TERMS OF REFERENCE FOR CONSULTING SERVICES FOR DESIGN AND DEVELOPMENT OF A GEOSPATIAL ASSET BASED MANAGEMENT SYSTEM (PLATFORM) FOR DATA MANAGEMENT AND MONITORING OF GARID PROJECT INTERVENTIONS

1.0 BACKGROUND

The Government of Ghana through the Ministry of Local Government, Decentralisation and Rural Development (MLGDRD) is implementing the Component 3.3 (Metropolitan Governance and operations and Maintenance) of the Greater Accra Resilient and Integrated Development (GARID) Project with funds provided by the World Bank. The project is in response to efforts aimed at addressing the long-term goal of strengthening flood and solid waste management, and the provision of public services in targeted flood prone communities in the Odaw River Basin. The project development objective is to *strengthen flood and solid waste management, and the provision of public services in targeted flood prone communities in the Odaw Basin.*

GARID consists of three (3) strategic components implemented by three (3) sector ministries as listed below:

Component 1 (MWH): Drainage and flood management improvements within the Odaw Basin Support to most vulnerable communities within the Odaw Basin.

Component 2 (MSWR): Improvements in solid waste management capacity including minimizing solid waste in water ways.

Component 3.3 (MLGRD): Strengthening capacity for planning, coordination, monitoring and evaluation.

This TOR supporting the Request for Expression of Interest (REOI) seeks to procure the services of a Consulting Firm for the establishment of the Geospatial Asset Based Management System. The System will support the long-term utility of the various assets developed under the various components of the GARID project in the areas of drainage, sanitation and community facilities The System would consist of a multi-layered web-based platform that identifies the project assets by their locations, characteristics, functions, and will track their performance in relation to their designed capabilities and the regime of maintenance applied in the operations of the facilities. The focus of this assignment is on the assets developed directly under the GARID project. However, the plug-in features of the system together with the anchoring online is expected to engender opportunity for linkages with assets from other projects.

The multi-layered web-based platform to be developed will feature the improved Odaw drainage channel with sand traps, expanded outlet into the sea, reconstructed bridges, detention ponds and further flow-relevant structures along the channel. It will also provide inputs from the Flood Early Warning System (FEWS), Digital Elevation Models (DEM), orthophotos and spot heights of Greater Accra Metropolitan Area (GAMA), transfer stations and final disposal sites, the decommissioned (capped) dump sites, solid waste collection equipment (see figure 1 below). The platform will provide real-time data on-demand for permitted users accessing the system.

Permitted users to all features shall primarily be from relevant government Ministries, Departments and Agencies (MDAs) as well as Metropolitan, Municipal and District Assemblies (MMDAs). There shall be open access for the general public for some restricted features. The combination of open access and limited access capacity for some sections is to ensure that the system delivers adequate information timeously, is robust enough for open-source inputs without compromising the integrity of the system utility. Thus, there will be 3 levels of access; for managers of the system, users from various government agencies, and the general public. In addition, the system shall have monitoring and reporting functionalities.

In view of the time lines for the implementation and completion of this facility, the construction phase of the assets shall not be monitored under this platform. On the other hand, once the development / construction of the asset is completed, the requisite geodata will be uploaded onto the Geospatial Asset Management System following which the operations and maintenance attributes of the assets and outcomes will be routinely monitored, catalogued and reported.

Figure 1: Model of Geospatial Asset Based Management System.

2.0 Objectives of the assignment

The objectives of the assignment are to:

Design and develop a web based Geospatial Asset Based Management System, for geographic database monitoring and management. The system will support the operation and maintenance of assets developed under GARID as well as provide functionality for spatial analysis and monitoring. The system should have access to a wide range of high-resolution geo-visual data, including up-to-date aerial imagery.

Develop a web-based automated M&E system with GIS, Impact, Outcome, Output, monitoring indicators for all ongoing program monitoring processes, avenues for collecting and processing performance data and review products across various initiatives to inform baseline.

The platform must be a user-friendly platform which enables Ministries, Assemblies and Agencies to harness the power of the cloud to extract insights from geo-visual data faster and more accurately.

Develop general policy and standards (Manuals) for data management i.e. Data formats, data ownership, hosting, sharing, metadata, security, etc.

3.0 SCOPE OF WORK

The requested system should have the following;

3.1 GEOGRAPHIC DATABASE

The service provider should study the existing GIS data models and platforms in use by the MDAs and MMDAs and then create a unified data model with studies from best practice models, based on which the geospatial database will be built. The data model should support open-source GIS applications and should avoid duplication of data between users, and representing the data more efficiently to facilitate reviewing, synchronizing and retrieving the data when needed. The provided data model should be suitable for the nature of work between The Ministries, Agencies and Assemblies under the project. The geographic database should allow future expansions of spatial data and the creation of new geographical layers in line with the future developments worldwide. The service provider should work in converting the data (Spatial and Tabular) that will be provided by The Ministries, Agencies and Assemblies as well as deliveries from other assignments into GIS data and upload it to the geographic database in a way that supports the needed GIS applications.

3.2 GIS APPLICATION AND DEVELOPMENT

All provided applications should support and be deployed on high availability production environment, and the architecture should support the number of expected concurrent users for each application. The provided applications will be hosted at a data center the provider can offer two alternatives one on premises with specification of needed hardware specs the other one on cloud while implementing all securities policies that guarantee the confidentiality of all data. A copy from the applications source code for any custom application feature should be provided with the final built deployed on the production environment. An interactive Geospatial applications development and configuration demo/prototype should be provided for each application to have the sign off on the final applications design before the actual implementation.

Below is the list of needed applications:

Content Management System (CMS): a collaborative platform for managing map content centrally that: Enables users to create, manage, and share maps and applications within the project

boundaries. Allows the expansion of the GIS area so that all users on the project can access and use it. The administrator can deploy the recommended policies behind the internal firewall, so the geographic applications need to meet the requirements of privacy and security. A map browser built that allows different Key stakeholders to view and update geographic data in accordance with their respective mandates. Key stakeholders should be able to add map elements, by integrating with other system components and Items to be available for viewing on the map in accordance with the terms of reference of the users. Provide map, layers and geo applications catalogues containing thumbnails and meta data each.

Decision Maker Dashboard: A web-based dashboard that should provide a common operating picture for monitoring, tracking, and reporting events, to allow Key stakeholder to follow up the various performance indicators through a simple and easy to use application.

Field Management App: An application designed for mobile data collection that:

Enables field crews to capture and update spatial data including (point, line and polygon data) as well as tabular information directly from their smartphones and tablets—even without a data connection.

Enables the user should to quickly and easily integrate these field reports into his database and share them across CMS.

Can use configurable data-driven forms to create a standardized survey format such as (Kobo Toolbox, Survey123 collector) that improves data quality and consistency.

Enables the user to mark features on a map, measure distances and areas, and capture photos and videos

3.3 MONITORING TOOLS FOR ASSESSMENT AND REPORTING

Implement an online M&E system with the following features:

- Program and Project Dashboard Indicators,
- Document Management tools for attachment of documents,
- GIS Analytical tools and integrated workflows,
- Program/strategy indicators: impact/outcome/outputs,
- Inbuilt analysis template with import and export functionality MS Excel,
- Inbuilt template for report generation,
- Self-service (SS) online & offline portal for each project and program,
- Automated email notifications for level two analyses, review & approval, Reports. Generate notification emails for approaching & past deadlines of periodic reports, with automatic escalations in case of default.
- The system should be usable in both online and offline contexts and cross platforms compatible with mobile capability (Android / IOS).

3.4. Technical and insitutional set-up of the Geospatial Asset Management System:

The service providr, in consultation with the proejct/stakeholders respectively intended users, shall develop options and agree on solutions for the technical and insitutional set-up of the system (including detailed description of requirements and system features, softwares to be used, use of open-source vs commercial softwares/components, interoperability options, licencing, costs, etc.).

4.0 TRAINING

In order to ensure transfer of knowledge to counterpart staff for the sustainability of the system, the Consulting Firm shall conduct needs assessment on other fields like programming, database functions and on complex tasks such as data updates for technical experts and those for general tasks such as data viewing and querying. The needs assessment to be conducted by the Consultant shall comprise 5 counterpart staff from the principal departments and agencies of the Client organisations involved in the oversight of this assignment and the management of the outputs after the Consultant has finalized and handed over the deliverables.

The Consultant shall design and implement specific training models in the fields of (a) Online Monitoring and Evaluation applications, (b) open source softwares in GIS (namely QGIS) (c) Website management, and (d) Spatial and Attribute Data Collection to benefit the nominated counterpart staff. The training modules shall include and not limited to technical GIS training programs for all levels.

The 5-counterpart staff are expected to work as trainers of the staff from the local governments involved in the GARID project, building the capacity of the Assembly staff in the fields named above.

5.0 DURATION OF ASSIGNMENT

The consultancy shall cover a period of 26-man months to be spread over 12 months. This will allow for the different delivery timelines of the respective infrastructure and facilities to be completed and integrated into the system.

6.0 DELIVERABLES

The Consulting Firm shall be required to develop preliminary design options (prototypes) of the geospatial asset management system for evaluation, testing selection by Client and further submit the following reports to the Project Coordinator at the Project Coordinating Unit for onward submission to The Ministry of Local Government, Decentralization and Rural Development.

Inception Report: Ten (10) copies to be submitted in hard-copy and a soft copy on a flash drive not later than four (4) weeks after commencement of consultancy. The report shall cover among other things:

(i)   Proposed approach to the design of platform;
(ii)   Information needs for effective operation of platform;
(iii)   A road map for further development; and
(iv)   Preliminary options/roadmap for technical and institutional set-up.

The Inception Report shall be reviewed and comments provided by the client within two (2) weeks upon receipt of the report.

Monthly Progress Reports: Five (5) copies of the progress reports shall be submitted in hard copy and a soft copy on a flash drive on/before the 10th day of each month. This should give a general account of work progress and highlight opportunities and constraints impacting on the assignment.

Draft Final Report: Ten (10) copies shall be submitted in hard copy and a soft copy on a flash drive thirty-two (32) weeks after commencement of consultancy. The report will include the following:

(i)   Demonstration of the system;
(ii)   Operational manual for Geospatial Asset Based Management System (includes the final agreed solutions on technical and institutional set up);
(iii)   Back-up and data recovery plan; and
(iv)   Maintenance and Security Plan.

The Consulting Firm shall present the report on the design and development of the Geospatial Asset Based Management System with the new tools at an appropriate forum for comments/observations by relevant stakeholders within two (2) weeks after submission of the draft report.

Final Report: Ten (10) copies shall be submitted in hard copy and a soft copy on a flash drive Forty-eight (48) weeks after commencement of consultancy. The consultant is expected to incorporate relevant comments after presentation at a stakeholders' forum incorporating and also demonstrate to the client.

The Consulting Firm shall also submit the following as part of the final deliverables:

I.   The Web Based Geospatial Asset Based Management System
II.   Manual for the operation of the system (should contain instructions for installation, use, maintenance, and steps for effective deployment of equipment.)
III.   System design and architecture

IV.   Data model description
V.   General policy and standards for data management i.e. data formats, data ownership, hosting, sharing, metadata, etc.
VI.   Training report indicating number of selected trained personnel in the use and management of the system
VII.   The source code for the system design
VIII.   Back-up and data recovery plan
IX.   Maintenance and Security Plan

The Client shall establish a Technical Working Committee to assist in the review of the key outputs prepared and submitted by the Consultant as listed above (I to IX). The Consultant will be required to make presentation to the Technical Committee to enable a quick review of the outputs.

The Consulting Firm shall hand over the source code and all data to the client. All reports should appropriately reflect the name of the client and affirm its ownership of the documents.

7.0 QUALIFICATION REQUIRED

The Consulting Firm must be a legally registered firm, with proof of registration, and shall have a least 5 years' experience in the development of Geospatial database management system. The firm should have proven records in similar assignments. Must have Experience working in a developing country or in the West African Sub Region.

Team Leader

The Team leader will be responsible for the overall coordination and quality control of the deliverables for this assignment and, will lead and guide the development and implementation process of the proposed assignment. Minimum Qualifications and Experience Required for the Team Leader: a post graduate degree (Master's degree or equivalent) in subjects related to IT and computer science. At least 10 years' experience working in similar projects related to developing software/applications or relevant Information Technology (IT) environment; In-depth understanding of and experience in undertaking and managing IT related assignments in Ghana or the West African Sub-Region; Must be a member of a recognized professional body and experience in capacity building must have Excellent written and spoken English language skills.

Geoinformation Systems Specialist

The individual shall have a Master's degree in Geoinformatics, or Computer Science or related field in Systems Development with proven record in similar assignments and a strong background in the development of web-enabled spatial database systems. Must have at least 10 years' experience in website development. The individual must also have at least 5 years' experience in the field of spatial planning or related field and establishment of GIS for local/regional authorities and Ministries. Must have Experience in a developing country or in the African region.

Membership of recognized professional body is a requirement. Must be proficient in spoken and written English language.

Monitoring and Evaluation (M&E) Specialist

The M&E Specialist shall have a Master's degree in development economics, social science or other related field, with at least 5 years relevant experience in monitoring and evaluation of government-funded projects. The candidate must have demonstrated experience in designing and implementing M&E systems in a multi- faceted Project. Membership of recognized professional body is a requirement. The candidate must be proficient in spoken and written English language.

Spatial Database Developer

The individual shall have a Master's degree in Spatial Database development or related field in Systems Development with proven record in similar assignments. Must have at least 5 years' experience in database development and management with at least 2 years' experience in the field of Spatial Database development. Experience in a developing country in the African region. Membership of recognized professional body is a requirement. Must be proficient in spoken and written English language.

8.0 CLIENT INPUT

The Client will provide the Consulting Firm with time/expertise, data and documents in its possession including the following:

KML/KMZ files of GARID Project sites, relevant shapefiles, National Geospatial Policy, Structural Plans, and available baseline data for existing infrastructure under GARID. These are expected to serve as input for the design and development of the Geospatial Asset Based Management System.

The Client shall nominate 5 staff as counterpart staff to be trained by the Consultant. The Consultant is required to design and implement training packages for the benefit of the counterpart staff. Contacts for consultations (i.e., project managers and stakeholder, future users of the system)