

POLICY BRIEF

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STRENGTHENING WATER SECURITY WITHIN THE IISHANA SYSTEM, NAMIBIA: ADDRESSING WATER DEMAND AND QUALITY

**Junias Eino^{1*}, Valentine Yato Katte¹, Afis Olumide Busari¹, Evanilton Edgar Serrão Pires⁴, Petrina Johannes¹,
Monique Fahrenberg², Christian Reinhardt-Imjela², Robert Jüpner³ and Achim Schulte²**

¹Department of Civil and Mining Engineering, University of Namibia, Ongwediva, Namibia

²Freie Universität Berlin, Institute of Geographical Science, Applied Physical Geography – Environmental Hydrology, Germany

³Technische Universität Kaiserslautern-Landau, Germany

⁴Departamento de Engenharias, Instituto Superior Politécnico Tundavala, Angola

KEY MESSAGES

- The current water demand of the Iishana-based population is estimated at 2,479 m³/d, with projections of 0.9, 0.5, and 0.1 Mm³/year for 2033, 2043, and 2053, respectively. Therefore, it is recommended to build water infrastructure in the region to improve rural communities' well-being and livelihoods.
- Increase the storage capacity of existing natural pans by removing accumulated sediments to harvest flood and rainwater, improving water availability for use during prolonged droughts.
- Plant trees within the basin for ecological restoration, flood control, and enhance the resilience of rural livelihoods to climate change impacts.
- Treat the water stored in the Iishana system for domestic use and other uses, such as construction, irrigation, and other agricultural activities.
- Regularly monitor surface water to detect contamination caused by rapid socio-economic development, agricultural activities, and climate change.



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PROBLEM STATEMENT

The Namibian people, particularly those living within the lishana system, a subset of the Cuvelai Basin, often encounter recurrent floods and droughts (Shaamhula et al., 2021; Shifidi, 2016). The ephemeral lishana water system faces mounting pressure from three key stressors: climate change-induced hydrological variability, agricultural runoff that contaminates water quality, and unsustainable water extraction driven by rapid socio-economic development (Mendelsohn and Weber, 2011). These factors threaten both the system's ecological integrity and water security. In this context, understanding water demand and quality is crucial for developing effective coping strategies for the lishana basin water security.

SUMMARY

Water demand was estimated using census data, field interviews, questionnaires, and secondary sources. Ten surface-water samples were collected from the lishana system during the study period and analyzed for physical, chemical, and microbiological parameters. Field measurements included turbidity, dissolved oxygen, electrical conductivity, and pH, while laboratory analyses covered major ions, nutrients, and coliforms. Water quality was assessed using the Water Quality Index, multivariate statistical techniques, and Piper diagrams, following Eino et al. (2024, 2025).

The selected parameters were chosen because they significantly affect surface water quality. Physical parameters (turbidity, dissolved oxygen, electrical conductivity, and pH) were measured on-site, while the elemental and biological compositions (sodium, chloride, potassium, magnesium, calcium, iron, nitrate, nitrite, total coliform, and faecal coliforms) were analyzed in the laboratory at Namibia Water Corporation Ltd (NamWater). Water Quality Index (WQI), Multivariate statistical techniques, and the Piper diagram were employed for water quality analysis, as in Eino et al. (2025).

KEY FINDINGS

Current Rural Water Demand Estimation

The estimated water demand for the present year, 2023/24, was calculated based on the current domestic population and livestock numbers, using adopted water consumption norms. Table 1 shows the resulting estimate of current rural water demand.

Table 1: Estimated current (2023/24) water demand of the lishana system

Domestic			Livestock			Total
Rural Population	Water Consumption Per capita	Demand	Livestock Numbers	Water Consumption per stock	Demand	Rural Water Demand
[Total]	[m3/capita/d]	[m3/d]	[Total]	[m3/stock/d]	[m3/d]	[m3/d]
61,969	0.04	2,479	95,156	0.045	4,282	6,761

The total current rural water demand was calculated at 6,761 m³/d, with domestic demand at 2,479 m³/d and livestock demand at 4,282 m³/d, representing 37% and 63% of the total, respectively.

Strategic harvesting of flood and rainwater could significantly alleviate water scarcity and drought in the region by increasing wet-season storage and providing a buffer supply to meet population demand. Arendt et al. (2021) found more than 63,000 existing pans can store 0.63 km³ of water. The study also identified over 700 plans for potential expansion, which could simultaneously enhance water security and flood protection in the region.

Water Quality Index

The WQI for the 10 sampled pans ranges from 81.30 to 320.65, as shown in Table 2. Based on the WQI classification, none of the sampled points were considered suitable for drinking. This under-score the need for appropriate treatment for people who use Oshana water.

Table 2: The status of the water samples

Site	WQI	Class
1	143.89	Unsuitable
2	258.57	Unsuitable
3	84.98	Very poor
4	265.60	Unsuitable
5	91.91	Very poor
6	320.65	Unsuitable
7	311.30	Unsuitable
8	263.77	Unsuitable
9	81.30	Very poor
10	272.81	Unsuitable

Principal component analysis indicates that agricultural runoff predominantly controls surface water quality in the lishana system. Additional contributing factors are the inherent salt concentration in the pans, microbial presence, and seasonal geochemical processes involving mineral dissolution. Meanwhile, anion distribution exhibits a more heterogeneous spatial pattern across the region (Eino et al., 2025).

POLICY GAPS / CHALLENGES

Namibia's National Water Policy has a limited focus on climate change and drought resilience, with insufficient attention to prolonged droughts, increasing rainfall variability, and the need for climate-resilient water infrastructure and adaptation planning. In addition, the policy provides insufficient guidance on managing seasonal surface-water systems, including wetlands, lishanas, and other temporary water bodies. These gaps may hinder effective planning and sustainable water resource management in climate-vulnerable rural areas.

POLICY OPTIONS

- **Integrate climate-risk measures into water-resource planning:** Revise the National Water Policy to require all regional water plans to include drought-risk assessments, climate projections, seasonal water-availability assessments, and contingency measures for prolonged dry periods.
- **Establish a national lishana and seasonal-water management programme:** Develop guidelines for the protection, monitoring and sustainable use of lishanas and other seasonal water bodies, including clear rules for domestic and livestock abstraction and measures to prevent pollution.
- **Invest in climate-resilient rural water infrastructure:** Prioritize drought-resilient water infrastructure, including strategically located boreholes, storage facilities and water reticulation systems, in communities that depend heavily on seasonal surface water.

CALL-TO-ACTION

- Rainwater harvesting should be regulated and promoted by the Ministry of Agriculture, Fisheries, Water and Land Reform (MAWLR).
- The surface water quality should be regularly monitored by the Ministry of Health and Social Services and MAWLR.
- Awareness about the risks of using untreated water should be increased among residents who utilize surface water.
- Water treatment should have standard procedures for all drinking water from the lishana. Planting trees, creating gardens, and restoring natural vegetation within the basin should be encouraged.
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CONCLUSION

This study highlights significant rural-urban outmigration, driven primarily by water insecurity stemming from limited water availability, poor infrastructure, long distances to water sources, and inadequate sanitation. These hydrological challenges are exacerbated by climatic factors, including high evaporation rates and variable rainfall, which cause floods and droughts. Concurrently, water quality assessment underscores the need for enhanced water management, rigorous surveillance, and effective pollution control to mitigate public health risks in the absence of adequate treatment protocols. Contaminants include both natural (such as sodium, chloride, aluminium, magnesium, EC, potassium, and sulphate) and anthropogenic (such as bacteria and turbidity) sources. Anthropogenic contaminants come from agricultural activities and livestock waste, which wash into surface water, especially during rainy-season runoff. Therefore, limited water infrastructure renders the basin highly vulnerable to water insecurity. The findings conclusively indicate that water from the lishana system is unsuitable for human consumption without prior treatment.

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