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Review of community-based water resource management for sustainable livelihood

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Abstract

The foundation of community-based water resource management lies in the agreement that community members, who directly benefit from the water resources, will make efforts to ensure the resources' sustainability by assuming responsibility for their management, operation, and maintenance. This review outlines the community-based initiatives adopted by rural communities in South Africa to independently manage their water resources, to ensure the long-term provision of high-quality water for household consumption. The review findings indicate that community water infrastructure is managed through the protection of the resources from damage, response to disruptions in water supply, restrictions on water usage, and the implementation of water-use regulations by community-level water structures. These water management practices have the potential to either magnify or diminish the effects of climate change on water resources, while also fostering community engagement and control over water resources. The main argument of this review is that local communities have the power to independently manage their water resources by reaching a consensus on certain limitations and rules. This approach ensures the long-term viability of water resources, food security and healthcare.

Keywords: Community-Based Water Management; Rural Community; Water Resource; Water Infrastructure; Sustainable Water Supply

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1. Introduction

The provision of sustainable and quality water is becoming more and more significant as population densities rise and the adverse effects of climate change on water supplies become more apparent. The imperative to secure and manage water resources at different tiers of governance is pressing and persuasive. The global promotion of water resource management has led to the perception that national and multi-national agencies primarily have to oversee the management of major river basins, even those that span multiple nation-states. However, it is important to recognise and give proper recognition to the capacity for surveillance and control of water resources at the local or community scale. This practice is referred to as a community-based water resource management approach that empowers local water users to actively participate in and take ownership of the management of their water resources. The acknowledgment and utilisation of community-based water management practices should serve as the basis for the formulation of future water management strategies. There has been a lack of focus in the literature on the management of water resources at the community level. Nevertheless, it is crucial to explore the capacity of communities to independently manage their water resources to guarantee the long-term supply of high-quality water.

The review is based on the discernible effects of climate change and fluctuations in natural water resources, which serve as the primary water supply for many rural communities in developing countries. The African continent is unsafe, vulnerable, and struggling to provide drinking water to about 320 million people (Etongo et al., 2018). Some highly vulnerable regions, such as Botswana, Namibia, South Africa, and Zimbabwe in southern Africa, are likely to be more vulnerable to water scarcity as a result of climate change (International Panel on Climate Change [IPCC], 2022). Before the implementation of bulk water supplies, rivers, ponds, wells, springs, and lakes served as the primary sources of water for domestic usage. Efficient allocation and administration of water resources are essential for the implementation of advanced technological systems for water service. Rural areas rely on municipalities as their primary sources of water. The review findings indicate that community water infrastructure is governed by measures aimed at safeguarding the resources from damage, promptly addressing any interruptions in water supply, and imposing restrictions on water usage. Additionally, community-level water structures enforce regulations about water resources use. These water management practices have the potential to either magnify or diminish the effects of climate change on water resources, while also fostering community involvement and ownership of water resources. The main contention of this review is that local communities can independently oversee their water resources by reaching a consensus on prescribed limitations and regulations. This approach aims to guarantee the long-term viability of the water resources and the well-being of the community.

2. Literature review

About 88.7% of households in South Africa have access to improved water sources, while approximately 14% of households in rural areas depend on a communal or neighbor's tap as their primary supply of drinking water (Statistics South Africa, 2022). While there has been an overall improvement in households' access to water, a significant number of households (19%) in rural regions still rely on manually collecting water from various sources such as rivers, streams, stagnant water pools, dams, wells, and springs (Statistics South Africa, 2019). Since the year 2020, the government made significant strides in enhancing water accessibility, particularly in metropolitan areas where water supplies have been upgraded. Despite dependency on natural water resources

for household consumption in the rural areas, there has been a remarkable improvement in both the distribution and availability of water resources (Statistics South Africa, 2022). The management of water resources in rural areas is a significant global challenge. To overcome this challenge, water management institutions are altered to be more people-oriented as opposed to the technocratic orientation of the past (James, 2003). The purpose of people-oriented management in water resource management was to facilitate the exchange of ideas between water management and the local population (James, 2003). The central government and water authorities explicitly acknowledge the importance of community-based institutions to allow water consumers to actively participate in negotiations regarding water allocation. According to Tapela (2012), community-based water management techniques are founded on the belief that if community members who directly benefit from water resources are responsible for managing, operating, and maintaining those resources, they will make efforts to sustain them. Mabhaudhi et al. (2019) see this as the most important development is an engagement of communities in tasks such as allocating water resources, conducting local-level monitoring, enforcing rules or operating principles for daily water usage, and establishing a management system with well-defined regulations. This will allow local water users to actively participate in the management of water resources, acknowledging the economic significance of water and its contribution to sustaining people's lives (Mabhaudhi et al., 2019). Water users are encouraged to implement communal water management through the utilisation of their own established regulations and customs (Zvogbo and Do, 2020).

Similarly, Faysse (2005) argues that water management institutions in South Africa have undergone restructuring to facilitate public involvement in the management of water resources. The catchment management forum serves as the governing body in water resource management, enabling individuals to voice their opinions regarding water resources (National Water Act, 1998). The inclusion of the public in the management of water resources is widely recognised as an essential element of water resource management in South Africa, as stated by Boakye and Akpor (2012). South Africa possesses an ample array of legal mechanisms that facilitate community involvement in water management (Vhumbunu, 2021). For example, the National Water Act (1998) allows water beneficiaries to participate by creating water management institutions such catchment management agencies, water user groups, and water advisory committees. Municipalities have been given the responsibility of ensuring access to water and fair distribution for the socio-economic progress of local communities (Van Koppen et al., 2020). Nevertheless, municipalities are obligated to encourage the involvement and empowerment of local populations in the delivery of water services. Implementing community-based water resource management guarantees the long-term supply of high-quality water, which directly contributes to achieving the Sustainable Development Goals of poverty eradication, hunger eradication, food security, improved health, and sustainable economic growth (Tapela, 2012). Community-based water management strategies enable individuals to strategise for the long-term availability of water, emphasising processes driven by the community's priorities, needs, knowledge, and abilities (Rankoana, 2022).

The involvement of local communities in water supply and provision is crucial for addressing basic requirements, impacting the right to access water, and guaranteeing the long-term viability of water management (Mkize, 2021; Monyai et al., 2022). These align with the United Nations' (UN, 2018) assertion that involving communities actively can enhance existing water provision institutions by mobilising residents and creating opportunities to align community needs with the water management process to foster a sense of ownership and accountability in service delivery for the provision of quality water thus ensuring food security and healthcare. Community management was first proposed in 1990 for municipalities to engage local

communities in water resource management programmes, shifting from a hierarchical approach to a more comprehensive strategy centred on community-driven initiatives, empowering them to oversee their facilities (National Water Act, 1998). Community-based water management is essential as people are likely to respond to a threat if they understand what they have to gain from changing their practices or what they risk losing if they decide not to act. A major limitation is that water resource management cannot be achieved by individuals alone; it must be accomplished as a society with all sharing a common understanding of the risks, impacts of climate changes and the measures necessary to adapt (IPCC, 2022). This assessment outlines the community-based initiatives implemented in rural communities in South Africa to independently manage their water resources and to ensure the long-term provision of high-quality water.

3. Methodology

This review analysed previous research on the types and conditions of water resources that supply water to rural areas. The search for these sources was conducted in electronic databases such as Elsevier, Wiley Journals, Emerald Management Journals, and Science Direct, with a restriction to publications composed in the English language. The main search criteria included empirical studies related to water resources and the collective efforts made by the community to manage and regulate the use of these resources. A standardised search methodology was utilised to examine the global research on community-based water resource management. To be eligible, the research demonstrated the local communities' endeavors to implement measures that guarantee the long-term viability of water resources and assure the provision of high-quality water for household use. The investigation was conducted without any temporal limitations.

4. Results and discussion

4.1. Water service delivery in South Africa

South Africa is dedicated to implementing a policy of providing free basic water to all poor households, ensuring that they have access to a fundamental water supply without any expense to the household (National Water Act, 1998). Since democratic constitutionalism in 1994, the country has made significant achievements in developing water infrastructure. The country faces a potential water crisis due to several factors, including the imbalance between water supply and demand, water resource theft, deteriorating infrastructure, loss of essential skills, a failing educational pipeline, failure in demand management, and declining water quality (du Plessis, 2017). Over the previous 25 years, there has been a 27.57% decrease in the backlog of water infrastructure, measured in terms of population (Statistics South Africa, 2019). Access to water infrastructure refers to the availability of piped water supply achieved by accessing water from a shared standpipe situated at 200 metres from a residence, having water available in the outside area, or having water readily accessible inside a dwelling (Statistics South Africa, 2019). However, despite these promises, the installation of water infrastructure remains unattainable for some households as the Statistics South Africa General Household Survey (2018) depicts a significant number of South African households who relied on unsafe sources of drinking water, such as dams, pools, rivers, streams, and springs, in 2018 (Statistics South Africa, 2018). The

distribution exhibits a significant degree of skewness. Provinces with a high level of urbanisation, including Gauteng and the Western Cape, have successfully decreased the water infrastructure backlog to less than 2% of the population in the last 25 years (Statistics South Africa, 2019). Although there has been significant improvement at a national level, there is still a substantial backlog in access to water in predominantly rural provinces such as the Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, and the Northwest (Statistics South Africa, 2019). Furthermore, the provision of water infrastructure in these provinces is significantly lower. The most appropriate approach to tackle this scenario is through the implementation of the Agenda 2030 on Sustainable Development, which is centred around the fundamental principle of 'Leave No One Behind' (LNOB) as outlined by the United Nations in 2018. For South Africa to adhere to this guideline, water infrastructure investment must focus on provinces with significant water deficits and limited access to water infrastructure. On the other hand, if the notion is not embraced, it will merely exacerbate existing inequities and result in increased inequality. Nevertheless, there are persuasive justifications for granting local communities the authority to engage in water service management.

4.2. Rural water resources

The primary sources of water supply in South Africa's rural communities are boreholes and water reticulation systems equipped with standpipes (Statistics South African General Household Survey, 2018). These water supplies have been established through programmes supported by either the government or donors (Mabhaudhi et al., 2019). Government or non-government entities are establishing public gravity systems with many street taps in rural locations to facilitate the provision of water to local people (Claassen, 2013). This approach is common in rural areas when the government's water infrastructure is augmented by water infrastructure provided by a private organisation for the benefit of a smaller community (Wellfield, 2011). After the project is finished, the infrastructure is formally transferred to the community, which then assumes responsibility for operating the system independently (Maryat et al., 2022). In a study conducted by Marks and Davis (2012) in Kenya, it was found that involvement in rural water projects enhances the consumers' perception of ownership towards the small-scale water infrastructure. Therefore, to enhance the feeling of ownership among beneficiaries, several governments choose to install water supplies only after the beneficiaries have paid an initial contribution (Tapela, 2012). When government-funded programmes construct software water infrastructure, it is commonly considered that a genuine sense of ownership can be conveyed to rural communities when the infrastructure is handed over to them (Selala et al., 2019). Monitoring and evaluation of government and non-government-funded water infrastructure is the responsibility of the community water committee, who get training from the funders and municipality staff (Wellfield, 2011). Monitoring reports are used to assess the infrastructure water levels and usage (Rankoana, 2016).

4.3. Community-based rural water resource management

This section outlines community-based methods in rural water resource management. This section delineates the process by which community-based water management systems proactively oversee and regulate water resources through the inclusive participation of community members where the members welcome such activities, as they are intended to guarantee the availability and accessibility of water for everyone in the community. The practices encompass the following:

4.3.1. Protection of rural water infrastructure

Vulnerable community water infrastructures are protected by either a wall or durable fence from destruction due to their exposure to potential inadvertent harm from passing traffic or their remote location in the wilderness, away from the community site (Wellfield, 2011). This practice also applies to the pilferage of electrical supply transformers and diesel pumps. For example, in the previous Mutale Local Municipality (now known as Musina Local Municipality) in the Vhembe District of Limpopo Province in South Africa, numerous community water assets are safeguarded by robust enclosures to prevent the theft of diesel pumps and power transformers (Wellfield, 2011). Jagals (2012) acknowledges that safeguarding water infrastructure is crucial for facilitating the operations of water service delivery, including ensuring convenient and sustainable access to a regularly available and high-quality water supply. In Bisung's (2021) study, the term "rural-urban gap in safely managed water services" refers to the disparity between rural and urban areas in terms of access to water services that are both safe and well-maintained. The study found that in rural areas, most residents who have access to enhanced water services rely on standalone boreholes that are protected to ensure the provision of sustainable, high-quality water.

4.3.2. Restrictions on water use

Usually, communities would impose limitations on water usage during periods of escalating water scarcity due to breakage or low water resource output. The community would reach a consensus, and its members adhere to the restrictions and regulations to guarantee a sustainable water supply (Rankoana, 2016). Strict measures embrace restrictions from bathing and washing, and livestock drinking from the water resources. Additionally, water committees are stationed at the water resources to oversee their utilisation and prevent excessive strain on the pumps, which could lead to damage or a reduction in the water level (Wellfield, 2011). Selala et al. (2019) support that when these limitations are in effect, alternative water sources such as springs and river water are utilised to satisfy water requirements. For instance, cattle watering can occur in manually excavated wells or communal reservoirs for self-sufficiency in specified grazing zones. Bisung (2021) asserts that a water resource management approach that relies on communal action has the ability of residents to benefit from managing water resources collaboratively and jointly. These limiting practices align with the concept of community engagement, as defined by Shunglu et al. (2022), which is crucial for effectively managing and fairly using water resources. This phenomenon of social trust elucidates why individuals are more prone to engage in cooperative behaviour rather than behaving solely in their self-interest, as rational egoists would (Shunglu et al., 2022).

4.3.3. Response to disruptions of water provision

Rural water infrastructure is managed by local municipalities as per the provisions of the National Water Act (1998). The main responsibility is to oversee and maintain borehole pumps, standpipes, and reticulation systems (Wellfield, 2011). This is made possible by engaging local communities in joint efforts and enhancing their abilities to effectively manage water resources. Communities assume the responsibility for overseeing the management of water resources, which includes handling operational, maintenance, and governance procedures (Wellfield, 2011; Rankoana, 2022). Selala et al. (2019) argue that community-based management practices are beneficial rather than urban areas, which frequently experience significant delays in addressing

minor disruptions due to a lack of joint effort to manage the resources. Nevertheless, if the resources are not repaired promptly, rural communities inevitably act to independently procure the required services to fix the water resources (Zvobgo and Do, 2022). Furthermore, it is worth noting that communities proactively engage in monitoring the operational status of water infrastructure. In such cases, any member of the community has the authority to convene a meeting when the water infrastructure experiences a breakdown, to deliberate on the necessary actions to be taken (Selala et al., 2019). This aligns with the claim made by Harvey and Reed (2004) that the desire to handle water resources does not necessarily result in the creation of management frameworks. Several studies have indicated that the presence of these standards has a positive impact on the sustainability of water infrastructure, leading to an improvement in the provision of water supply services (Peter and Nkambule, 2012). Typically, communities assume responsibility for overseeing and financing continuous maintenance and operations to enhance a sense of ownership over the resources and ensure their long-term viability (Bisung, 2021).

The study conducted by Zvobgo and Do (2022) reveals that the community-based management model has gained significant popularity in water management. Under this model, the government, civil society, or non-governmental organisations construct the water infrastructure and subsequently transfer its management to the community. This approach ensures the sustainable provision of water. The enduring viability of water resources relies on their usage by communities (Wellfield, 2011). Toan et al. (2023) acknowledge that under this particular approach to managing water resources, the purpose of the water infrastructure is frequently to enhance the quality of life for rural communities. When faced with significant challenges that exceed their capacity, the infrastructure is prone to deterioration. This problem frequently arises due to the ineffective functioning and upkeep of the system over an extended duration. Within the community-based approach, the water supply management is entrusted to community members, with the active involvement of civil society organisations (Maryati et al., 2022). The insufficiency of infrastructure exacerbates the severity of water service delivery for many communities in South Africa (Van Koppen et al., 2020). According to Tapela (2012), the situation is anticipated to deteriorate due to the increase in population and economic expansion. Patric (2020) argues that in many rural areas, a substantial portion of the water infrastructure that was established shortly after the end of apartheid became inoperative within a few years. This was primarily due to a lack of capacity for maintenance and basic repairs. These practices support the acknowledgment made by Habiba and Shaw (2012) that including the local people in the planning and development processes is essential for achieving sustainable and safe access to drinking water.

4.3.4. Community water structures

As part of community-based water resource management, water point committees are established to enhance the long-term viability of the water infrastructure (Selala et al., 2019). The structures primarily oversee the utilisation and state of the infrastructure, detect, and fix leaks, prohibit the use of community taps for washing, and address unauthorised connections (Rankoana, 2016). These functions of water structures align with Abdulai and Osumanu's (2023) perspective that integrating community initiatives and harnessing their ability to collaborate fully with the government and utilities necessitates ongoing endeavours, including capacity development and empowering communities to engage in the decision-making process for a sustainable water supply (Bogale and Urgessa, 2012). According to the South African Department of Water Affairs and Forestry (2011), the community water committees are responsible for including the community in creating water

management rules, and regulations for the water supply scheme. The rules and regulations should encompass various provisions to address issues such as graffiti, community reporting, handling of defaulters and non-payers, grievances, and conflicts. In Patrick's study conducted in 2020, the water committees are of utmost importance in avoiding acts of vandalism and theft against water infrastructure. The water user's committees serve to empower communities and promote equitable use of water, while ensuring the ongoing functioning of water points, per participatory theory (Entogo et al., 2018). Community-based water management serves as a means for governments to utilise local resources, offer water at a comparatively reduced expense, and empower certain individuals with technical expertise within the rural communities to oversee and carry out repairs on rural water infrastructure (Bisung, 2021). Once the infrastructure is completed, it is handed over to the local municipality to ensure sustainable water provision through infrastructure maintenance (Wellfield, 2011). The municipality will in turn hand over the infrastructure to the local authorities, and subsequently to the water committees, who receive training on monitoring, evaluation, and management of the water resources (Rankoana, 2016). Funding for the sustenance of community water infrastructure rests with the local municipality, where an operational budget is set for the maintenance and renewal of existing infrastructure (Wellfield, 2011).

5. Conclusion

This review demonstrates that community-based water resource management is a crucial component of rural water management, wherein the entire community actively participates in water management methods. The community members manage water resources through a consensus on resource management techniques to ensure a sustainable and high-quality supply of water. The management of community water infrastructure is governed by established protocols and guidelines, which include measures to safeguard the resources from damage, procedures to address any interruptions in water supply, and limitations on water consumption. The research concludes that in addition to community-wide practices to manage water infrastructure, there are community structures, referred to as water committees, that oversee and facilitate community involvement in the management of water resources. Community members adhere to the norms and initiatives proposed by the committees due to trust and the necessity for a reliable water supply. Community-based water resource management is dependent on the collaborative efforts of the community to effectively oversee and regulate the utilisation of the resources. The involvement of community members in water resource management is recommended to protect the water infrastructure, particularly in the current era characterised by climate change-induced fluctuations in rainfall patterns and drought, which are depleting water resources.

References

Abdulai, I.A. and Osumanu I.K. (2023), "How urbanisation shapes availability of provisioning ecosystem services in peri-urban Ghana", *International Journal of Urban Sustainable Development*, Vo.15, pp. 282-298. https://doi.org/10.1080/19463138.2023.2267518

Bisung, E. (2021), "Community-based collective action for safe water in rural sub-Saharan Africa", *Water Security*, Vol. 13, pp. 2468-3124. https://doi.org/10.1016/j.wasec.2021.100088

Boakye, M.K. and Akpor, O.B. (2012), "Community Participation in Water Resources Management in South Africa", *International Journal of Environmental Science and Development,* Vol.3, pp. 511- 516. https://doi.org/10.7763/IJESD.2012.V3.277

Bogale, A. and Urgessa, B. (2012), "Households' willingness to pay for improved rural water service provision: application of contingent valuation method in eastern Ethiopia", *Journal of Human Ecology*, Vol. 38, pp.145-154. https://doi.org/10.1080/09709274.2012.11906483

Claassen, M. (2013), "Integrated water resource management in South Africa", *International Journal of Water Governance*, Vol.1, pp. 323–338. https://doi.org/10.7564/13-IJWG12

du Plessis, A. (2017), *South Africa's Water Availability and Use. In: Freshwater Challenges of South Africa and its Upper Vaal River*. Springer, New York. https://doi.org/10.1007/978-3-319-49502-6

Etongo, D., Fagan, G.H., Kabonesa, C. and Richard, A.B. (2018), "Community-Managed Water Supply Systems in Rural Uganda: The Role of Participation and Capacity Development", *Water*, Vol.10, pp. 1-18. https://doi.org/10.3390/w10091271

Faysse, N. (2005), *An assessment of small-scale users' inclusion in large-scale water user associations of South Africa*. International Water Management Institute Research Report 84, 2005.

Habiba, U. and Shaw, R. (2012), *Bangladesh experiences of community-based disaster disk reduction. Shaw, R. (Ed.), in Community, Environment and Disaster Risk Management*, Emerald Publishers, Bingley, pp. 91-111. https://doi.org/10.1108/S2040-7262(2012)0000010012

Harvey, P.A. and Reed, R.A. (2004), *Rural Water Supply in Africa-Building Blocks for Handpump Sustainability*. Loughborough University, London.

Intergovernmental Panel on Climate Change [IPCC] (2022), *Climate change 2022: Impacts, adaptation and vulnerability*. In H.O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, and B. Rama (Eds.), Contribution of working group II to the sixth assessment report of the intergovernmental panel on climate change (pp. 30-56). Cambridge University Press. Cambridge University Press, Cambridge, UK and New. York, NY, USA. https://doi.org/10.1017/9781009325844

Jagals, P. (2012), *The impacts of rural small-community water supply interventions in rural South Africa*. Water Research Commission, Republic of South Africa. Available at: https://www.wrc.org.za (accessed 19 March 2025).

James, A.J. (2003), *Institutional challenges for water resources management: India and South Africa",* WHIRL Project Working Paper 7.

Mabhaudhi, T., Nhamo, L., Mpandeli, S., Nhemachena, C. and Senzanje, I. (2019), "The water–energy–food nexus as a tool to transform rural livelihoods and well-being in Southern Africa", *International Journal of Environmental Research and Public Health,* Vol. 16, pp. 1-21. https://doi.org/10.3390/ijerph16162970

Marks, S.J. and Davis, J. (2012), "Does user participation lead to sense of ownership for rural water systems? Evidence from Kenya", *World Development,* Vol. 40, pp. 1569-1576. https://doi.org/10.1016/j.worlddev.2012.03.011

Maryati, S., Firman, T. and Humaira, A.N.S. (2022), *A sustainability assessment of decentralized water supply systems in Bandung City*, Utility Policy, Number 76, 101373, Indonesia. https://doi.org/10.1016/j.jup.2022.101373

Mkize, O.S. (2021), "Limited access to safely managed water in resource poor rural contexts: A photovoice study of adult experiences in KwaZulu-Natal, South Africa", Doctoral dissertation, University of KwaZulu-Natal, South Africa. Available at: https://ukzn-dspace.ukzn.ac.za/handle/10413/19919 (accessed 19 March 2025).

Monyai, P.B., Chivanga, S.Y., Monyai, T. and Ndlovu, S. (2022), "The role of communities in innovative water management: Sustainability governance in the emerging country", *Journal of Governance and Regulation*, Vol. 11, pp. 123–135. https://doi.org/10.22495/jgrv11i4art12

Patrick, H.O. (2020), "Climate change, water security, and conflict potentials in South Africa: assessing conflict and coping strategies in rural South Africa", In: Filho, W. L., Luetz, J. and Ayal, D. (eds), *Handbook of Climate Change Management*, Springer, New York. https://doi.org/10.1007/978-3-030-22759-3_84-1

Peter, G. and Nkambule, S.E. (2012), "Factors affecting sustainability of rural water schemes in Swaziland", *Physical Chemistry of the Earth*, Vol. 52, pp. 196-204. https://doi.org/10.1016/j.pce.2012.09.011

Rankoana, S.A. (2016), "Sustainable use and management of indigenous plant resources: A case of Mantheding community in Limpopo province, South Africa", *Sustainability,* Vol. 8 No. 3. https://doi.org/10.3390/su8030221

Rankoana, S.A. (2022), "Community-Based adaptation practices to cope with drought in the era of climate change in a rural community in Limpopo Province, South Africa", *Natural Resources and Sustainable Development*, Vol. 12, pp. 149-162. https://doi.org/10.31924/nrsd.v12i1.096

National Water Act. Act No. 36 of (1998), Government Gazette 19182. Government Printer, Cape Town. Available at: http://www.dwa.gov.za/documents/publications/NWAguide.pdf/ (Accessed 2 May 2023).

Selala, M.S., Senzanje, A. and Dhavu, K. (2019), "Requirements for sustainable operation and maintenance of rural small-scale water infrastructure in Limpopo Province, South Africa", *Water South Africa*, Vol. 45, pp. 291-304. https://doi.org/10.4314/wsa.v45i2.16

Shunglu, R., Köpke, S., Kanoi, L., Nissanka, T.S., Withanachchi, C.R., Gamage, D.U., Dissanayake, H.R., Kibaroglu, A., Ünver, O. and Withanachchi, S.S. (2022), "Barriers in Participative Water Governance: A Critical Analysis of Community Development Approaches", *Water*, Vol. 14, pp. 1-17. https://doi.org/10.3390/w14050762

South African Department of Water Affairs and Forestry's view (DWAF) (2011), "Sustainability Best Practices Guidelines for Rural Water Services", available at: https://www.dws.gov.za (accessed 19 March 2025).

Statistics South Africa (2019), *Statistical Release P0318, General Household Survey 2018*, Pretoria, South Africa: Statistics South Africa. Available at: www.statssa.gov.za (accessed 19 March 2025).

Statistics South Africa (2018), *General Household Survey*, Pretoria, South Africa. Available at: www.statssa.gov.za (accessed 19 March 2025).

Statistics South Africa (2022), Statistics South Africa, Pretoria. Available at: www.statssa.gov.za (accessed 19 March 2025).

Tapela, B. (2012), *Social Water Scarcity and Water Use*. Report No. 1940/1/11. Water Research Commission, Pretoria.

Toan, T.D., Hanh D.N. and Thu, D.T. (2023), "Management Models and the Sustainability of Rural Water Supply Systems: An Analytical Investigation in Ha Nam Province, Vietnam", *Sustainability,* Vol. 15 No. 9212, pp. 1-14. https://doi.org/10.3390/su15129212

United Nations. (2018), "Sustainable Development Goal 6 Synthesis Report on Water and Sanitation", p. 11. Available at: https://sustainabledevelopment.un.org/content/documents/19901SDG6_SR2018_web_3.pdf (accessed 19 March 2025).

van Koppen, B., Hofstetter, M., Nesamvuni, A.E. and Chiluwe, Q. (2020), "Integrated management of multiple water sources for multiple uses: rural communities in Limpopo Province, South Africa", *Water South Africa*, Vol. 46, pp. 1-11. https://doi.org/10.17159/wsa/2020.v46.i1.7870

Vhumbunu, C.H. (2021), "Counting down to day zero: Exploring community-based water management strategies in Western Cape Province drought, South Africa (2017/2018)", In: R. Djalante, M. B. F. Bisri, R. Shaw (Eds.), *Integrated Research on Disaster Risks (pp. 193-212)*. Springer, Cham. https://doi.org/10.1007/978-3-030-55563-4_11

Wellfield Consulting Services (2010), *Development and Testing of Groundwater Drought Management Strategies in the Limpopo Basin Pilot Areas Final Report – October 2011,* British Geological Survey, Botswana.

Zvobgo, L. and Do, P. (2020), "Covid-19 and the call for safe hands - challenges facing the under sourced municipalities that lack potable water access", *Research*, Vol. 10, pp. 1-11. https://doi.org/10.1016/j.wroa.2020.100074