**TERMS OF REFERENCE FOR A DIRECTED WRC PROJECT**

**THEME:** **Water Availability**

**TITLE:** **State-of-the-art of managed aquifer recharge in southern Africa**

**TOR NUMBER:** 1010010

**Rationale**

Water security is a critical concern for southern Africa, characterised by variable and increasingly scarce water resources. The challenges posed by climate change, rapid urbanisation, population growth, and over-reliance on conventional water storage methods necessitate alternative solutions. Managed Aquifer Recharge (MAR), also referred to as artificial recharge, is as a proven, cost-effective, and sustainable approach to enhancing water resource management. MAR involves intentionally transferring water into aquifers for storage and later use, offering a multitude of benefits including reduced evaporation losses, stabilisation of groundwater levels, and provision of a reliable buffer during droughts and seasonal water shortages. Traditional water storage methods, such as dams and reservoirs, are increasingly unsustainable because of high evaporation rates and ecological impacts. MAR offers a viable alternative, leveraging underground aquifers as natural storage systems that are protected from evaporation and contamination. This approach not only enhances water availability but also mitigates the risks of over-abstraction and groundwater depletion.

Globally, MAR has demonstrated significant success in addressing water challenges. For example, in the Netherlands, MAR supports municipal water supply through infiltration ponds that ensure sustainable groundwater recharge. India has invested heavily in MAR to enhance water security for agriculture and rural communities, while cities like Windhoek in Namibia rely on MAR to secure urban water supplies. New research identified novel approaches that include poor quality water for MAR. These international examples illustrate the potential of MAR to transform water management practices. Lessons learned from these schemes can improve South Africa's own MAR strategy. In South Africa, several pilot MAR projects have shown promising results. The Atlantis project near Cape Town has successfully used stormwater and treated wastewater to recharge aquifers, providing a cost-effective water source for decades. Similarly, the Polokwane and Namaqualand projects demonstrate MAR's potential to enhance local water supply resilience. In the recent years, new schemes were developed like Cape Flats and the Western Karoo recharge enhancement schemes. Despite these successes, the application of MAR in the region remains limited, constrained by technical, institutional, and regulatory barriers.

Despite its potential, MAR is underutilised in southern Africa, primarily because of the absence of a cohesive and updated framework. Current practices often lack sufficient understanding of aquifer capacities, recharge potentials, and the long-term impacts on water quality. There is limited capacity within municipalities and water management institutions to design, implement, and monitor MAR projects effectively. Regulatory challenges, including unclear policies, licensing process and inconsistent standards for water quality and aquifer compatibility, further impede progress. An updated MAR framework (Artificial Recharge Strategy, 2010)[1] is essential to address these gaps. It must integrate region-specific research, technology innovation, and capacity-building initiatives to promote the sustainable use of MAR. The framework should align with international best practices while considering the unique hydrological, geological, and socio-economic contexts of Southern Africa.

Updating the MAR framework for Southern Africa is a strategic imperative which is also captured as an action in the National Water and Sanitation Master Plan. It provides an opportunity to integrate innovative research, robust implementation strategies, and enabling regulatory mechanisms to maximise the potential of MAR. By addressing existing barriers and fostering collaboration among stakeholders, the updated framework can position MAR as a cornerstone of sustainable water management in the region. This initiative will not only enhance water security but also contribute to broader socio-economic development and resilience to climate change.

**Main Objective:**

To establish a comprehensive framework for advancing Managed Aquifer Recharge (MAR) in southern Africa by evaluating current practices, developing innovative methodologies, strengthening regulatory and policy mechanisms, building stakeholder capacity, and fostering regional collaboration for sustainable water resource management.

*The Specific Objectives:*

1. Evaluate current MAR practices and potential
   *Assess the performance of existing MAR projects in Southern Africa, such as those in Atlantis, Polokwane, and Namaqualand, and identify opportunities for optimisation and expansion of new schemes.*
2. Develop advanced MAR methodologies
   *Update of innovative techniques tailored to the region's hydrological, geological, and climatic conditions, ensuring their scalability and affordability.*
3. Strengthen regulatory and policy frameworks
   *Propose updates to policies and regulations to streamline MAR implementation.*
4. Enhance capacity and stakeholder engagement

[1]https://www.artificialrecharge.co.za/strategydocument/ARTIFICIAL_RECHARGE_STRATEGY_Ver_2_071210_update_010211_1.pdf

*Develop training programme frameworks for water managers, engineers, and communities to build expertise and support for MAR projects (enhancing existing initiatives).*

5. Promote regional integration and knowledge sharing
   *Establish platforms for regional collaboration to share lessons learned, best practices, and advancements, aligning MAR strategies with broader water management goals under existing frameworks in the Southern African Development Community (SADC).*

**Expected Deliverables**

1. Comprehensive assessment report on MAR practices in southern Africa
2. Innovative methodologies report for MAR
3. Updated regulatory and policy framework recommendations
4. Capacity-building and stakeholder training framework
5. Regional integration and knowledge sharing platform
6. Print-ready final integrated report

**Total Budget:** R 1 200 000.00 (Including VAT)

**Year 1:** R 600 000.00 (Including VAT)

**Duration:** 1.5 years