

## OPINION

### From crisis response to system care: Rethinking water security in South Africa



*South Africa's water problems are often blamed on drought, but the real crisis runs deeper. Failing infrastructure, weak governance and short-term thinking are turning manageable risks into chronic water insecurity. To secure our water future, we need to move beyond firefighting and start caring for the system as a whole. So writes Dr Shafick Adams, Senior Research Manager of the Water Research Commission.*

Many of South Africa's water crises are driven not by climatic shocks alone, but by a series of avoidable, simple mistakes. Over-reliance on single water sources, such as surface water, leaves systems highly vulnerable to drought. Historical neglect of alternatives like groundwater, desalination, or water reuse limits resilience. Insufficient investment in infrastructure expansion, driven by population growth and urbanisation, intensifies demand pressures. Slow adoption of technologies and innovations undermines efforts to improve water efficiency, monitoring, and maintenance. Poorly maintained infrastructure, much of it operating beyond its design life, leaks precious water at eye-watering rates across the country. Insufficient monitoring and weak data systems prevent timely interventions. Taken together, these oversights, along with high-consumption behaviour and the vandalism and theft of infrastructure, turn natural water scarcity into full-scale water insecurity, often long before environmental shocks strike.

Municipal water insecurity is also rarely the result of a single failure. It emerges from the convergence of infrastructure fragility, weak institutions, environmental pressures, vandalism, and growing demand. At the local level, it is experienced through intermittent supply, declining water quality, and

rising conflict between communities and municipalities. These localised failures reflect broader challenges of national water availability, storage and distribution, climate variability, and uneven institutional capacity.

Recent hydrological droughts and technological or human-caused stressors have again exposed the vulnerability of municipal systems. Emergency measures, behavioural change, and the rapid development of alternative sources have sometimes averted total failure. Yet these responses have also highlighted municipal unpreparedness for prolonged or recurring stress. Infrastructure investment alone is not enough; governance, technical skills, routine maintenance, and public trust are equally critical. Where these are weak, interventions are short-lived and unsustainable. In several places, emergency boreholes that were drilled are neglected and fall into disuse, illustrating this pattern. A more resilient approach would be to maintain these assets for future crises, or better still, integrate them into the regular water supply system. Drought is often treated as an exceptional event rather than a recurring certainty, leaving systems exposed.

Groundwater has emerged as both a critical buffer and a

frequently misunderstood resource. When planned and managed effectively, it can support essential services and community water supply during periods of stress. Where it is poorly understood, however, it often becomes the focus of myths, fear, and unrealistic expectations. Groundwater is neither a quick fix nor an unlimited reserve. Its sustainable use requires specialised expertise, ongoing monitoring, and clear governance. Failures are rarely due to the groundwater itself, but to weak institutional capacity, poor coordination and short-term decision making. Over-pumping will lead to aquifer depletion and “boreholes drying up” but this is because of the poor management of the system or absent operating rules and not the resource itself.

These experiences show that many of South Africa’s water challenges are governance challenges rather than purely technical ones. Delayed decision-making, fragmented mandates across government, and a chronic lack of in-house technical capacity undermine effective action. Emergency powers enable rapid intervention, but long-term planning, licensing and operational responsibility often lag. Once immediate pressure eases, systems are neglected or abandoned because no institution assumes ongoing responsibility. This stop-start pattern reflects short political cycles, weak accountability and gradually erodes resilience.

A central challenge in municipal water management is a persistent failure of sense-making. Too often, municipalities misread the nature of the problem and then reach for solutions that do not fit, treating deep system weaknesses as if they were simple operational glitches. Having a rational way to separate routine issues from complex, fast-changing risks helps decision-makers respond with the right approach. One useful guide is the Cynefin framework, developed in the late 1990s by Dave Snowden. It groups problems into five domains: clear, complicated, complex, chaotic and disorder, reflecting how predictable cause and effect are in each case. Its practical value is simple: it helps prevent the costly mistake of applying the wrong type of response to the wrong kind of challenge.

Water governance spans all five domains of the Cynefin framework, shaping how water management decisions and practices operate within them, such that weaknesses in one domain often propagate across the system. Routine tasks, such as pump maintenance and meter reading, fall within the clear domain and can be managed through standard procedures. Although these are among the simplest functions, they are often poorly resourced and inconsistently implemented, undermining system reliability and weakening early-warning feedback. In contrast, infrastructure planning and hydrogeological assessments sit within the complicated domain, requiring specialist expertise and detailed analysis. Groundwater schemes are particularly vulnerable as only 2 of 257 municipalities have in-house groundwater expertise, limiting informed decision-making across the system.

Challenges such as climate variability, drought, and social inequality occupy the complex domain where cause-and-effect relationships are non-linear and outcomes emerge over time, demanding adaptive management and continuous learning. When accumulated stresses overwhelm the system, such as major failures or contamination events, push municipalities into the chaotic domain, requiring rapid action to restore basic order. Often, however, municipalities operate in a state of disorder,

unable to accurately diagnose the nature of the problems they face, allowing risks to escalate across domains and resulting in fragmented and ineffective responses.

This misalignment drives local water insecurity. Infrastructure decay, groundwater mismanagement, and declining water quality are often treated as simple or clear operational issues, when they are in fact complicated or complex and require continuity, coordination, expertise, learning, and adaptation. Drought intensifies this complexity, yet responses remain short term and reactive. When systems fail, governance shifts abruptly into crisis mode, characterised by firefighting and delayed accountability rather than preparedness and adaptation. Water management is a deeply interconnected system in which climate variability amplifies existing weaknesses. Droughts, floods, and rising temperatures strain fragile infrastructure, funding models, and governance arrangements. These pressures interact with entrenched inequality, limited institutional capacity and poor system understanding, reinforcing local water insecurity. Climate change is not a standalone threat but a multiplier of risk. Improving water security requires adaptive, integrated governance that recognises complexity, rather than relying on isolated technical fixes or recurring emergency interventions.

Strengthening water security requires a shift from crisis response to system care. Routine maintenance, leak repair, metering, and basic monitoring must be funded and enforced as core services, not deferred until failure. Water supplies should be deliberately diversified, with groundwater, reuse and decentralised sources integrated into normal operations and emergency infrastructure maintained as permanent assets. Technical capacity needs rebuilding, particularly in asset management, groundwater, and data systems, through in-house skills or shared regional support. Financing must prioritise prevention, with ring-fenced funding for operations and maintenance and incentives that reward early intervention rather than late-stage emergencies. Governance must match the complexity of the challenge, with clear accountability, adaptive planning and institutions that assume climate variability and drought as recurring conditions rather than exceptional shocks.

Water security both underpins and depends on the effective functioning of interdependent systems, including energy, public health, municipal finance, spatial planning, housing, and food systems, all of which are embedded within and dependent on healthy ecological systems. Resilient water services enable electricity generation, sanitation, healthcare delivery, environmental protection, economic activity, and urban development, while water systems themselves rely on coherent governance, sustainable financing, institutional capacity, spatial planning, and reliable energy supply to function and adapt. Addressing water insecurity, therefore, requires integrated, systems-based planning that aligns decisions across these interconnected systems to manage climate variability alongside governance failures, infrastructure deterioration, spatial inequality, demographic pressures, and fiscal constraints, recognising feedback loops, trade-offs, and cascading risks that shape long-term resilience and livelihood outcomes. In practice, this means recognising that water insecurity is not a failure of rainfall or infrastructure alone, but of how we understand, govern, and manage complex systems over time.