

Climate change and disaster resilience: A case study of the April 2022 floods in Deelpan, North-West province, South Africa

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ABSTRACT: Building resilient and sustainable communities requires serious spatial planning and land use management consideration. However, because infrastructure is significantly impacted, the built environment community faces a serious challenge because of climate change. Thus, one of the strategies to reduce the impact of climate change on already existing infrastructure is through spatial planning. The primary goal of this project is to raise awareness of the significance of spatial planning in rural areas for disaster resilience since inadequate planning can have a detrimental effect on infrastructure. Additionally, the Spatial Planning and Land Use Act 2013 has noted that traditional land use development processes are poorly integrated into the formal systems of spatial planning and land use management. A study using a qualitative method based on an explanatory approach was conducted. The results showed that spatial planning is crucial for reducing the potential effects of climate change on current infrastructure.

Keywords: Climate change, disaster management, disaster, spatial planning, land use

1 INTRODUCTION

Spatial planning and land use management are crucial for creating resilient and sustainable communities. These tools play a vital role throughout the disaster cycle (Triantis 2023:30). In South Africa, the Spatial Planning and Land Use Management Act 2013 (SPLUMA) requires the incremental introduction of land use management in areas under traditional leadership, rural areas, and informal settlements (SPLUMA 2013:36). Historically, municipal planners had limited authority in these areas, despite their jurisdiction (Constitution of the Republic of South Africa 1996:74).

Climate change, defined by the Intergovernmental Panel on Climate Change (IPCC) as a persistent change in climate patterns (United Nations Framework Convention on Climate Change 2011), poses significant challenges for rural spatial planning. The impacts of climate change are experienced worldwide (United Nations 2019:2). In rural areas, the relationship between municipal planners and traditional leaders plays a significant role in spatial planning.

The effects of global warming, including increased rainfall and severe floods (Avand *et al.* 2021:1) put the well-being and sustainable development of rural communities like Deelpan in the North West province of South Africa at risk. This study examined the impact of the catastrophic floods that struck Deelpan in April 2022, exploring the challenges faced by residents, the response of the Tswaing Local Municipality, the role of traditional leaders, and key takeaways for rural spatial planning.

2 LITERATURE REVIEW

All concepts covered in this paper are related to the research study. Understanding what each idea means is essential to understand the research topic better. Spatial planning, which involves the organization and design of physical spaces, is required to tackle the problems caused by climate change while striving for sustainability. Spurlock (2016), emphasized the vital role spatial planning can play in mitigating future climate change, including sustainable development, promoting resilience, and reducing greenhouse gas emissions across various sectors of society.

It entails a comprehensive method of land use that considers environmental, social, and economic factors (Reidsma *et al.* 2011). The research topic emphasizes or focuses on the impacts of climate change, particularly floods that hit Deelpen, a rural area in the North West province. This paper focuses on different concepts relevant to the research study by defining each of the impacts, and highlighting which is relevant. Furthermore, the paper focuses on the theoretical and conceptual frameworks by identifying and discussing the importance of its relevance to this study. This will assist in better understanding the research topic and understanding its relevance and significance.

3 CONCEPTUAL FRAMEWORK

This section outlines and defines different concepts relevant to the research study. Varpio *et al.* (2020:22) defined *conceptual framework* as a justification of why a given study should be conducted.

3.1 Disaster

Scholars have defined disasters in many ways: The American College of Emergency Physicians defined it as when the destructive effects of natural or man-made forces overwhelm the ability of a given area or community's ability to meet healthcare demands (Lomaglio *et al.* 2020:56). Carr (cited in Furedi 2007:483) argued that a disaster is defined by human beings and not by nature, indicating that not every windstorm or earth tremor is a catastrophe if there are no serious injuries, deaths or other severe losses. These definitions of a disaster are all centered around humanity, while the American College of Emergency based it more on healthcare, and Carr's definition is more on the effects of the disaster on lives.

Perry (2007) and Reinhardt (2015), cited in Reinhardt and Lutmar (2022:6), defined disasters as disruptions to society caused by unplanned events. Gaborit (2022) highlighted that climate-related disasters such as storms, floods, rising sea levels, cyclones, and dry spells are expected to increase in frequency, intensity, and impact. The unplanned events resulting from disasters and climate-related disasters call for a proactive approach at all levels of government, so that when a disaster strikes, mitigation plans are already in place.

3.2 Disaster management

Faulkner (2001), cited in Arora and Chakraborty (2021:675), defined disaster management as a multi-stage process requiring collaborative efforts of several stakeholders, each getting a small and often simultaneous time window to respond and contribute. Moreover, according to Harrald (2006), cited in Efendi *et al.* (2019:628), disaster management is defined as a phenomenon that requires both discipline and agility in the mobilization of forces and resources to anticipate the disaster, mitigate risks, and reduce the impact of post-disaster chaos, both for natural and artificial disasters. This study adopted both definitions of disaster management because it is indeed a multi-stage process, and it entails the mobilization of forces to anticipate a disaster. Anticipating a disaster and then having recovery plans shows the level of preparedness, and climate change impacts require immediate actions to reduce their severity.

3.3 *Climate change*

The IPCC (2011) defined climate change as an apparent change in the state of the climate (e.g., by using statistical tests) by variations in the average and the variability of its characteristics, and that lasts for a long time, usually decades or more (O'Neill 2017:22). This definition emphasizes that climate change involves changes in the long-term patterns and averages of temperature, precipitation, wind, and other climate-related factors. It recognizes that climate change can result from both natural processes and human activities, including the emission of greenhouse gases from deforestation, the burning of fossil fuels, and other human-caused changes to the Earth's systems. The definition also underscores that climate change is a persistent phenomenon that occurs over extended periods, distinguishing it from short-term fluctuations in weather patterns.

The effects of climate change, mostly in developing countries (Lucas *et al.* 2019:488), disproportionately affect poor rural areas. The Global Environmental Outlook 6 (GEO6) of 2019 and the Summary for Policy Makers in Climate Change and Land by the IPCC (2019) both stressed that climate change has worsened land degradation throughout the world, and this has been evident through natural disastrous events taking place such as the rise in sea levels, droughts, floods, and wildfires. This supports the IPCC's definition, emphasizing that the impacts of climate change persist for an extended period.

4 THEORETICAL FRAMEWORK

This section focuses on generating discussions of some of the concepts guiding this study. Varpio *et al.* (2020) defined a theoretical framework as a logically developed and connected set of concepts and premises, developed from one or more theories.

4.1 *Spatial planning in rural areas*

Spatial planning has been perceived as a delivery tool rather than a regulatory one (Medeiros 2019). Municipalities or local authorities must have spatial plans as tools to ensure sustainable development. These plans are not used in isolation, but together with other relevant planning policies, acts, and by-laws such as land use schemes, and intergraded development framework policies. The significance of spatial planning in rural areas lies in its ability to address the unique challenges and opportunities of these areas. These challenges include limited infrastructure, scarce resources, and balancing economic development with environmental conservation. This is why spatial planning is essential because it helps to tackle these challenges.

4.2 *Disasters in rural regions*

Disasters in rural areas can be both man-made and natural events that pose significant challenges and risks to the local communities (Furedi 2007). These disasters can be devastating for local communities due to their limited access to resources and services. The impacts of natural disasters in rural regions can be extensive, as these areas often have limited infrastructure and resources to withstand or recover from such events (Ahmed *et al.* 2019). The limited infrastructure and resources can exacerbate the damage and hinder recovery efforts. Rural areas face unique challenges in disaster management due to their remoteness (Paltemaa 2017), limited resources, and lower population density. Disaster management in rural areas is a complex and vital process that involves understanding the specific challenges faced by remote communities, developing appropriate strategies, and mobilizing adequate resources.

5 METHODOLOGY

The methodology employed a qualitative approach, which included interviews with a comprehensive desk review. Data collection involved conducting in-depth interviews with a diverse range of stakeholders, including Deelpan residents, representatives from the traditional authority, officials from the Tswaing Local Municipality, and rural community members. These interviews aimed at capturing personal narratives and insights into the lived experiences during and after floods, as well as the responses and roles of various authorities. The qualitative data gathered through these interviews provided a rich, nuanced understanding of the community's resilience and the effectiveness of the disaster response.

In addition to the interviews, a thorough desk review was conducted to analyze data from existing literature, including academic articles, policy documents, and books relevant to climate change, disaster resilience, and rural spatial planning. The findings from these sources were subjected to thematic analysis, a method that involves identifying, analyzing, and reporting patterns or themes within the data. This approach allowed for the synthesis of large amounts of qualitative information into coherent themes that reflect the broader implications of the floods. Furthermore, textual analysis was employed to critically evaluate the content of the literature review, ensuring a comprehensive understanding of the existing knowledge and contextual factors related to the April 2022 floods. This methodological framework facilitated a robust analysis of the impact of the disaster and the effectiveness of the community's and authorities' responses, ultimately contributing to the study's aim of enhancing disaster resilience in rural areas.

6 STUDY AREA

Deelpan is one of the rural areas under the Tswaing Local Municipality, which is rural. The local municipality falls under the Ngaka Modiri Molema District Municipality, which has offices in Mmabatho. Deelpan is located on a wetland that is unsuitable for residential development (Figure 1).



Figure 1. Deelpan, Tswaing local municipality (Source: Google Maps).

7 FINDINGS

7.1 *Lived experiences of Deelpan residents during and after the April 2022 floods hit the area*

It is important to identify the lived experiences of the community members during and after the floods, because it provided knowledge and insights into how well the community members

were informed about activities taking place in their area. All residents spoke of how saddening and inconveniencing the floods were. The floods damaged most respondents' homes, while two respondents indicated that the floods damaged both their homes, businesses, and work-place. The traditional authority representative compared the April 2022 floods with the floods in 1987/88, and said these were more severe, and even caused much more damage to internal roads. The graph overleaf indicates responses based on the damage the floods caused.

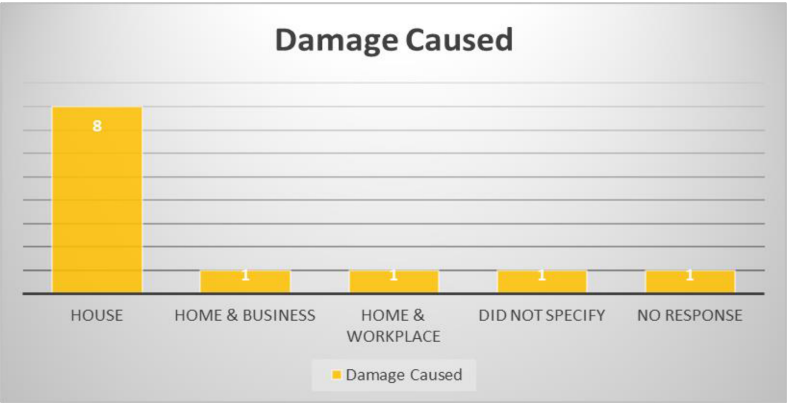


Figure 2. Responses based on damages caused (Source: Authors 2023).

7.2 *Reaction of Tswaing Local Municipality to the floods during and after they hit the Deelpan area in April 2022*

From the officials who worked in Tswaing Local Municipality, it is evident that the aftermath of the floods came as a shock. They did not expect the area to be flooded, even though the planners mentioned that the place they currently occupy was unsuitable for development. Unfortunately, the municipality was not prepared for such a disaster because it did not have a disaster management unit.

The devastating events of the floods, which led the municipality to liaise with its District Municipality and other relevant departments for assistance, led to the decision to create a new disaster management department within the Tswaing Local Municipality. That unit will be responsible for having a disaster management plan in place for the municipality to avoid future disasters from occurring without the municipality being ready and prepared.

With all the efforts the municipality put in place, only the ward councilor knew what the municipality did. Most of the community members had a different view and said that their local municipality offered no assistance. Some of them were not even aware that the local municipality did not have a disaster management department. This raised concerns about the level of transparency in the local municipality to its community members.

7.3 *The role of traditional leaders during and after the April 2022 floods*

The representative from the traditional authority was an old woman with many insights about the area. She compared the April 2022 floods with the floods that took place in 1987/88. She also indicated that over the years, their community had grown, and suspected that the growth might have caused the severity of the floods compared to the 1987/88 floods. She recalled that the severe floods that occurred in 1987/88 did not cause any changes to the main big river and explained that after the April 2022 floods hit, their river has now grown, and she feared future floods.

The representative explained that as a traditional authority, the floods took them by surprise as they were not prepared for the devastating impacts that followed. She then indicated that the traditional authority donated land to the municipality to build houses for the community members affected by the floods.

7.4 Implications of lack of rural spatial planning

Spatial planning is essential, and rural spatial planning is of paramount importance as the lack of it can result in devastating events where rural community members find themselves in compromising situations beyond their control. These compromising situations are due to their limited infrastructure, lower population densities, and remote location in disaster management.

Furthermore, SPLUMA and all other relevant policies and legislation, speak one language of developing and improving the livelihoods of those living in rural areas in accessing basic infrastructure needs compared to those living in urban areas, who already have access to such infrastructure. All of the above will be possible with the implementation of spatial plans in rural areas. Spatial plans should incorporate disaster management plans unique to all areas under the Tswaing local municipality to ensure their effectiveness.

8 CONCLUSION AND RECOMMENDATIONS

The importance of spatial planning, especially now when the impacts of climate change are experienced all over, has no settlement boundaries, and every settlement needs to be formally planned to ensure disaster resilience and sustainability for future generational use. The following recommendations are presented to ensure that flood disaster management is incorporated in spatial plans to ensure disaster resilience and sustainability of settlements.

8.1 Intersectoral collaboration

The departments within the local municipality must start working hand in hand. The Town Planning Department needs to have relationships with the Housing Department, the Infrastructure Department, the Integrated Development Plan (IDP) Department, the Local Economic Department, and the Disaster Management Department. Their plans for all areas under their jurisdiction need to inform each other. Regular inspections need to be conducted, and as highlighted in Chapter 3 of the Constitution, 1996, the Municipal Systems Act, and SPLUMA, previously disadvantaged areas, such as rural areas under traditional authorities, need to be considered in all planning processes and the community needs to be involved in assisting the local municipality with ideas properly.

The local municipality also needs to liaise with other local municipalities and the district municipality to benchmark itself, to see what others are doing differently, what they can learn from others, and what they can offer because this will spark a proactive approach in their plans instead of a reactive mindset. This relationship should not be limited to only municipalities, but relevant government departments, such as the Department of Public Works and Roads, the Department of Human Settlements, and the Department of Health, should ensure that the infrastructure provision plans are in line with municipal needs.

8.2 Good working relationship between municipal planners and the traditional authority

These two need to be in constant communication regarding the future development of their area. This goes to all rural areas under the different traditional authorities in the Tswaing Local Municipality.

A committee consisting of representatives from the traditional authority needs to be established so that planning issues can be addressed and agreed upon before consultation is done with the community members. The findings are clear that the community members are more used to their traditional authority than their local municipality, and as a result, they will be more likely to listen, participate, and comment on development projects if they see that their traditional authority is involved.

Indigenous knowledge in tackling the impacts of climate change has proven to work over the years in some areas. A good working relationship will allow for the sharing of knowledge and exchange of knowledge in finding or developing mitigation and adaptation plans for future disasters such as floods, as it looks as if Deelpan will be one of the areas that experience devastation.

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