WATER RESEARCH COMMISSION

RESEARCH, DEVELOPMENT, AND INNOVATION

CALL FOR PROPOSALS 2023

1. BACKGROUND

It is the role and function of the Water Research Commission (WRC) to coordinate and promote water research, development, and innovation (RDI) in South Africa. The WRC effectively undertakes its mandate by prioritising water research as informed by the needs of the water sector and related stakeholders.

The RDI agenda and projects of the WRC must make meaningful contribution in addressing water security and socio-economic challenges in South Africa while enabling the country to have an innovation-driven water sector. The WRC's outcomes shall be realised through innovative and smart initiatives that enhance adaptability of biophysical systems associated with water challenges and opportunities. It is envisaged that a heightened adaptation of these systems will improve the resilience of the South African water sector, communities, and industries.

The WRC has organised its RDI activities around 5 (five) thematic areas, namely, water availability, water use, water quality & health, knowledge dissemination, and advisory support. The 5 (five) thematic areas are interlinked and interdependent to yield useful and required knowledge.

The WRC as a custodian and funder of water RDI also must ensure the dissemination and transfer of water knowledge and innovation to various users to improve water security in the country. The knowledge and innovation produced by the WRC should be prepared (evaluated, tested, and demonstrated) so that the water sector or users can be smartly advised to fully benefit from the water RDI knowledge and products.

The WRC hereby invites all South Africans from various backgrounds and disciplines to submit proposals.

2. PROPOSALS ARE INVITED IN THE FOLLOWING THEMATIC AREAS:

1. Water Availability
2. Water Use
3. Water Quality and Health
4. Advisory Support

3. AIM OF THE CALL

The overarching aim of the call is to respond to national challenges through research that contributes to water security while paying attention to adaptation and resilience. The different thematic areas indicate priority areas that are the focus of this Call for Proposals and are presented in Annexure A – which attached to and is part of this Call.

4. THE CROSS-CUTTING AREAS OF IMPORTANCE FOR THE WRC ARE:

- Applied research.
- Blue sky research.
- Innovation and/or technology.
- Systems and data.

5. THE WRC IS ENCOURAGING PROPOSALS THAT SUPPORT LEADERSHIP, EMPOWERMENT, AND/OR PARTICIPATION BY:

Seasoned researchers linked to institutions of higher learning (e.g., Universities)	[allocated 10% of the total budget]
Emerging researchers: longer term funding for PhD student on existing projects + post/Doc + WRC funded projects: 5-year window	[allocated 20% of total budget].
Postgrad students seeking funding in the thematic areas of research	[allocated 20% of total budget].
Women, youth, Cooperatives, environmental groups, and people living with disabilities	[allocated 30 % of total budget]
Indigenous people knowledge systems/ non-tech researchers	[allocated 5% of the total].
Innovation and tech companies - SMMEs and commercial partners	[allocated 10% of the total]
Consulting companies	[allocated 5% of the total].

Interested parties are requested to note the following:

a) The WRC will first require a submission of a **Concept Note** that briefly presents the research project you are seeking funding for.

b) ***Click here to access, complete and submit the online concept note form:***

c) The WRC will review all the Concept Notes submitted prior to the due date and select the most relevant ones that address the requirements of this Call for Proposals.

d) Only the proposers or researchers of the selected Concept Notes will be invited to submit full proposals to the WRC. The invitation letter will provide all required details regarding the due date and the channel to use to submit the full proposal.

e) If you are unable to access the **online Concept Note Form**, contact the WRC Contract Manager by email vhafunanit@wrc.org.za or mobile number 071 234 5529 for assistance.

6. SUBMISSION OF CONCEPT NOTE(S)

6.1. Only Concept Notes addressing the following themes will be considered for funding:

- Water Availability
- Water Use
- Water quality and Health
- Advisory Support

*Details about the thematic areas are provided as annexure A here below. In addition, the WRC strategic plan for 2023-2028 is available here (**www.wrc.org.za**).*

6.2. Closing (due) date

The **closing due date** and **time** for submission of Concept Notes is ***Friday, 29 September 2023, at 15h30***. By this date and time, a completed Concept Note should have been received by (or have reached) the WRC.

6.3. Submission (Invitation) of the Full Proposals

- Full proposal submission will be invited from approved or accepted Concept Notes. This will happen after the review of the Concept Notes.
- Details about submission of the Full proposal will be stated in the invitation letter.

7. KEY DATES

Action	Date
Call Announcement	8 September 2023
Concept Notes Due Date	29 September 2023
Concept Notes Review	01 October – 13 October 2023
Announcement & Invitation of Successful Concept Notes	18 October 2023
Due date for full proposal submission	30 November 2023
Proposal Review	01 December 2023 – 29 February 2024
Offer Letters	15 March 2024
Contract Start	01 April 2024

NB: Full proposals will be submitted for external reviews.

8. FOR ANY SUPPORT REQUIRED, PLEASE CONTACT

Mr Vhafunani Tshishonga
Email: Vhafunanit@wrc.org.za
Cell: 071 234 5529
Tel: 012 761 9300

ANNEXURE B: THEMATIC AREAS

Theme 1: Water Availability

Improving water availability through resource expansion and discovery is vital for tackling water stress and ensuring sustainable water management in South Africa. The country faces challenges such as the uneven distribution of water resources, climate change impact, and inadequate infrastructure. Factors such as population growth, urbanisation, and inefficient water management worsens water availability to meet domestic, environmental, industrial, and agricultural demands. Climate change exacerbates this issue, with changing rainfall patterns, rising evaporation, and increasing temperatures threatening water sources. Climate models predict more frequent and intense droughts in some areas, impacting both water supply and food security. South Africa's water infrastructure, including dams, reservoirs, canals, and pipelines, is essential. However, operation and maintenance, ageing, and lack of infrastructure investment pose additional challenges. Initiatives like water restrictions, public awareness, and water-saving technologies are key to reducing demand while exploring and developing alternative water sources can help South Africa adapt to a water supply mix and build resilience to environmental shocks.

OBJECTIVES

- To ensure sustainable water availability across all scales and contexts; and
- To produce innovations that resolve water challenges & improve water management practices.

OUTCOMES

Four interlinked strategic outcomes will form the basis for the thematic area that supports the strategic outcomes of the WRC.

1. **Build Climate Resilience**

- Develop advanced monitoring and modelling tools to assess water availability, predict water scarcity, flooding and facilitate informed decision-making.
- Enhance water conservation practices through the development of smart technologies and devices, and sustainable water management strategies.

2. **Develop New Supply Sources**

- Develop comprehensive studies and tools to assess the quantity, quality, and distribution of water resources at different scales.
- Explore technologies and infrastructure to expand access to freshwater resources in water-stressed regions.

3. Enhance Sustainable Water Management

- Develop innovative localised and context-driven water management strategies, including demand management, water reuse, and integrated water resources management approaches.
- Conduct socioeconomic studies to understand the implications of water scarcity on communities, livelihoods, and economic development, and develop strategies for equitable water allocation.
- Enhance knowledge about the importance of water availability, conservation, and responsible water use.
- Develop platforms for water and related data to improve decision-making and planning.

4. Promote Ecosystem Protection

- Enhance the protection and use of blue and green infrastructure.
- Ensure the mainstreaming of Strategic Water Source Areas in by-laws and policies.
- Promote the adoption of nature-based solutions for water availability, such as rainwater harvesting, green infrastructure, and catchment restoration.

REQUIRED PROJECT PROPOSALS

To meet the identified Strategic Objectives and Outcomes, the call for proposals will have the following characteristics:

- Directed calls specified through a dedicated topic with a brief description of the outputs.
- Open calls where proposers use the thematic strategy to propose new ideas and innovations.

a. Directed Project Proposal

Project	Outputs	End-user	Duration (approx..)
Developing a water security index for South African settlements	Water Security Index. Priority area reports. Map/Atlas on Water Research Observatory.	DWS, Municipalities	5 years
Disaster preparedness for local municipalities	Tools for droughts, floods, and heatwaves	DWS, other regulators, water sector public entities	5 years
Refinement of Groundwater Recharge Estimation Methods and Approaches	Updated localised groundwater recharge estimation methods and guidelines for South Africa.	DWS, Researchers, consultants	3 years
Integration of Urban Groundwater Flows into Urban Planning and Infrastructure Development	Guidelines and tools for integrating urban groundwater flows into urban planning processes	Urban planners, infrastructure developers, municipalities	2 years

Project	Outputs	End-user	Duration (approx..)
Green infrastructure streamlining into municipal asset management.	Green Infrastructure included in city asset management decisions.	Municipalities	2 years
Citizen science toolbox enhanced and integrated.	Integrated agricultural, domestic and biophysical tools produced, validated and standardised. Society in place	Citizen scientists, Department of Fisheries, Forestry and Environment (DFFE), Department of Water & Sanitation (DWS), South African Weather Services (SAWS) Practitioners	
River restoration tools piloted and shared in Africa.	Restoration tools (guidelines)	DWS, LM, SER, Practitioners	

b. Blue-sky project proposals

Project/Idea	Outputs	Duration
Investigating the Synergistic Potential of Deep Geothermal Energy for Groundwater Management in South Africa	Technical feasibility and effectiveness of coupling deep geothermal systems with groundwater resources. Policy and regulatory frameworks recommendation to support the integration of deep geothermal energy as a tool for groundwater management in South Africa.	3 years
Prediction Research	Modelled future – new tools and approaches	1 year

c. Repackage existing knowledge.

Issue	Outputs	Duration (yrs)
Monitoring tools	Desk reference	<1
Adaptation and resilience tool for local authorities	Desk reference	<1
Groundwater Guidance Documents, Governance of urban groundwater flows and the Groundwater Training manual	Comprehensive Groundwater Management Handbook	<1
Quantifying the extent and rate of changes in wetland types of the Maputaland Coastal Plain with remote sensing	Remote sensing to enhance national wetlands monitoring programme	<3
Advancing the management of wetland resources in South Africa: Integrating hydropedology into wetlands management and development authorisation at catchment and site scales.	Wetlands catchment level management inclusive of hydropedoloy and linked to delineation	<2

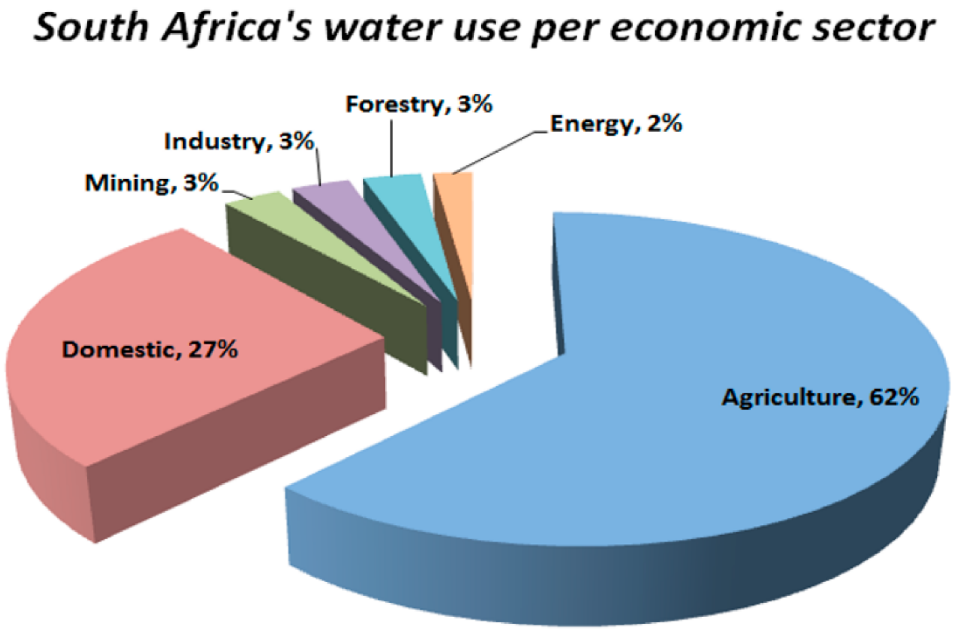
Theme 2: Water Use

Objective

To ensure sustainable water use across the water sectors

Scope of the Thematic Area

- Water Use is defined as the total amount of water withdrawn from its source for (socio-economic) use.
- Measures of water usage help evaluate the level of demand by users.
- The Water Use theme focuses on municipal water use (water supply, wastewater, and sanitation services), agriculture water use, industrial water use and mining-influenced water use.



A ONE WATER USE CONCEPT

Water sensitive settlements: Focusing on water supply, use and security in settlements.

This may involve the use of:

- Water sensitive planning offers greater opportunity diversifying towards a water mix for (re)designing settlements to adapt and be more resilience to the effects of climate change.

- Smart Water services and institutional management ensures that relationships and partnerships between service providers, both external and internal, are important prerequisites to sustainable water service delivery covering innovative solutions to critical problems with the financing, behaviour, cost recovery, regulation, and management of essential services such as water supply and sanitation.
- Smart water supply networks and efficiency offer the prospects for systems to be resilient to the effects and consequences climate impacts, population growth and resource constraints.

TOPICS FOCUSING ON WATER SENSITIVE PLANNING

- A study to determine the impediments to the use of water sensitive urban design (WSUD) at a municipal level, identifying implementation drivers, community perceptions and systemic issues.
- Developing a planning approach for water and climate resilience through the use of water sensitive urban design.
- A compendium of best management practices in WSUD of relevance to South Africa.
- Developing an integrated investment decision support framework for WSUD projects.

REQUIRED PROJECT PROPOSALS

1. Projects focusing on smart water services and institutional management

- A strategy to strengthen the position and roles of Water Boards in the water services delivery value chain.
- Developing a strategy and guidelines for the establishment of community-based water services providers or enterprises.
- A scoping study to determine the institutional modality of water services in managing a water mix scenario.
- Scoping study to determine the optimal model and requirements of a water services provider under a licensing regime.
- Forecasting the costs and requirements of an independent WSP regulator.
- An evaluation of the support (quality, quantity, appropriateness, and efficacy) provided to water service authorities and water service providers by National and Provincial Government.
- Mechanisms to improve municipal water services revenue collection rates. Municipal revenue collection is generally dismal and there is a need for proven solutions that have resulted in improvement. This must cover practical mechanisms for all municipal categories.
- Municipal support and intervention success case studies. Case studies of instances where municipal performance improved and where improvement was sustained. We need to see what was done there and how, such that we can learn from those and build on them.
- Practical mechanisms for municipal water services professionalisation that starts to map out a practical strategy and plan for the sector.

2. Projects focusing on Smart water supply networks and efficiency related to technology velopments.

- While sometimes pipes cannot be repaired repeatedly and may need replacement, improved repair techniques will be an enabler for future. The development of innovative repair techniques e.g., in-pipe or keyhole type repairs, is required. If the techniques do not develop in time, this may result in a tipping point where find-and-fix becomes too expensive.
- Further research should be done on remote sensing using drones and/ or satellite imagery which have potential uses of vegetation indexing, ground movement or chlorine detection to identify leakage. Relatively new techniques and cost-benefits need to be fully assessed under a variety of different seasonal conditions and spatial variation could impact on benefits.
- Permanently deployed loggers and sensors often have constraints related to battery life. The idea of self-powered loggers that run off the flow of the water is a novel area, requiring intensive further research to bring the idea to reality. Alternate energy sources to power such devices should also be further explored.
- Scoping study on the trends and development of pipe linings and associated materials.
- Scoping study to establish trends and development in smart water pipes.

3. Projects related to policy and frameworks

- ✓ Overarching risk management framework to strengthen the capacities of water utilities to protect their systems systematically, determine gaps in security technologies and improve their risk management approaches and technologies. Defending critical infrastructure is a cat-and-mouse game, forcing water utilities to stay on guard, innovate constantly, and implement new technologies.
- ✓ Policy frameworks require integration between the Department of Water and Sanitation (DWS) and Science and Innovation (DSI). This could be facilitated by the WRC to provide an enabling environment for utilities to invest.
- ✓ The government has been working to establish the South African National Cloud Strategy, which provides guidelines and recommendations for the adoption and utilisation of cloud services in both the public and private sectors. This could allow utilities to have better guidance over the adoption of cloud-based technologies. This policy should be finalised and strengthened with utility inputs.
- ✓ Countries with strict regulatory targets that impose financial penalties for high leakage rates, such as the UK and Denmark, have provided particularly appealing markets to leak detection vendors, and hence innovation uptake in these parts of the world is greater. Stricter regulation is required whereby NRW targets are set, and penalties issued if they are not met.

4. Industrial Water Use & Wastewater Management

- This focuses on water use by various industrial sectors, wastewater reuse and resource recovery from industrial, mining-influenced, and domestic wastewaters, their monitoring and regulation.

    - ✓ The main focus of the current call is on a research programme on water and green hydrogen economy.
    - ✓ The programme focus under this call includes research support towards sustainable water use management and availability requirements for transitioning to a green hydrogen economy in South Africa.

Outcomes:

The project outcomes should be useful in contributing to the national policy on transition to a green economy in South Africa, its potential impact on both water use, availability, and quality in support of sustainable water resilience and security.

5. **Sanitation transformation initiative**

Sanitation and climate adaptation and resilience are interconnected because climate change can affect water availability, damage sanitation infrastructure, and impact public health. Addressing these challenges requires a holistic approach that considers both climate adaptation and sanitation needs to ensure the well-being and safety of communities in a changing climate.

Aims:

- Ensure effective and sustainable sanitation services across the sanitation value chain.
- Enhance public health and safety by improving practices.
- Minimise the environmental impact of sanitation services.
- Promote resource efficiency and resource recovery.
- Improve the efficiency and cost-effectiveness of sanitation services.
- Promote innovation and research in sanitation technologies and practices.

Desired Outcomes:

- Develop adaptive sanitation solutions that can withstand the impacts of climate change.
- Support the reduction of environmental pollution and health risks associated with inappropriate and/or improper sanitation services through RDI.
- Stimulate increased resource recovery across sanitation value chain, such as water reduction/reuse, energy generation and nutrient recycling through RDI.
- Improved efficiency and effectiveness of sanitation services, including reduced operational costs.
- Enhanced knowledge and skills among professionals involved in water and sanitation services.
- RDI products to heighten public awareness and participation in responsible sanitation practices.

- Adoption of advanced technologies and best practices for sustainable sanitation services.
- Strengthened collaboration and coordination among stakeholders for common sanitation challenges.
- Development of sustainable planning and financing models to support sanitation management infrastructure and operations.
- Continuous RDI leading to improved techniques and solutions.

(For directed topics, see Annexure B to this Call).

6. Water use in agriculture

This involves:

- Improving water use efficiency and understanding of the water footprint in agriculture.
- Improving irrigation systems and agriculture practices while protecting water resources.
- Supporting communities and farmers by improving agricultural products and mainstreaming indigenous underutilised crops.
- Supporting the adoption and use of transformative and sustainable agriculture approaches such as Water – Energy – Food (WEF) nexus and the Circular Economy.
- Extending the service life of the irrigation water infrastructure in South Africa.
- Enhancing the harmonisation of WEF sector policies and advancing cross-sectoral management of related resources through scenarios and pathways development.
- Strengthening existing weather early warning systems to enhance preparedness and intervention for risk reduction.
- Promoting water use efficiency pathways to ensure water security.
- Accelerating pathways for achieving SDGs and NDP goals to enhance resilience and adaptation.
- Optimising water productivity of pecan orchards through canopy management and remote sensing tools in the Northern Cape Province's Western production region.

Theme 3. Water Quality & Health

OBJECTIVES

The main objective of this thematic area is to drive integrated research and innovation activities to generate new knowledge, insights and data to inform the establishment of appropriate health-based targets and thresholds for different water uses, development and deployment of appropriate and innovative water treatment and ecological infrastructure rehabilitation methods, inform adaptive strategies, and support the development of effective interventions to protect public/environmental health, build resilient communities and contribute to the attainment of water security.

FOCUS AREAS

- Water quality governance and support
- Global change impacts on water quality and health
- Water quality surveillance and risk communication

- Developing and testing innovative nature-based solutions

OUTPUTS

Expand the understanding on the influence of global change factors on water quality and one health, studying the effects of water quality changes / pollution on human health, biodiversity, habitat degradation, and ecological balance and development of innovations and tools to build communities' resilience and enhance water security at all levels of planning.

REQUIRED PROJECTS

1. Directed call topics with terms of reference (TOR)

a. A strategic market assessment on the production and use of chemicals for water, wastewater, and sludge management in South Africa
b. An audit of chemical use and safety in water, wastewater, and sludge management in South Africa.
c. National research (and capacity building) initiative on contaminants of emerging concern (CECs).

2. Projects focusing on water quality

a. Water quality governance and sector support

* Develop and test a framework for implementing a water pollution register, based on the categorisation of polluting industries / water uses based on risk. The framework should include a plan for data collection, storage, analysis, and visualisation to facilitate efficient pollution monitoring and management.
* Develop and test a framework for voluntary water quality regulation.
* Investigate the disproportionate impacts of water pollution on vulnerable populations, including low-income communities and marginalised groups, and develop equitable solutions.
* Study the effectiveness of community engagement, education campaigns, and citizen science initiatives in raising awareness about water quality issues and promoting public participation in water protection.
* Examine the potential risks and benefits of water reuse for irrigation and other purposes, considering both water quality and human health concerns.

b. Global change impacts on water quality and health

* Investigate the multi-faceted costs of pollution, including municipal water treatment; health impacts and healthcare costs; environmental impacts of pollution, such as habitat

destruction, biodiversity loss, and degradation of ecosystems; economic losses and productivity reduction; economic losses due to decreased agricultural productivity, reduced tourism, and damage to infrastructure caused by pollution; cost of clean-up and restoration, etc.

* Conduct case studies in different localities to capture variations in pollution costs based on unique socio-economic, environmental, and geographic factors.
* Research on the Health Vulnerability Index (HVI) in the context of water quality and health focusing on assessing the susceptibility of communities to health risks associated with poor water quality.
* Investigate the contribution and impact of different change factors and water uses on water quality and human health and design an interactive platform that presents water quality data in a user-friendly and informative manner.
* Investigate the effects of urbanisation, stormwater runoff, and wastewater discharge on water quality, and develop urban planning approaches to minimise pollution.
*State of inland and coastal aquatic biodiversity services in SA, with focus on fish threats, management, and socio-economic implications

C. Water quality surveillance and risk communication

*Assess the quality of drinking water sources, including groundwater and surface water, to identify potential contaminants and design an interactive platform that presents water quality data in a user-friendly and informative manner.
* Investigate the occurrence and distribution of priority waterborne pathogens (bacteria, viruses, protozoa) in various water sources, and evaluate their potential health risks.
* Develop methods to trace the sources of microbial contamination in water bodies to better understand pollution origins and prevent outbreaks of waterborne diseases.
* Investigate the presence, sources, and fate of emerging contaminants such as pharmaceuticals, personal care products, and microplastics in water bodies, and assess their potential health impacts on humans and aquatic life.
* Conduct data mining and visualisation from WRC scientific research data records on water quality and develop a framework for water quality data reporting.

d. Development and testing of innovative engineered and nature-based solutions.

* Development and testing of innovative and cost-effective water treatment technologies for removing pollutants, including disinfection byproducts, from drinking water sources.
* Development and testing of management tools for minimising water pollution, including treatment technologies, best practices, recycling and reuse of water, and recovery of products.
* Development of a nature-based solution framework to guide contesting conservation and agricultural land uses of Lake St Lucia Ramsar/UNESCO site.

Theme 4: Water Advisory & Support

OBJECTIVES

- ✓ Supporting extension services and strengthening capacity building instruments through support for centres of excellence, communities of practice, chairs and advisory panels in areas of strategic importance at a local, provincial or local level
- ✓ Accelerating development support for technologies ready for demonstration
- ✓ Supporting innovation transfer and advisory
- ✓ Supporting grassroots innovators, startups and entrepreneurs while building resilience

FOCUS AREAS

a. **Capacity Building:** This focus area is seeking proposals that smartly organise research groups to contribute to capacity building which enables the quadruple helix towards an aligned strategic outcome. This focus area will provide support to historically disadvantaged institutions, and community-based organisations driving sustainable practices, resilience and adaptation.

b. **Innovation**: This focus area will seek highly innovative ideas (patentable ideas) where knowledge is translated into innovation to build climate resilience and adaptation for the water sector. It will focus on providing opportunities for entrepreneurs, grassroots innovators and inventors wishing to disrupt practices and conventional technologies. Water and sanitation innovation in the following areas will be considered: alternate sources, low carbon technologies, digital technologies, resource efficient technologies, water efficient technology, new material science, smart monitoring and metering, circular economy, nature-based solutions, treatment technologies, non-revenue water, operations and maintenance and off-grid plug and play systems for water supply and sanitation.

c. **Expert and Extension Services:** This focus area aims to offer experts and communities the opportunity to conceptualise a project with a specific outcome/s that transforms a stakeholder or set of stakeholders toward outcomes that build resilience and adaptation for the water sector through advisory or extension services.

REQUIRED PROJECT

1. Open call process for concepts notes in the 3 focus areas (stated above).
2. Directed Call for onboarding into a 5-year support programme for grassroots innovators, female innovators, green industry entrepreneurs and township innovators.

OUTPUTS

- Building stronger academic, industry and public sector alliances
- Increasing the pipeline of relevant innovations and enhancing uptake through strengthening the readiness of technologies
- Increasing inclusivity in innovation through the support of youth, female and grassroots innovators
- Climate-based solutions that build resilience in communities, industry and public sector institutions.

ANNEXURE B

Establishing a National Programme for the Monitoring of Emerging Contaminants of Concern in Water, Soil & Sludge

Background and Rationale

Contaminants of Emerging Concern (CECs) represent synthetic or naturally occurring compounds. These compounds can pose a risk to human health and the environment, and their presence in the water, the environment and through water and wastewater treatment processes raises concerns about the safety across the water and sanitation cycle. Commonly detected CECs include pharmaceuticals and personal care products, pesticides, as well as industrial chemicals. Research has shown that some of these compounds can persist in the environment, bioaccumulate in organisms, and have negative effects on human health and the environment. Several engagements undertaken by the WRC have highlighted the need to create a National Programme for the Monitoring of CECs aimed understanding the analytical capabilities of laboratories, optimisation, harmonisation, and unified approach to methods of analysis with the ultimate intention of transferring the established knowledge and analytical techniques to relevant personnel across different sectors for routine monitoring/surveillance of CECs and for decision-making. The envisaged activities under this research initiative include.

- Coordination and compilation of interlaboratory studies for optimisation, testing and validation of methods for analysing CECs in freshwater, wastewater, treated water, municipal sludges (drinking water, wastewater, and faecal sludges), soil and sediments. The output from this exercise is a compendium of harmonised methods for use.
- Coordinating and facilitating a national capacity building initiative for monitoring CECs in water and sanitation environments.
- Development and dissemination of content on CECs in different media to different audiences.

Objectives (and scope):

The objectives of the project are to:

- Conduct a review of the CECs in water and sanitation cycle and South African laboratory capacity to undertake CECs detection and analysis on water, wastewater, soil and sludges. The research should also provide insights into possible national priority CECs, possible catchment priorities, surrogates/bulk parameters for routine monitoring, as well as financial costs associated with laboratory set-up and analytical methods.
- Develop a compendium of methods for routine sampling, analysis, and risk assessment of CECs.
- Establish gaps for testing in water cycle e.g., in faecal sludge sources and re-engineered sanitation systems and /or resource recovery application and undertake selected CECs testing based on national priority CECs identified above.
- Knowledge dissemination: hosting stakeholder and partnership workshops; collation of the produced outputs on a centralised Knowledge Hub; creation of user-friendly dissemination material (including online material) to regulatory bodies as well as researchers to avoid duplication of studies; and a scientific evaluation of the research

effort and partnership models to inform success indicators and understand key challenges for future programmes.

Specific:
This project aims to co-ordinate the research activities for the water sector on CECs. The research requires representation from a wide variety of stakeholders, including private, municipal and water board laboratories, and national regulatory bodies. Stakeholder workshops should be designed throughout the duration of the project. The project is aimed developing a unified approach to analytical methods for the detection of CECs and establishing the likelihood of adverse impacts of CECs, as means for assessing water and environment safety. The scope of the study must cover the following work packages:

Work package 1: Stakeholder Workshops and Mapping
- Establish and co-ordinate a network of partners and laboratories as part of the project plan.
- Conduct a review of the South African laboratory capacity to undertake CECs detection and analysis on across the water and sanitation cycle. The research should also provide insights into possible national priority CECs, possible catchment priorities, surrogates/bulk parameters for routine monitoring and financial costs associated with laboratory set-up and analytical methods.
- Provide detailed analysis of research gaps across the water and sanitation cycle.

Work package 2: Develop a Compendium of appropriate methods for routine sampling, analysis and risk assessment of CECs.
- Develop a selection of appropriate sampling and sample treatment methods, as well as appropriate analytical tools for assessing CECs across the water and sanitation cycle.
- Provide guidance for routine CECs tests that could be introduced and applied nationally and cost-effectively.
- Provide overall guidance on the interpretation of results in relation to risk assessment.
- Address research gaps where testing has been limited using streamlined priority list CECs. Possible avenues include faecal sludge sources, resource recovery products (liquid fertilizer, BSF larvae, effluent recycling from re-engineered sanitation systems).
- Undertake laboratory comparison of selected methods across water and sanitation cycle to ensure reliable and repeatable analytical results. This output should be accompanied by a scientific journal.

Work package 3: Knowledge Dissemination, Education and Communication
- Development and implementation of a stakeholder engagement plan for the duration of the project.
- Development of factsheets and education material for regulators, water users and practitioners. Training manuals should be included.
- Collation of the produced outputs on a centralised Knowledge Hub.
- A scientific evaluation of the research effort and applied partnership models to inform success indicators and understand key challenges for future programmes.
- Compilation and dissemination of final project reports and products.

Deliverables:
The deliverables below may be sub-divided by the proposers, if desired, into not more three deliverables per financial year. The first-year deliverables may NOT include an advance – An Inception Report detailing the Project Plan and Management will be accepted. The final deliverable of the print-ready final report, valued at 20% of the Budget is required.

Inception report
Annual progress report(s)
Final report

Time Frame: 01 April 2024 – 31 March 2029

Budget Guidance:
Final Report = 20% of the Total Project Budget

Knowledge Dissemination, Education and Communication
Budget of approximately 10% of total project budget should be geared towards WP3. This should include stakeholder workshops, targeted events at national conferences, scientific journal outputs, a paper on the project and outcomes, and contribution to a CEC Knowledge Hub

Further reading:
https://www.sciencedirect.com/science/article/abs/pii/S0045653520329350
https://wrcwebsite.azurewebsites.net/wp-content/uploads/mdocs/TT%20804%20final_web.pdf
2474 final.pdf (wrcwebsite.azurewebsites.net)
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https://ukzn-dspace.ukzn.ac.za/bitstream/handle/10413/19978/Sokhela_Fortunate_Sthabile_2021.pdf?sequence=1&isAllowed=y

Development of Curricula and Training Materials for Non-Sewered Sanitation & Sludge Valorisation

Background and Rationale

The Water Research Commission (WRC) has generated a plethora of world-leading research into non sewered sanitation (NSS). This includes ground-breaking research into pit latrine science, the drying kinetics of faecal sludge and the development and science advancement of various novel household and community-based sanitation systems. Despite the generation of this knowledge, there has little uptake of this research into university curricula with conventional systems, specifically sewered system design, remaining entrenched within the academic learning space. Under the constrained resource availability and urbanisation trends expected, the next generation of sanitation engineers, scientists and decision-makers need exposure to alternative approaches in this field.

It is well-known that developing countries have cities and towns that use more than sanitation technology and that non sewered sanitation approaches are equally as important as sewered approaches in delivering sanitation services. The development of a curricula on non-sewered sanitation would serve several vital functions that a critical to the needs of the country:
Building the next cohort of skills to support non-sewered sanitation (NSS).

- Introduce learners to Faecal Sludge Management (FSM) and its importance as part of Public Health.
- Provide the scientific and engineering fundamentals and required information for the design and selection of non-sewered approaches.
- Introduce learners to new and latest innovative non-sewered sanitation approaches, including circular economy principles.
- Provide a dissemination and learning platform for WRC non-sewered sanitation products.
- Stimulating and developing grassroot engineering and scientific capacity in non-sewered sanitation.
- Would assist current and / future municipal and government employees in understanding integrated sanitation planning that includes sewered and non-sewered approaches.

The development of the curricula through the WRC would allow universities and other learning centres to make use of the material that will be designed and formatted for learners. There is also opportunity to have the developed material used as virtual courses, including Massive Open Online Courses (MOOCs), and utilise Artificial Intelligence (AI) to develop online training material. Issues related to copyright ownership, permission, public domain, public performance and display, and attribution would need to be understood and outlined in the Final Report. Virtual learning tools such as MOOCs have been shown to be instrumental in knowledge dissemination. While there are other MOOCs available for internationally for Faecal Sludge Management (FSM), there is a need to have content that is tailored to the South Africa context and be aligned to the WRC's vision and strategy for sanitation.

Objectives (and scope):

The objectives of the project are to:

- Develop a curriculum on Non-Sewered Sanitation that includes WRC Reports, Circular Economy principles and latest non-sewered engineering approaches.
- Package and convert the curricula into easily understandable knowledge products through innovative approaches. Proposers should consider innovative approaches to knowledge dissemination platform / pathways besides hard copy reports.
- Unpack issues related to copyright ownership, permission, public domain, public performance and display, and attribution.
- Produce training and marketing material linked to outputs of study.
- Conduct a trial of the knowledge product(s) with and provide feedback for improvement.

  This trial should serve as the basis for application to other water-related technical content.

Specific:
This project aims to develop and package non-sewered sanitation knowledge products for the water sector. Non-sewered sanitation systems are not covered within curricula for grassroot engineers and scientists who will eventually be involved in sanitation decision-making. Most cities in South Africa are not fully sewered; the development and adoption of the learning material will allow for knowledge transfer and exposure to alternative sanitation approaches at grassroot level.

Deliverables:
The deliverables below may be sub-divided by the proposers, if desired, into not more three deliverables per financial year. The first-year deliverables may NOT include an advance – An Inception Report detailing the Project Plan and Management will be accepted. The final deliverable of the print-ready final report, valued at 20% of the Budget is required.

Inception report
Annual progress report(s)
Final report

Time Frame: 01 April 2024 – 31 March 2027
Final Report = 20% of the Total Project Budget

Further reading:
https://www.mooc-list.com/tags/fsm
https://www.eawag.ch/en/department/sandec/e-learning/moocs/
https://www.coursera.org/learn/faecalsludge
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