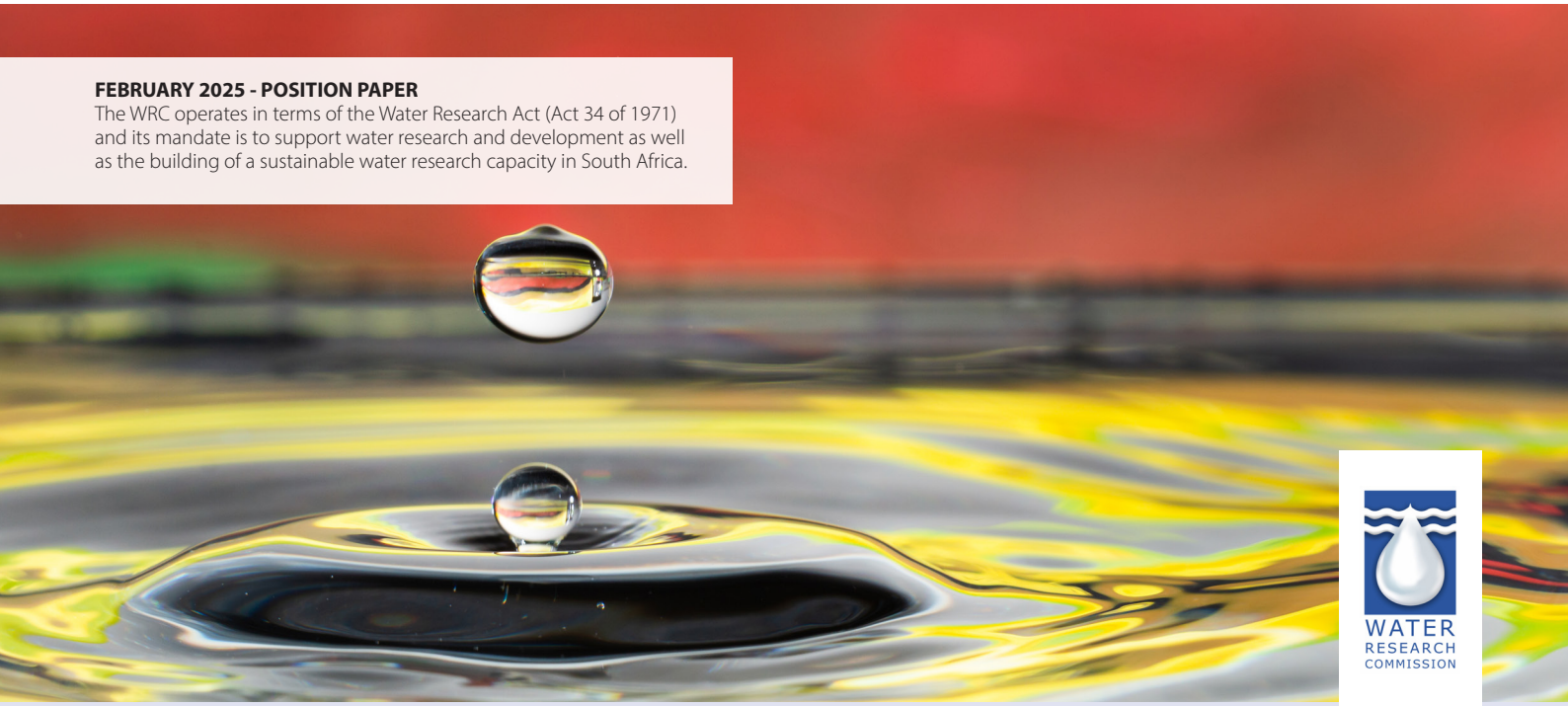
FEBRUARY 2025 - POSITION PAPER
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.



REIMAGINING TECHNOLOGY AND INNOVATION DEVELOPMENT, SCALE UP AND UPTAKE AS A CONTRIBUTOR TO SOLVE 21ST CENTURY WATER CHALLENGES AND ENHANCEMENT OF ECONOMIC DEVELOPMENT AND SOCIAL COHESION

Valerie Naidoo, and Shanna Nienaber

BACKGROUND

There has been significant research and development undertaken within the South African water sector. This has largely been driven by the Water Research Commission (WRC), water sector institutions, academic institutions, the Department of Science, Technology and Innovation (DSTI), international donors, grassroots innovators, and industry. The Water RDI Roadmap and National Water and Sanitation Masterplan is an example of such a collaborative effort between DSTI, the WRC and the Department of Water and Sanitation.

While there is also collaboration between institutions to undertake research, it uses a project-by-project model. As a result, many innovations never reach the market and are not successfully taken up. Most institutions do not take a holistic ecosystem wide approach with established partnerships to support the development of the innovation to a level that full derisking and due diligence is undertaken. It also does not recognise that markets sometimes need to be developed, especially if disruptive innovation is being proposed and that start-ups and entrepreneurs may require further support to build supply chains. The latter can only occur if demand is clear and an sector wide approach is taken to shift to a new way of doing things using different technologies and business (institutional) models. This position paper provides a point of discussion for the water sector leadership to reimagine our role in fostering an enabling environment for public and private ecosystem partners to work together pooling resources, funds, expertise, research, development and innovation (RDI) infrastructure and learning through technology and innovation testing, scale up and uptake.

This position paper takes a deep dive into whether the procurement system is enabling enough and whether the water sector leadership is rising to the challenges of the water sector which requires transformative processes to effect change. The study which interviewed several sector stakeholders showed that there are several policy misinterpretations (Table 1). It outlines that more often than not, public officials may be misinterpreting value for lowest cost and lengthening supply chain management (SCM) processes through poor planning. This leads to readvertising tenders by not managing their SCM processes effectively via well trained SCM and technical staff and enabling SCM and innovation policies and calculated risk appetite strategies. Thus, the study showed that knowledge, effort, policy and training enablement are critical to supply chain management processes being instituted correctly.

Table 1. Interpretation of SCM policies

Item	Comment
Competitive bidding means open tender.	Section 4.7.8 of the SCM Accounting Officers Guide allows for single and sole quotations.
Municipal contracts are limited to a maximum of three years.	Section 33 of the MFMA outlines the process to be used for a contract that will impose a financial obligation beyond three years.
Process is long and onerous	The planning process for the procurement of innovation is important to confirm the value proposition and business case. The risk management process and approvals are also required to ensure that public funds are spent in the best interests of the communities served.
Current conventional processes are cost-effective	Value-for-money assessments are based solely on capital costs and do not account for the full life cycle costs, potential savings that may accrue, as well as other strategic benefits.
Bids must be readvertised if less than three quotations are received.	There is no reason to readvertise if the competitive bidding process was complied with and tenderers were provided sufficient time to prepare a response.

IS THE PROCUREMENT SYSTEM ENABLING FOR INOVATION UPTAKE?

The Municipal Finance Management Act No. 56 of 2003 (MFMA), Public Finance Management Act No. 1 of 1999 (PFMA) and associated procurement legislation and policy does not prevent the scale-up of innovative water solutions and technologies. Whilst scale-up of innovation is not specifically incentivised, if the procurement process is properly planned and carefully prepared with an appropriate pro-innovation SCM policy that supports it, it is possible to deploy innovations into the sector at scale.

INTEGRATING INNOVATION POLICY INTO SCM POLICY AND PROCESSES

South Africa's public sector institutions, primarily municipalities responsible for water and sanitation services, face a pressing challenge in the form of inadequate innovation policies and procedures. The lack of formalised institution-wide processes and policies inhibits the large-scale uptake of innovations. Such policies and processes can build clear planning and market analysis processes for emerging innovations that could solve problems the municipality or water sector institution wishes to assess for scale up. Furthermore, the policy could guide the ecosystem partnerships required, the funding to those partners and the necessity for constant evaluation of innovations so that utilities and water sector institutions are up to date with technological advancements and can build capability where transformative institutional models may be required to deal with extreme challenges such as water scarcity, water shortages, mismanagement of green and blue hydrological flows, pollution, sanitation and public health, and climate impacts on infrastructure and services.

To address this issue, the proposed interventions developed through this research focuses on bolstering the development of internal innovation policies and procedures. This involves defining academic and public sector RDI institutions, working with innovators and entrepreneurs in pre-competitive phases and managing a higher risk appetite in public institutions for these type of collaborations. Furthermore, the innovation policy can define other investment and grant financing or funding that the organisation needs to explore and secure, as well as the multi-lateral partnerships that could pool finances.

For municipalities, the South African Local Government Association (SALGA) could partner with. For example, a national entity like the WRC and other national science councils to create a comprehensive toolbox that aligns and harmonises all municipalities to follow a step-by-step policy guideline, tools and processes. SALGA could ensure innovation policy sessions and that related case studies developed are shared. Such alignment would also have the buy-in and support of DWS so that grant funds can be used more effectively to solve water and sanitation challenges.

Once, the sector is aligned, capacity building initiatives, spearheaded by the Water Institute of Southern Africa (WISA) will empower water sector professionals with the necessary skills to effectively implement these innovation policies. The principles underpinning these policies include the imperative to enhance service delivery, recognise the practicality of large-scale innovation uptake, manage associated risks, and integrate innovation into the normal business operations of institutions. This will result in a higher return on investment for the sector as a whole and less wastage as certain innovations are tested individually municipality by municipality and abandoned prior to all the technical and market readiness stages are completed. This could result in the emergence of early adopter water sector institutions, with the smaller, less skilled and less resourced water sector institutions / municipalities taking the necessary lessons from the early adopters and using the correct tender processes to solve problems.

Finally, SCM is a critical internal partner in supporting new and general operations. Internal workshops that include SCM in the innovation planning, policy and process development would be wise. This will enable technical teams to better understand SCM and SCM to better advise on the interpretation and application of, amongst others, the PFMA and MFMA in supporting innovation. SCM should transition towards an enabler for the implementation of innovations that assists the organisation meet their business objectives rather than focus only on compliance.

Sourcing of expertise and capability to support or manage SCM phases

Practitioners are encouraged to work with national partners in building their internal capabilities and technology information base that will aid in identifying, engaging on, and sourcing innovations. This involves actively seeking out innovative solutions that address specific challenges within the water sector. Key partners and resources made available by innovation partners (e.g. TIA, WRC's WADER and SASTEP technology accelerator programmes, CSIR's Water Centre and Smart Places, and the Innovation Hub amongst others) can play a pivotal role in facilitating access to water and climate trends, new approaches and technology trends, innovative solutions and sharing of experiences in the innovation development and adoption domain.

Value for money vs lowest cost

Value for money is often perceived as lowest cost. This is, however, the incorrect application of the principle as was confirmed by discussions with national treasury officials. Value for money should include total lifecycle costs, revenue savings, opportunity costs, as well as, the externalised costs of pollution, negative impact on public health and strategic benefits that a solution may provide. This will ensure the holistic evaluation of the solution is sought and not the lowest cost that may actually result in a higher cost over the longer term or a higher cost to one of the water sector institutions in the water value chain. Studies show that technologies are not failing but the way we budget for operations and maintenance are failing technological advancements, and service delivery. Ageing infrastructure and the building of new infrastructure is exacerbated due to poor skills development both within institutions and the private sector partners that support projects within WSI's, which could also result in escalation of costs.

Making the business case for innovation procurement

The business case must include the financial implications associated with a solution but could also include regulatory and environmental compliance, as well as strategic municipal and national targets. This would enable decision-makers to make decisions that are aligned to strategic goals while understanding that a slight premium on capital expenditure may be required.

As an example, a connection to a bulk sewer connection could be a lowest total cost option, as compared to a non-sewered sanitation system (NSSS), but the bulk sewer connection could only be completed in four to six years. Secondly, due to the terrain/geography or density the sewered option may not be the best solution. Thirdly, the settlements may be categorised as transient and unplanned and sewered networks may not be suitable at that point in time. Finally, due to climate data and impacts, the area may be prone to floods and droughts and decentralised technologies like NSSS may become more sustainable if centralised services are built into the institutions operational model. Decision-makers may be willing to pay a slight premium to implement a NSSS solution at a school, commercial node or within a municipality as this can be implemented in three to six months and provide access to an acceptable yet sustainable level of sanitation service.

In many innovations that are being developed, the value proposition is often the financial and environmental savings that are realised over the operations of the innovation. Thus, it is important that the business case specifies the operational model that will ensure that the unit is operated as intended over the expected useful life of the asset. This is where the grant system fosters negative consequences as it forces institutions to think about centralised infrastructure only (CAPEX) but not look at innovative centralised services models.

AN ALTERNATIVE MODEL FOR THE PROCURING INNOVATIONS

The definition of competitive bidding includes both multistage (as well as single- and sole-source bidding), though from the research it seems that many in the sector perceive competitive bidding process as the only complete open tendering option. Multistage bidding does comply with the constitutional requirements of transparency and open and competitive bidding.

The strategic sourcing process

The strategic sourcing process (SSP) is a collaborative and structured approach to analysing government spending to acquire commodities and services effectively. The SSP is not intended for the purchase of good and services on a day-to day basis. It is rather a long-term and all-encompassing means of achieving procurement and strategic business goals. The uptake of innovation within the water sector is a strategic objective and is therefore aligned to the Strategic Procurement Process. (OPCO - NT, 2016).

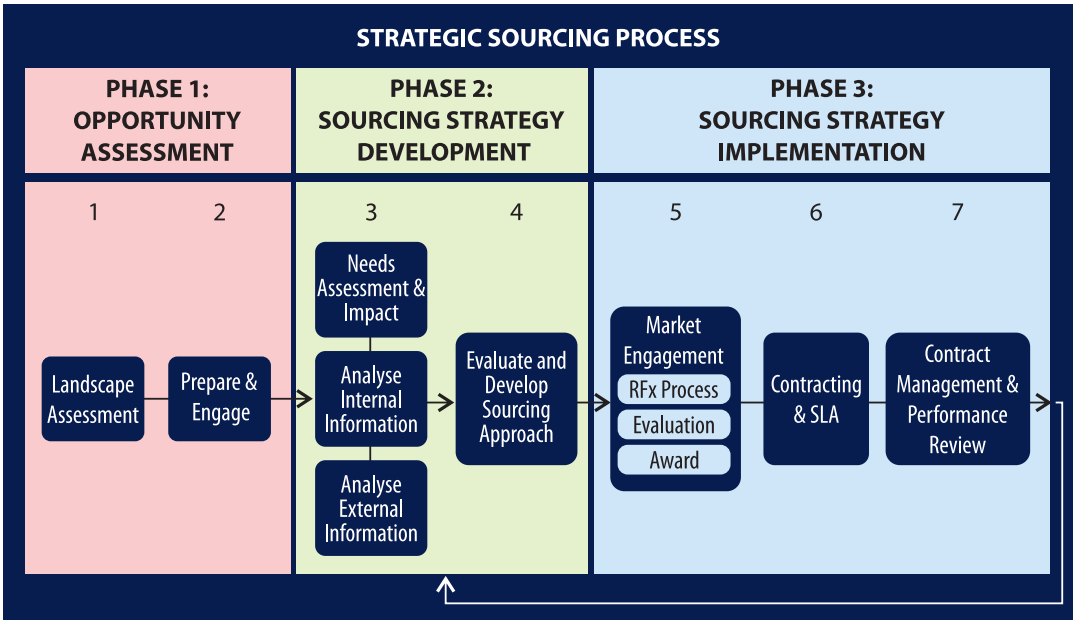


***Figure 1. Strategic Sourcing Process* National Treasury (2016)**

The SSP provides a structured approach to analyse which areas of the water and sanitation business innovation is necessary to improve service delivery and business sustainability and determine the optimal implementation strategy for the innovation using an evidence-based approach. The SSP includes the analysis of supplier markets (emerging innovation market suppliers) and the development of a business case.

Multi-stage bidding

The multi-stage bidding process has emerged as a possible procurement (acquisition) method for emerging water and sanitation innovations. This approach should be confirmed by making use of the SSP process during demand management process. The diagram below provides an indication of a procurement process that could enhance the uptake of innovation.

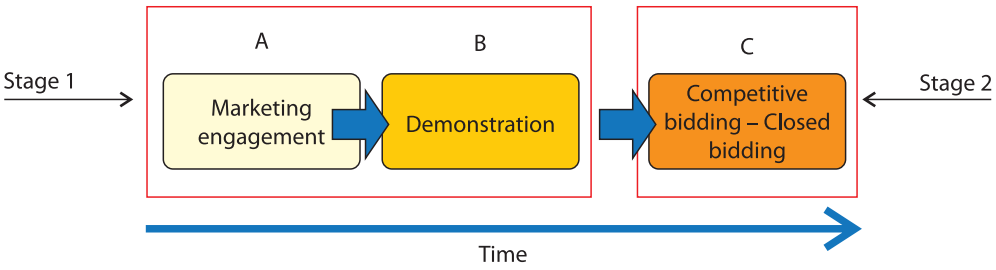


Figure 2. Multi-Stage bidding process

The diagram above indicates the potential to invite innovators using an EoI process (phase A and B) to demonstrate a particular group of innovations. However, the EoI would also specify the performance criteria that will be used to evaluate the emerging innovations during the demonstration phase, as well as the quantities required to be supplied post the demonstration phase. Thereafter, innovators that meet the performance and sustainability criteria will be invited to respond to an RFP process to provide solutions at a larger scale (phase C). The RFP process will also be for innovators to provide a price for solutions once the demonstration phase has been completed.

Note!
Key lesson learnt from the scale-up of communal Reinvent the Toilet technologies with the Department of Basic Education is that pricing must be divided into standard civils processes which should have benchmarked costs to compare against vs the actual cost of the prototype or technology cost. Specification must also be set by the institution/ municipality for standard items such as energy costs, security, preventative maintenance and fencing. The Cost of the operating model must also be called for to ascertain if cost savings can be achieved through innovative services models and discounts based on demand. Bids should be evaluated against performance, sustainability and value. The organisation may then use academic expertise or build internal economic modelling expertise to conduct economic modelling studies to evaluate.

the quantities to be provided during the broader scale-up ensure that the principles of transparency and fairness would be met. This process also allows for progression from demonstration to bidding for implementation at scale without the need to advertise to parties that had not participated during the demonstration phase.

It is envisaged that the process outlined above could be implemented with various partners during the demonstration and implementation phases. However, it is important to ensure the demonstration and implementation components of the process are included in the different organisations planning and budgeting processes. It may also be possible to make use of an Implementing Agent or Programme Manager during the implementation phase if organisational support or additional capacity is required.

Two-step bidding process

A two-step bidding process is often followed internationally when appointing a professional services provider. This usually consists of an Expression of Interest (EOI), from which a shortlist of service providers are selected for the next stage. In the following stage, a Request for Proposals (RFP) are requested from the selected shortlist of service providers, with the selected shortlist typically being between three and six providers. **This would typically be used if the institution is confident and has a good understanding and capability of the technology or project being implemented.**

This has the benefit to both the tendering entity and the prospective tenderers in that it reduces the resources required to compile and adjudicate tenders:

- Compiling an EOI is not resource intensive since it usually consists of company and proposed team profile, track record and project experience, while evaluating these are also easier since an EOI does not include a method and budget.
- Compiling an RFP is a resource intensive task, but is worth the effort for a shortlisted provider, while evaluating a full proposal is resource intensive, but this is much reduced since it is only for a limited number.
- It is administratively easier for the institution that has issued the advert to evaluate the responses to the EOI rather than having to evaluate a RFQ submission from each potential tenderer.

Piloting projects and the development of technical specifications

Piloting or demonstration of technologies and innovations (institutional or service models) or application of tools for better decision-making helps build internal processes and key capabilities in water sector institutions. In addition, to improving internal know-how and operations, the pilot (demonstration) acting as a testbed allows the institution to better understand their needs to develop clearer technical specifications in the demand planning phase. Practitioners should acquire the ability to define precise requirements and technical parameters for innovations to ensure compatibility with existing infrastructure and alignment with strategic objectives. Lessons provided by municipalities such as eThekwini and Johannesburg Water include:

- New and emerging technologies solving major service delivery or changes to current institutional ways of working need to be demonstrated in real operating environments
- Such demonstrations require a set of defined partnerships with science councils, academia and innovation companies who collaborate in a pre-competitive environment
- There is no one-size-fits-all solution to solve the challenges facing municipalities and water sector institutions
- There is a need to consider operations and maintenance (O&M) strategies and budgets before rollout of new infrastructure
- Without community engagement, support for and understanding of O&M, the implementation phase will fail
- Development of policy, specifications and regulations based on the findings of the pilot is important to ensure scale-up is sustainable and successful and fully embedded in operations
- Monitoring and evaluation, which could include the adoption of remote sensing and use of digital twin technologies in partnership with commercial or academic partners, can enhance digital transformation in the sector. It is important that institutions budget for additional support activities through partnership agreements.
- Calculated risk to continually improve service delivery requires enabling policy and risk appetite definitions within risk management procedures

PARTNERING ACROSS MANDATES AND SECTORS

The study looked at procurement of innovations by water sector institutions. However, several of the water sector problems require a whole of government and cross sectoral approach. Water belongs to the commons in both hydrological and atmospheric flows, and these interlinkages, synergies and trade-offs are well established in several sustainable development goals (SDGs) research reports and the Global Commission on the Economics of Water report (2024). Hence, for water to be managed sustainably it requires public-private partnership as well cross-sectoral and multi-lateral governmental partnerships. According to the Global Commission (2024), key considerations that water sector institutions must build into their strategies include:

1. Govern the hydrological cycle as a global common good due to the interdependence of the blue and green water flows, the interconnections between water crises, climate shifts, and the loss of the planet's natural capital. Water flows through all 17 SDGs with varying levels of centrality, synergies, and trade-offs.
2. Recognition of supply and access gaps globally and that a minimal water requirement for a dignified life

must be set at e.g. 4000 L/p/d as a reference.

3. Valuing water to reflect its scarcity and ensure its equitable and efficient use and preserve its role in sustaining other natural ecosystems.
   - Price and incentivise conservation
   - Account for impacts of industrial, national and global development
   - Embed the value of green water on land use to protect evapotranspiration hotspots and measure ecosystem good and services
   - Shape market development and investments to drive a wave of mission orientated innovation, capacity building and innovations across the entire value chain of water. Such investments must not be evaluated on short-term cost benefit analysis, but on how effectively they catalyse dynamic long-term social, economic and environmental benefits. Hence, investments require shared risk models with a higher risk reward framing. Utilities or water sector institutions should enhance collaborative decision making and ensure contract design steers the private sector towards value creation with risk reward sharing for long term efficiency and system resilience.
4. Build partnerships between local, and global stakeholders that address the interconnected challenges viz:
   - Drive a new revolution in food systems
   - Drive and restore natural habits to protect green water
   - Establish a circular economy
   - Enable clean energy
   - Enable an artificial intelligence (AI) rich era with lower water intensity
   - Ensure no child dies from unsafe water by provision of reliable and safe water and sanitation for the underserved communities
   - Raise the quality, quantity and reliability of finance for water in every sector
   - Enhance data as a foundation for action by government, private sector and communities.

CONCLUSION

Based on the triangulated method of analysis of the procurement processes and how officials use and implement it, the following recommendations are made to enhance deployment of innovations into the sector:
The multi-stage bidding process has emerged as a possible procurement (acquisition) method for emerging water and sanitation innovations. This approach should be confirmed by making use of the Strategic Sourcing Process during demand management process. The diagram below provides an indication of a procurement process that could enhance the uptake of innovation. Thus, the EOI must state that post-demonstration, a bidder or a selection of bidders will be selected to move to the next stage to support the scale-up based on due diligence reports on technology tested. Where transformation is required, then more complex longer term partnership programmes and agreements need to be established to jointly work towards shared vision and outcomes the sector wishes to reach. These can be built into policy and strategic sourcing processes. When the time is right to scale the innovation, then the multi-stage bidding process could be used.

NOTE:
This proposed alternative model for procuring innovations has been extensively investigated in this project through engagement with the literature, interviews and surveys with water sector practitioners, guidance from the reference group, which included partners from SALGA and DSI, National Treasury, the municipal and utility environment, etc. Please refer to the full report for a more detailed unpacking of this position paper. A complete overview of the Strategic Sourcing Process (SSP) is available from treasury website which provides Best Practice Guide, Tools, Templates, and Outputs.

REFERENCES

- **Global Commission on the Economics of Water**, (2024) Valuing the hydrological cycle as a common good
- **Paladh R, Holder J, Southgate D, and Vermeulen A,** (2024) Supporting The Enabling Environment For Public Sector Uptake Of Water And Sanitation Innovations – Final Evaluation And Recommendations**,** WRC Report No. TT 941/24, ISBN 978-0-6392-0655-4
- **Paladh R, Baloyi C and Foster K**, (2018) Mapping out Financing Opportunities and Models for Water-Linked Research, Development and Innovation, WRC Report No. TT 776/18 ISBN 978-1-4312-0008-8 August 2018.
- **Water Research Commission,** (2024) A Water Practitioners Guide: Implementing innovative solutions and supply chain management, WRC Special Publication Report no. SP174/24