



MINISTRY OF WATER, SANITATION AND IRRIGATION

STATE DEPARTMENT FOR IRRIGATION

**KENYA WATER SECURITY AND CLIMATE RESILIENCE
PROJECT**

TERMS OF REFERENCE

FOR

**CONSULTING SERVICES TO DEVELOP A NATIONAL
IRRIGATION SECTOR INVESTMENT PLAN (NISIP) –
MANAGEMENT INFORMATION SYSTEM**

JANUARY 2024

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1.0 INTRODUCTION

The State Department for Irrigation was established vide Executive Order No.1 of 2023 under the Ministry of Water, Sanitation and Irrigation and bestowed with the following functions: National Irrigation Policy and Management; Water Harvesting and Storage for Irrigation; Management of Irrigation Schemes; Water Storage and Flood Control Management; Mapping, Designating and Developing Areas ideal for Irrigation Schemes; Development of irrigation infrastructure; and Land Reclamation. These functions generally bestow the State Department with the overall responsibility of development and management of irrigation and drainage in the country.

In execution of her mandate, the State Department is guided by key strategic goals which include: improved water harvesting and storage capacity for irrigation; Optimal and sustainable exploitation and development of irrigation potential; improved productivity of irrigation schemes; and achievement of land degradation neutrality.

The State Department for Irrigation is thus desirous to procure consultancy services of an Expert to carry out the irrigation sector financing and investment assessment necessary to enhance mobilization of resources for the realization of the State Department for Irrigation goals and objectives.

Public investment towards irrigation infrastructure development has averaged at KES. 5 billion over the period between 2010 and 2015, and has increased gradually to the current investment level of KES.23 billion in the 2023-2024 financial year. This level of investment is low given the target of the National Irrigation Policy 2017 of 40,000 ha (100,000 acres) per year. To attain the envisaged annual target of new irrigation area, the sector will require an estimated investment of KES. 65 billion annually including the cost of developing water resources for irrigation.

The State Department of Irrigation has therefore embarked on developing a National Irrigation Sector Investment Plan to act as a resource mobilization tool with the main goal of establishing a robust, coordinated and sustainable financing and investment framework for promotion of socio-economic development in the country. The Plan will thus look into the current legal and institutional arrangements within the sector, propose the necessary business lines to focus on with their respective institutional and coordination arrangements and finally prescribe the Monitoring, Evaluation and reporting framework to ensure successful implementation of the Plan. It is against this background that the State Department for Irrigation is seeking consultancy services to assist on matters of investment financing.

In this regard, a NISIP MIS is a system that will provide management with the necessary information to make decisions about Irrigation sector investments. The MIS will gather information from all the Irrigation related sources to provide information tailored to the management and staff needs. This system

will allow for data visualization, offer progress reports on the investments made, data on all Irrigation schemes in Kenya, water availability for irrigation, expected productivity to assist in assessment of Food security in the country. It will also assist the management in determining which projects are worth investing in and the return on investment for those projects..

2.0 OBJECTIVES OF THE NISIP-MIS

The State Department for Irrigation is seeking to procure a well-designed and secure web-based Management Information System (MIS) for the National Irrigation Sector Investment Program (NISIP). This system's purpose is to provide Monitoring and Evaluation (M&E) information.

The NISIP MIS will serve technical specialists and decision-makers at both the National and County levels in Kenya. Its goal is to facilitate quick access to vital information regarding water resource availability, the extent and progress of irrigation development, and insights into suitable types of irrigation and water resource development. This information will aid in making informed decisions about investments aimed at improving performance and developing sustainable resources.

Ultimately, NISIP aims to support evidence-based decision-making for irrigation investments. This approach seeks to optimize development outcomes while ensuring the sustainability of resources.

The NISIP-MIS is expected to meet the following key requirements:

I. Web-based GIS System: This system will house the NISIP Monitoring and Evaluation (M&E) framework and manage data from current and potential irrigation investments nationwide. It will generate annual reports and track investment progress. One of the benefits of Web-based GIS is that they can simplify complex data and functions for the benefit of non-technical users.

II. Integration with Existing Systems: Linked to various databases within the State Department for Irrigation (SDI), National Irrigation Authority (NIA), National Water Harvesting and Storage Authority (NWHSA), Ministry of Agriculture, and e-citizen platform. Additionally, it will utilize hydrological resource tools and remote sensing platforms for detailed irrigation performance insights.

III. Decision Support System (DSS): Analytical tool to process extensive data for decision-making. It will analyze large amounts of data and present the management with the best possible options available. It will generate reports projecting revenue, viable schemes, water usage, inventory management, and impact assessments based on current and past data.

IV. Irrigation Acceleration Platform: it is a platform where demand and supply can meet, interact and exchange ideas facilitating collaboration among stakeholders like financing institutions, development partners, equipment suppliers, extension services, and more.

V. Spatial Data Inventory: Housing collected spatial data including farming, irrigation, technical/financial/performance data, water storage, and institutional data. This feature should allow for filtering and comparisons between different sets of data.

VI. Non-Spatial Data Repository: An online library hosting non-spatial data such as policies, technical designs, and other relevant information. This will allow for downloading of the data.

VII. Platform for Small-Scale Irrigation: this platform is to allow farmers to express interest in small-scale irrigation development, fostering demand-driven initiatives under Farmer Led Irrigation Development (FLID).

VIII. Transparent Prioritization Model: Within FLID for clear and transparent scheme prioritization.

IX. Visual Representation of Existing Irrigation Areas: Descriptive characteristics of existing irrigation areas including size, technical details, management setups, and crop types. This visualization tool will be used to organize spatial data and related information into layers that can be analyzed or displayed as maps, three-dimensional scenes, summary charts, tables, time-based views, and schematics.

X. Representation of Non-Spatial Data: Lists of reference values, addresses, and aggregated features like national roads.

XI. Visualization of Irrigation Scheme Performance: Metrics including land-use intensity, water productivity, and crop yield, fee collection rates, etc.

XII. Dashboards for Program Visualization: Displaying temporal and spatial distribution of irrigation program financing, existing, and planned (pipeline) project information.

XIII. Water Harvesting and Storage Information: Representing volume and location of water available for irrigation, including dams and water pans.

XIV. Land Reclamation and Restoration: Visualizing reclaimed land, areas needing restoration, their locations, and status.

3.0 FUNCTIONAL REQUIREMENTS FOR THE PROPOSED NISIP-MIS

The NISIP MIS should meet the following functional requirements: -

1. **Monitoring and Evaluation (M&E)**

- **Requirement:** The system must track and evaluate the progress of irrigation projects, capturing key milestones and outcomes.

2. **Financial Management**

- **Requirement:** Enable the recording, analysis, and reporting of financial data related to irrigation investments, including budget allocation, expenditures, and revenue forecasts.

3. **GIS Mapping and Spatial Analysis**

- **Requirement:** Integrate GIS capabilities to accurately map irrigation areas, water resources, and enable spatial analysis for effective planning and decision-making.

4. **Data Integration and Interoperability**

- **Requirement:** Ensure seamless integration with existing databases and systems within the State Department for Irrigation (SDI), National Irrigation Authority (NIA), National Water Harvesting and Storage Authority (NWHSA) and related agencies for efficient data sharing and retrieval.

5. **Decision Support System (DSS)**

- **Requirement:** Provide tools for data analysis, scenario modelling, and report generation to assist decision-making processes related to irrigation investments. Decision support systems allow for more informed decision-making, timely problem-solving, and improved efficiency in dealing with issues or operations, planning, and even management.

6. **Stakeholder Collaboration Platform**

- **Requirement:** Create a platform that allows effective communication and collaboration among stakeholders involved in irrigation projects, facilitating interaction between farmers, financial institutions, suppliers, and government bodies.

7. **Irrigation Scheme Performance Analysis**

- **Requirement:** Enable the assessment of various irrigation schemes based on predefined performance indicators such as water productivity, yield, and efficiency.

8. **Water Resource Management**

- **Requirement:** Monitor water harvesting, storage and availability, usage patterns, and conservation strategies to ensure sustainable management of water resources.

9. Small-Scale Irrigation Development

- **Requirement:** Facilitate the process of collecting expressions of interest from farmers for small-scale irrigation projects and implement transparent prioritization under the Farmer Led Irrigation Development (FLID) initiative.

10. Reporting and Dashboards

- **Requirement:** Develop comprehensive reporting functionalities and intuitive dashboards to visually represent data for easy comprehension by decision-makers.

4.0 NON FUNCTIONAL REQUIREMENTS FOR THE PROPOSED NISIP-MIS

The NISIP MIS must adopt a multitier system architecture comprising distinct presentation, application logic, and data tiers to ensure scalability and performance. The architecture should segregate user interaction (presentation tier), core functionalities and business rules (application logic tier), and data storage (data tier). This structure must facilitate ease of maintenance, enable scalability, and efficient resource allocation as the system expands.

1. Performance:

- The system should handle concurrent user loads efficiently, supporting a minimum of [X number] of users simultaneously without compromising performance.
- Response times for data retrieval and processing should meet predefined benchmarks, ensuring timely access to information.
- The system should be capable of handling large volumes of data without significant performance degradation.

2. Multitier Architecture:

- The NISIP MIS must adopt a multitier system architecture comprising distinct presentation, application logic, and data tiers to ensure scalability and performance.
- The architecture should segregate user interaction (presentation tier), core functionalities and business rules (application logic tier), and data storage (data tier).

3. On-premise and cloud-based deployment:

- The NISIP MIS should support both on premise and cloud-based deployment models to offer flexibility in hosting options. The system must be deployable on local infrastructure

(on premise) as well as on cloud platforms (such as AWS, Azure, or GCP) to accommodate varying preferences and ensure scalability, accessibility, and resilience

4. Security:

- Data stored within the system must be encrypted both in transit and at rest to prevent unauthorized access, modification or data breaches to ensure non-repudiation. The system should satisfy the CIA Triad as it is valuable in assessing what went wrong and what worked after a negative incident.
- Role-based access control (RBAC) should be implemented to ensure that users only have access to the information relevant to their roles.
- Regular security audits and updates must be conducted to identify and address vulnerabilities proactively, ensure compliance with regulations, proactively address emerging threats, and maintain user trust.

5. Reliability:

- The system must have a high level of availability, with scheduled downtime for maintenance communicated well in advance.
- Backup and disaster recovery mechanisms must be in place to minimize the risk of data loss in case of system failures or unforeseen events.

6. Scalability:

- The system architecture should be designed to accommodate future growth and increasing data volumes without significant reconfiguration or performance degradation.
- It should support scalability both vertically (increasing resources within a single server) and horizontally (adding more servers or nodes to the system).

7. Usability:

- The system interface should be intuitive, user-friendly, and accessible, requiring minimal training for users to navigate and perform tasks.
- Compatibility with commonly used browsers and devices should be ensured for a seamless user experience e.g Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge etc.

8. Interoperability:

- The system should adhere to industry standards and protocols to facilitate seamless integration with external systems, APIs, and data sources.
- It should support multiple data formats and standards to enable interoperability with various data sources and applications.

9. Maintainability:

- The system should be designed with modular components, allowing for easy maintenance, updates, and enhancements without disrupting the entire system.
- Code documentation and commenting standards should be followed to facilitate ease of maintenance and future development. The use of open-source Content Management Systems is recommended.

5.0 PROJECT IMPLEMENTATION WORKPLAN

The NISIP MIS will be developed progressively with different subsystems to be established in stages that will be closely aligned to the needs of the NISIP program formulation in early 2024, establishment during the first half of 2024, and subsequent rollout. The MIS will initially interface with, and then be progressively integrated with the State Department for Irrigation MIS and other hydrological and information management systems.

The consultancy will be conducted in two stages: **Stage 1** will address immediate and minimum MIS functionalities to help inform the development of the NISIP business lines and the discussion on indicators and measurement metrics. The work will commence in December 2023, with conceptual MIS functionality design to inform NISIP formulation in January 2024, followed by (**Stage 2**) full development of the MIS after April 2024:

Stage 1 – Scoping and concept formulation of MIS functions for NISIP preparation: The Consulting firm shall review reports and documents on the NISIP Program and conduct consultative interviews with relevant Government and program consultants, and assess at scoping level, all related Government MIS arrangements and databases in the water and irrigation sector.

The intention of Stage 1 is to identify the minimum system requirement specifications and to propose, at concept level, the main MIS functionalities that will then inform the next stage of NISIP preparation. The MIS team will, based on their review of government databases and MIS systems, and the planned remote-sensing and related project initiatives, define the MIS functionalities. The team will contribute ideas, options, and examples to the NISIP preparation team on MIS possibilities and benefits when the NISIP framework is being finalized.

Initial MIS functionalities are anticipated to be relatively simple and would provide an interim platform for NISIP program information and then build the MIS architecture progressively into a subsequent fully developed MIS.

Stage 2 - Full MIS development: Stage 2 will comprise development of the comprehensive and fully functional MIS following NISIP conceptualization. The fully developed platform will include the detailed MIS system design description, the implementation plan, training plan, data collection, data compilation and validation, management, user interfacing and results presentation, and related budget requirements. To comply with this requirement, the consultant must present a Detailed Implementation Methodology and Work Plan that clearly delineates the following aspects:

1. Detailed Implementation Methodology:

- Clear outline of the step-by-step approach to implementing the MIS, including phases such as initiation, requirements gathering, design, development, testing, deployment, and support. This should detail methodologies used (e.g., Agile, Waterfall) and specific activities within each phase.

2. Detailed Project Work Plan:

- A comprehensive work breakdown structure (WBS) outlining tasks, timelines, dependencies, resource allocation, milestones, and deliverables for each phase of the project.

3. Testing Plan:

- Detailed strategy outlining types of testing (unit, integration, system, UAT), testing methodologies, tools used, test scenarios, resources involved, and acceptance criteria.

4. User Training Plan:

- An elaborate plan detailing training needs analysis, training modules, training schedules, methods of delivery (e.g., workshops, online training), training materials, trainers, and evaluation mechanisms.

5. Business Continuity Plan:

- A comprehensive strategy to ensure system uptime, data integrity, and operational continuity in case of unexpected events or disasters. This includes backup plans, disaster recovery procedures, and risk mitigation strategies.

6. Change Management Plan:

- A structured approach to managing changes throughout the project lifecycle, including processes for requesting, reviewing, approving, implementing, and communicating changes to stakeholders.

7. Documentation Plan:

- Detailed documentation guidelines for the MIS, including system requirements, design specifications, user manuals, technical documentation, and maintenance procedures.

8. Security Plan:

- A comprehensive security strategy covering CIA, data protection, access controls, encryption, compliance with regulatory standards, security audits, and measures to safeguard against cyber threats.

9. Deployment Plan:

- A detailed plan outlining steps for deploying the MIS into the production environment, including data migration, configuration, rollout strategy, user acceptance, training and post-deployment support.

10. Support and Maintenance Plan:

- A plan outlining ongoing support mechanisms, service level agreements (SLAs), maintenance schedules, bug fixes, updates, and continuous improvement processes post-deployment.

6.0 TIMELINES OF THE ASSIGNMENT AND PAYMENT SCHEDULE

Activity	Duration After Contract Commencement in weeks	% payment.
Concept formulation and Detailed Inception Report	4 weeks	20
Prototype MIS system	12 weeks (3 months)	20
Fully developed MIS system	28 weeks (7 months)	40
Training	30 weeks	10
Maintenance and Support	1 year after handover of system	10
		100

7.0 QUALIFICATIONS OF THE CONSULTING FIRM

The consultant must be a competent firm with presence in Kenya that has a minimum of 5 years' experience in implementing IT systems. They must have successfully executed at least 2 projects related to Project Planning, Monitoring, and Evaluation within the last 3 years. Additionally, the firm must be compliant with all statutory requirements, registered with the ICT authority, and accredited by the Office of the Data Protection Commissioner.

Furthermore, the consultant must demonstrate their capability to provide project staff possessing the qualifications specified below. Additionally, they are required to guarantee the continuous availability of these staff members throughout the entire duration of the project.

Staff/Role	Required Number	Description	Qualification	Minimum Experience (Years)

Team Leader/ Product Manager	1	Oversees the entire project, responsible for planning, organizing, leading, and controlling activities.	MSc Computer Science/IT/ Equivalent	10
System/ Business Analyst	1	Evaluates system functionalities, refines requirements, and supports the development team in understanding user needs and ensure the system is aligned with business needs, scalability and technical requirements.	MSc Computer Science/IT/ Equivalent	5
Full Stack Developers	3	Build and code the system based on specifications provided by the technical architect and system analysts.	BSc Computer Science/IT/ Equivalent	3
Testing and Security Specialist	1	Conducts various testing to ensure the system meets quality standards and user requirements. Implements and maintains security measures, ensuring system protection and compliance with regulations.	BSc Computer Science/IT/ Equivalent	3
Training Coordinator	1	Develops and delivers training programs for end-users and stakeholders on system usage.	BSc Computer Science/IT/ Equivalent	5
Support/Mai ntenance Team	2	Provides ongoing technical support, troubleshoots issues, and maintains the system post-implementation.	BSc Computer Science/IT/ Equivalent	3
Irrigation expert	1	Provide technical irrigation support, help developers in understanding user needs and test the system from the Irrigation and user perspective	BSc Agriculture/Hort iculture/ Agricultural Extension/ Agricultural Economics/ Engineering	10

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8.0 REPORTING OBLIGATION

During this assignment, the consultant firm will be accountable to the Taskforce overseeing the NISIP program. Collaborative efforts will be established with the personnel of the State Department for Irrigation, the National Irrigation Authority, and the National Water Harvesting & Storage Authority, all supervised by the Principal Secretary. The final reports must incorporate revisions and recommendations as follows:

- The consultant is required to conduct bi-monthly meetings (twice a month) with the Taskforce to evaluate the progress in development.
- Three (3) copies of the final report should be submitted to the Principal Secretary, State Department for Irrigation.
- The acceptance of reports is contingent upon approval by the Principal Secretary, based on recommendations from the evaluation committee, which includes members of the Taskforce.
- The State Department for Irrigation will have complete ownership of the system and code base. The consultant is prohibited from replicating, reproducing, or using any software datasets utilized for this assignment without prior consent from the owner.
- The system will undergo review by the State Department for Irrigation staff.
- State Department for Irrigation staff members will oversee data collection.
- State Department for Irrigation staff will provide support for user acceptance testing and actively participate in system training.