacerbating the ongoing food crisis in the region.
2017–2018	In early 2017, Cyclone Dineo struck Mozambique, bringing heavy rainfall and strong winds. The cyclone caused widespread destruction, damaging infrastructure, homes, and crops. In 2018 Southern Africa faced a drought affecting South Africa, Zambia, and Zimbabwe. The depletion resulted in water scarcity, crop failures, and livestock losses, increasing food insecurity and economic challenges.
2019	In early 2019, Mozambique was hit by Cyclone Idai, one of the deadliest tropical cyclones ever affecting the region. The cyclone caused extensive flooding, resulting in the loss of thousands of lives, displacement of people, and widespread destruction of infrastructure.

Year	Explanation
2020	Southern Africa experienced another year of drought, with Zimbabwe, Zambia, and South Africa facing significant water scarcity and crop failures. The deficit worsened the food crisis in the region.
2021–2023	The region continued to face drought impacts, particularly in Zimbabwe and Zambia, leading to water shortages, crop failures, and increased food insecurity. In April 2022, heavy rains hit the eastern coast of South Africa – causing floods and landslides across the provinces of KwaZulu-Natal and the Eastern Cape. Cyclone Freddy struck Southern Africa in 2023, displacing more than 400,000 individuals and causing significant infrastructure damage.

Droughts

Droughts are among the most common climate-induced disasters in Southern Africa, affecting millions of people and leading to food insecurity, malnutrition, and displacement (Lukamba, 2010; Rusca *et al.*, 2023). A drought is generally characterised by an extended period when there is a deficiency of precipitation, resulting in water scarcity. In Southern Africa, deficits can be seen through a lack of rainfall and reduced water availability in rivers, lakes, and groundwater. In recent years, severe shortages have been experienced in several regions, including Zimbabwe, Zambia, Malawi, Mozambique, and South Africa.

Southern Africa is highly susceptible to droughts due to its location and climate patterns. The region's economy relies heavily on rain-fed agriculture, making it particularly vulnerable to fluctuations in rainfall patterns. Crop failures, reduced yields, and livestock losses are expected consequences. Droughts in Southern Africa generally result in food shortages, increased food prices, and heightened food insecurity for local communities. Small-scale farmers, who often lack access to irrigation systems or insurance, are particularly affected. The economic impacts of droughts in Southern Africa are also significant. Reduced agricultural productivity leads to income losses for farmers and increased dependence on food imports. Shortages also affect other sectors, such as hydroelectric power

generation, tourism, and manufacturing, further exacerbating economic challenges. Droughts also have adverse health and social effects on the affected populations. Water scarcity increases the risk of waterborne diseases, such as cholera and dysentery, due to inadequate sanitation and limited access to clean water. Drought-related food shortages can lead to malnutrition and weakened immune systems. Droughts also often result in internal and cross-border migration, creating social challenges and straining vulnerable communities.

Floods

Floods are also significant climate-induced disasters in Southern Africa, particularly in low-lying areas and river basins. In 2019, Cyclone Idai caused severe flooding and landslides in Mozambique, Malawi, and Zimbabwe, leading to more than 1,000 deaths and large-scale migrations of over 3 million people (Chapungu, 2020). Floods cause immediate physical damage to infrastructure and homes and have long-term impacts on human health, livelihoods, and ecosystem services. Several other cyclones have hit the region recently, including Cyclone Kenneth in 2019 and Cyclone Eloise in 2021 (Mugabe, 2021). In 2023, Southern Africa was hit by Tropical Cyclone Freddy, the longest-lasting and highest-ACE-producing tropical cyclone ever recorded worldwide. Tropical Cyclone Freddy was an exceptionally long-lived, powerful, and deadly storm that traversed the southern Indian Ocean for more than five weeks in February and March 2023. It landed in south Malawi on March 12, 2023, causing heavy rainfall, floods, and landslides. The cyclone affected 14 of 28 districts, displacing more than 500,000 people and killing over 500 as of March 21, 2023. The cyclone also caused severe damage to infrastructure, including power lines and telecommunication structures, flooded houses and roads, and destroyed bridges, schools, and health facilities. The cyclone led to crop and livestock losses, affecting the livelihoods of local communities.

Heavy rainfall in February and March 2023 also caused flooding in seven provinces of South Africa, including KwaZulu-Natal. The floods were caused by the La Niña weather

phenomenon, resulting in casualties and damage to homes, businesses, basic infrastructure, roads, and bridges, and affected crops and livestock. The floods also resulted in the loss of basic infrastructure and forced thousands of people from their homes. KwaZulu-Natal was also hit by deadly floods in April 2022, causing over 400 deaths and destroying thousands of homes. The floods were caused by heavy rain across the province, which was also attributed to the effects of La Niña and climate change. In 2024, Cape Town experienced acute flooding that highlighted the vulnerability of urban infrastructures to extreme weather events. Particularly hard-hit were informal settlements such as Khayelitsha, Gugulethu, and Masiphumelele, where inadequate drainage systems led to substantial flooding. These areas suffered extensive property damage, infrastructural destruction, and displacement of residents, emphasising the urgent need for improved urban planning and robust flood management systems to mitigate future impacts.

Heat waves

In recent years, there has also been an increase in the frequency and intensity of heat waves in the region, which can be attributed to climate change, with temperatures exceeding 40°C in some areas (Meque *et al.*, 2022). Southern Africa experiences heat waves during summer, typically between October and March. These heat waves are characterised by prolonged periods of unusually high temperatures, often accompanied by hot and dry conditions. Heat waves pose a significant risk to human health, particularly to vulnerable populations such as the elderly, children, and individuals with pre-existing health conditions. High temperatures can lead to heat exhaustion, heatstroke, and other heat-related illnesses. Heat waves can also worsen air quality, leading to respiratory problems. Heat waves also have detrimental effects on agriculture in Southern Africa. High temperatures and dry conditions can lead to drought and reduced water availability for crops and livestock. Heat stress can also harm livestock, lower crop yields, and affect regional food security. Farmers need to implement adaptive measures such as efficient irrigation systems, crop diversification, and

improved soil moisture management to mitigate the impact of heat waves.

Furthermore, heat waves disrupt ecosystems in the region, affecting wildlife, plant communities, and overall biodiversity. Increased temperatures and reduced water availability lead to habitat loss, reduced reproductive success, and increased mortality for many species. Furthermore, heat waves can contribute to the spread of wildfires, further impacting ecosystems.

Climate-induced Disasters, Regional Integration, and the Security-Development Nexus in Southern Africa

Southern Africa faces multiple challenges stemming from climate-induced disasters - droughts, floods, and heatwaves, which pose a threat to human safety and livelihoods and have broader implications for regional security and development. The security-development nexus emphasises the interconnectedness of regional stability and socio-economic development, asserting that security cannot be achieved without development and vice versa (Buzan, 2003). In this context, climate-induced disasters can exacerbate existing vulnerabilities and conflicts, influencing migration patterns and straining resources, posing a security and development risk (Adger *et al*., 2005).

Regional integration in Southern Africa has been identified as a critical mechanism for addressing these complex challenges. It involves collaborative strategies that transcend national borders to foster a coordinated response to climate threats while promoting sustainable development goals (SDGs). The Southern African Development Community (SADC) is pivotal in facilitating regional integration by aligning national policies with broader regional strategies that enhance disaster resilience and promote economic stability. For instance, the SADC's Regional Indicative Strategic Development Plan outlines frameworks for member states to integrate climate adaptation into their national development strategies, promoting resource sharing and disaster preparedness on a regional scale. This plan emphasises the importance of adaptive approaches and

holistic planning, which are vital for reducing the impact of climate-induced disasters. Such strategies ensure that infrastructure development, agricultural policies, and water resource management are approached with a view to long-term sustainability and resilience, mitigating the adverse effects of disasters on regional security and economic development.

Furthermore, implementing regional water agreements, such as the Revised Protocol on Shared Watercourses, exemplifies how cooperative management of natural resources can enhance security and development. Promoting equitable and sustainable utilisation of water resources, these agreements help mitigate conflicts over resources, which are often exacerbated by climate impacts (Turton & Funke, 2008). Additionally, the security-development nexus in Southern Africa is reinforced through regional security mechanisms that address the destabilising effects of climate-induced disasters. For example, the SADC's Mutual Defence Pact provides a framework for collective security, enhancing regional preparedness and response to climate-related security threats. Such integration bolsters regional resilience and ensures that development gains are protected against the disruptive impacts of climate change (Tysiachniouk, 2012).

Towards better responses to climate-induced disasters in Southern Africa

Holistic planning

Holistic planning is a comprehensive approach that considers the interconnected and dynamic nature of disaster risks and aims to address them in a coordinated and integrated manner (Djalante, 2012). In the context of climate-induced disasters in Southern Africa, holistic planning can be a better response strategy that reorients the planning process from traditional siloed approaches (Wilson & Piper, 2010). Holistic planning involves the coordination of multiple sectors, including disaster risk reduction, climate change adaptation, social welfare, and economic development (Mattoni *et al.*, 2019). This coordination

of a multi-scale perspective allows for a more comprehensive approach that addresses the root causes of disaster risks, such as poverty and inequality and promotes sustainable development that can build resilience to future disasters. The coordination of the multiple sectors is to be achieved pre-disaster through mitigation, preparedness, and early warning.

Holistic planning focuses on the pre-reduction and post-disaster recovery phases, where rescue, relief, rehabilitation, and reconstruction strategies are mapped out before disaster attacks. This is a means to strengthen social, economic, institutional, and spatial resilience. The Malawian government developed a National Climate Change Management Policy in 2016 in Malawi that integrates disaster risk reduction, climate change adaptation, and sustainable development (Pardoe, 2020). The policy aims to coordinate the efforts of multiple sectors, including agriculture, energy, water, and health, to build resilience to climate-induced disasters. The approach also recognises the importance of community participation in disaster risk reduction and climate change adaptation and encourages the integration of traditional knowledge into planning and decision-making.

Holistic planning also involves integrating traditional knowledge and indigenous practices into disaster risk reduction and climate change adaptation strategies by unifying disaster mitigation and adaptation solutions (Gandini *et al.*, 2021). Southern Africa has a rich diversity of cultures and indigenous knowledge systems that have evolved over centuries to cope with climate variability and extreme weather events. Integrating these practices into disaster risk reduction and climate change adaptation strategies can enhance their effectiveness and sustainability. The Zimbabwean government developed a National Climate Change Response Strategy recognising indigenous knowledge's importance in disaster risk reduction and climate change adaptation (Muzari *et al.*, 2016; Iloka, 2016). The strategy aims to incorporate traditional practices, such as conservation agriculture, agroforestry, cultivation of conventional cultivars, growing different varieties of crops simultaneously on the same field and water harvesting, into

modern technologies and practices. The strategy also involves training traditional leaders and communities on climate change adaptation and developing community-based adaptation plans.

There is also an emphasis on community-based approaches to disaster risk reduction and climate change adaptation. These approaches involve working with local communities to identify their vulnerabilities and strengths and developing tailored solutions sensitive to local cultures and contexts (Shaw, 2012). By involving communities in planning and implementing disaster risk reduction and climate change adaptation strategies, these strategies are more likely to be effective and sustainable in the long term. The government of Mozambique developed a National Disaster Risk Reduction and Management Strategy emphasising community-based approaches to disaster risk reduction (Schafer & Bell, 2002). The strategy aims to strengthen the capacity of local communities to identify and manage disaster risks and to promote participatory planning and decision-making. The process also involves the establishment of early warning systems, the development of contingency plans, and the provision of training and equipment to communities.

Holistic planning also involves adopting adaptive management approaches to disaster risk reduction and climate change adaptation (Djalante, 2012). Adaptive management involves continually monitoring and evaluating the effectiveness of strategies and adjusting as necessary in response to changing conditions and uncertainties (Gandini *et al.*, 2021). This means disaster risk reduction and climate change adaptation strategies can be more flexible, responsive, and resilient to future disasters. In South Africa, the government developed the National Climate Change Adaptation Strategy, which adopts an adaptive management approach to climate change adaptation. The strategy involves monitoring and evaluating the effectiveness of adaptation measures, identifying new risks and vulnerabilities, and adjusting plans and actions, as necessary. The process also consists of establishing a Climate Change Fund to finance adaptation projects and provide technical assistance

and capacity-building support to local governments and communities (Koch *et al.*, 2007).

Holistic planning has also been used in developed countries to respond to climate-induced disasters, with some lessons on how this approach could be adapted to the context of Southern Africa. One example of holistic planning is the Dutch "Room for the River" project. This flood protection initiative, launched in response to the risk of flooding in the Netherlands, sought to create more space for the river to expand during periods of high water rather than relying solely on traditional flood control measures like dikes and levees (De Bruijn, de Bruijne & Ten Heuvelhof, 2015; Dutch Water Sector, 2017). The project involved a range of interventions, including land acquisition, the construction of new floodplains and channels, and the relocation of infrastructure and housing. Taking a comprehensive approach that integrated engineering, ecology, and social considerations, the project reduced the risk of flooding with adjustable openings while also improving the ecological health of the river system and enhancing the quality of life for nearby residents (Bogdan, Beckie & Caine, 2022).

Another example of holistic planning is the "Rebuild by Design" initiative in the United States. Launched in response to the devastation wrought by Hurricane Sandy in 2012, this initiative brought together teams of designers, engineers, and community stakeholders to develop innovative solutions for building resilience in vulnerable coastal areas (Lentini, 2016). Projects included creating flood-resistant parks, installing new stormwater management systems, and developing new housing typologies to withstand extreme weather events. Incorporating social and environmental considerations into their designs, the teams created solutions that reduced the risk of future disasters and improved the liveability and sustainability of affected communities (Bogdan, Beckie & Caine, 2022).

So, how might these examples of holistic planning be adapted to the context of Southern Africa, which faces a range of climate-induced disasters, including droughts, floods, and cyclones? One approach could be to focus on developing green

infrastructure, which can help mitigate the impacts of extreme weather events while providing a range of other benefits. For example, green roofs and walls can help reduce the heat island effect in urban areas. In contrast, creating green corridors can improve the connectivity and biodiversity of ecosystems (Nyarumbu & Magadza, 2016). In addition, green infrastructure can be designed to provide ecosystem services such as water filtration, carbon sequestration, and food production, which can be critical in climate change (Busayo *et al*., 2022).

Another key element of holistic planning is community engagement and participation. Involving the communities affected by climate-induced disasters in planning is essential to create effective and sustainable solutions. This can involve various activities, from community workshops and meetings to creating citizen science programs that allow residents to contribute data and knowledge about their environments. Engaging with communities meaningfully, planners can ensure that their solutions are culturally appropriate, socially just, and responsive to the needs and priorities of those most affected by climate change.

In summary, holistic planning is a powerful tool for responding to climate-induced disasters, as it allows for a coordinated and comprehensive approach that integrates social, economic, and environmental considerations. Drawing on examples from the developed world, policymakers and practitioners in Southern Africa can create innovative and effective solutions that reduce the risk of disasters while improving the quality of life for affected communities. To adopt this approach to the context of Southern Africa, it will be necessary to focus on the development of green infrastructure and community engagement, as well as to ensure that solutions are culturally appropriate, socially just, and responsive to the needs and priorities of those who will be most affected by climate change.

Adaptive approaches

Adaptive approaches involve flexible and resilient strategies that enable individuals, communities, and institutions to cope with climate change impacts and reduce their vulnerability to disasters (IPCC, 2012). These approaches recognise that climate change is a long-term and evolving problem, and they aim to build the capacity of communities and institutions to adapt to changing conditions (Aderinto, 2023). This approach considers modern disaster thinking to climate change, shifting the focus to reduction and prevention strategies because disaster management is a continuous process (Uys, 2005). Various examples of adaptive approaches respond to climate-induced disasters in Southern Africa. Skinner and Rampersad (2014) propose that disaster risk reduction should go beyond traditional forms of communication that rely only on print and electronic media. Instead, an integrated communication strategy that involves all relevant stakeholders should be devised for disaster risk reduction and preparedness through public relations, media relations and advocacy.

Early warning systems

Early warning systems are prevention strategies that can provide advance notice of impending disasters, such as floods, droughts, and cyclones (Van Niekerk, 2014). These systems rely on data from weather monitoring stations, satellite imagery, and other sources to detect changes in weather patterns that could lead to disasters. Once a potential catastrophe is identified, early warning systems can alert communities and authorities, enabling them to take preventive measures or evacuate people from high-risk areas (Zschau & Küppers, 2013). Some practical examples exist where early warning systems have been used in Southern Africa to provide advance notice of impending disasters.

In Malawi, the government developed a national flood forecasting and warning system that uses data from weather monitoring stations and river gauges to provide warnings of floods through the establishment of the Malawi National Flood

Early Warning System (F-EWS) (Chinguwo & Deus, 2022). This system had bureaucratic complications that prevented it from delivering the desired outputs. However, a new system was proposed that involves the community's participation, called a Community-based early warning system (CBEWS). The new and improved system has successfully reduced the impact of floods by enabling communities to prepare and evacuate people from high-risk areas by conscientizing and strengthening the community's preparedness. However, the recent Cyclone Freddy that struck Malawi in February 2022 still left a trail of destruction (Aderinto, 2023).

Nhamo *et al*. (2019) proved that using statistical and dynamical forecasting provides spatiotemporal data for the SADC region, allowing Drought Early Warning Systems (DEWS) to develop well-planned and proactive response mechanisms for climate-induced disasters, particularly drought. The purpose of early warning systems is to help decision-makers and stakeholders plan and prepare using an evidence-based approach to predict the future.

Another example of adaptive approaches is Ecosystem-Based Approaches. Ecosystem-based strategies involve the conservation and restoration of natural ecosystems, such as wetlands and forests, to reduce the impacts of climate-induced disasters, and this was well executed in South Africa through the Durban Metropolitan Open Space System (D'MOSS) (Roberts *et al*., 2012). These ecosystems provide a range of services, such as flood control and water regulation, which are critical for reducing the vulnerability of communities to disasters. By conserving and restoring these ecosystems, communities can reduce their reliance on costly and unsustainable infrastructure, such as dams and levees (Pasquini & Cowling, 2015). The ecosystem-based approach is innovative in tackling climate change by acknowledging and preserving indigenous ecosystems. Busayo *et al*. (2022) confirm that South Africa faces a staggering 83.3% flood risk yearly, especially in Kwa-Zulu Natal, Eastern Cape, and Western Cape coastal areas. For sustainability, Nature-Based Solutions (NBS) such as green roofs, permeable pavements, soakaways, and infiltration basins

are all solutions that promote the reduction of surface water overflow.

Ecosystem-based approaches

Ecosystem-based approaches are increasingly recognised as effective tools for mitigating the impacts of climate-induced events like floods and droughts in Southern Africa. These strategies leverage the natural properties of ecosystems to provide services that help mitigate disaster risks, enhance biodiversity, and support sustainable community livelihoods. The government has undertaken significant efforts in Zimbabwe to restore wetlands within the Lake Chivero catchment area. This area had become highly eutrophic due to agricultural runoff and urban wastewater, leading to diminished water quality and reduced flood mitigation capacity (Utete *et al*., 2019). The restoration project focused on rehabilitating these wetlands to their natural state, where they function as hydrological buffers. Through absorbing excess rainfall during periods of heavy precipitation, these wetlands reduce the velocity and volume of floodwaters, significantly mitigating the risk of flooding downstream. During droughts, the same wetlands slowly release stored water, maintaining river flows and providing essential water supplies to ecosystems and communities (Nyarumbu & Magadza, 2016). This dual function not only enhances water security but also supports biodiversity and provides cleaner water for agricultural and domestic use.

Additionally, the concept of green infrastructure, which includes projects like the Green Roof Pilot Project in South Africa, exemplifies another successful ecosystem-based approach. Initiated in 2008, the project involved installing green roofs on urban buildings to combat rising urban heat temperatures and manage stormwater in densely populated areas. These green roofs are composed of vegetation layers that absorb rainfall, thus reducing runoff and lowering flood risks in urban settings. Furthermore, they help to insulate buildings, reducing the need for air conditioning and thereby decreasing energy consumption. Over time, these installations contribute to reducing the urban heat island effect, where urban regions

experience higher temperatures than their rural counterparts due to human activities and concentrated energy use.

These ecosystem-based strategies mitigate the immediate impacts of climate events and contribute to longer-term sustainability goals by restoring and maintaining the ecological functions that underpin human well-being. The continued development and expansion of such approaches across Southern Africa are crucial for building resilience against ongoing and future environmental challenges, ensuring that communities can adapt to and thrive amidst the increasing variability of the climate.

Climate-smart agriculture

Climate-smart agriculture is also another adaptive approach. Climate-smart agriculture involves farming practices adapted to changing climate conditions (Scherr *et al.*, 2012). These practices include using drought-resistant crops, soil conservation techniques, and water management systems. Thus, the strategies implemented focus on changing the field and farm practices to impact climate change positively. Adopting climate-smart agriculture as a framework, farmers can increase their resilience to droughts and other climate-related risks, ensuring food security and reducing the need for external aid during times of disaster (Bhanye *et al.*, 2024; Bhanye, 2024; Taylor, 2018). Climate-smart landscapes support adaptation and mitigation objectives to increase agricultural resilience to climate change. This is achieved through protecting natural habitats, creating climate-friendly livestock systems, farming with perennials, enriching soil carbon, and restoring degraded watersheds and rangelands. Climate-smart agriculture has been used in countries like Zambia, where the government implemented a program to promote conservation agriculture, which involves using minimum tillage, crop rotation, and cover crops. This approach has helped to reduce soil erosion, increase soil fertility, and improve water retention, making farmers more resilient to droughts (Azadi *et al.*, 2021).

Community-based disaster risk reduction

Community-Based Disaster Risk Reduction approaches can also be adopted. Community-based disaster risk reduction involves empowering local communities to identify and manage risks (Shaw, 2012). This approach recognises that communities have unique knowledge and skills that can be harnessed to reduce their vulnerability to disasters. Involving communities in disaster risk reduction planning and decision-making can help build resilience and ensure that disaster response efforts are effective and sustainable. Community-based disaster risk reduction has been used in Southern Africa to empower local communities to manage their risks. The Mozambiquan government implemented a program to train community members in disaster risk reduction and response (Schafer & Bell, 2002). The program enabled communities to identify and manage their risks, reducing their flood vulnerability. Kienberger (2014) developed a community map of low- and high-risk areas in Munamicua, Mozambique, which are at risk of flooding. The purpose was to create an early warning system through participatory mapping to provide the community with appropriate decision support and awareness tools.

Social protection programs

Governments and donor assistance can also adopt Social Protection Programs as adaptive approaches to climate-induced disasters. Social protection programs involve supporting vulnerable groups, such as older people, women, and children, during times of disaster (Heltberg *et al.*, 2008). These programs can include social funds for community-based adaptation, emergency food aid, safety nets, and other forms of support that help to ensure that vulnerable groups are not left behind during times of crisis (Peacock & Prater, 2012). Holzmann and Jørgensen (2001) note that climate-induced disasters mainly affect people experiencing poverty because shocks are most likely to have the most significant socio-economic impact on them. Therefore, social risk management tools should be used to assist such vulnerable people. For example, in Zimbabwe, the government implemented the Harmonized Social Cash Transfer

(HSCT) program that provides bimonthly cash transfers to vulnerable households during droughts (Bhalla *et al.*, 2018). The program has helped to ensure that vulnerable families have access to food and other essential goods during times of crisis.

Adaptive approaches are critical for responding to climate-induced disasters in Southern Africa. Through adopting early warning systems, ecosystem-based strategies, climate-smart agriculture, community-based disaster risk reduction approaches, and social protection programs, communities and institutions can build resilience, reduce vulnerability, and ensure that their response efforts are effective and sustainable. While challenges are associated with implementing adaptive approaches, such as funding and capacity building, the long-term benefits of these approaches make them a worthwhile investment for Southern Africa's future.

Holistic planning and adaptive approaches for regional integration and security-development in Southern Africa – A critique

Holistic planning and adaptive approaches are increasingly recognised as essential strategies for addressing the multi-dimensional challenges posed by climate-induced disasters in Southern Africa. These strategies are pivotal in integrating efforts across various sectors and countries to enhance regional security and development. However, their implementation is not without challenges, and their success depends on several critical factors, including governance, stakeholder engagement, and resource allocation. Holistic planning in Southern Africa should integrate environmental, economic, and social policies to enhance resilience against climate-induced disasters. This approach requires a comprehensive understanding of the interconnectedness of these systems and the potential cascading effects of disasters across sectors. For example, the transboundary water management initiatives under SADC demonstrate holistic planning by addressing shared water resources critical for agriculture, industry, and human consumption (SADC, 2020). However, while such initiatives aim to prevent conflicts and ensure sustainable use of water

resources, they often run into obstacles such as differing national priorities, limited enforcement of agreements, and political tensions, which can undermine collaborative efforts.

While holistic planning is conceptually sound, fragmented governance structures can hinder its practical application. Many Southern African countries struggle with coordinating policies across different levels of government and between various departments and sectors. This lack of coordination can lead to inconsistent implementation of disaster risk reduction and climate adaptation strategies, reducing effectiveness.

Adaptive approaches are designed to be dynamic, allowing policies and strategies to evolve in response to new information and changing circumstances related to climate variability. These approaches are crucial for managing uncertainties associated with climate change impacts, such as shifting rainfall patterns and unpredictable disaster events. An example of successful adaptive management is the use of climate-smart agriculture techniques that adjust farming practices to current conditions, which can help stabilise food security and improve economic resilience. However, adaptive approaches require robust data collection and monitoring systems to inform policy adjustments. Many Southern African countries lack the infrastructure to effectively collect and analyse environmental and meteorological data. Without accurate data, it is challenging to implement adaptive strategies effectively and to evaluate their success in real time, which is crucial for managing ongoing and future climate risks.

Despite these challenges, holistic planning and adaptive approaches provide significant opportunities for enhancing regional integration and the security-development nexus. Countries can overcome individual limitations and leverage regional strengths through cooperation and sharing of best practices, resources, and data. Enhanced regional cooperation can also lead to more effective responses to transboundary climate risks, such as cyclones and droughts, which do not respect national borders. Additionally, integrating security considerations into climate adaptation strategies can help

mitigate the risks of conflict over resources, exacerbated by climate impacts. For instance, joint water basin management can reduce tensions by ensuring fair and sustainable access to water, thereby contributing to regional peace and stability.

Conclusion and recommendations

In conclusion, this chapter argues that a holistic planning and adaptive approach is necessary to develop more effective responses to climate-induced disasters in Southern Africa. The region's current approach to disaster management, which primarily focuses on reactive response and relief efforts, needs to be revised to address the complex and dynamic nature of climate-induced disasters. The chapter presented case studies from Southern Africa that demonstrate the potential of a holistic planning and adaptive approach to enhance resilience, reduce vulnerability, and promote sustainable development in the face of climate-induced disasters. The case studies highlight the importance of integrating disaster risk reduction and climate change adaptation into development planning processes, incorporating local knowledge and participation, and promoting flexible and adaptive strategies that respond to changing conditions and uncertainties. Through holistic planning and adaptive approaches, decision-makers can better understand the complex and interconnected nature of climate-induced disasters and develop more effective and sustainable strategies to reduce the risks and impacts of such disasters.

The findings of this chapter are relevant not only for Southern Africa but also for other regions facing similar challenges related to climate-induced disasters. The impacts of climate change are being felt globally, and there is an urgent need for new and innovative approaches to disaster management that can address the underlying causes of vulnerability and enhance the resilience of communities and ecosystems. Policymakers, practitioners, and researchers should prioritise adopting a holistic planning and adaptive approach to disaster management, considering the interconnected and dynamic nature of climate-induced disasters. This will encourage the development of more effective, sustainable, and

resilient strategies to reduce the risks and impacts of climate-induced disasters and promote sustainable development in the face of a changing climate. The following recommendations can be adopted to improve responses to climate-induced disasters in Southern Africa:

Integrate disaster risk reduction and climate change adaptation into development planning processes: This will ensure that development activities are aligned with efforts to reduce disaster risks and enhance resilience.

Incorporate local knowledge and participation: Local knowledge and participation are essential for developing context-specific and culturally appropriate disaster management strategies. Decision-makers should engage with local communities in disaster management planning and implementation.

Promote flexible and adaptive strategies: Disaster management strategies should be flexible and adaptive to respond to changing conditions and uncertainties. This includes incorporating early warning systems and developing contingency plans that can be adjusted as new information becomes available.

Strengthen institutional capacity: Disaster management institutions in Southern Africa should be strengthened to ensure they can implement effective disaster management strategies. This includes developing human resources, improving coordination between institutions, and providing adequate funding for disaster management activities.

Address underlying vulnerabilities: To reduce the impacts of climate-induced disasters, it is crucial to address underlying vulnerabilities such as poverty, inequality, and environmental degradation. This requires a holistic approach, including social and economic development, environmental protection, and adaptation to climate change.

Collaborate across sectors and borders: Collaboration across sectors and boundaries is essential for developing effective disaster management strategies. Policymakers

should collaborate across industries such as agriculture, water management, and health, and across borders to evolve regional approaches to disaster management.

The chapter also demonstrates the critical role of holistic planning and adaptive approaches in advancing regional integration and cooperation within the security–development nexus in Southern Africa. The evidence presented demonstrates the necessity of integrating disaster risk reduction with climate change adaptation to simultaneously secure developmental goals and regional stability. As Southern Africa continues to face escalating climate-induced challenges, fostering such integrative strategies will be paramount. This chapter recommends that policymakers prioritise cross-border collaborative frameworks that embrace holistic and adaptive planning, ensuring that regional responses to climate threats also advance security and developmental objectives.

References

Aderinto, N. 2023. Tropical Cyclone Freddy exposes significant health risks in the hardest-hit Southern African countries: Lessons for climate change adaptation. *International Journal of Surgery*, 6: 0152. https://doi.org/10.1097/GH9.0000000000000152

Adger, WN, Hughes, TP, Folke, C, Carpenter, SR. & Rockstrom, J. 2005. Social-ecological resilience to coastal disasters. *Science*, *309*(5737), 1036-1039. https://doi.org/10.1126/science.1112122

Azadi, H, Moghaddam, SM, Burkart, S, Mahmoudi, H, Van Passel, S, Kurban, A & Lopez-Carr, D. 2021. Rethinking resilient agriculture: From climate-smart agriculture to vulnerable-smart agriculture. *Journal of Cleaner Production*, 319: 128602. https://doi.org/10.1016/j.jclepro.2021.128602

Becker, P, Hagelsteen, M & Abrahamsson, M. 2021. 'Too many mice make no lining for their nest': Reasons and effects of parallel governmental structures for disaster risk reduction and climate change adaptation in Southern Africa. *Jàmbá: Journal of Disaster Risk Studies*, 13(1):1-8. https://doi.org/10.4102/jamba.v13i1.1041

Bhalla, G, Handa, S, Angeles, G & Seidenfeld, D. 2018. The effect of cash transfers and household vulnerability on food security in Zimbabwe. *Food policy*, 74:82-99. https://doi.org/10.1016/j.foodpol.2017.11.007

Bhanye, JI., 2024. Migrants' food systems in foreign cities: Socio-spatial segregation and implications for health. *Developments in Environmental Science*, 15:9-97. https://doi.org/10.1016/B978-0-443-21948-1.00023-6

Bhanye, JI., Matooane, L., Matamanda, A. & Bhanye, AS. 2024. Food and housing insecurity: Addressing the dual burden of health risks. *Developments in Environmental Science*, 15:477-502. https://doi.org/10.1016/B978-0-443-21948-1.00023-6

Bogdan, EA, Beckie, MA & Caine, KJ. 2022. Making room for nature? Applying the Dutch Room for the River approach to flood risk management in Alberta, Canada. *International Journal of River Basin Management*, 20(2):153-165. https://doi.org/10.1080/15715124.2020.1723604

Buzan, B. 2003. *Regions and powers: The structure of international security* (Vol. 226). Cambridge University Press. https://doi.org/10.1017/CBO9780511491252

BizCommunity. 2016. Beef production threatened by deepening drought. Bizcommunity News. 4 February. [26 April 2023] https://www.bizcommunity.com/Article/196/742/140354.html

Chagutah, T. 2013. Land tenure insecurity, vulnerability to climate-induced disaster and opportunities for redress in Southern Africa. *Jàmbá: Journal of Disaster Risk Studies* 5(2):1-8. https://doi.org/10.4102/jamba.v5i2.79

Chapungu, L., 2020. *Mitigating the impact of cyclone disasters: Lessons from Cyclone Idai*. Policy briefing: Climate change and migration. South African Institute of International Affairs.https://doi.org/10.13140/RG.2.2.25933.46563

Chikondi T. 2023. Cyclone Freddy broke records and ravaged countries. How does the healing begin? https://www.npr.org/sections/goatsandsoda/2023/03/17/1164256900/cyclone-freddy-shattered-records-people-lost-everything-how-does-the-healing-beg

Chinguwo, D & Deus, D. 2022. Assessment of Malawi's community-based flood early warning system. *Jàmbá-Journal of Disaster Risk Studies*, 14(1):1166. https://doi.org/10.4102/jamba.v14i1.1166

De Bruijn, H, de Bruijne, M & ten Heuvelhof, E. 2015. The politics of resilience in the Dutch 'Room for the River' project. *Procedia Computer Science*, 44:659-668. https://doi.org/10.1016/j.procs.2015.03.070

Djalante, R. 2012. Adaptive governance and resilience: The role of multi-stakeholder platforms in disaster risk reduction. *Natural Hazards and Earth System Sciences*, 12(9):2923-2942. https://doi.org/10.5194/nhess-12-2923-2012

Füsse, HM and Klein RJ. 2006. Climate change vulnerability assessments: An evolution of conceptual thinking. *Climatic change*, 75(3):301-329. https://doi.org/10.1007/s10584-006-0329-3

Gandini, A, Quesada, L, Prieto, I & Garmendia, L. 2021. Climate change risk assessment: A holistic multi-stakeholder methodology for the sustainable development of cities. *Sustainable Cities and Society*, 65: 102641. https://doi.org/10.1016/j.scs.2020.102641

Heltberg, R, Jorgensen, S & Siegel, PB. 2008. Climate change: Challenges for social protection in Africa. *Available at SSRNSSRN 1174774*. https://doi.org/10.2139/ssrn.1174774

Holzmann, R & Jørgensen, S. 2001. Social risk management: A new conceptual framework for social protection. *International Tax and Public Finance*, 8: 529-556. https://doi.org/10.1023/A:1011247814590

Iloka, NG. 2016. Indigenous knowledge for disaster risk reduction: An African perspective. *Jàmbá: Journal of Disaster Risk Studies*, 8(1): 1-7. https://doi.org/10.4102/jamba.v8i1.272

IPCC. 2012. Managing the risks of extreme events and disasters to advance climate change adaptation. Special report of the intergovernmental panel on climate change. Cambridge: Cambridge University Press.

Juhasz-Nagy, E, Lindkvist, CM, Nielsen, BF, Lobaccaro, G, Neumann, HM & Wyckmans, A. 2017. September. Holistic planning approaches: Starting with common ground. In: *Proceedings of the Urban Transitions Pathways Symposium*. 18-20.

Kamara, JK, Akombi, BJ, Agho, K & Renzaho, AM. 2018. Resilience to climate-induced disasters and its relationship to well-being in Southern Africa: A mixed-methods systematic review. *International Journal of Environmental Research and Public Health*, 15(11): 2375. https://doi.org/10.3390/ijerph15112375

Kienberger, S. 2014. Participatory mapping of flood hazard risk in Munamicua, District of Búzi, Mozambique. *Journal of Maps*, 10(2): 269-275. https://doi.org/10.1080/17445647.2014.891265

Koch, IC., Vogel, C, & Patel, Z. 2007. Institutional dynamics and climate change adaptation in South Africa. *Mitigation and Adaptation Strategies for Global Change*, 12:1323-1339. https://doi.org/10.1007/s11027-006-9054-5

Lentini, R. 2001. Rebuild by design: Building resilience with winning strategies *The Australian Journal of Emergency* Management, 31(1):46-48. https://doi.org/10.1007/s11027-006-9054-5

Mail and Guardian. 2015. Drought predictions for Southern Africa. https://mg.co.za/article/2015-09-24-00-drought-predictions-for-southern-africa/

Mattoni, B, Nardecchia, F & Bisegna, F. 2019. Towards the development of an intelligent district: Applying a holistic planning approach. *Sustainable Cities and Society*, 48: 101570. https://doi.org/10.1016/j.scs.2019.101570

Neque, A, Pinto, I, Maúre, G & Beleza, A. 2022. Understanding the variability of heatwave characteristics in Southern Africa. *Weather and Climate Extremes*, 38:100498. https://doi.org/10.1016/j.wace.2022.100498

Mpandeli, S, Nhamo, L, Hlahla, S, Naidoo, D, Liphadzi, S, Modi, AT & Mabhaudhi, T. 2020. Migration under climate change in Southern Africa: A nexus planning perspective. *Sustainability*, 12(11):4722. https://doi.org/10.3390/su12114722

Mugabe, VA, Gudo, ES, Inlamea, OF, Kitron, U & Ribeiro, GS. 2021. Natural disasters, population displacement and health emergencies: Multiple public health threats in Mozambique. *BMJ global health*, 6(9):p.e006778. https://doi.org/10.1136/bmjgh-2021-006778

Muzari, W, Nyamushamba, GB & Soropa, G. 2016. Climate change adaptation in Zimbabwe's agricultural sector. *International Journal of Science and Research*, 5(1):1762-1768. https://doi.org/10.21275/v5i1.23011602

Nemakonde, LD, Van Niekerk, D, Becker, P & Khoza, S. 2021. Perceived adverse effects of separating government institutions for disaster risk reduction and climate change adaptation within the Southern African Development Community Member States. *International Journal of Disaster Risk Science*, 12:1-12. https://doi.org/10.1007/s13753-020-00303-9

Nhamo, G. 2014. Addressing women in climate change policies: A focus on selected East and Southern African countries. *Agenda*, 28(3):156-167. https://doi.org/10.1080/10130950.2014.946734

Nhamo, L, Mabhaudhi, T & Modi, AT., 2019. Preparedness or repeated short-term relief aid? Building drought resilience through early warning in southern Africa. *Water SA*, 45(1):75-85. https://doi.org/10.4314/wsa.v45i1.09

Nyarumbu, TO. & Magadza, CH. 2016. Using the Planning and Management Model of Lakes and Reservoirs (PAMOLARE) as a tool for planning the rehabilitation of Lake Chivero, Zimbabwe. *Environmental Nanotechnology, Monitoring & Management*, 5:1-12. https://doi.org/10.1016/j.enmm.2015.10.002

Owusu-Sekyere, E., Lunga, W. & Karuaihe, S.T. 2021. The impact of disasters on economic growth in selected Southern Africa development community countries. *Jàmbá: Journal of Disaster Risk Studies*, 13(1). https://doi.org/10.4102/jamba.v13i1.1081

Pardoe, J, Vincent, K, Conway, D, Archer, E, Dougill, AJ, Mkwambisi, D & Tembo-Nhlema, D. 2020. Evolution of national climate adaptation agendas in Malawi, Tanzania and Zambia: The role of national leadership and international donors. *Regional Environmental Change*, 20(4): 118. https://doi.org/10.1007/s10113-020-01693-8

Pasquini, L & Cowling, RM. 2015. Opportunities and challenges for mainstreaming ecosystem-based adaptation in local government: Evidence from the Western Cape, South Africa. *Environment, development, and sustainability*, 17:1121-1140. https://doi.org/10.1007/s10668-014-9594-x

Peacock, WG & Prater, C. 2012. Social protection and disaster. In: *The Routledge Handbook of Hazards and Disaster Risk Reduction*. Routledge. 687-696.

Putsoane, T, Bhanye, JI. & Matamanda, A. 2024. Extreme weather events and health inequalities: Exploring vulnerability and resilience in marginalized communities. *Developments in Environmental Science*, 15:225-248. https://doi.org/10.1016/B978-0-443-21948-1.00011-X

Roberts, D, Boon, R, Diederichs, N, Douwes, E, Govender, N, Mcinnes, A, Mclean, C, O'Donoghue, S & Spires, M. 2012. Exploring ecosystem-based adaptation in Durban, South Africa: "Learning-by-doing" at the local government coal face. *Environment and Urbanization*, 24(1):167-195. https://doi.org/10.1177/0956247811431412

Rusca, M, Savelli, E, Di Baldassarre, G, Biza, A & Messori, G. 2023. Unprecedented droughts are expected to exacerbate urban inequalities in Southern Africa. *Nature Climate Change*, 13(1):98-105. https://doi.org/10.1038/s41558-022-01546-8

Schafer, J & Bell, R. 2002. The state and community-based natural resource management: The Moribane Forest Reserve, Mozambique case. *Journal of Southern African Studies*, 28(2):401-420. https://doi.org/10.1080/03057070220140775

Scherr, SJ., Shames, S & Friedman, R. 2012. From climate-smart agriculture to climate-smart landscapes. *Agriculture & Food Security*, 1:1-15. https://doi.org/10.1186/2048-7010-1-12

Shaw, R. (ed). 2012. *Community-based disaster risk reduction*. Emerald Group Publishing. https://doi.org/10.1108/S2040-7262(2012)10

Skinner, C & Rampersad, R. 2014. A revision of communication strategies for effective disaster risk reduction: A case study of the South Durban basin, KwaZulu-Natal, South Africa. *Journal of Disaster Risk Management*, 6(1) https://doi.org/10.4102/jamba.v6i1.132

Taylor, M 2018. Climate-smart agriculture: What is it suitable for? *The Journal of Peasant Studies*, 45(1):89-107. https://doi.org/10.1080/03066150.2017.1312355

Turton, A & Funke, N. 2008. Hydro-hegemony in the context of the Orange River Basin. *Water Policy*, 10(S2):51-69. https://doi.org/10.2166/wp.2008.207

Tysiachniouk, MS. 2012. *Transnational governance through private authority: The case of the Forest Stewardship Council certification in Russia*. Wageningen University and Research. https://doi.org/10.3920/978-90-8686-772-1

Utete, B, Phiri, C, Mlambo, SS, Muboko, N & Fregene, BT. 2019. Vulnerability of fisherfolks and their perceptions towards climate change and its impacts on their livelihoods in a peri-urban lake system in Zimbabwe. *Environment, Development and Sustainability*, 21:917-934. https://doi.org/10.1007/s10668-017-0067-x

Van Niekerk, D & Wentink, GJ. 2017. The capacity of personnel in disaster risk management in South African municipalities. *TD: The Journal for Transdisciplinary Research in Southern Africa*, 13(1):1-10. https://doi.org/10.4102/td.v13i1.427

Van Niekerk, D. 2014. A critical analysis of the South African Disaster Management Act and Policy Framework. *Disasters*, 38(4):858-877. https://doi.org/10.1111/disa.12081

Vermaak, J & Van Niekerk, D. 2004. Disaster risk reduction initiatives in South Africa. *Development Southern Africa*, 21(3):555-574. https://doi.org/10.1080/0376835042000265487

Warner J. & Van Buuren, A. 2011. Implementing room for the river: Narratives of success and failure in Kampen, the Netherlands. *International Review of Administrative Sciences*, 77(4):779-801. https://doi.org/10.1177/0020852311419387

Wilson, E & Piper, J. 2010. *Spatial planning and climate change*. Routledge. https://doi.org/10.4324/9780203846537

Xie W, Sun C & Lin Z. 2023. Spatial-temporal evolution of urban form resilience to climate disturbance in the adaptive cycle: A case study of Changchun city. *Urban Climate*, 49:1-23. https://doi.org/10.1016/j.uclim.2023.101461

Zschau, J & Küppers, AN (eds). 2013. *Early warning systems for natural disaster reduction*. Springer Science & Business Media.