

Agricultural water access conflicts among smallholder farmers in the Western Cape, South Africa

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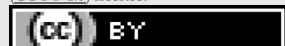
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Abstract: Despite extensive legal reforms to democratise water governance, smallholder farmers in South Africa face challenges in accessing productive water. This paper describes water access conflicts among smallholder farmers in fourteen (14) historical rural towns in the Western Cape. The study examined how historical injustices, socio-economic disparities, environmental concerns, and colonial legacies have influenced current water governance and access mechanisms. Using a qualitative-exploratory framework, smallholder farmers were interviewed one-on-one (n = 119) and through focus group discussions (n = 51) to explore their understanding of water governance and agricultural water access conflicts. The findings from participant narratives were analysed thematically using Atlas.ti. The study found that historical inequities, inadequate infrastructure, differing social identities, and exclusion from decision-making perpetuate water access disparities among smallholder farmers, leading to resource conflicts. Climate change has impacted farmers, who have limited adaptive capacity due to land ownership constraints and water access barriers. Participants highlighted how these systemic issues converge to undermine investment in water-saving technologies, sustain cycles of vulnerability, and create the potential for in-group and out-group conflicts. A nuanced understanding of how social identity, particularly

‘intra-ethnicity’, and land ownership influence water access is needed. We recommend equitable water allocation mechanisms, community-based participatory governance, and investments in infrastructure to mitigate conflicts and promote sustainable water management.

Keywords: Inequity, smallholder farmers, agricultural water, water conflicts, identity.

1. Introduction

After the transition to democracy in 1994, the South African government urgently needed to redress past inequities in water access. The process began with the White Paper on Water Supply and Sanitation Policy (1994). The Water Services Act (WSA) No. 108 of 1997 was enacted, mandating local governments to ensure access to basic water services. The National Water Policy White Paper (1997) laid the foundation for new water legislation, focusing on integrated policy positions for the protection, use, development, conservation, management, and control of South Africa’s water resources. The National Water Act (NWA) No. 36 of 1998 established the legal framework governing water management, designating water as a public resource managed by the state on behalf of all citizens. The Act addressed historical inequities by prioritising equitable and sustainable access to water, particularly for disadvantaged communities, including smallholder farmers (Sadiki & Ncube, 2020). The Water Allocation Reform (WAR) Strategy (2008) set targets for equitable water allocation; however, it did not yield the expected results. Implementation challenges, bureaucratic inefficiencies, and systemic biases have hindered the effectiveness of current policies and legislation. The complex and slow water licensing process disadvantages smallholder farmers, who primarily operate informally without secure water rights, leaving them vulnerable to exclusion when allocations are formalised (Aleu et al., 2022). Limited representation of smallholder farmers in Water User Associations (WUAs) has led to perceptions of procedural injustice, as commercial farmers often dominate decision-making processes (Ngarava, 2024). Additionally, land tenure insecurity

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undermines the water rights envisioned in the WAR Strategy, as many smallholders farm on communal or leased land without formal claims, making it difficult to secure water permits (Fanadzo et al., 2021; Ncube, Shoko, Mugejo, Manyiki & Mashile, 2025).

The National Water Resource Strategy 3 (NWRS-3) (2023) acknowledges the need to amend the WSA and the NWA as part of water allocation reform, particularly to address historical inequalities. The strategy advocates for financial support for emerging, historically disadvantaged, and resource-poor farmers (most smallholder farmers fall into this category). While the NWRS-3 presents a promising framework for addressing water access challenges, we argue that it is still new, and its effectiveness remains to be seen. It is unclear how well the proposed mechanisms will be implemented, particularly in ensuring equitable access and addressing governance shortcomings. Key concerns include enforcement capacity, bureaucratic efficiency, and the balancing of economic and social priorities. Thus, while legal frameworks provide for equitable access, implementation challenges, such as a lack of enforcement and infrastructure deficits, continue to create disparities in water access, contributing to conflicts among different user groups.

While there is existing research on a range of socio-economic factors that influence water access for marginalised farming communities (Aleu et al., 2022; Ncube, 2018; Ngarava, 2024; Sadiki & Ncube, 2020), we argue in this paper that there is a need to understand how social identity, particularly 'intra-ethnicity,' affects access to water institutions and the responses of those excluded. Additionally, there is a need for further research on the role of land ownership and water riparianism as causes of conflict; for example, how those who own land and have water sources on their farms use and share water with others due to the persistence of existing lawful water use in South Africa. Furthermore, there is a gap in research that examines the impact of climate change on water access conflicts for smallholder farmers in the Global South. Given the wealth of literature predicting the increasing frequency and severity of climate-related disasters (Ikhuoso et al., 2020; Koebele & Simpson, 2023; Ruwanza et al., 2022), it is important to understand how climate change exacerbates existing inequalities in water access and its potential for conflict. Thus, this paper discusses water access conflicts among historically marginalised and disenfranchised smallholder farmers. The study posed the following question: What factors contribute to water access disparities and conflicts among smallholder farmers in selected rural towns within the West Coast and Overberg District Municipalities in the Western Cape Province, South Africa? We explored how historical injustices and socio-economic inequalities shape water governance and access.

2. Literature Review

This section discusses existing scholarship on smallholder farmers and water conflicts, framing the study within historical, socio-political, and institutional contexts. We define smallholder farmers and discuss their challenges, debating colonial and apartheid legacies that shape contemporary water access disparities (2.1). This is followed by an exploration of the drivers of water conflicts, including climate change, governance inefficiencies, and competing user priorities, while discussing those tenets of the frustration-aggression hypothesis and procedural justice relevant to conflict management (2.2). The review, therefore, contextualises the intersectional pressures—historical, environmental, and institutional—that reinforce agricultural water management conflicts among smallholder farmers.

2.1 Smallholder farmers

Smallholder farmers are classified and defined by the South African Department of Agriculture (2015) as:

"... those farmers who produce for household consumption and markets, subsequently earning ongoing revenue from their farming businesses, which form a source of income for the family. The farmers have the potential to expand their operations and to become commercial farmers, but need access to comprehensive support (technical, financial, and managerial instruments)."

The definition shows the potential for smallholder farmer growth and reliance on comprehensive support. However, the experiences of South African smallholder farmers in water governance have been remarkably similar to those of other previously colonised countries in the global South. The ability of smallholder farmers in South Africa to access water institutions has been shaped by historical apartheid policies, which purposefully denied the Black population access to essential services, including irrigation water (Weindl, 2022). As a result of this historical legacy, many smallholder farmers still face difficulties in accessing water institutions and participating in water governance mechanisms (Ncube, 2018; Sadiki & Ncube, 2020).

In addition to these historical antecedents, it is essential to note that other factors currently contribute to smallholder water conflicts. Frequently cited reasons include competition for water resources among smallholders and between smallholder and commercial farmers (Sohrabi et al., 2023), as well as unequal access to water based on political influence (Madrigal-Solís et al., 2022). These imbalances increase tensions and even confrontations among smallholder farmers, between these farmers and the government, and between resource-rich and resource-poor farmers (Chen & Shen, 2023).

Various constraints impede smallholder farmers' access to water resources and water institutions. In some cases, farmers are further marginalised by a lack of land ownership and insufficient access to markets and financing, limiting their capacity to invest in water infrastructure and technology (Ziervogel, 2018). Conflicts may intensify due to disparities in smallholder farmers' water-use objectives. For instance, while some prioritise productive water for irrigation to maintain commercial crops, others may require it for their livestock, and yet others prefer potable water for home use (Akurugu et al., 2021). Conflicts over the distribution and use of water within communities can arise from these conflicting requirements. In Africa, where small-scale farming is a significant source of income for many smallholder farmers, disparities in water usage priorities are particularly pronounced. Conflicts may emerge between those who use irrigation water for crop productivity and those who depend on water for residential or animal use (Ikhuoso et al., 2020).

Water infrastructure is insufficient to meet the needs of smallholder farmers in several African nations, which hampers their ability to access and efficiently manage water (Chikozho et al., 2020). Conflicts are exacerbated by restricted water access and inadequate water infrastructure, such as limited irrigation systems or storage facilities (du Plessis, 2019). Thus, inadequate storage facilities and limited irrigation systems intensify conflicts over water allocation and usage.

2.2 Water conflicts

Although water bodies abound globally, in the Global South, climate change has led to heightened competition and conflicts, exacerbated by 'manufactured' water scarcity (Koebele & Simpson, 2023). The 'manufactured' nature of this scarcity means that political narratives depict it as natural, universal, and permanent, while overlooking elite-driven deforestation and the overexploitation of groundwater. This dynamic intensifies competition, resulting in disputes between smallholder and commercial farmers, as reported by Mwangi (2020) in Kenya, and among agricultural and urban-industrial water users, as noted by Ruwanza et al. (2022) in South Africa. Climate change poses significant challenges to water access for smallholder farmers, characterised by erratic rainfall patterns and droughts, which heighten the potential for conflict over scarce water resources among competing users (Shunglu et al., 2022). Smallholder farmers, with limited adaptive capacity and resources, are disproportionately affected by these climate change stressors, further exacerbating their vulnerability.

In addition to the effects of climate change, smallholder farmers encounter obstacles in accessing water institutions and participating in decision-making due to corruption (Mwangi, 2020). Inequities in water access and management are perpetuated by the exclusion or inadequate representation of marginalised farmers' interests in many water governance organisations in the Global South (Boelens, 2020). Smallholders frequently face discrimination when attempting to secure water resources and

rights, particularly in water-stressed regions (Jacques, 2023). Inefficient water governance exacerbates these challenges. Ineffective institutions and corruption undermine attempts to manage water resources sustainably, making inefficient water governance in Africa a serious issue (Mwangi, 2020). Lastly, water-related challenges persist due to closed and exclusive decision-making processes.

Previous literature has demonstrated that conflicts manifest when people feel blocked from accessing resources (Miller et al., 1958). Procedural justice (Syme et al., 1999), perceived fairness (Shoko & Ncube, 2024), and equality (Davidson, 2021) may aid in managing water conflicts. The frustration-aggression theory proposed by Miller et al. (1958) suggests that unfulfilled desires and perceived barriers to achieving goals can increase aggression and conflict. Syme et al.'s (1999) study on Australian water reform found that local procedural justice, particularly public involvement in decision-making, was crucial in evaluating the fairness of water management decisions. They noted that perceived inequities can lead to social unrest and resistance. This complements the frustration-aggression theory by demonstrating how perceptions of fairness intersect with psychological responses to unmet expectations. Recently, Syme (2024) argued that considerations of fairness must also integrate non-ethical dimensions of water allocation, such as self-interest.

Rawls' theory of redistributive justice suggests that fairness in the distribution of water resources should prioritise the least advantaged (Davidson, 2021). Thus, equitable systems should be implemented to address historical disparities, particularly in communities with socio-economic inequalities, such as South Africa (Sadiki & Ncube, 2020). Cleaver et al. (2021) argue that worldviews shape local water resource governance and entitlement judgments. In water allocation, the worldviews of smallholder farmers regarding scarcity and 'deservingness', and their perceptions of resource distribution based on 'merit' or 'necessity', are pertinent (Shoko & Ncube, 2024). Consequently, although access to water resources is influenced by corresponding access to water institutions, perceived (in)justice in allocation and rights is equally important in studying conflicts among smallholder farmers (Boelens, 2020).

Another legacy of apartheid, characterised by economic and spatial inequality, impedes access to water infrastructure and services, as many smallholders are located in peripheral areas with limited access to dependable water infrastructure (Ziervogel, 2018). Smallholder farmers also experience latent conflict over water due to the complicated government structure. For example, conflicting authorities, unclear legislation, and power struggles in smallholder farmer water governance arise from the conflicting mandates and misalignment of institutions such as the Department of Water and Sanitation (DWS), Catchment Management Agencies, the Department of Agriculture, municipalities, and community-based groups (Dlangalala & Mudhara, 2020). Likewise, as in much of the Global South, conflicts among South African smallholder farmers also stem from differences in water use primacy (Lebek et al., 2021).

South Africa struggles with institutional misalignment and the historical legacies of apartheid, which hinder the effective implementation of reforms envisaged in the National Water Resource Strategies 1-3. Drawing lessons from previous studies, South Africa could benefit from stronger community-based governance structures, more explicit institutional mandates, and enhanced stakeholder participation to address water conflicts. In studying water access conflicts among South Africa's smallholder farmers, we argue that there exists an intersectionality of historical legacies, climate change, land ownership, social identities, and power dynamics that shape experiences of water access and governance.

3. Methodology

This study adopted the Exploratory-Descriptive Qualitative (EDQ) research (Hunter et al., 2019) to investigate the complexities of water access conflicts among smallholder farmers in the Western Cape. A qualitative methodology was deemed appropriate for an in-depth analysis of the lived experiences

of smallholder farmers, as well as the institutional barriers and socio-political dynamics in agricultural water management. The EDQ was suitable because it allowed us to examine the gaps between water policy intentions and the on-the-ground realities faced by smallholder farmers through semi-structured interviews and focus group discussions. The study focused on historical inequities, policy limitations, and community-level conflicts, leveraging the flexibility of the Exploratory-Descriptive Qualitative framework to generate rich, context-specific insights.

3.1 Study area

The target group consisted of smallholder farmers in the Western Cape Province of South Africa, specifically those in 14 historical rural towns within the Overberg (Genadendal, Greyton, Caledon, Buffeljagsrivier, Napier, Bredasdorp, Elim, Tesselaarsdal, Swellendam, Villiersdorp, Barrydale, and Suurbraak) and West Coast (Goedverwacht and Potterville) District Municipalities. These historical towns were selected as study sites because their deep-rooted socio-cultural dynamics and legacy of marginalisation provide critical insights into how historical injustices shape contemporary water reform challenges. Their unique context, marked by racial integration, missionary influence, and freed slave settlements, offers a lens through which to examine community resistance, perceptions of equity, and barriers to policy implementation in water governance. Figure 1 shows the location of the towns.

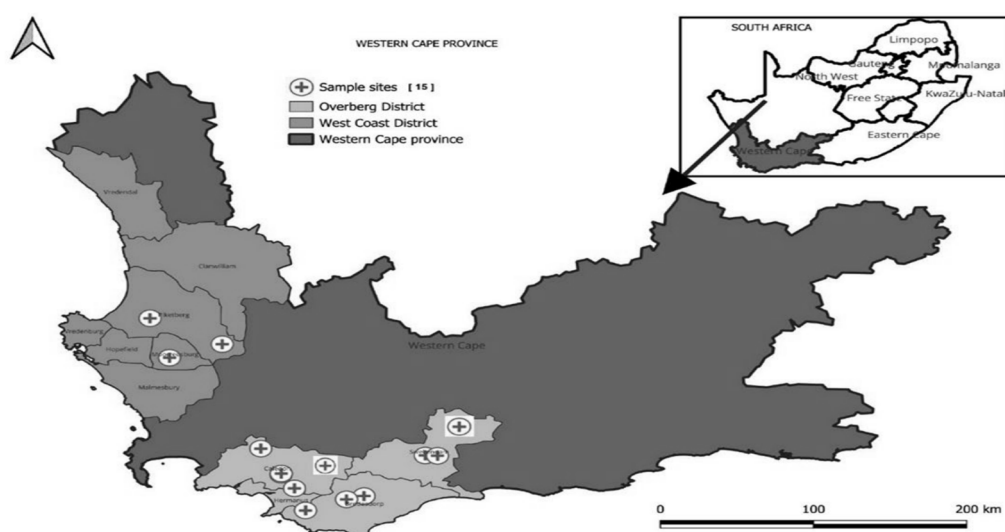


Figure 1: Location of the historical rural towns where smallholder farmers in the study reside

3.2 Sampling

The study used purposive and snowball sampling techniques to obtain the study participants. With the assistance of a list prepared by the Western Cape Department of Agriculture (WCDoA) officials, this study purposively sampled smallholder farmers for one-on-one interviews. However, since most were part-time farmers and may have been busy with other commitments, the researchers snowballed through referrals by interviewees to other participants. For focus group discussions, the WCDoA extension officers assisted by mobilising participants through purposive sampling. A sample of 119 participants (Goedverwacht (14), Porterville (5), Swellendam (11), Bredasdorp (7), Caledon (9), Elim (10), Genadendal (24), Napier (11), Suurbraak (1), Buffeljagsrivier (2), Tesselaarsdal (10), Villiersdorp (2), Barrydale (10), Greyton (3)) were interviewed one-on-one, and 51 (Caledon (6), Elim (5), Genadendal (5), Goedverwacht (13), Swellendam (5), Tesselaarsdal (8), Bredasdorp (5), Porterville (4)) were involved in the focus group discussions (FGDs). This study interviewed 170 participants as part of a larger grant-funded project exploring multiple dimensions of climate change, water governance, infrastructure, and adaptation among smallholder farmers, with the qualitative findings presented

here drawn from a focused subset of questions. While the broader dataset informed the research context, only the most salient interview and FGD transcripts directly addressing water access conflicts were analysed and reported to maintain depth and relevance to this study's specific objectives.

3.3 Data collection

One-on-one interviews were conducted using a facilitator-assisted qualitative questionnaire focused on understanding smallholder farmers' conflicts over water access and the water governance situation within the historical towns. A recorder was used to capture the interview process, which lasted an average of 30 to 45 minutes. The interviews were held at the farmers' homes or on their plots. They took place in May 2023, June 2023, July 2023, and April 2024, involving farmers across 14 towns. Four researchers conducted focus group discussions over four days in December 2023. Seven different sites were chosen for these discussions, with five located in the Overberg District (Genadendal, Caledon, Bredasdorp, Elim, Tessaarsdal, and Swellendam) and two in the West Coast District (Goedverwacht and Potterville). Key informants from both districts played a crucial role in facilitating the focus group discussions, particularly in mobilising smallholder farmers and arranging suitable venues. Following Creswell & Creswell's (2017) recommendation to consider participants' comfort, venue accessibility, and minimising distractions, the team ensured that each site had ample seating, allowing participants a clear view of one another and the facilitators. A focus group guide developed by the research team included questions and prompts for facilitators to use during the discussions. Recording and photo-capturing devices were employed during the sessions. Participants were encouraged to express their views in their language of choice. Although most participants were comfortable using English during the discussions, despite it not being their home language, there were cases where participants preferred to communicate in IsiXhosa or Afrikaans. The team accommodated this diversity by having a facilitator who understood IsiXhosa and by using an extension officer for translation when participants spoke and understood Afrikaans.

3.4 Data analysis

The data on water conflicts and governance gathered from smallholder farmer interviews and focus group discussions were transcribed and coded to safeguard the anonymity of project participants. Pseudocodes were generated based on the interview site and their corresponding district (for example, Genadendal (SGenOD), Greyton (SGreOD), Caledon (SCalOD), Buffeljagsrivier (SBufOD), Napier (SNapOD), Bredasdorp (SBreOD), Elim (SElOD), Tessaarsdal (STesOD), Swellendam (SweOD), Villiersdorp (SvilOD), Barrydale (SBarOD), and Suurbraak (SSuuOD), and West Coast (Goedverwacht (SGoeWD) and Potterville (SPorWD)). The FGDs also followed a similar pattern (for example, Caledon (FGDCalOD), Elim (FGDElimOD), Genadendal (FGDGenOD), Goedverwacht (FGDGoewD), Swellendam (FGDSweOD), Tessaarsdal (FGDTesOD), Bredasdorp (FGDBreOD), Porterville (FGDPorWD)). For data analysis, Atlas.ti was used. In utilising Atlas.ti, the initial qualitative step involved coding by generating categories. During this phase, researchers listed emerging ideas, created relationship diagrams, and identified frequently used keywords by the participants as indicators of significant themes. The second stage comprised focused coding, where researchers refined, merged, or subdivided coding categories identified in the first step. Emphasis was placed on recurring ideas and broader themes connecting the codes. This process yielded qualitative results for comparisons across focus groups or individual participants' statements.

3.5 Ethical considerations

Ethical clearance to conduct the research was received from the Cape Peninsula University of Technology (CPUT) after a review of the project proposal in January 2023 (Certificate Number 2023FEBEREC-ST-01). In addition to CPUT, further clearance was obtained from the Directorate of the Western Cape Department for Agriculture to ensure compliance with the requirements of the Protection of Personal Information Act (POPIA) 4 of 2013 during the research. Before each interview

or focus group discussion, the research was explained to the participants, who were then asked for their voluntary participation and permission to record. They were also asked to sign a consent form. Participant identities were anonymised to ensure confidentiality, and they could omit questions they were uncomfortable answering or leave the interview if needed.

4. Presentation of Results

Participant narratives highlighted significant drivers of water conflicts among smallholders, as well as latent conflicts between smallholders and outside groups. Key factors included in-group and out-group divisions, inequity, frustration, lack of land ownership, and distortions in resource management (Figure 3).

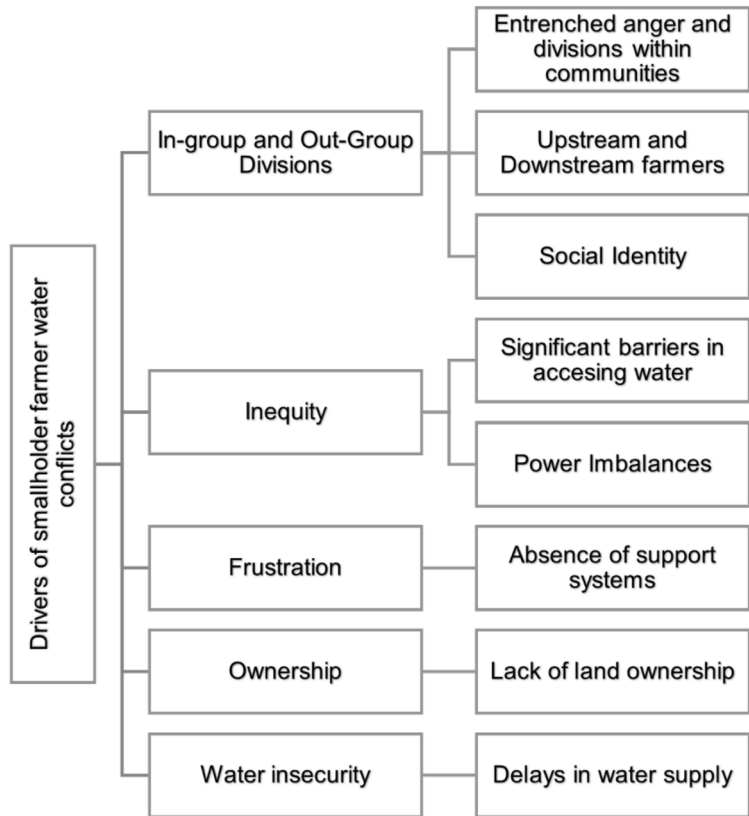


Figure 3: Conceptual map showing drivers of smallholder water conflicts in selected sites

4.1 In-group and out-group divisions

Participant narratives revealed in-group and out-group divisions that considerably raised the spectre of conflict among smallholder farmers. In-group conflicts were characterised by disagreements among smallholder farmers about the amounts of water to abstract.

“There were a lot of conflicts in the past. Nowadays, it is getting a little bit better because of fewer water users.” (FGDElimOD2)

There were conflicts over the irrigation schedule, and downstream farmers accused upstream farmers of sometimes using more than their water allocation, leading to shortages for the former group. This was caused by a lack of clarity on water allocation per farmer, as one participant put it:

“There is no way to measure the amount of water a single farmer uses. That is why people fight with one another. They mostly fight about the schedule and accuse each other of taking too much

water, which results in others not completing their activities. This creates hostility among farmers around the community.” (SGoeWD3)

The participants expressed frustration with the intractable conflicts due to community divisions.

“Despite being vocal about the issues, some often do not actively participate in providing solutions or offering input when water systems are constructed. The root of the problem lies in the lack of unity and proactive initiatives within the community. I believe that if the community can unite, devise initiatives, and take responsibility for the maintenance and management of water and infrastructure, we can address these issues without solely relying on external assistance.” (FGDGoeWD10)

Water conflicts were difficult to manage because of the presence of groups within the smallholder farming community. Out-group conflicts were characterised by divisions based on social identity that contributed to tensions over water access. One participant argued:

“There is a division among the farmers in the area, making it difficult to manage water resources. On the one hand, there are Khoi people or those who want to belong to the Khoi, and on the other hand, there are those who identify themselves as Rastas and are all from within the community. These groups fight about the water, although they already view each other as enemies and constantly blame each other.” (SGoeWD 4)

In this area, community members were primarily of Khoisan heritage but also identified with religions such as Christianity and Rastafarianism, which introduced distinct cultural dynamics. These intersecting identities—Indigenous, religious, and historical—occasionally influenced water use and management practices. As a shared and essential resource, water often became a commodity where differing cultural perspectives converged, sometimes bringing latent tensions to the surface during collective use or decision-making processes. Despite these common divisions, some participants argued that they employed local conflict management mechanisms, emphasising the importance of community-led approaches to managing disputes and fostering cooperation and peaceful co-existence. One participant stated: “We talk with each other to resolve water issues. We manage our water conflicts without involving the police” (SNapOD 7).

4.2 Inequity

One major cause of conflict was that smallholder farmers faced significant barriers to accessing water resources and support services. Over half of the participants claimed that commercial farmers located upstream wielded heavy control over water resources, leaving smallholders without adequate access to irrigation water.

“Commercial farmers drill too many boreholes or dams, diminishing the water table and reducing the flow of river water downstream, preventing smallholder farmers from receiving water.” (SBarOD 78)

“You cannot just pump up there because the river is on someone’s property. Before, it was everyone’s water, and then someone built a dam upstream, and then the water started to come down slowly and now, we do not have water.” (SCalOD 34)

Participants reported a lack of opportunities for smallholder farmers, citing limited access to support programmes, training in water conservation, and markets. They claimed that power imbalances between large commercial farmers and smallholders perpetuated inequities in resource allocation. Participants argued that commercial farmers monopolised water resources, disregarding smallholders and increasing the potential for conflict over access.

“When the water is upstream, the White people [majority of commercial farmers] give the Coloured people nothing. The White people got the physical water and protected it within their properties, and that is challenging. They overabstract the groundwater for their needs.” (STesOD69)

"Commercial farmers cut river water upstream, preventing smallholder farmers from receiving water." (SGenOD19)

"The installation of boreholes and well points by these commercial farmers results in the excessive withdrawal of water, which should ideally flow downstream to us as smallholder farmers. In previous years, when commercial farmers did not have as many dams, well points, and boreholes, water availability was more consistent. However, with the development of these infrastructures, the impact on water availability for us has become noticeable." (FGDGoeWD3)

These narratives demonstrate that smallholder and commercial farmers frequently compete when sharing water from common water sources. This highlights the racialised dynamics in water resource allocation and control, with White farmers often benefiting from preferential treatment and historical privileges.

4.3 Frustration

There was evidence of frustration among smallholder farmers due to the absence of measures to address extreme weather events, such as heatwaves and storms, which affected their access to water and sometimes destroyed their water infrastructure and livestock. Without sufficient preparation or water infrastructure, farmers are left vulnerable to the impacts of climate change, resulting in financial losses. Considering the frustration-aggression theory by Miller et al. (1958), we can argue that frustration may lead to conflict, as it is associated with increased aggression, especially if there is a perception of goal interference. Recently, scholars have utilised the concept of deservingness to understand perceptions of fairness in aid distribution between host communities and refugees in Kenya (Breslawski, 2024) and the social construction of energy access in Spain (Varo, 2024). In the context of deservingness and emotions, Feather (2006) showed that *undeserved outcomes are expected to be accompanied by a feeling of injustice that is manifested in a degree of resentment*. In another study, Feather McKee and Bekker (2011) explain that deservingness contributes to the social psychology of justice and emotion, explaining how *beliefs about deservingness influence the way people feel about outcomes*. These frustrations were apparent in one participant's narratives:

"After storms, the roads were severely damaged, making it impossible to access the farm. Additionally, the stormwater channel suffered damage, and no efforts were made to assess the impact of the storm, indicating neglect by those responsible for governance. When faced with problems related to water or other issues, neither the municipality nor the church claims responsibility, and the owner of the farm remains unknown and uninvolved. This situation leaves individuals to address challenges on their own without external support or assistance. The lack of responsibility and action from the entities supposed to oversee governance in the area is a clear indication of poor governance, and it leaves residents feeling unsupported and neglected." (FGDGoeWD7)

The challenge with the setup in the study is that, although the problems are local, they are historically inherent, and the solutions may require a broader policy review of land and water processes. In the current study, smallholder farmers expressed a desire for support systems that would help them cope with challenges and recover from setbacks to achieve profitability. However, limited access to resources such as water storage tanks led to water shortages for crop irrigation and livestock, forcing farmers to resort to manually abstracting water using buckets and stowage bakkies.

"I lost a lot of water with the storm. My tanks could be full now, but I cannot store water. Now I must carry water out from the river to irrigate my vegetables. I wish I could just get one tank." (ScalOD17)

"We have not received any assistance from the government, and what the government says often does not align with their actions. It's frustrating because many white commercial farmers claim that the government should allow them to invest in black farmers. We have been requesting assistance from them, but they are yet to provide any help. They are rather condescending

towards us and seem to be attempting to push us out because they do not want black farmers near them.” (ScaIOD12)

The above narrative represents a sense of frustration with the lack of support services that smallholder farmers believe they deserve from government water institutions. Despite their differences and identity conflicts, the smallholders have united in their grievances over inadequate assistance and the challenges of farming in a harsh environment, creating an ‘us against them’ conflict scenario. They desire practical solutions and support, such as funds to purchase water storage tanks, enabling them to better cope with environmental challenges and sustain their livelihoods.

4.4 Land ownership

In five of the study sites, the land for smallholder farming activities is owned by the Moravian Church. However, despite ownership being vested in the church, community members live and work on the land. Since the church owns the land, it follows that the institution has power and influence over water use within the same land.

“The Moravian Church is the landowner in our area. We live on the land, which, while we regard as ours, is officially registered in the name of the Moravian Church. An overseas council is responsible for managing the land and overseeing the daily affairs of the community ... Those claiming ownership neither reside here nor have families in the community. Despite asserting ownership, they seem indifferent to the well-being of the people in this area, displaying little concern for the residents' lack of necessities, even in life-threatening situations.” (FGDGoeWD5)

However, some participants felt that community members play a role in decision-making processes related to the use of water resources, as there were consultations between community members, the church and local authorities, showing the importance of community cooperation and peaceful co-existence in water resource management. According to one participant:

“If there is a shortage of water, the municipality and the church must sit with us to decide how we are going to save the water. In 2019 and 2020, they did it because there was little water in the river, and argued that if we planted, we would pay the water bill, not them [municipality].” (SNapOD45)

Participant narratives, however, imply that the ownership system of the land may impact access to resources such as rivers and boreholes for irrigation. The community’s farming operations depend on these resources, even if the church or another organisation owns the land. The conversations highlight a sense of communal sovereignty and local governance. Participants argued that decisions regarding water use should be made locally rather than by outside authorities, such as the municipality, asserting their rights to control resources like water.

In contrast, in other study sites primarily controlled by the municipalities, economic disparities were evident, with some individuals possessing extensive land while others struggled to acquire even small plots for farming. One participant argued:

“Regarding the land matter, the municipality tends to overlook applications from individuals, particularly if they lack personal connections. They often dismiss applications solely based on paperwork without considering the applicants. Small-scale farmers face minimal chances of acquiring land through the application process. Interestingly, some individuals possess extensive land, yet when approached for land use, they demand a rent of R10,000 [approximately USD 530]. Upon investigation, it was revealed that these landowners only pay an annual tax of R120 [approximately USD 6].” (SSuu52)

This disparity highlights the challenges smallholder farmers face, as rental fees are significantly higher than landowners' minimal tax obligations. The lack of land and the need to lease contribute to the disadvantages faced by smallholder farmers, who also have to set up irrigation equipment with little

assistance from responsible water institutions. Most study participants were smallholder farmers operating on a subsistence or low-profit basis, with monthly earnings often below the national minimum wage of around R4,300 (USD 230). This means that renting land at this rate could consume more than two months' income for an average low-income farmer. To put this in perspective, essential farming inputs such as fertiliser (R500–R1,300 (USD 70) per 50kg bag), seeds (R200–R600 (USD 32) per kg, depending on the crop), and water access fees further strain smallholder farmers' finances. In contrast, landowners who demand this rent pay only R120 (USD 6) in annual property tax, a negligible amount compared to the rent they charge. This imbalance reflects systemic barriers in land access, where smallholder farmers struggle with affordability while landowners benefit from low taxation and speculative landholding. Consequently, many small-scale farmers cannot expand their operations, reinforcing existing inequalities in land ownership and agricultural production.

4.5 Water Security

Another area that may lead to conflicts is the challenge related to water availability, particularly during periods of low rainfall and extreme weather events.

"Our primary challenge revolves around the inadequacy of water storage tanks to capture rainwater during the winter period. The current tanks are too small, filling up quickly during the winter rainy season. Secondly, in times when we run out of water, especially in the dry summer months, establishing a reliable system to receive water from the municipality is essential. The existing tanks are inadequate for such situations." (FGDTessOD2)

Delays in water supply from the municipality worsen these challenges and impair the smallholder farmers' capability to irrigate their crops.

"When communicating with the municipality, there is often a delay in the supply of water. We find ourselves waiting for the water truck, which unfortunately does not arrive for days, leaving us without water for irrigation. This situation poses a significant challenge for us in obtaining the necessary water resources." (FGDCalOD4)

To manage potential conflicts related to water security, participants recognised the importance of educational programmes to enhance farmers' understanding of effective farming practices. They acknowledged their insufficient familiarity with topics such as water conservation and soil management.

"If the water institutions could offer educational programmes to enhance people's understanding of farming practices, it would be beneficial. Many individuals lack the necessary knowledge and understanding of farming. Additionally, the shortage of water exacerbates the situation, as I resort to using tap water for irrigation." (SCalOD16)

Most participants felt that collaboration and coordination among community members were important for effective water management. There were suggestions for establishing forums or groups where farmers could share knowledge, identify resources, and develop collective solutions to address water access conflicts and improve water resource management practices. The necessity of investing in water infrastructure, such as dams and water tanks, was emphasised by most participants (70%), who cited the need to enhance water distribution and storage systems to mitigate conflicts over water availability. Farmers could collect rainwater for irrigation with access to water tanks, reducing their reliance on municipal water sources. Infrastructure projects like dams and pumps can also help alleviate the problem of water shortage and provide a more reliable water supply for farming.

5. Discussion of Findings

The results from this study suggest that smallholder internal conflicts are due to scheduling and water allotment. Latent conflicts sometimes manifest as a result of opaque methods for distributing and measuring water. Without transparent and equitable measures for water allocation, disagreements fuelled by allegations of unfair water consumption will persist. More profound social differences

within the community, notably between those who identify as Moravian Christians and those following Rastafarianism, are causing out-group disputes. These divisions reflect larger cultural and historical unresolved issues based on identity and intensify conflicts over water supplies. Water serves as a focal point for these fundamental tensions since it is a common and necessary resource. A shared perspective was the significance of local, community-led approaches to conflict management, despite the prevalence of differences and disputes. These systems demonstrate the ability to manage internal conflict by focusing more on communication and collaboration rather than external intervention. This study, along with earlier studies by Akurugu et al. (2021) and du Plessis (2019), shows that measurement and water allocation procedures must be well-defined to avoid intragroup conflicts. The findings corroborate earlier observations by Green (2015) that social and cultural identities contribute to resource conflicts. A recurrent theme in the literature and the current findings is the efficacy of locally driven conflict management systems in communal water use.

While the study's findings underline the importance of informal behaviours in conflicts over water distribution, studies conducted in South Africa focus more on formal institutions (Dlangalala & Mudhara, 2020; Lebek et al., 2021; Ziervogel, 2018). Compared to the more generalised ethnic or cultural differences frequently mentioned, the specific and nuanced identity conflicts, such as those between the Khoi and Rasta identities, present a more complicated picture. The usefulness of non-formal conflict management techniques highlights an area that may be overlooked in studies on formal community-led strategies. The psychological undertones and ingrained anger associated with water conflicts introduce complexities that structural or institutional reviews often miss.

The results show obstacles to obtaining water resources and assistance for smallholder farmers, whereas commercial farmers, often situated upstream, have considerable authority over these resources. This relationship exemplifies historical racial injustices and power disparities, as commercial farmers, who are primarily White, benefit from privileged access. Research has shown that smallholder farmers are disadvantaged when large-scale or commercial farmers control most water supplies. For example, Sohrabi et al. (2023) demonstrate how wealthy landowners dominate irrigation infrastructure, resulting in uneven water distribution. In related studies, Ncube (2018) and Sadiki & Ncube (2020) found that smallholder farmers experienced water shortages due to unequal access and a lack of infrastructure. According to Yousef (2021) and Fanadzo et al. (2021), conflicts arise between upstream users who have an advantage in acquiring water and downstream users who receive less. This tendency sometimes worsens in areas with weak regulatory structures that fail to guarantee equitable distribution (Sadiki & Ncube, 2020). The present study provides additional evidence and a comparatively thorough and refined understanding of the obstacles faced by smallholder farmers, illustrating how conflicts result from activities such as excessive extraction by larger commercial farms and limited availability of support services. The findings present a continued picture of racialised dynamics in water access, highlighting more clearly than in other larger studies the ongoing effects of past advantages and systematic discrimination.

The findings also reveal significant dissatisfaction with the insufficient measures taken to address extreme weather events, which negatively impact infrastructure and water availability. Miller et al.'s (1958) frustration-aggression theory, which posits that unfulfilled needs and perceived barriers to goals can escalate aggression and conflict, is used to frame these frustrations. According to this theory, conflict and aggression can result from frustration caused by blocked objectives (Miller et al., 1958). This framework illustrates how perceived discrimination and unmet needs can intensify tensions and has been applied to various natural resource conflicts (Schweitzer, 2008). Research indicates that environmental changes may exacerbate rivalry and resource scarcity, leading to conflict, especially when combined with pre-existing social tensions (Ikhuoso et al., 2020; Ziervogel, 2018) and negative perceptions (Ncube, 2018).

In contrast to the current literature that focuses on conflicts over unity, smallholder farmers' solidarity in their frustrations about inadequate support demonstrates how shared difficulties can generate collective action. Perceived injustices, such as discriminatory allocation practices, may lead to solidarity among affected groups, as evidenced by smallholder farmers' shared grievances and collective action efforts. Thus, shared challenges can foster unity and coordinated responses among marginalised groups. The focus on achievable, quick fixes, such as financing for water infrastructure, highlights the necessity of more direct interventions, in addition to the more wide-ranging institutional and policy changes recommended in earlier studies (Sadiki & Ncube, 2020). To expand on Sadiki and Ncube's (2020) argument, we assert that stakeholders in the agricultural water sector may play a distinct but complementary role in direct interventions that address smallholder farmers' challenges. Government agencies, such as the catchment management agencies, the Department of Water and Sanitation, and the Department of Agriculture, may focus on providing financing and policy support for essential water infrastructure and equitable resource distribution. Local municipalities can facilitate the implementation of projects, such as installing water storage systems and maintaining distribution networks, while ensuring alignment with community needs. Farmers' associations and cooperatives can act as intermediaries, voicing farmers' concerns and ensuring transparency in the allocation of resources. NGOs and private sector actors can offer technical expertise, funding, and innovative solutions like efficient irrigation systems. Farmers themselves play a key role in maintaining infrastructure, adhering to usage agreements, and participating in decision-making processes to ensure interventions are sustainable and inclusive.

The results shed light on the intricate relationships between land ownership, water resource management, and smallholder farming operations. The Moravian Church plays a vital role in managing land and water resources, demonstrating strong control over them. Nevertheless, there is evidence of community participation in decision-making, indicating a cooperative strategy. Similar to the current findings, literature on decentralisation and communal governance claims the benefits of local control over water resource management, arguing that local stakeholders are better positioned to manage resources sustainably and fairly (Lebek et al., 2021). Research also highlights community difficulties, such as power disparities and the need for supportive institutional frameworks (Sadiki & Ncube, 2020; Ruwanza et al., 2022). Access to water resources and agricultural land varies depending on income (Dlangalala & Mudhara, 2020). Smallholder farmers face several obstacles, while larger landholders often have better access to these resources (Boelens et al., 2023) due to historical advantages. For example, a study by Abrams et al. (2021) revealed that a lack of contacts and bureaucratic obstacles may prevent smallholder farmers from obtaining land, exacerbating economic disparities. However, this study expands on previous research by enhancing the understanding of institutional responsibilities in resource management, particularly concerning the role of a religious institution. The narratives of smallholder farmers demonstrate how governance issues and economic inequality are intertwined and how both impact their lives. This is closely aligned with a lack of fairness and inclusivity in water resource allocation. For instance, water governance issues involving bureaucratic procedures and favouritism exacerbate the economic challenges faced in acquiring property. Historically marginalised smallholder farmers may require preferential policies or support to overcome systemic disadvantages. This notion is associated with the principles of distributive justice, where resources are allocated not equally but equitably, ensuring all groups have the means to thrive. The findings provide real-world examples of how resource management issues and land ownership affect smallholder farmers' day-to-day operations. One example is the need to transport water due to insufficient infrastructure, which was also reported by Pili and Ncube (2022) in a related study. This further deepens our understanding of the practical implications of these issues.

The findings reveal several critical issues that may lead to conflicts, particularly water insecurity and supply delays. Inadequate water infrastructure and a lack of information about efficient farming methods exacerbate these challenges. Studies have detailed the difficulties associated with water shortages, especially in arid and semi-arid areas, and how such shortages affect agriculture (Pili &

Ncube, 2022; Fanadzo et al., 2021; Sadiki & Ncube, 2020; Dlangalala & Mudhara, 2020; Koebele & Simpson, 2023). These studies confirm the vital role that stable water supplies play in maintaining agricultural output. Previous literature also highlights challenges related to institutional inefficiencies and water delivery delays, which can worsen water shortages. For example, research by Koebele and Simpson (2023) describes how farmers may suffer from bureaucratic inefficiencies and delays in water delivery. Evidence from the literature also underscores the importance of funding water infrastructure—such as irrigation systems, dams, and water tanks—to alleviate water shortages and enhance agricultural output (Mugejo & Ncube, 2022). While prior research tends to adopt a more macro or policy-focused approach, the new findings provide a more localised perspective on water security issues and their direct effects on smallholder farmers. In contrast to institutional assistance and large-scale initiatives, the current findings place a significant emphasis on self-sufficiency and local infrastructural solutions.

6. Conclusions and Recommendations

The study revealed that inconsistencies in water allocation and a lack of clear distribution mechanisms are primary drivers of intragroup conflicts, while disparities in land ownership and administrative inefficiencies contribute to broader tensions. Farmers expressed frustration over delayed infrastructure projects, leading to perceptions of exclusion and unfair resource allocation. Findings suggest that implementing precise water measurement tools (such as flow meters and allocation logs) and developing equitable scheduling systems can significantly reduce uncertainty and conflict. Infrastructure investments, such as water storage tanks and community-managed reservoirs, were highlighted as key solutions for improving water access and security.

This study had a few limitations that may impact the findings; for example, it focused solely on the Western Cape Province, which we acknowledge may not fully capture the diversity of water conflicts across South Africa. Additionally, reliance on self-reported farmer experiences could introduce bias, while excluding the perspectives of commercial farmers may overlook broader systemic dynamics.

However, despite these limitations, we recommend streamlining bureaucratic processes and incorporating farmers into participatory decision-making structures to enhance institutional responsiveness. Addressing knowledge gaps through targeted educational initiatives on sustainable water use and conservation techniques would empower farmers to adopt more efficient practices and mitigate conflict risks. These findings indicate that a multi-pronged approach combining transparent governance, improved infrastructure, and community-driven management can reduce water-related conflicts and ensure sustainable resource access for smallholder farmers. Government agencies and non-governmental organisations should concentrate on initiatives such as community-managed dams and rainwater harvesting systems that provide smallholder farmers with the resources to manage water more efficiently.

7. Declaration

Author Contributions: Conceptualisation (E.S. & B.N.); Literature review (E.S. & B.N.); methodology (E.S. & B.N.); software (E.S. & B.N.); validation (E.S. & B.N.); formal analysis (E.S. & B.N.); investigation (E.S. & B.N.); data curation (E.S. & B.N.); drafting and preparation (E.S. & B.N.); review and editing (E.S. & B.N.); supervision (B.N.); project administration (B.N.); funding acquisition (B.N.). All authors have read and approved the published version of the article.

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References

- Abrams, A. L., Carden, K., Teta, C., & Wågsæther, K. (2021). Water, sanitation, and hygiene vulnerability among rural areas and small towns in South Africa: Exploring the role of climate change, marginalisation, and inequality. *Water*, 13(20), 2810. <https://doi.org/10.3390/w13202810>
- Akurugu, C. A., Jatoe, M. M., & Domapielle, M. K. (2021). Empowering rural women for sustainable development through the provision of water infrastructure in north-western Ghana. *World Development Perspectives*, 21, 100287. <https://doi.org/10.1016/j.wdp.2021.100287>
- Aleu, R. B., Larsen, R. K., & Methner, N. (2022). Participation and marginalisation in water governance: Probing the agency of powerholders. *Ecology and Society*, 27(4). <https://doi.org/10.5751/ES-13680-270433>
- Boelens, R. (2020). Water justice: Blatant grabbing practices, subtle recognition politics and the struggles for fair water worlds. In *Environmental Justice* (pp. 207-221). Routledge.
- Breslawski, J. (2024). Who deserves aid? Perceptions of fairness in contexts of forced displacement. *World Development*, 183, 106710. <https://doi.org/10.1016/j.worlddev.2024.106710>
- Chen, M., & Shen, R. (2023). Rural settlement development in Western China: Risk, vulnerability, and resilience. *Sustainability*, 15(2), 1254. <https://doi.org/10.3390/su15021254>
- Chikozho, C., Managa, R., & Dabata, T. (2020). Ensuring access to water for food production by emerging farmers in South Africa: What are the missing ingredients? *Water SA*, 46(2), 225-233. <https://doi.org/10.17159/wsa/2020.v46.i2.8237>
- Cleaver, F., Whaley, L., & Mwathunga, E. (2021). Worldviews and the everyday politics of community water management. *Water Alternatives*, 14(3), 645-663.
- Davidson, M. D. (2021). How fairness principles in the climate debate relate to theories of distributive justice. *Sustainability*, 13(13), 7302. <https://doi.org/10.3390/su13137302>
- Department of Water Affairs and Forestry. (1994). *White paper on water supply and sanitation policy*. DWAF.
- Department of Water Affairs and Forestry. (1997). *White paper on a national water policy for South Africa*. DWAF.
- Department of Water Affairs and Forestry. (2008). *Water allocation reform strategy*. DWAF.
- Department of Water and Sanitation, South Africa. (2023). *National water resource strategy* (3rd ed.). Department of Water and Sanitation.
- Dlangalala, S. F., & Mudhara, M. (2020). Determinants of farmer awareness of water governance across gender dimensions in smallholder irrigation schemes in KwaZulu-Natal Province, South Africa. *Water SA*, 46(2), 234-241. <https://doi.org/10.17159/wsa/2020.v46.i2.8238>
- du Plessis, A. (2019). Water as a source of conflict and global risk. In A. du Plessis (Ed.), *Water as an inescapable risk* (pp. [page range]). Springer Water. https://doi.org/10.1007/978-3-030-03186-2_6
- Fanadzo, M., Ncube, B., French, A., & Belete, A. (2021). Smallholder farmer coping and adaptation strategies during the 2015-18 drought in the Western Cape, South Africa. *Physics and Chemistry of the Earth, Parts A/B/C*, 124, 102986. <https://doi.org/10.1016/j.pce.2021.102986>

- Feather, N. T. (2006). Deservingness and emotions: Applying the structural model of deservingness to the analysis of affective reactions to outcomes. *European Review of Social Psychology*, 17(1), 38-73. <https://doi.org/10.1080/10463280600662321>
- Feather, N. T., McKee, I. R., & Bekker, N. (2011). Deservingness and emotions: Testing a structural model that relates discrete emotions to the perceived deservingness of positive or negative outcomes. *Motivation and Emotion*, 35, 1-13. <https://doi.org/10.1007/s11031-011-9202-4>
- Green, A. (2015). Social identity, natural resources, and peacebuilding. In *Livelihoods, natural resources, and post-conflict peacebuilding* (pp. 19-40). Routledge.
- Hunter, D., McCallum, J., & Howes, D. (2019). Defining exploratory-descriptive qualitative (EDQ) research and considering its application to healthcare. *Journal of Nursing and Health Care*, 4(1).
- Ikhuoso, O. A., Adegbeye, M. J., Elghandour, M. M. Y., Mellado, M., Al-Dobaib, S. N., & Salem, A. Z. M. (2020). Climate change and agriculture: The competition for limited resources amidst crop farmers-livestock herding conflict in Nigeria—a review. *Journal of Cleaner Production*, 272, 123104. <https://doi.org/10.1016/j.jclepro.2020.123104>
- Jacques, P. J. (2023). Civil society and survival: Indigenous Amazigh climate adaptation in Morocco. *Global Environmental Change*, 81, 102682. <https://doi.org/10.1016/j.gloenvcha.2023.102682>
- Koebele, E. A., & Simpson, K. (2023). The impacts of water scarcity on the security of democracies. In *Handbook on democracy and security* (pp. 45-63). Edward Elgar Publishing. <https://doi.org/10.4337/9781839100208.00010>
- Lebek, K., Twomey, M., & Krueger, T. (2021). Municipal failure, unequal access and conflicts over water: A hydro-social perspective on water insecurity of rural households in KwaZulu-Natal, South Africa. *Water Alternatives*, 14(1), 271-292. <https://www.water-alternatives.org/index.php/alldoc/articles/vol14/v14issue1/613-a14-1-8/file>
- Madrigal-Solís, H., Echeverría-Sáenz, S., Pizarro-Mendez, Y., Alfaro-Chinchilla, C., Jiménez-Cavallini, S., Centeno-Morales, J., ... & Suárez-Serrano, A. (2020). What do we think about water? Public perception of the current situation of water resources in Costa Rica: An indicator of water understanding and management. *Uniciencia*, 34(1), 152-188. <https://doi.org/10.15359/ru.34-1.10>
- Miller, N. E., Mowrer, O. H., Doob, L. W., Dollard, J., & Sears, R. R. (1958). Frustration-aggression hypothesis. In C. L. Stacey & M. DeMartino (Eds.), *Understanding human motivation* (pp. 251-255). Howard Allen Publishers. <https://psycnet.apa.org/doi/10.1037/11305-023>
- Mugejo, K., & Ncube, B. (2022). Determinants of water security in smallholder farming systems in South Africa: A review. *Fundamental and Applied Agriculture*, 7(3), 235-249. <https://doi.org/10.5455/faa.81266>
- Mwangi, J. K. (2020). Effect of imposed self-governance on irrigation rules design among horticultural producers in peri-urban Kenya. *Sustainability*, 12(17), 6883. <https://doi.org/10.3390/su12176883>
- Ncube, B. (2018). Constraints to smallholder agricultural production in the Western Cape, South Africa. *Physics and Chemistry of the Earth, Parts A/B/C*, 106, 89-96. <https://doi.org/10.1016/j.pce.2018.05.012>
- Ncube, B., Shoko, E., Mugejo, K., Manyiki, P., & Mashile, P. H. (2025). Infrastructure performance, water governance and climate change impacts on water resource management for smallholder farmers in the Western Cape, South Africa. Report to the Water Research Commission, No. 3194/1/24.
- Ngarava, S. (2024). Is larger always lekker? A comparative analysis of South Africa's water user associations (WUAs) and catchment partnerships (CPs) and their impact on water, energy, and food (WEF) security. *Environmental Development*, 51, 101022. <https://doi.org/10.1016/j.envdev.2024.101022>
- Pili, O., & Ncube, B. (2022). Smallholder farmer coping and adaptation strategies for agricultural water use during drought periods in the Overberg and West Coast Districts, Western Cape, South Africa. *Water SA*, 48(1), 97-109. <https://doi.org/10.17159/wsa/2022.v48.i1.3846>

- Republic of South Africa. (1997). *Water Services Act, Act 108 of 1997*. Government Gazette No. 18522. 19 December 1997.
- Republic of South Africa. (1998). *National Water Act, Act 36 of 1998*. Government Gazette No. 19182. 26 August 1998.
- Ruwanza, S., Thondhlana, G., & Falayi, M. (2022). Research progress and conceptual insights on drought impacts and responses among smallholder farmers in South Africa: A review. *Land*, 11(2), 159. <https://doi.org/10.3390/land11020159>
- Sadiki, A., & Ncube, B. (2020). Challenges of accessing water for agricultural use in the Breede-Gouritz Catchment Management Agency, South Africa. *Water Alternatives*, 13(2), 324-346.
- Schweitzer, S. (2008). What determines violent conflicts over natural resources? Evidence from land conflicts in South Africa and Zimbabwe.
- Shoko, E., & Ncube, B. (2024). Cooperation in common property resource management: A group engagement approach. *Journal of Psychology in Africa*, 34(4), 441-446. <https://doi.org/10.1080/14330237.2024.2371724>
- Shunglu, R., Köpke, S., Kanoi, L., Nissanka, T. S., Withanachchi, C. R., Gamage, D. U., ... & Withanachchi, S. S. (2022). Barriers in participative water governance: A critical analysis of community development approaches. *Water*, 14(5), 762. <https://doi.org/10.3390/w14050762>
- Sohrabi, M., Ahani Amineh, Z. B., Niksokhan, M. H., & Zanjani, H. (2022). A framework for optimal water allocation considering water value, strategic management and conflict resolution. *Environment, Development and Sustainability*, 1-32. <https://doi.org/10.1007/s10668-022-02110-2>
- Syme, G. (2024). Fair water distribution: From theory to application. In E. Wohl (Ed.), *Oxford Bibliographies in Environmental Science*. New York: Oxford University Press.
- Syme, G. J., Nancarrow, B. E., & McCreddin, J. A. (1999). Defining the components of fairness in the allocation of water to environmental and human uses. *Journal of Environmental Management*, 57(1), 51-70. <https://doi.org/10.1006/jema.1999.0282>
- Varo Barranco, A. (2024). From deserving to denied: Exploring the social construction of energy-excluded citizens. *Energy Research and Social Science*, 2024, 113, Article 103544. <https://doi.org/10.1016/j.erss.2024.103544>
- Weindl, L. (2022). *Hegemony, water and power: A case study on water allocation inequalities within agriculture in the Western Cape, South Africa* [Master's thesis, Uppsala University].
- Yousef, S. F. (2021). Water scarcity and conflict between upstream and downstream riparian countries. *Water Economics and Policy*, 7(3), 2150012. <https://doi.org/10.1142/S2382624X21500120>
- Ziervogel, G. (2018). Climate adaptation and water scarcity in Southern Africa. *Current History*, 117(799), 181-186.

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