# TERMS OF REFERENCE

# FOR THE

# CONSULTANCY SERVICES TO CONDUCT THE SHIRE RIVER BASIN COMPREHENSIVE GROUNDWATER STUDY

## 1. Background

SADC GMI was established as a Section 21 Not-for-Profit Company under South African law, and it is a subsidiary structure of the SADC Secretariat. The vision of the SADC-GMI is to ensure the equitable and sustainable use and protection of groundwater and be a Centre of Excellence in groundwater management and management of groundwater-dependent ecosystems in the region. The role of the SADC-GMI is to:

- Promote sustainable groundwater management and provide solutions to groundwater challenges in the SADC region through building capacity, providing training, advancing research, supporting infrastructure development, and enabling dialogue and exchange of groundwater information.
- Conduct and support the SADC Member States in groundwater research and serve as a focal interlocutor with national, regional, and international groundwater initiatives.
- Promote the sustainable conjunctive use of surface and groundwater.

After completing the Sustainable Groundwater Management in the SADC Member States Phase 1 project, the SADC-GMI is now implementing Phase 2 of the same project under the strategic guidance of the SADC Secretariat. The 4-year phase 2 project is financed by the Multi-Donor Trust Fund Cooperation in International Waters in Africa (CIWA), in collaboration with the Global Environment Facility (GEF) through the World Bank.

Phase 2 comprises three components:

- Component 1: Capacity building for sustainable groundwater management
- Component 2: Knowledge development, dissemination, and advocacy
- Component 3: Building resilient livelihoods and inclusive groundwater management.

During phase 1 of the Sustainable Groundwater Management in SADC Member States Project (2014 – 2021), SADC-GMI supported the Member States of Malawi and Mozambique to undertake some work on the Shire Transboundary Aquifer through the development of the Shire River-Aquifer System TDA and SAP in line with the MoU signed between SADC-GMI and ZAMCOM in February 2019.
The objective of the MoU is to foster cooperation between SADC-GMI and ZAMCOM in groundwater management in the Zambezi Basin through:

i. Supporting the updating of protocols and agreements to address challenges in groundwater management in the Zambezi Basin.
ii. Promoting Transboundary Aquifer Management in the Riparian States of the Zambezi Basin in collaboration with relevant Government Authorities.
iii. Jointly finding solutions to shared groundwater challenges through Transboundary Diagnostic Analyses (TDAs) and Strategic Action Plans (SAPs).
iv. The collection and sharing of groundwater data.
v. The promotion of Transboundary Aquifer Management.
vi. Conducting joint research to find solutions affecting groundwater in the Zambezi Basin
vii. The joint implementation of groundwater projects and interventions.

The Shire River Basin is a watershed within the greater Zambezi River Basin. It drains portions of southern Malawi and Central Mozambique. Originating from the southern edge of Lake Malawi/Nyasa, the Shire River flows 490km southwards and joins the main stem of the Zambezi River at Caia in Mozambique. The Shire Basin covers an area of 32,000 $km^2$. About 71% of the basin is in Malawi, home to a population of 5.5 million people. The remaining part, about 29%, is in Mozambique, where the population is significantly smaller.

In January 2019, the Government of Malawi, and the Government of Mozambique, in collaboration with the SADC-GMI and the International Water Management Institute (IWMI), developed the Transboundary Diagnostic Analysis (TDA) for the Shire River-Aquifer System. The aims of the TDA were to:

- Gather, interpret, and synthesize information on the water-related issues in the transboundary Shire River-Aquifer System.
- Identify and prioritize the transboundary issues in the system.
- Assess the depth and gaps of the data on the system.
- Forster convergence towards a common understanding of the current and future state of the Shire River-Aquifer System.

After the development of the TDA, the Shire River-Aquifer System Strategic Action Plan was developed in April 2019 through a joint consultative process in partnership with government institutions that include the Department of Water Resources in the Ministry of Agriculture Irrigation and Water Development (MoAIWD) and the Shire River Basin Management Program (SRBMP) in Malawi and ARA-Zambeze and the National Directorate of Water Resources Management in Mozambique. Three phases were involved in the development of the SAP, i.e. assessment of the system, envisioning the future, and planning for a shared future. The objective of the SAP was to put in place plans to address issues identified and prioritized in the TDA. The following priority actions were identified in the SAP:

1. The establishment of a joint Shire River Basin Committee to coordinate and cooperate with conjunctive water development and management in the Shire River-Aquifer System.
2. The identification of areas for joint studies and research.
3. The development of a Memorandum of Understanding on data sharing between Malawi and Mozambique, considering the existing Zambezi Watercourse Commission (ZAMCOM) protocol on data sharing.
4. The development of a data-sharing portal between Malawi and Mozambique, linked to the Zambezi Water Resources Information System (ZAMWIS). The information system will facilitate joint information sharing between Malawi and Mozambique.
5. The promotion of joint project proposals to mobilize funds for specific projects on sustainable catchment and natural resources management in the Shire River-Aquifer System.
6. The training of personnel in research and collection of surface and groundwater data.

Pursuant to the challenges posed by gaps in groundwater data and information identified in the Shire River-Aquifer System TDA, the strategies to address the gaps spelled out in the SAP and the provisions of the MoU between SADC-GMI and ZAMCOM, SADC-GMI in partnership with the Government of Malawi, the Government of Mozambique and ZAMCOM, intends to conduct a comprehensive research study to:

i. Gather, interpret, and synthesize groundwater data in the Shire River-Aquifer to address the information gaps identified through the TDA and prioritize transboundary issues in the system.
ii. Explore means to facilitate the sharing and exchange of data between Malawi and Mozambique and linking the data to ZAMWIS and the SADC Groundwater Information Portal; and
iii. Promote transboundary conjunctive management of water resources in the Shire River-Aquifer System by establishing a River Basin Committee and fostering convergence towards a common understanding of the current and future state of the system.

## 2. Objectives of the Assignment

To establish the hydrological/hydrogeological (quantity and quality) status of water resources in the Shire Basin through a research study considering climate change scenarios and enhancing data and information on the aquifer-river system. The research will also explore methods for promoting groundwater recharge (natural and managed) to protect the groundwater resources of the system.

## 3. Scope of Work and Specific Tasks for the Assignment

To achieve the objective of the assignment, the following specific tasks will be undertaken, which include but not be limited to:

- **Producing a digital compendium of hydro(geo)logical data for the Shire Basin:** This activity involves **the** collection of hydro(geo)logical data and information about the Shire Basin in time and space. It also includes sourcing data on the Shire River-Aquifer System from various country databases. The activity also includes sourcing data on the Shire River-Aquifer System from various country databases.
- **Producing a groundwater situational analysis report**: The activity includes characterizing and conceptualising the aquifer(s) in the Shire Basin through literature review and remote sensing.
- **Conducting a groundwater hydrocensus**: Collecting data and analyzing groundwater samples for selected physiochemical parameters utilizing recognized procedures and sampling protocols. An agreed number of samples will be collected in the Shire Basin for hydrochemical analysis on spatial density, as agreed upon with SADC-GMI and the government agencies responsible for groundwater management in Malawi and Mozambique. The hydrocensus should collect at least the following data and information:

  i. The location of existing boreholes (coordinates)
  ii. Boreholes use
  iii. Groundwater levels
  iv. Borehole abstraction rates
  v. Information on metered boreholes
  vi. Infield groundwater quality analysis for selected physicochemical parameters such as Temperature, Electrical Conductivity (EC), TDS, pH, DO, and Alkalinity
  vii. Groundwater samples for chemical analysis (macro- and trace-constituents) and submission to an accredited laboratory
  viii. Characterization of current and potential sources of pollution and associated contaminants of concern.
  ix. General conditions/status of boreholes and issues of concern.

- **Hydrocensus report**: This task includes data recordings and analysis. This task will assess the data obtained from the various countries' databases and the

hydrocensus. The groundwater data will be uploaded to the SADC-GMI Groundwater Information Portal. The analysis will also identify possible problem areas associated with groundwater and present mitigation options.

- **Producing a groundwater conceptual model of the Shire Basin**: This task involves producing a conceptual model of the groundwater of the Shire Basin.

- **Produce a groundwater flow map of the Shire Basin**: This task includes the production of a groundwater map of the Shire Basin highlighting potential recharge and discharge zones and areas where there is interaction between surface and groundwater. The map must also indicate potential areas suitable for managed groundwater recharge.

- **An analysis report on climate change scenarios and their impact on groundwater**: A report on the likely impact of different climate change scenarios on water resources in the Shire Basin, particularly groundwater.

- **Produce a report on the formation of the Shire River Basin Committee:** This task includes conducting a mapping exercise and producing a report on the stakeholders in the Shire River-Aquifer system. The task also includes developing the Terms of Reference of the Shire River Basin Committee and facilitating its formation.

## 4. Key Deliverables

1. The kick-off meeting within 1 week after the contract signature.
2. Inception Report within 4 weeks after commencing the assignment.
3. A digital compendium of hydro(geo)logical data for the Shire Basin within 12 weeks after commencing the assignment.
4. A report on stakeholder and institutional analysis in the Shire River-Aquifer System within 16 weeks of commencement of assignment.
5. Groundwater situational analysis report within 24 weeks after commencing the assignment.
6. Terms of reference for the Shire River Basin Committee within 28 weeks after commencing the assignment.
7. Hydrocensus report within 36 weeks after commencing the assignment.
8. Conceptual groundwater model for the Shire Basin within 48 weeks after commencing the assignment.
9. A report on the formation of the Shire River Basin Committee within 56 after commencing the assignment.

10. Groundwater map of the Shire basin, indicating flow paths, discharge zones, recharge zones and areas where there is interaction between surface and groundwater within 64 weeks after project commencement.
11. Analysis report on the impact of climate change scenarios on groundwater in the Shire Basin within 68 weeks of project commencement.
12. Project closure report within 72 weeks of project commencement.

## 5. Eligibility

This consultancy targets a firm or individuals with more than 8 years of proven experience conducting similar groundwater studies/assessments, which may include groundwater monitoring within the RBO contexts, preferably in the SADC region. The successful consultancy firm/team must demonstrate experience in at least three projects undertaking extensive groundwater research activities.

In the case of a partnership of individuals for this assignment, relevant experience from the Key Experts will be aggregated to the team's experience. Previous working experience with donor-funded projects, notably the World Bank, is desirable.

## 6. Team Composition

The minimum qualifications, skills, and experience for key experts whose CVs are to be evaluated as part of the assessment of proposals are defined below. The Services are expected to be performed mainly in the two countries that share the Shire basin, i.e. Malawi and Mozambique.

### Key Expert 1: Team Leader (Estimated 60 days)

At least a Master's degree in a relevant water-related discipline and 15 years of experience working in the groundwater field. At least 10 years should have been in groundwater governance research and development. Demonstrated team leadership on at least 3 similar research projects, 1 of which should have been in the SADC region at the Member State or regional level. The team leader must demonstrate proven proficiency with the regional groundwater studies, conjunctive water resources management concepts, and engagement of multi-country transboundary water course stakeholder institutions and issues. The Team Leader should be fluent in English. Professional proficiency in Portuguese is desirable.

### Key Expert 2: National hydrogeologist Malawi (Estimated 40 days)

At least a Master's degree in hydrogeology and 10 years of working experience in the groundwater field, 5 of which should have been in Malawi. The national hydrogeologist should know key issues pertaining to managing groundwater resources in national and transboundary aquifers in the SADC region, including recharge, pollution, and impacts of climate change and droughts. They should have participated in at least 2 projects where similar skills required for this assignment were applied. Demonstrated skills in applying and interpreting groundwater modelling and water quality models, including using related

software, and demonstrated expertise in developing conceptual and numerical groundwater models. The national hydrogeologist should be fluent in English. Professional proficiency in Portuguese is desirable.

### Key Expert 3: National hydrogeologist Mozambique (Estimated 40 days)

At least a Master's degree in hydrogeology and 10 years of working experience in the groundwater field, 5 of which should have been in Mozambique. The national hydrogeologist should know key issues pertaining to managing groundwater resources in national and transboundary aquifers in the SADC region, including recharge, pollution, and impacts of climate change and droughts. Should have participated in at least 2 projects where similar skills required for this assignment were applied. Demonstrated skills in applying and interpreting groundwater modelling and water quality models, including using related software, and demonstrated expertise in developing conceptual and numerical groundwater models. The national hydrogeologist should be fluent in Portuguese and English.

### Key Expert 3: Hydrologist (Estimated 40 days)

At least a bachelor’s degree in an engineering discipline (Civil/Water) or similar and about 10 years of experience in assessing the hydrology of major rivers and potential climate change impacts. They should have experience with at least two projects of a similar magnitude in Southern Africa. Experience working in Malawi and Mozambique will be beneficial. Proven experience in data analysis and interpretation using computer software models is essential. Fluency in English is mandatory, and working knowledge of Portuguese is desirable.

### Key Expert 4: Institutional and governance expert (Estimated 20 days)

Ideally, possess at least a master's degree in international development, institutional development, development studies, or similar with at least 10 years in institutional assessment and organizational development in the public sector/national government ministries, departments and agencies, and private sector. Familiarity with the SADC region's regional integration and development agenda is essential, particularly in the groundwater sector, through participation in at least 2 institutional assessment and development projects implemented in the SADC region. Experience with transboundary water courses, governance structures, and institutional strengthening is required.

### Non-Key/Other Expert Staff

The Consultant can select and hire other experts and support staff as required according to the deemed requirement to deliver the services in accordance with the contract (e.g. Communications expert, Water quality experts, modellers, etc.). CVs for such other experts should not be submitted in the Technical Proposal. Although hiring other expert staff will not be subject to the prior review of the Client, such staff shall otherwise meet

the professional standards and possess adequate experience to conduct their work safely and professionally.

NB: The firm may deploy additional non-key experts and support staff to deliver the outputs within the allocated period. The time inputs for these additional experts and support staff are over and above the levels of effort listed against each Key expert above.

The levels of effort listed against each key expert are the maximum allowable professional time inputs, including fieldwork, office work, and travel.

## 7. Schedule and Duration of Assignment

This is a once-off assignment without any obligation for follow-up work and is expected to run for eighteen (18) months with an estimated aggregate level of effort of 200 person-days for the key experts only, all-inclusive of field, travel, and office work. The Consultant shall include in their submission a proposal for the deployment of the key experts and any non-key experts and support staff deemed necessary to timely deliver the objectives of the assignment.

## 8. Liaison and Logistics

On a day-to-day basis, the Consultant will liaise with the SADC-GMI through the Project Manager delegated by the Executive Director of SADC-GMI. Logistics for international air and road travel and cross-border travel are the responsibility of the Consultant. If required, SADC-GMI can also issue letters of support to facilitate access to the Member States. The Consultants will meet the visa, cross requirements, and cross-border charges. These should, therefore, be included in the Consultant's technical and financial Proposal.

## 9. Data, services & Facilities to be provided by the Client.

The client will facilitate for letters of introduction to SADC Member States and avail documents as well as data during the desk review phase. The Consultants will be expected to work from their respective offices. All costs resulting from the execution of this assignment will be incorporated in the Consultant's financial proposal.

## 10. Contract Management and Other Information

This is a lump sum contract since the scope of it is well defined and the contract amount is fixed, and all payments will be linked to the contractual milestones. The client will provide the consultant with data and information to facilitate the execution of the assignment including introduction letters to relevant stakeholders.

## 11. Proposals Submission

Interested and qualifying consulting firms are required to submit expression of interest proposals to SADC-GMI on or before **31 May 2024** to procurement@sadc-gmi.org by 12:00 midnight (RSA Time). The same e-mail address above can be used if further information is required – inquiries can be submitted during working hours, 8:00 – 17:00, Monday to Friday.