MUNICIPAL WATER SUPPLY

Groundwater: A strategic asset for municipal water security

While groundwater makes up a relatively small share of major bulk water supply in South Africa, it is an indispensable water source for hundreds of small towns and rural settlements, with even large metropolitan areas depending on it to some extent. K Pietersen, E Masemola, S Clarke, T Kanyerere, B Wilschut and T Hlatywayo emphasise the importance of recognising groundwater as a strategic municipal asset and provide some pointers to local authorities to improve its governance.



Despite the important role of this water source, there is still a general reluctance to recognise groundwater as a strategic municipal asset and to make the governance, funding and risk-management decisions needed to protect it. Groundwater should not be treated only as an emergency supply during droughts or service disruptions. It should be incorporated into the municipal water supply strategy alongside surface water, reuse, demand management, storage and climate-resilience measures, with clear responsibilities, lifecycle funding and routine risk oversight.

Strategic value of groundwater

Groundwater strengthens municipal water security because it is locally available in many areas, naturally stored in aquifers, less exposed to evaporation than surface storage, and able to buffer drought and seasonal variability when managed correctly. It supports rural settlements, small towns, agriculture, schools, clinics, ecosystems and, in some areas, urban supply systems.

Groundwater's strategic value lies not only in the volume of water available, but also in its ability to diversify supply, reduce dependence on distant bulk schemes, support phased infrastructure development and improve resilience during climate extremes.

The strategic value of groundwater therefore depends on how deliberately municipalities govern it. Once groundwater is recognised in planning and performance systems, council and senior management must assign responsibilities, fund the necessary institutional capacity and ensure that technical decisions are linked to executive oversight.

Decisions about borehole development, abstraction rates, water quality, sanitation, stormwater, land use and industrial activity all

affect aquifer sustainability, so groundwater requires the same level of strategic attention as other water sources and municipal infrastructure assets.

Figure 1 illustrates groundwater as one component of a diversified municipal water supply portfolio. It shows why groundwater should be planned and managed alongside surface water, reuse, demand management, storage and climate-resilience measures rather than treated as a separate emergency source. This portfolio approach reduces dependence on any single source, supports drought preparedness and strengthens long-term water security when each component is governed, funded, monitored and operated as part of an integrated municipal system.

Governance responsibilities

Municipal councils and senior management should provide clear political and administrative leadership for groundwater. Council should approve the policy direction, bylaws, budgets and performance expectations needed to protect aquifers and secure reliable services. The municipal manager should ensure that groundwater responsibilities are allocated across water services, engineering, planning, environment, finance, disaster management and performance-management functions. Groundwater cannot be left only to technical staff or consultants; it requires institutional ownership and routine executive oversight.

Water services authorities (WSAs) and water services providers (WSPs) should ensure that groundwater schemes are properly investigated, authorised where required, operated within sustainable yield, monitored for water levels and quality, maintained through planned operation and maintenance (O&M) programmes, and protected from contamination and vandalism.

Municipal planning and environmental functions should identify recharge areas, wellfields and vulnerable aquifers in spatial plans and development-control systems. Finance officials should ensure that capital and operating budgets reflect the full lifecycle costs of groundwater schemes, including monitoring, treatment, security, energy, rehabilitation and professional support.

National government remains responsible for overall water-resource regulation and custodianship, while municipalities are responsible for water-services planning, delivery and local controls. This division of responsibilities means municipalities must work closely with the Department of Water and Sanitation (DWS), catchment management agencies (CMAs), neighbouring municipalities, water boards, private users, farmers, industries and communities. Shared aquifers require shared data, coordinated abstraction management and clear arrangements for pollution prevention, compliance and emergency response.

Funding requirements

Groundwater schemes often fail when funding focuses on drilling and equipping boreholes while ignoring the investigation, testing, monitoring, treatment, security, energy, operator training, data management, operation and maintenance required to keep them working. Municipal budgets should therefore treat groundwater as an asset class with full lifecycle cost requirements.

Capital expenditure should cover professional hydrogeological assessment, borehole siting, drilling, testing, infrastructure design, treatment where needed, telemetry or monitoring equipment and secure headworks. Operating expenditure should cover electricity or alternative energy, pump maintenance, sampling, laboratory analysis, data management, rehabilitation, security, spare parts and ongoing technical support.

Municipalities should create dedicated groundwater budget lines in the Medium-Term Revenue and Expenditure Framework (MTREF) and link them to measurable outputs in the Service Delivery and Budget Implementation Plan (SDBIP). Funding applications and infrastructure programmes should require evidence that groundwater projects are based on sound aquifer assessment, sustainable yield estimates, water-quality testing, O&M planning and long-term monitoring. Where grants or emergency funds are used to develop groundwater, municipalities should ensure that future operating costs are budgeted before schemes are commissioned.

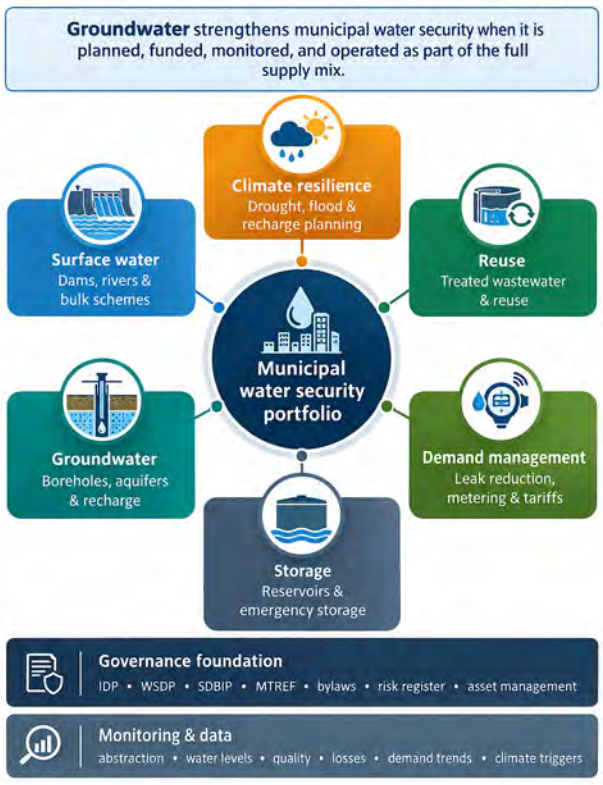
Funding should also support preventative action. Protecting recharge zones, repairing leaking sewers, improving sanitation, securing wellfields and maintaining monitoring networks are usually cheaper and more effective than responding to aquifer contamination, borehole failure or emergency water shortages. Council should therefore regard groundwater protection and monitoring as risk-reduction investments, not optional technical expenses.

Figure 2 presents groundwater as a lifecycle investment that requires funding beyond initial drilling and equipment. It shows the full cost chain from hydrogeological assessment, borehole siting, drilling, testing and commissioning through to operation, monitoring, treatment, security, maintenance, data management and eventual rehabilitation or replacement. By linking these costs to the MTREF, SDBIP, asset management, procurement and risk-management systems, the figure shows how sound funding decisions reduce the likelihood of scheme failure, unsafe water and avoidable emergency expenditure.

Risk management priorities

Groundwater risk management should be incorporated into municipal risk registers, drought plans, water safety planning, asset management and internal audit systems. Key risks include overabstraction, declining yields, contamination, saline intrusion in coastal areas, drought stress, weak monitoring, inadequate technical capacity, unregistered private boreholes, vandalism, pump and power failure, poor water quality, insufficient treatment, fragmented mandates and funding gaps. Each material risk should have an assigned owner, a monitoring indicator, a response threshold, a budget requirement and a reporting route to senior management and council structures.

Groundwater monitoring is the foundation of risk management. Municipalities should monitor abstraction volumes, water levels, pump performance, water quality, energy use, infrastructure condition and user impacts. Monitoring data should be stored in a municipal system, reviewed regularly by competent technical staff, and used to trigger operational responses such as reducing abstraction, rotating boreholes, repairing infrastructure, increasing treatment, investigating contamination or communicating restrictions to users.



Groundwater should be viewed as one managed component of an integrated municipal water supply portfolio, working alongside surface water, reuse, demand management, storage and climate-resilience measures, and supported by governance, funding, monitoring and risk-management systems.

The most important governance message is that groundwater reliability is managed, not assumed. Municipalities that plan early, allocate responsibility, fund lifecycle costs, protect aquifers, monitor continuously and respond to warning signs can use groundwater to improve long-term water security. Municipalities that treat groundwater as an emergency fallback risk borehole failure, public-health impacts, rising costs, service interruption and loss of community trust.

Figure 3 illustrates the groundwater risk pathway and response cycle that municipalities should use to move from early warning signs to accountable action. It shows how groundwater risks are identified, monitored through agreed indicators, assigned to responsible officials, escalated to senior management when thresholds are exceeded, linked to funding and corrective actions, and reported to council for oversight. The figure reinforces the principle that groundwater risk management is a continuous governance process that connects technical monitoring, administrative accountability, budget decisions and political oversight.

Recommended actions for government management

To turn these governance, funding and risk-management principles into practice, municipalities should adopt a deliberate groundwater management programme that converts policy commitments into routine planning, budgeting, monitoring and reporting. The following recommendations provide a practical agenda for councillors, municipal managers and senior officials responsible for water security, infrastructure investment and service-delivery accountability.

1. **Recognise groundwater as a strategic municipal asset**. Council should formally recognise groundwater in the IDP, WSDP, MSDF, drought plan, infrastructure plans and municipal risk register, with clear policy statements on its role in long-term water security and climate resilience.
2. **Assign accountability at senior level.** The municipal manager should allocate groundwater responsibilities across water services, infrastructure, planning, environment, finance, disaster management and performance-management functions, with a designated senior official responsible for coordination and reporting.
3. **Secure competent hydrogeological support.** Municipalities should appoint, contract or share qualified hydrogeological expertise to guide borehole siting, testing, sustainable yield assessment, monitoring network design, abstraction rules, water-quality interpretation and scheme rehabilitation.
4. **Create and maintain a groundwater asset register.** All municipal boreholes, springs, wellfields, pumps, meters, treatment units, reservoirs, telemetry equipment and monitoring points should be recorded in an asset register that includes location, condition, yield, water quality, ownership, operating status and maintenance history.
5. **Fund the full lifecycle cost of groundwater schemes.** MTREF and SDBIP allocations should provide for investigation, drilling, testing, equipping, monitoring, treatment, security, energy, maintenance, operator training, data management and rehabilitation, not only for initial infrastructure installation.
6. **Monitor water levels, abstraction and quality routinely.** Municipalities should establish minimum



Figure 2. Groundwater lifecycle funding model – the full cost chain from hydrogeological assessment and drilling through commissioning, operation, monitoring, treatment, security, maintenance, data management and rehabilitation, supported by municipal budgeting, asset management, procurement, risk management and council oversight.

monitoring schedules for groundwater levels, abstraction volumes, pump performance, water quality, infrastructure condition and energy use, with results reviewed regularly and reported to management.

7. **Operate within sustainable yield and defined rules.** Abstraction should be based on tested aquifer and borehole performance, with operating rules for pumping hours, borehole rotation, drought restrictions, recovery periods, emergency use and response thresholds when water levels or water quality deteriorate.
8. **Protect recharge areas, wellfields and vulnerable aquifers.** Groundwater protection zones should be reflected in spatial planning, land-use decisions, development approvals, sanitation planning, stormwater management, waste management and environmental controls.
9. **Strengthen bylaws and local controls.** Municipal bylaws should address borehole registration, source protection, pollution prevention, drilling standards, private borehole information, land-use controls near sensitive aquifers and enforcement mechanisms where local activities threaten groundwater.
10. **Integrate groundwater into drought and climate-resilience planning.** Manage groundwater conjunctively with surface water, reuse, demand management, and storage, with clear rules for when and how groundwater is used under normal, dry, and emergency conditions.
11. **Build operational capacity.** Operators and technicians should be trained in pump operation, basic hydrogeological monitoring, water-quality sampling, meter reading, fault detection, maintenance procedures, security checks and escalation protocols.
12. **Use data for decision-making and public accountability.** Groundwater information should be stored in an accessible municipal system, reviewed by competent staff, used to trigger management actions and summarised in reports to council, senior management and relevant oversight structures.
13. **Groundwater can make a significant contribution to municipal water security** when it is treated as a managed public asset rather than an emergency fallback. Its strategic value lies in its ability to diversify supply, strengthen drought resilience, support local service delivery and reduce pressure on over-stretched surface-water systems. These benefits, however, depend on deliberate governance, adequate funding, routine monitoring and disciplined risk management.

For councillors and senior managers, the central policy task is to make groundwater visible in municipal planning, budgeting and accountability systems. This means assigning clear responsibilities, funding lifecycle costs, protecting recharge areas and wellfields, monitoring abstraction and water quality, responding to early warning signs and reporting performance and risks through established municipal oversight structures. Groundwater management should therefore be embedded in the IDP, WSDP, MTREF, SDBIP, asset register, risk register, drought plan and water safety planning processes.

The conclusion for municipalities is clear: groundwater reliability is achieved through governance choices made before a crisis occurs. Municipalities that plan, budget, monitor and protect



Figure 3. Groundwater risk pathway and response cycle — risks are identified, monitored, assigned to responsible officials, escalated to management, funded through municipal planning and budgeting systems, and reported to council for oversight and corrective decisions.

groundwater can build a more resilient and flexible water supply portfolio. Municipalities that neglect these responsibilities risk infrastructure failure, unsafe water, rising costs, reduced public trust and greater vulnerability to drought and climate variability. Groundwater should therefore be managed as a long-term strategic asset that supports reliable, equitable and climate-resilient municipal water services.



Unlocking the power of groundwater: A practical guide for municipalities

Groundwater is a lifeline for many South African communities, but managing it sustainably requires the right knowledge and tools. The Water Research Commission's new Groundwater Management Handbook (**WRC report no. TT 973/26**) provides municipalities with practical guidance to unlock and protect this valuable resource. From borehole maintenance and water quality monitoring to pollution prevention, sustainable abstraction and long-term planning, the handbook offers solutions to common groundwater challenges. Packed with practical checklists, management tools and real-world case studies, this essential resource helps municipalities prevent costly infrastructure failures, strengthen drought resilience and improve water security. A must-have guide for municipalities committed to reliable, sustainable water services.