


Ethical implications of water tankering in urban water provision: Case of eThekweni Municipality

**Author:**Nyashadzashe Chiwawa¹ **Affiliation:**

¹Department of Public Governance, School of Management, Information Technology and Governance, University of KwaZulu-Natal, Durban, South Africa

Corresponding author:

Nyashadzashe Chiwawa,
chiwawan@ukzn.ac.za

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Background: Water tankering has increasingly been adopted as a short-term water provision strategy by South African municipalities, particularly in regions experiencing infrastructure failures, governance challenges, and recurrent water shortages. While this practice offers immediate relief, it raises significant ethical concerns related to sustainability, equity, and long-term dependency.

Aim: The study aimed to examine the ethical implications of water tankering as a crisis-response mechanism, with a focus on how the practice shapes social equity, governance accountability, and environmental sustainability.

Setting: The study explored the lived experiences and perceptions of diverse stakeholders within the eThekweni Municipality, KwaZulu-Natal Province.

Methods: A qualitative research design was employed, drawing on semi-structured interviews. In total, 20 interviews were conducted, and the data were analysed thematically to identify key patterns from the responses.

Results: Findings indicate that although water tankering plays an important role in emergency contexts, it often perpetuates inequitable access to water and reinforces existing social and spatial inequalities. Marginalised communities experience irregular and unreliable tanker services, while decision-making processes frequently exclude community voices, undermining trust and accountability. Rather than addressing underlying infrastructural and governance challenges, water tankering often entrenches dependence on temporary measures, delaying long-term solutions.

Conclusion: The study concludes that while water tankering may be defensible as an emergency intervention, it is inadequate and problematic as a sustained water provision strategy. Achieving equitable and sustainable water access requires a shift from reactive, tanker-based responses towards long-term infrastructural investment, transparent governance, and participatory water management.

Contribution: This study advances the discourse on ethical water governance by highlighting the moral, environmental, and socio-political implications of tanker-based water provision.

Keywords: water tankering; ethical governance; sustainable water management; South Africa; municipal service delivery; water justice; community engagement; environmental sustainability.

Introduction

Water tankering, the transportation of water to communities experiencing shortages because of infrastructural failures, drought or governance inefficiencies – has become a critical short-term intervention across South African municipalities. Particularly in semi-arid provinces such as KwaZulu-Natal, it serves as an emergency measure where piped networks are unreliable or entirely absent. However, the increasing reliance on tankering raises significant ethical, environmental and governance concerns. These include the perpetuation of inequality, environmental degradation from fuel-based operations and systemic neglect of long-term infrastructural investment (Maheshwari et al. 2020).

Existing scholarship has explored water governance from human rights and technical standpoints (Edokpayi et al. 2018; Sutherland et al. 2014), yet few studies have critically examined the ethical dimensions of short-term water provision strategies such as tankering. The practice, while providing short-term relief, may institutionalise dependency and undermine efforts towards sustainable water management. This ethical dilemma is particularly pertinent within South Africa's socio-political context, characterised by resource inequities, corruption and

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governance failures (Masuku & Jili 2019; Munzhedzi 2021). In this context, this study seeks to contribute to the growing discourse on ethical water governance by examining how short-term water interventions interact with broader issues of sustainability, justice and accountability. Specifically, it aims to explore how the ethics of water tankering intersect with governance, environmental and socio-economic challenges in South African municipalities, with a focus on KwaZulu-Natal Province.

The objective of this study is to critically examine the ethical implications of water tankering as a short-term water provision strategy within South African municipalities. In doing so, the study seeks to: (1) identify how water tankering practices influence social equity and sustainability, (2) investigate the governance and political factors that shape reliance on tanker-based delivery systems and (3) propose ethically grounded policy recommendations for long-term, sustainable water management. By situating these analyses within the framework of sustainable water governance, this research contributes to broader discussions on justice, accountability and environmental responsibility in resource management. It underscores the urgent need to balance short-term crisis responses with long-term infrastructural solutions that ensure equitable and sustainable access to water for all communities.

Theoretical framework

This study is anchored in the theoretical framework of Sustainable Water Management and Governance (SWMG), which integrates principles from sustainability science, environmental ethics and governance theory to analyse how water resources are managed in socially equitable and ecologically sound ways. The framework originates from the foundational ideas of Allan (2003) and Rogers and Hall (2003), who advanced the concept of integrated water resources management (IWRM) as a means of balancing ecological preservation, social justice and economic viability. Later scholars, such as Al-Jawad et al. (2019) and Whaley (2022), expanded this theoretical base by embedding ethical governance and participatory decision-making, arguing that sustainable water management cannot be achieved without institutional accountability and public inclusion. Grounded in these perspectives, the SWMG framework positions water as both a finite natural resource and a social right, highlighting the moral responsibility of governance systems to ensure access, transparency and long-term sustainability.

Within this study, the SWMG framework serves as the analytical lens through which water tankering is examined as a governance practice in South African municipalities. It provides a structured approach for interrogating how short-term water interventions reflect broader tensions between sustainability, equity and ethical responsibility. Applying this framework enables a critical evaluation of whether municipal reliance on tankering aligns with the goals of sustainable governance or perpetuates systemic deficiencies such as

corruption, inequitable distribution and environmental harm. The framework identifies four interrelated constructs: sustainability, equity and ethics, governance and accountability and community participation, which together form the core of its analytical structure. Sustainability refers to the ability to meet current water needs without jeopardising future supply; equity and ethics address fairness and moral legitimacy in water distribution; governance and accountability assess institutional integrity and transparency and community participation captures the empowerment and engagement of citizens in water management. These constructs are operationalised through qualitative data from interviews, documentary analysis and thematic interpretation of stakeholder experiences.

The framework operates primarily at the meso- and macro-levels of analysis, focusing on how institutional and societal structures mediate access to water and shape governance outcomes. While grounded in local experiences, it examines broader systemic interactions between municipalities, political actors and communities. The logical consistency of the SWMG framework lies in its integration of ethical governance and sustainability principles within a cyclical model: ethical governance promotes sustainability, while unsustainable practices erode ethical legitimacy. This interdependence explains how temporary interventions such as water tankering become both a response to and a symptom of governance failure. The framework thus captures the recursive nature of water management – where reactive, short-term solutions perpetuate structural inequities and ecological degradation, undermining long-term resilience and justice.

Empirical and theoretical support for this framework is well established across global and regional contexts. Studies in India and Bangladesh (Ahmed & Araral 2019; Vij, John & Barua 2019), the Caribbean (Cashman 2014) and sub-Saharan Africa (Chiwawa & Wissink 2024; Hove et al. 2022) demonstrate that ethical governance and participatory management improve sustainability and equity, whereas weak governance fosters dependency and environmental decline. These insights align with the concept of water justice articulated by Sultana and Loftus (2015), which frames water access as a moral and human rights issue rather than a mere technical concern. By situating this study within the SWMG framework, water tankering is understood not simply as a logistical response to scarcity but as a manifestation of ethical and institutional choices that shape the sustainability of municipal governance. The framework therefore provides both an explanatory and normative foundation for assessing how South African municipalities can transition from reactive, short-term measures to ethically grounded, sustainable water management practices.

The concept of water tankering versus sustainable development

Water tankering as a short-term solution in water provision has been scrutinised for its alignment with sustainable development, which prioritises resource conservation and equitable distribution. In the context of this study, sustainable

development refers to the pursuit of water provision strategies that meet current human needs without compromising the ability of future generations to meet their own. It emphasises social equity, environmental protection and economic viability as mutually reinforcing goals. Within South African municipalities, sustainable development therefore entails ethical water governance, long-term infrastructure investment and participatory decision-making that ensures all citizens – especially marginalised groups – have equitable access to safe and reliable water.

This study adopts sustainable development not merely as an environmental principle but as an ethical and governance framework against which water tankering practices are evaluated. Sustainable development, in this sense, provides the moral and analytical lens through which the ethical implications of water tankering are examined. It calls for decisions that balance immediate humanitarian relief with environmental responsibility and institutional accountability. Water reallocation based on sustainable thresholds is crucial to meet excess demand effectively, reinforcing the need for tanker operations to adhere to sustainable water management practices. The ethical considerations involved in water tankering, especially within South African municipalities, further underscore the importance of ethical decision-making to support sustainability and social equity in water distribution. Al-Jawad et al. (2019:220) highlight that integrating sustainable development principles within water management can serve as a guiding framework for investments in water systems, with the potential to balance short-term needs and long-term goals of universal access to safe water.

Sustainable development in this study therefore functions as both a benchmark and a critique: it is a benchmark insofar as it defines what ethical and resilient water governance should achieve, and a critique insofar as water tankering, as currently practised, often falls short of these ideals. By contrasting the temporary, resource-intensive nature of tankering with the principles of sustainability, this study highlights how short-term relief efforts may inadvertently perpetuate inequity, dependency and environmental degradation.

Omarova et al. (2019) point to the need for holistic approaches in water resource management, where social, economic, and environmental factors are addressed concurrently to ensure sustainable outcomes. Dai, Li and Chen (2021) emphasise the integration of sustainability within water delivery systems, arguing for a comprehensive strategy that balances immediate needs with broader developmental goals. Accordingly, this study positions sustainable development as a normative goal for ethical water governance – demanding that municipalities transition from reactive measures such as tankering towards proactive, long-term water infrastructure planning. While the literature collectively supports the notion of water tankering within a sustainable framework, a more critical evaluation of these sources could have enriched the review, offering a stronger basis for understanding the

complex intersections of immediate water supply solutions and sustainable development practices.

Governance challenges in water provision

The governance challenges in water provision are multifaceted, encompassing technical, social and ethical dimensions. A considerable portion of the literature identifies ineffective institutional frameworks, corruption and insufficient community engagement as core issues disrupting optimal water governance. For instance, Kwami and Tyler (2020) emphasise that adaptive governance is crucial for ensuring public accountability in water provisioning, and it is particularly important in diverse urban contexts where governance models vary significantly. Meanwhile, Mthiyane, Wissink and Chiwawa (2022) argue that socioeconomic disparities complicate water service delivery, particularly in rural areas where marginalised communities often receive inadequate services, exacerbating local inequities. The failure to secure equitable water access leads to broader implications for public health and community well-being, ultimately undermining social cohesion and fostering conflict over dwindling resources.

The underlying causes for such governance challenges stem largely from historical inequities, financial mismanagement and environmental pressures. Chiwawa and Wissink (2024) highlights the deep-rooted systemic issues within South African governance structures that have perpetuated failures in service delivery, especially regarding water and sanitation. Similarly, Mthiyane et al. (2022) state that service delivery challenges reflect a lack of comprehensive strategies that address systemic governance failures, inadequate funding and poor infrastructural development. The increasing strain on water resources because of climate change and urbanisation further complicates these challenges, emphasising the need for innovative governance models that prioritise ecological sustainability and community participation. Geographical disparities also play a significant role; for instance, disparities in fiscal autonomy between cities impact local governments' capacity to effectively manage water resources, which can result in inconsistent service quality (Kithatu-Kiwekete 2013).

The consequences of these governance challenges are disproportionately felt by vulnerable populations, who typically lack the political clout needed to influence decision-making processes. Informal and decentralised water systems can provide partial solutions, but they often fail to meet long-term needs in a socially just manner. Those experiencing inequitable service delivery not only face immediate challenges regarding water quality and availability but also suffer broader socioeconomic impacts, which further entrench existing inequalities. This dynamic benefits those in power, as governance failures can enable the privatisation of water services, yielding profits for private investors while compromising the public good (Bresnihan 2016). Additionally, integrating ethical principles into water

provision could promote greater fairness and accountability. The intertwined nature of these challenges and ethical dimensions underscores the necessity for holistic approaches that extend beyond mere efficiency metrics to incorporate equity and justice within water governance paradigms (Hutete & Sibanda 2022).

Political influences on water management: Impact of local government politics

The role of political influences in water management is complex and pervasive, shaping policies, resource distribution and the engagement of stakeholders across various levels of governance. Studies by Dewan, Mukherji and Buisson (2015) highlight the historical shifts in water management in coastal Bangladesh, observing that although depoliticised community-managed models emerged because of donor demands, local communities still advocate for greater political involvement from elected representatives. Similarly, Suhardiman, Karki and Bastakoti (2020) underscore the intertwined nature of politics and water governance, suggesting that power dynamics significantly impact water quality governance and decision-making processes. However, while attempts are made to frame water governance as a technical issue, these studies collectively argue that political factors are integral and unavoidable, affecting both local and transboundary water management.

Despite efforts to neutralise governance frameworks, political interference continues to complicate sustainable water management, often exacerbating challenges rather than fostering resilience. Muharram et al. (2021) explore how political pressures intersect with ecological considerations, illustrating the challenges in achieving sustainable governance when political agendas conflict with environmental needs. Chiwawa and Uwizeyimana (2025) highlight that even transboundary water management requiring cooperative diplomacy cannot escape political influences, which deeply impact cooperation and resource-sharing efforts. This critical synthesis demonstrates that addressing these entrenched political dimensions is essential for creating inclusive, transparent governance that can adapt to and mitigate the complexities of water management, ultimately supporting long-term sustainability.

Research methods and design

This study adopted a qualitative research design, aligning with the exploratory nature of the research objectives. The qualitative approach was selected because it facilitates an in-depth understanding of complex ethical dimensions associated with water tankering, particularly in contexts where social, governance and environmental factors intersect. This approach was appropriate for exploring the lived experiences and perceptions of diverse stakeholders within the eThekweni Municipality, KwaZulu-Natal Province, one of South Africa's largest metropolitan areas and the study's locus. The eThekweni Municipality, encompassing the city of

Durban and surrounding areas, has a population of approximately 3.9 million residents (Statistics South Africa 2022). Among these, an estimated 1.6–1.8 million residents experience intermittent or unreliable water supply, particularly in peri-urban and informal settlements (eThekweni Municipality 2023; Sutherland et al. 2014). This demographic formed the broad target population of the study – households and individuals directly or indirectly affected by water shortages and reliant on municipal or contracted tanker services.

The study also focused on the institutional actors responsible for implementing tanker-based water distribution. Within eThekweni's Water and Sanitation Unit, approximately 250 municipal employees are directly involved in tanker operations, logistics coordination and emergency water supply management (Chiwawa & Wissink 2024). These personnel, alongside residents, community leaders and civil society representatives, collectively constituted the population from which the study sample was drawn. Using purposive sampling, participants were selected based on their involvement in or experience with water tankering operations, water governance and advocacy for equitable water access. The inclusion criteria ensured the selection of individuals capable of providing nuanced insights into the ethical, logistical and sustainability aspects of water tankering within the municipality.

A total of 25 potential participants were initially targeted for interviews. Participants were selected based on their first-hand involvement with tanker water provision, ensuring representation across administrative, technical and community levels. These included municipal officials overseeing tanker logistics and resource allocation, water utility employees engaged in the management and dispatch of tankers, community activists and non-governmental actors advocating for sustainable water solutions, and residents from areas chronically affected by water shortages. Of these, 20 participants were successfully interviewed, representing a diverse range of stakeholders including municipal officials, water utility employees, community leaders, residents, activists, and professionals engaged in water governance. The sample size was guided by the principle of thematic saturation, consistent with Guest, Namey and Chen (2020), which posits that qualitative saturation is typically achieved between 12 and 20 participants when the research questions are well defined and the participant group is homogenous in experience and context. This approach ensured sufficient depth and representativeness of perspectives across the stakeholder spectrum.

Table 1 presents the participant sample of 20 individuals interviewed for the study, representing key stakeholder categories involved in or affected by water tankering operations within the eThekweni Municipality. The target population comprised residents experiencing recurrent water shortages and technical personnel from the municipality's water management division.

Data collection relied primarily on semi-structured interviews conducted face to face and via virtual platforms where necessary, each lasting between 45 and 60 min. The interview guide included open-ended questions designed to elicit detailed narratives about participants' experiences, perceptions of fairness and sustainability in tanker operations and reflections on governance and accountability in municipal water provisioning. The qualitative interviews were complemented by documentary analysis of municipal policy documents, service delivery reports, government circulars and media coverage pertaining to water provision in eThekweni.

The analysis employed thematic analysis following Braun and Clarke's (2019) framework, using NVivo software to manage and code the data. The process involved iterative reading of transcripts, development of initial codes and clustering of related codes into themes such as equity, sustainability, governance and community participation. Themes were refined through constant comparison and triangulation with documentary evidence to ensure analytical rigour and validity. Triangulation enhanced the reliability of findings by aligning participant narratives with municipal and policy-level evidence.

Results and analysis

To provide clarity, Table 2 summarises the interview results, highlighting the main themes that emerged from the analysis alongside illustrative quotes from participants.

TABLE 1: Participants' sample composition for the eThekweni municipality study.

Participant	Category and/or role	Description of role	Number of participants
P1, P2, P3 and P4	Municipal officials	Officials overseeing tanker logistics and water distribution within eThekweni Municipality.	4
P5, P6 and P7	Water utility employees	Technical team managing tanker operations, maintenance and water allocation systems.	3
P8, P9 and P10	Community leaders	Local leaders representing affected communities, responsible for mobilising residents and reporting issues.	3
P11, P12, P13 and P14	Residents (Water-Scarce Areas)	Residents living in eThekweni's most affected wards experiencing recurrent water shortages.	4
P15 and P16	Water activists	Activists advocating for equitable and sustainable water solutions.	2
P17, P18, P19 and P20	Engineers and environmental specialists	Professionals involved in technical evaluation, environmental assessment and sustainability planning.	4

TABLE 2: Thematic analysis overview.

Major theme	Related themes/Interconnections	Key influences
Governance and political influence	<ul style="list-style-type: none"> Influences equity and resource distribution Indirect environmental impacts 	<ul style="list-style-type: none"> Political decisions shape resource access and distribution Governance failures impact sustainability
Environmental sustainability	<ul style="list-style-type: none"> Indirect environmental impacts from governance Engagement reduces tanker dependency 	<ul style="list-style-type: none"> Tanker dependency affects the environment Sustainable management reduces ecological harm
Community engagement and empowerment	<ul style="list-style-type: none"> Community advocacy for change Engagement reduces tanker dependency 	<ul style="list-style-type: none"> Empowered communities can foster change Participation leads to self-sufficiency in water management
Socioeconomic factors and equity	<ul style="list-style-type: none"> Public participation fosters equity Influences equity and resource distribution 	<ul style="list-style-type: none"> Equitable access to resources Socioeconomic factors determine vulnerability to water scarcity

In the findings, various critical ethical and practical concerns emerge around water tankering as a short-term water provision strategy in South African municipalities. These concerns include issues of equity, sustainability and the perpetuation of systemic disparities. The results further show that water tankering often disproportionately affects marginalised communities. Participants, especially residents in areas serviced by water tankers, expressed frustration over the inequities in distribution. The frequent delays in tanker deliveries highlight a systemic failure to prioritise the most vulnerable populations, perpetuating social inequalities. This inequitable access is significant not just at a local level but also mirrors global issues where marginalised communities receive inadequate water resources. Drawing comparisons with other regions where water tankering is employed, such as in rural parts of India and Ghana (Ahmed & Araral 2019), similar patterns of inequity were observed, further underlining the need for equitable water governance. This finding aligns with other global studies on water as a human right (Sultana & Loftus 2015), suggesting that South African municipalities must prioritise inclusive policies to address these disparities.

The research also identifies a critical tension between short-term water relief and long-term sustainability. Water tankering is resource intensive, both financially and environmentally. While it addresses immediate needs, participants, particularly municipal officials, highlight its unsustainability. The carbon footprint from tanker operations and the potential depletion of water sources because of over-reliance on such emergency solutions challenge the long-term viability of this strategy. Comparisons with water management approaches in urban Accra (Alba et al. 2019) reveal similar environmental concerns, indicating that without investment in sustainable infrastructure, municipalities risk long-term environmental degradation. These findings suggest an urgent need for policies that integrate both immediate water relief and sustainable water infrastructure development to avoid long-term environmental and resource crises.

Another recurring theme was the lack of meaningful community engagement in decision-making around water management. Participants pointed out that water tankering is often seen as a top-down, reactive measure, with minimal input from affected communities. This alienation fuels resentment and mistrust. In contrast, other regions that have employed more participatory water governance models have

shown better outcomes in terms of social equity and long-term sustainability (Hove et al. 2022). Community-driven initiatives, such as rainwater harvesting or localised water treatment systems, were suggested by some interviewees as more sustainable alternatives that could enhance community resilience and self-sufficiency. This aligns with existing literature on the importance of engaging local stakeholders in water governance.

Figure 1 synthesises the four primary themes identified in the study – Governance and Political Influence, Environmental Sustainability, Community Engagement and Empowerment and Socioeconomic Factors and Equity – and illustrates their interconnections. The arrows indicate the reciprocal influences among these dimensions: for instance, governance failures exacerbate inequities, which in turn affect community engagement and environmental outcomes. The diagram demonstrates how these interrelated factors collectively shape the ethical landscape of water tankering practices within South African municipalities.

As shown in Figure 1, the thematic interconnections highlight that water tankering cannot be understood in isolation. Governance failures reinforce inequitable distribution; these inequities reduce community trust and participation, which further weakens sustainability initiatives. The cyclical nature of these relationships underscores that ethical water governance requires a holistic, systemic approach integrating political accountability, environmental stewardship and community empowerment.

Governance and political influence

The governance and political dynamics surrounding water resource allocation in South Africa highlight the ethical and systemic issues underpinning reliance on water tankering

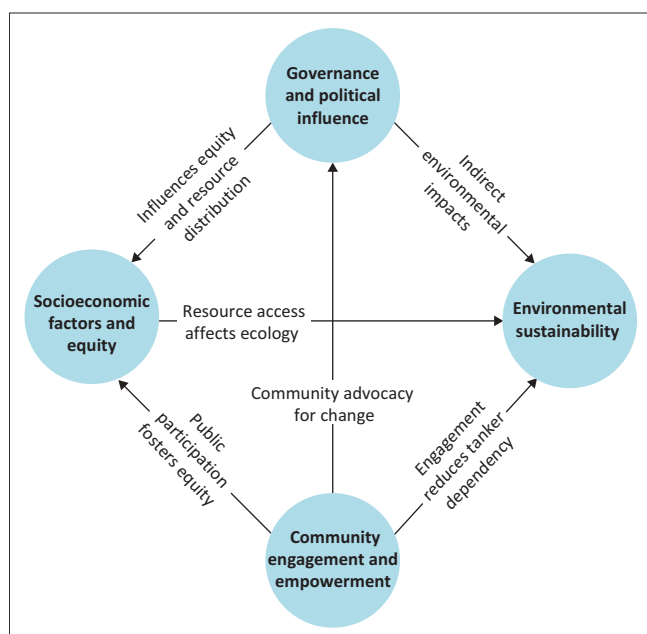


FIGURE 1: Conceptual representation of key themes and interrelationships emerging from the qualitative analysis of stakeholder interviews.

as a temporary measure. The issue of water tankering, as observed by Interviewee 1, raises ethical concerns surrounding sustainability and long-term planning, where resources are diverted to temporary solutions instead of addressing fundamental infrastructure needs:

‘From my perspective within the water utility, water tankering presents ethical dilemmas related to sustainability and long-term planning. It often becomes a temporary solution to systemic issues such as infrastructure decay or mismanagement. We need to ask ourselves if it is morally justifiable to invest resources in short-term interventions instead of addressing the root causes of water scarcity.’ (Interviewee 1, Water Utility Employee, male)

This view resonates with the findings of Jaglin (2012), who argues that the frequent use of temporary solutions such as water tankering reflects governance failures that disregard systemic infrastructure investment, especially in areas experiencing chronic scarcity. Similarly, Von Schnitzler (2016) underscores that inadequate governance often leads to reliance on unsustainable solutions in marginalised communities, which only serves to exacerbate existing inequalities. Consequently, it becomes a moral imperative to prioritise long-term water security solutions, particularly in under-resourced areas where temporary measures perpetuate rather than resolve water insecurity.

In contrast, municipal officials, like Interviewee 5, emphasise the need to explore alternative water provision strategies to address these ethical challenges:

‘As a municipal official, I believe exploring alternative water provision strategies is crucial to address the ethical concerns surrounding water tankering. We need solutions that are sustainable, reliable, and equitable for all residents.’ (Interviewee 5, Municipal Official, female)

This suggests that sustainable water management involves addressing the root causes of scarcity by investing in robust infrastructure and implementing policies that promote equity across regions. As a result, governance should pivot from short-term relief measures to durable infrastructure planning to prevent future crises. The emphasis on sustainable alternatives not only aligns with ethical governance principles but also reflects broader trends in public policy advocating for fair access to resources. These findings underscore a significant point that policies prioritising long-term water provision over temporary relief measures promote ethical governance and reduce dependency on practices such as tankering that are ultimately unsustainable and inequitable.

The analysis also revealed some systemic issues related to water tankering, particularly in terms of equity and access. Participants highlighted systemic issues such as corruption, unequal resource allocation and infrastructural neglect as major challenges. These insights emphasise how structural governance failures hinder equitable water distribution. The outcome highlights the disparities in water distribution, emphasising how marginalised communities face greater

challenges in obtaining water. For example, one Municipal Official opined:

‘Water tankering is a symptom of deeper systemic issues such as corruption and political neglect. It negatively affects marginalised communities who lack political power to advocate for their rights. Ethically, we cannot turn a blind eye to the injustices perpetuated by this practice. We must hold authorities accountable and demand equitable access to water for all South Africans.’ (Interviewee 13, Municipal Official, female)

This suggests that the distribution system is inherently flawed, leaving vulnerable populations to fend for themselves. Residents shared experiences that further underscored these systemic challenges. Their perspectives, informed by daily interactions with the water tankering process, illuminated the inconsistencies and frustrations experienced during water shortages. Municipal officials and water utility employees also contributed valuable insights, identifying logistical challenges and governance issues that complicate effective water distribution. This confirms that corruption in water resource management directly affects marginalised communities by diverting resources from essential infrastructure projects, thereby entrenching inequities. This echoes the conclusions of Chiwawa and Wissink (2024), who argues that the ethical implications of water governance demand accountability, particularly in regions where political neglect has resulted in systemic inequities. Holding authorities accountable, as advocated by Interviewee 13, is a necessary step towards ethical governance, ensuring that water access is regarded as a right rather than a privilege.

Environmental sustainability

The environmental consequences of water tankering are another significant theme. Stakeholders highlight the environmental harm associated with this practice, such as increased carbon emissions, ecological disturbance and pollution, stemming from the transportation and overuse of groundwater reserves. The temporary nature of tankering, driven by a lack of investment in sustainable water systems, contradicts environmental ethics and principles of sustainability. Water tankering is viewed as a costly, energy-intensive stopgap that can lead to long-term degradation of natural resources. An engineer emphasised that although tankering may offer short-term relief, it is unsustainable for long-term water security. Addressing these environmental issues requires prioritising sustainable infrastructure investment to reduce tankering dependency. This call for an environmentally responsible approach to water scarcity underlines the ethical responsibility municipalities hold in ensuring minimal ecological harm and fostering resilience against future climate impacts. One municipal official pointed out:

‘While water tankering might offer a quick fix during emergencies or shortages, it’s important to recognise its environmental impact. The carbon emissions from transporting water via tankers contribute to air pollution, and the increased traffic can

disrupt local ecosystems and wildlife habitats.’ (Interviewee 14, Municipal Official, male)

This aligns with existing literature, where Chiwawa and Wissink (2023) argue that dependency on carbon-intensive methods for water supply worsens climate change, making water tankering a detrimental short-term solution. Similarly, Kithatu-Kiwেকে (2013) found that the environmental strain from such methods contradicts sustainability goals, adding an ethical layer to the debate about resource management and climate justice.

Moreover, stakeholders in the study argue that the resource intensiveness of tankering conflicts with principles of environmental responsibility and economic viability. An engineer asserts that while tankering offers short-term relief, it is unsustainable for long-term water security:

‘Water tankering can provide short-term relief in emergency situations, but it’s not a sustainable solution for ensuring water security. It’s costly, energy-intensive, and can have negative environmental impacts. Long-term planning and investment in infrastructure are essential for meeting the water needs of communities.’ (Interviewee 17, Engineer, male)

Here, the financial and environmental burdens overlap, suggesting that without sustainable investment, tankering merely delays resource scarcity issues. Similarly, Chiwawa and Wissink (2023) point to the need for infrastructure investment to prioritise renewable water management over fossil fuel-based logistics, further supporting the need for an environmentally conscious transition.

The perspectives also reveal a strong advocacy for sustainable water management through decentralised approaches such as rainwater harvesting and localised treatment facilities. A community leader underscores:

‘As a community leader, I advocate for community-driven solutions such as rainwater harvesting systems or decentralised water treatment facilities. These approaches empower communities to manage their water resources sustainably and reduce dependence on external interventions like water tinkering.’ (Interviewee 10, Community Leader, female)

This resonates with the findings of Hove et al. (2022), who emphasise community-based solutions as effective and empowering in mitigating climate impact and promoting sustainability. Community involvement has proven vital in adapting to climate challenges, in that localised, decentralised management builds resilience and reduces ecological degradation in the long term. This highlights the necessity for coupling immediate crisis responses with proactive infrastructure investment is underscored by water management specialists.

By advocating for a dual focus on crisis response and sustainable development, this perspective finds support in literature suggesting that comprehensive water management approaches yield more sustainable water security. These studies reveal that balancing short-term responses with long-

term investment is critical for sustainable water solutions, emphasising the ethical obligation of municipalities to minimise environmental harm and adapt for future climate impacts.

Community engagement and empowerment

The theme of community engagement and empowerment is central to addressing ethical challenges in water management, particularly regarding the practice of water tankering. Tankering is often seen as a temporary solution to water scarcity, yet it fails to address the root causes of the issue and can exacerbate social inequities. Stakeholders, including community leaders and residents, argue that ethical water management requires a commitment to community-driven solutions that empower local populations. As one resident stated:

‘Our community values self-reliance and independence, so when water tankering becomes necessary, it’s often seen as a band-aid solution rather than addressing the root cause of water scarcity. We believe that sustainable infrastructure development is essential for our long-term well-being, and tankering doesn’t align with those values.’ (Interviewee 2, Community Leader, male)

This view is echoed in existing literature that emphasises the role of sustainable infrastructure and community involvement in achieving equitable water distribution and long-term resilience. These studies suggest that empowering communities to implement local solutions, such as rainwater harvesting and decentralised water treatment, builds resilience and mitigates dependency on external water sources. This also aligns with recent studies advocating for a balance between immediate response measures and the development of community-centred, sustainable practices that mitigate future vulnerabilities (Munzhedzi 2021). By involving communities in decision-making and planning, municipalities can ensure that water management strategies are aligned with cultural values, enhancing the sustainability of water resources.

Socioeconomic factors and equity

The interplay between socioeconomic factors and equitable water distribution is fundamental to understanding the ethical complexities of water tankering. The research highlights the entrenched inequities in water access tied to socioeconomic factors in South Africa, particularly through the reliance on water tankering in marginalised communities. As the study illustrates, the systemic nature of these disparities affects access to water services in rural and peri-urban areas, where the need for more consistent and equitable access is acute. In these settings, reliance on water tankering as a stopgap solution underscores the ethical and structural limitations within current water distribution strategies. This dependency on temporary solutions is captured by one participant, who describes it as:

‘Living in an area reliant on water tankering is frustrating and demoralising. We feel like second-class citizens, constantly at the mercy of erratic delivery schedules and uncertain water

quality. Ethically, we deserve access to reliable, clean water just like any other community. The current situation undermines our dignity and perpetuates a cycle of poverty and dependence.’ (Interviewee 3, Resident of Areas Served by Water Tankering, female)

Such feelings resonate with broader studies on water justice, which underscore the need for holistic, long-term investments in infrastructure to mitigate inequities in access, especially among economically disadvantaged populations. The role of socioeconomic status, geographic location and political representation in influencing water access is a central point within the manuscript’s findings:

‘Living in an area serviced by water tankering, I have noticed significant disparities in access to water tankering services are often influenced by factors such as socioeconomic status, geographic location, and governance structures. Marginalised communities, including those in rural or peri-urban areas, are unfairly affected due to limited resources and infrastructure. Addressing these disparities requires a multi-faceted approach, including policy reforms, investment in infrastructure, and community engagement.’ (Interviewee 7, Resident of Areas Served by Water Tankering, female)

This observation parallels research by Chiwawa and Wissink (2024), who assert that unequal water distribution in South Africa often correlates with socioeconomic status, geographic isolation and political neglect. Communities on the urban periphery or in rural regions frequently encounter barriers to accessing reliable water services, suggesting that governance failures are particularly detrimental to already vulnerable populations. Such barriers in South Africa mirror challenges observed in other regions with limited infrastructure, reinforcing the argument that policy reforms, infrastructural investment and community involvement are critical for advancing water equity. This aligns with Munzhedzi (2021), who discuss how disparities in water access perpetuate cycles of inequity, where marginalised groups are systematically disadvantaged because of political and geographic marginalisation. Consequently, addressing water access disparities requires targeted policy reforms and community-based solutions that prioritise equitable resource allocation.

However, water tankering, as depicted by the results of this study, is merely a ‘band-aid’ solution that fails to address the root causes of water scarcity. This was confirmed by one participant who had the following to say:

‘Water tankering is a Band-Aid solution that fails to address the root causes of water scarcity in our community. It’s frustrating to see our people rely on irregular deliveries for something as basic as clean water. We need investment in infrastructure and better management of water resources.’ (Interviewee 18, Community Leader, male)

This reliance on temporary solutions rather than sustainable infrastructure highlights the limits of reactive policies in addressing core issues of socioeconomic inequality. Researchers in similar contexts argue that such approaches

perpetuate cycles of dependency, where vulnerable populations lack agency over basic resources like water. Without significant infrastructural investment, water tankering will likely remain a recurring, rather than a diminishing, feature of water access for these communities, thereby cementing systemic inequalities.

This view is echoed by scholars who argue that ethical water access must involve long-term solutions that address the socioeconomic factors driving inequities. In the field of water ethics, scholars such as Masuku and Jili (2019) advocate for social equity frameworks that prioritise both immediate relief and systemic change. Ethical imperatives for social justice in water distribution, as supported by the study's findings, suggest that ensuring equitable access extends beyond the provision of water; it necessitates confronting the structural barriers that have historically marginalised certain populations.

Discussion

Water tankering, although often justified as a humanitarian response to crises, presents complex ethical dilemmas that extend beyond operational and governance considerations. The findings reveal that its short-term relief function coexists with deep moral tensions concerning justice, accountability and sustainability. These ethical implications can be interpreted through three interrelated lenses: distributive ethics, environmental ethics and governance ethics.

Distributive ethics and equity

At its core, the inequitable allocation of tanker water challenges the principle of distributive justice, which requires that essential goods such as water be provided according to need and not privilege. The study's findings show that marginalised communities – particularly those in rural and peri-urban areas – experience delayed or inconsistent access to tanker water. This inequity is not merely administrative; it is a violation of the moral obligation to ensure fair and dignified access to a basic human right. From a rights-based ethical perspective, the selective provision of tanker services reproduces spatial injustice and undermines social equity, contradicting the spirit of South Africa's Constitution and international human-rights standards on water access.

Environmental ethics and intergenerational responsibility

The environmental consequences of tinkering – such as carbon emissions, groundwater depletion and ecological disturbance – invoke ethical questions about intergenerational responsibility. Reliance on fuel-intensive logistics to deliver water represents a form of 'ethical short-termism', where immediate political or social gains are prioritised over the long-term well-being of ecosystems and future citizens. In ethical terms, such practices contravene the principle of *non-maleficence* (do no harm) by externalising environmental costs to vulnerable communities and future generations. A just

water-management system must therefore reconcile emergency responses with ecological stewardship, ensuring that crisis interventions do not perpetuate environmental degradation.

Governance ethics and accountability

The study also exposes governance failures – corruption, political patronage and weak oversight – that raise serious ethical questions regarding public accountability and fiduciary duty. When public funds are repeatedly channelled towards temporary tanker contracts instead of sustainable infrastructure, decision-makers compromise ethical governance principles of transparency, responsibility and fairness. Ethical governance demands not only technical competence but also moral commitment to equitable service delivery. In this sense, water tankering functions as a mirror reflecting the moral deficit in municipal accountability structures.

Procedural ethics and community agency

The exclusion of affected communities from water-management decision-making constitutes a violation of procedural ethics – the moral principle that those affected by decisions should have a voice in them. Findings reveal that tankering decisions are often imposed top-down, fostering mistrust and dependency. Ethical water governance must therefore prioritise participatory mechanisms that restore agency to communities, enabling co-production of solutions such as decentralised treatment systems and rainwater harvesting. Participation transforms beneficiaries into partners and aligns with the ethical ideal of respect for autonomy and dignity.

Ethical imperatives for sustainable alternatives

Taken together, these ethical dimensions underscore that water tankering, while providing short-term relief, is not ethically sustainable. The practice reproduces inequality, environmental harm and governance deficits that conflict with the moral duty of the state to promote justice and sustainability. Ethically informed policy must transition from emergency relief towards long-term infrastructural investment guided by principles of fairness, transparency and ecological care. Integrating ethical reasoning into water governance ensures that crisis interventions support, rather than undermine, sustainable development goals.

Recommendations and implications

The findings of this study underscore the urgent need to move beyond the short-termism of water tankering towards a governance model rooted in ethical responsibility, sustainability and social justice. Reliance on tanker-based water delivery, while useful in emergencies, exposes deeper governance failures, policy fragmentation and infrastructural neglect. Municipalities must therefore prioritise long-term infrastructure investment, strengthen institutional accountability and establish transparent mechanisms that

curb corruption and ensure equitable resource allocation. Such reforms require embedding ethical governance principles within municipal systems to align practice with Sustainable Development Goal 6, which advocates universal and equitable access to safe water. This transition from reactive crisis management to proactive, ethically guided governance represents not only a moral obligation but a strategic pathway towards sustainable development and improved public trust in local institutions.

Central to achieving this transformation is the ethical-sustainability model developed in this study, which integrates governance integrity, environmental stewardship, community participation and socioeconomic equity as mutually reinforcing pillars of sustainable water management. The model provides a diagnostic tool that policymakers can use to identify systemic weaknesses and evaluate how governance practices, political interference or inequitable resource distribution compromise sustainability. By institutionalising this framework, municipalities can move towards evidence-based policymaking where ethical considerations are not peripheral but integral to decision-making. The broader implication is that such a model fosters resilient governance structures capable of balancing immediate needs with long-term environmental and social goals, ultimately enhancing both the legitimacy and effectiveness of public water services.

Sustainable infrastructure development must remain a priority if ethical governance is to translate into tangible outcomes. The study recommends that resources currently devoted to tanker logistics be redirected towards resilient water systems, including piped networks, decentralised treatment plants and renewable energy-based supply mechanisms. These investments would reduce the ecological and financial costs associated with tanker operations while promoting climate resilience and equitable access. Furthermore, meaningful community participation should be institutionalised to ensure that water governance reflects the lived realities of affected populations. Empowering communities through participatory planning, local monitoring and the adoption of small-scale innovations such as rainwater harvesting can foster self-reliance, ownership and accountability. Together, these approaches can bridge the divide between policy intent and social experience, transforming beneficiaries into active agents of sustainable development.

Finally, the implications of this study extend beyond the water sector to broader questions of ethical public administration in developing contexts. Addressing water scarcity through an ethically grounded sustainability model demonstrates how governance systems can reconcile environmental imperatives with social justice. Policymakers should embed continuous learning mechanisms and research partnerships to test and refine the model across different regions and service sectors, fostering adaptive governance that evolves with changing climatic and socioeconomic realities. In doing so, South African municipalities can transition from dependence on temporary, inequitable

solutions towards a sustainable, inclusive and ethically coherent framework for water management – one that upholds the dignity, rights and well-being of all citizens.

Future research

Further research could quantify the environmental and social impacts of water tankering in different regions of South Africa, offering more granular data that can inform more effective policy decisions. Additionally, comparative studies between South Africa and other countries facing similar water crises could yield insights into alternative solutions and best practices.

Conclusion

This study provides a critical examination of the ethical implications of water tankering in South Africa, highlighting how reliance on this short-term water provision strategy exacerbates governance failures, social inequities and environmental challenges. While water tankering offers immediate relief to communities facing acute water shortages, it fundamentally fails to address the underlying infrastructural deficiencies that drive such crises. The findings illustrate that this practice perpetuates socio-economic disparities, as marginalised communities often experience irregular and inequitable access to tanker services. In addition, the environmental impact of tanker-based water distribution raises significant sustainability concerns, particularly regarding carbon emissions and water resource depletion.

The study's findings emphasise the need for policy reforms that prioritise sustainable infrastructure investments over reactive, short-term solutions. Municipalities should integrate long-term water management strategies that not only address immediate needs but also foster resilience through improved infrastructure and equitable resource allocation. Furthermore, community participation in decision-making processes must be enhanced to ensure that water governance is both inclusive and ethically sound. In conclusion, while water tankering may provide short-term relief, it is not a viable long-term solution for sustainable water management. This study calls for a paradigm shift in water governance – one that prioritises ethical, equitable and environmentally responsible approaches to water provision. The ethical responsibility of policymakers extends beyond crisis management, it requires a commitment to sustainable, just and transparent water distribution systems.

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Competing interests

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CRedit authorship contribution

Nyashadzashe Chiwawa: Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualisation, Writing – original draft, Writing – review & editing. The author confirms that this work is entirely their own, has reviewed the article, approved the final version for submission and publication, and takes full responsibility for the integrity of its findings.

Ethical considerations

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Data availability

The data that support the findings of this study are available from the author, Dr. Nyashadzashe Chiwawa, upon reasonable request. Because of the nature of the qualitative data (interview transcripts and municipal documents), access is subject to ethical considerations and participant confidentiality agreements. Any data shared will be anonymised to protect participants' identity.

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