Integrated Cities and Urban Development Project

Lump-Sum Contract

Design and Development of

Shared Urban Geo Database

For Nablus, Ramallah-Al Bireh, Bethlehem and Hebron Urban areas)

Terms of Reference

August 2021

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ACRONYMS

API	Application Programming Interface
BI	Business Intelligence
CAD	Computer-Aided Drafting
CI/CD	Continuous Integration/ Continuous Deployment
COTS	Commercial Of The Shelf
DBMS	Database Management System
GIS	Geographic Information System
GML	Geography Markup Language
GUI	Graphical User Interface
ICT	Information and Communication Technology
ICUD	Integrated Cities and Urban Development
JSC	Joint Service Council
LC's	Local Coordinators
LGU	Local Government Unit
MDLF	Municipal Development and Lending Fund
MOLG	Ministry of Local Government
MOU	Memorandums of Understanding
OSS	Open-Source Software
PLA	Palestine Land Authority
RFP	Request for Proposals
SQL	Structured Query Language
SRS	Software Requirements Specification
SUGDB	Shared Urban Geo Database
TIN	Triangulated Irregular Networks
ToR	Terms of Reference
UAT	User Acceptance Test
WFS	Web Features Service
WMS	Web Map Service

A. INTRODUCTION AND BACKGROUND

The Palestine Liberation Organization, for the benefit of the Palestinian Authority has sought financing from the World Bank for the Integrated Cities and Urban Development Project (ICUD). The Project Development Objective is to assist participating urban areas to enhance their capacity to plan for sustainable urban growth. The project is jointly implemented by the Ministry of Local Government (MoLG), who is responsible for technical oversight of the project, and the Municipal Development and Lending Fund (MDLF) that manages procurement, financial management, safeguards, and reporting for the project. The project works with local government units (LGUs) in Ramallah-Al Bireh, Bethlehem, Hebron, and Nablus urban areas through its intra-urban area coordination mechanisms.

Local Government Units (LGUs) are overwhelmed by existing demands for services and lack basic data, as well as lack of data sharing, instruments, and processes to utilize available spatial resources, forecast future estimates and manage overall urban growth. Urban plans often consist only of land use plans and in more advanced areas some additional sectoral plans. However, the administrative borders of the master plans frequently do not cover the full spatial extent of the LGU's areas of governance or service delivery. Additionally, regional planning in Palestine has been weak to nonexistent and so the urban plans do not fit into a greater regional framework and rarely consider neighboring authorities. Consequently, a number of weaknesses in intra-urban area coordination and strategic growth planning for urban areas, combined with insufficient public resources, pose real constraints to Palestine's social, spatial, and economic development. Therefore, effective data sharing is significantly considerable to help strengthen the capacity for data - driven decision making, supporting and sustaining the coordination within the LGUs at the level of urban area.

Joint Coordination Units (JCUs) were established for four of the urban areas provide effective governance framework to facilitate the intra-urban area coordination and collaboration regarding urban development and growth of their respective urban areas. Through memorandums of understanding (MOUs) between the four urban areas' LGUs signed in 2017, technical and steering committees were established to implement with the support of ICUD Local Coordinators (LCs) the project's activities and milestones.

During the development of the urban growth scenario exercise and other activities (ongoing or completed) under the project, large swaths of data was collected at the level of LGUs, compiled and validated at the urban area level and currently available for future use and analysis. Data includes land use, footprint, population, distributions of amenities, job distribution, road networks, housing costs, and environmental and ecological spaces. However, there are still major

gaps among the LGUs of the same urban area in terms of GIS availability and capacity. Therefore, the need for data management and development of city-wide geographic data have emerged. This will lead to improved sustainable planning and facilitate and enhance the working and planning process across the LGUs at the level of the urban area. It also will help city planners to holistically view and investigate all current or planned infrastructural, sectoral and development plans and studies within each urban area, contributing to strengthening joint planning and urban development.

The MDLF and MoLG intend to hire a consulting firm to design and develop a shared GIS database in order to use of data for better planning in the four targeted urban areas which consists of 29 LGUs. The assignment will be conducted in these urban areas to facilitate data sharing among LGUs. The main objective of this assignment is to improve the integrated joint urban and spatial planning at the urban area level through enhanced data sharing among LGUs. The SUGDB shall be GIS-Web-Based application that is able to provide the targeted LGUs in four clusters an insight looks to all features at cluster level. The system must be user friendly, dynamic, secure, and capable to be further developed in the future. The system shall be also equipped with all geographical tools (pan, zoom, scale, measure, draw, turn on/off, turn all on/off, print, clean, identify, normal search, dynamic search and any tool may be requested by the ICUD project team), dynamic reports and security function at user and feature scales.

B. ASSIGNMENT OBJECTIVES

The objective of this assignment is to improve the integrated, joint urban and spatial planning at the urban area level through enhanced data sharing among LGUs by establishing a Shared Urban Geo Database (SUGDB) on area level in the for below mentioned governates.

The project's targeted urban areas consist of four urban agglomerations in the West Bank. There are **29** LGUs targeted in this project, in which 5 of them have a GIS system. The assignment shall be implemented **only** for the four targeted urban areas in the West Bank:
- **Nablus Urban Area:** Nablus City, Sarra, Azmut, Deir-al-Hatab, Salim, Rujeib, Kafr Qalill, 'Iraq Burin, Tell, Beit Iba, Qusin, Zawata, Beit Wazan, and Deir Sharaf.
- **Ramallah and Al Bireh Urban Area:** Ramallah, Al Bireh, Bituniya, Surda & Abu Qash Municipalities.
- **Bethlehem Urban Area:** Bethlehem, Beit Jala, Beit Sahour, Al Khader, Al Doha and, Artas Village Council.
- **Hebron Urban Area:** Hebron, Dura, Halhul, Beit Khahil and Taffuh Municipalities.

This assignment will help MOLG and targeted LGUs to enhance their capacity in planning, and in the process, help achieve the following objectives:

1- Improve efficiency and quality of services inside LGUs.
2- Control and standardize procedures and systems inside the LGUs, especially those related to land use and the provision of services to citizens.
3- Allow on time access to relevant data related indicators.
4- Improve transparency and accountability.

By the end of implementation, the following goals should be achieved:

1- LGUs will be able to submit their GIS data and get feedback and required information from other LGUs.
2- LGUs and other stakeholders will be able to generate several reports generated through the report engine that will support data visualizations and Business Intelligence.
3- Each of the targeted LGUs will have its own cloud base GIS system that will share specific data with the SUGDB.
4- LGUs should be able through the Backend Management application to manage, monitor, and control their GIS systems and the user's access.

C. SCOPE OF WORK

C.1. PROPOSED SYSTEM STRUCTURE

The SUGDB should act as the overarching architecture that ensures all information needed by each cluster for planning joint projects is presented in a meaningful discipline and at the same time will allow the SUGDB to connect bi-directionally to the GIS systems at the LGUs.

The system will be developed and established by the consultant at the following levels:

1. LGU level: each of the LGUs that do not have a GIS system will be provided with a cloud-based GIS system that will be managed by the LGU after the service contract with contract expires and will be able to provide the SUGDB with all the required urban information in the appropriate format that is compatible with SUGDB.
2. The geodatabase in the Cloud system shall be connected to at least with one computer in the LGU with a Desktop GIS system (e.g., ArcMap or QGIS) to be used for managing, updating, and adding features by the LGU from their office. The main required urban information and features are not limited to the features listed in Annex III.

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3. SUGDB level:

The proposed Common Urban Geographic Database (SUGDB) will be generated by the current assignment in each of the four targeted urban areas; The main function of SUGDB will be to collect data from the GIS systems of each of the relevant targeted LGUs in these locations through an interoperable model and present it in a single connected GIS map based on the above urban information, and Annex III.

The consultant should consider two types of connections between the geodatabase of each LGU and SUGDB as follows:

a. The LGUs that owns their own existing Geodatabase within their premises and prefer to have direct connection between their local geodatabase and the SUGDB (or with their cloud geodatabase then with the SUGDB); the consultant will be responsible in coordination and cooperation with the LGU to develop/utilize Web services (e.g., WMS or WFS) to share the required features and information.

b. In the LGUs who do not have a Geodatabase within their premises; the consultant will work with all those LGUs to upload the required features to their own developed cloud geodatabase, then share the required features in these geodatabases with the SUGDB through the development/utilization of WEB services (e.g., WMS or WFS).

4. Connection with the GeoMOLG: all related features as requested by the ICUD shall be linked with the SUGDB as web-services. The consultant is responsible to coordinate with the MOLG and the ICUD project team to integrate these features with the SUGDB as a second source of data. Having a second source of information means that some features or information will be duplicated. To overcome duplication; the consultant shall develop the map in a manner that lets users turn on or off any or all features when requested.

5. Connection with the PLA Geodatabase: block, quarters and parcels features shall be linked with the SUGDB as web-services. The consultant is responsible to coordinate with the PLA and the ICUD project team to integrate these features with the SUGDB as a third source of data. Having a second source of information means that some features or information will be duplicated. To overcome duplication; the consultant shall develop the map in a manner that lets users turn on or off any or all features when needed. Check diagram in Appendix IV.

6. The consultant must take into consideration that the annexed appendixes are considered an integral part of the functional requirements of this assignment.

7. Since some features from the three sources (LGUs, GeoMolg and PLA) may be used and presented in the SUGDB, the consultant is requested to group features based on their

sources to prevent any confusion of system users. This shall include turn-on/off group of features. It is also recommended to arrange features within the same group based on their categories.

C.2. PROPOSED SYSTEM DESCRIPTION

The GIS-WEB-Based application of the SUGDB shall be developed in a way that:

1. Each LGU has access to its geodatabase only though connection developed within LGU's premises.
2. Master page shall be developed in friendly way to give all users the ability to enter to any cluster geodatabase or any other related geodatabase such as GeoMOLG or PLA. The consultant shall develop this page in a dynamic way to give the system administrator to add/remove new links with other geodatabases.
3. LGU members can access to the SUGDB using log-in and password with different level of security defined by the admin of the SUGDB administrator.
4. The geodatabase of each LGU as well as SUGDB shall contain all features and views, and the Tables to store temporal[1] data related to features. These tables can be edited (add, remove, update) through a special GUI (Web pages) of the web application.
5. After the development stage: the consultant shall be responsible to run and update the system in the four clusters with full coordination with the trained employees in each LGUs.

D. PROJECT PHASES

The consultant should propose a development methodology that will cover the full Software Development Life Cycle that will include the following three main phases:

D.1. PHASE 1: MOBILIZATION AND INCEPTION PHASE:

Within two weeks, the consultant shall review all related documents, meeting with target LGUs and the ICUD project team to develop his working plans including staff,

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[1] Temporal data: any data has time dimension or related to history, e.g., maintenance activities on roads, in this case, all data related to maintenance activities including date, road code/name, type of maintenance, contractor, cost and other data shall be stored on a table linked to the road feature by 1: M relation.

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communication, training, and risks management. At the end of this phase, the consultant is requested to submit the inception report.

D.2.   PHASE 2: PLANNING, REQUIREMENT ANALYSIS AND DESIGN:

1. Review current assessment reports of the current situation, policies and procedures, Current implemented GIS systems.
2. Identify the stages of developing the system.
3. Prepare the Software Requirement Specifications (SRS).
4. Identify the requirements of integration/interoperability with the currently existing systems and the integration/interoperability requirements between SUGDB and the existing LGUs' individual systems or the applications that will be developed for each LGU within this assignment and define the relevant best integration templates and methods (APIs, Web services, etc.).
5. List of all basic GIS features to be shared within the LGUs in the four clusters as well as define the minimum attributes (Fields) for each GIS feature. The attributes shall be defined in terms of type, length, primary key, look up values, etc.
6. Develop/design a standardized geodatabase to be used by all LGU and the four clusters. The design of the geodatabase shall include all requirements of all LGUs and clusters (e.g., temporal tables, non-spatial tables, views, triggers, and any other geodatabase components).
7. Develop the prototype and design of the new system taking into consideration the following:

   - Developing a form checklist and descriptive fields for the adoption of participatory approach.
   - Data entry forms for LGUs.
   - As a result, the consultant shall provide ICUD with the final version of the blueprint and design document according to the relevant standards and best practices, including 4+1 architectural view model. This document should be reviewed and approved by ICUD prior to the commencement of system development.

8. During this phase, the consultant should develop the following high-level methodologies / strategies:

   - Testing methodology of the system.
   - Integration methodology and approach between the LGU existing and developed GIS systems and the SUGDB.

- Training methodology of relevant users.
- Go-Live methodology.

D.3. PHASE 3: DEVELOPMENT AND IMPLEMENTATION PHASE

The consultant is required to develop/implement the SUGDB, geodatabase for each LGU, the Web services as needed, connections, and the and GIS-WEB-Based application for four urban Clusters, where the SUGDB will be connected to the LGUs Geodatabases to obtain the relevant information as detailed below as approved by ICUD and as per the functional and technical requirements detailed in this RFP including but not limited to the following tasks:

1. **Developing the Geodatabase for each LGU:** (LGU with no geodatabase yet): the consultant should collect all required features from LGU, update them to meet the project requirements, spot missing information and fill the gaps through adding all missing information to the developed Geodatabase in each relevant LGU, and should also develop or provide a compatible web service or interoperability model that has an appropriate and documented standard structure for data sharing., and transfer them to the standardized Geodatabase. This shall be conducted with full coordination and cooperation with the LGUs and MoLG project team the consultant should collect all required features from LGU, update them, fill gaps, and transfer them to the standardized Geodatabase. This shall be conducted with full coordination and cooperation with the LGUS and ICUD project team.

2. In LGUs that already have a geodatabase, the consultant will prepare and update the existing data to be ready and compatible with the requirements of the SUGDB, and the consultant should also develop or provide a compatible web service or interoperability model that has an appropriate standard structure for data sharing.

3. **Web Application:** in addition to the description in section 3, the system must include:
   - The administrative tools necessary for managing the web applications, including the creation and assignment of user rights and privileges, and should enable key users to modify certain template information in the database without requiring the assistance of the consultant.
   - A database management system (DBMS).
   - Develop and provide a database backup and recovery plan that will be tested for adequacy.
   - Develop the required integration tools including API and/or Web services that will include the fields needed for a SUGDB to connect to the database at each LGU.
   - Prepare the system manuals that includes but not limited to the following:
     - User instructions manual.
     - Technical manual / technical support problem solving.

- The minimum information required by SUGDB are listed in Appendix III.

4. **Shared Urban Geo Database SUGDB:** The consultant is required to develop an SUGDB for each urban area that will be integrated and connected in an interoperable approach with relevant web applications developed through this assignment to collect information provided by those web applications taking into consideration the following: The consultant is required to develop an SUGDB for each urban area that will be connected and integrated with relevant web applications developed through this assignment to collect information provided by those web applications taking into consideration the following:

   - The geodatabase is the native data structure and is the primary data format used for editing and data management. While geographic information in numerous geographic information system (GIS) file formats is designed to work with and leverage the capabilities of the geodatabase.

   - It is the physical store of geographic information, primarily using a database management system (DBMS) or file system. The user can access and work with this physical instance of collection of datasets either through GIS software or through a database management system using SQL.

   - Geodatabases have a comprehensive information model for representing and managing geographic information. This comprehensive information model is implemented as a series of tables holding feature classes, raster datasets, and attributes. In addition, advanced GIS data objects add GIS behavior, rules for managing spatial integrity and tools for working with numerous spatial relationships of the core features, raster, and attributes.

   - Geodatabase software logic provides the common application logic used throughout GIS software for accessing and working with all geographic data in a variety of files and formats. This support working with the geodatabase, and it includes working with shapefiles, computer-aided drafting (CAD) files, triangulated irregular networks (TINs), grids, CAD data, imagery, Geography Markup Language (GML) files, and numerous other GIS data sources.

These requirements are considered mandatory in implementing the complete solution. Together they define a system that will operate efficiently in the proposed hosting environment while providing a high level of flexibility in meeting current and future data needs.

D.4. PHASE 4: TRAINING, TESTING, IMPLEMENTATION AND HANDOVER PHASE

During this phase, the consultant should perform the following tasks:

D.4.1. CENTRALIZED IMPLEMENTATION:

The system will be implemented into a cloud environment where each LGU will have its own virtual cloud-based machine. The users will access the system through internet or/and through the developed connection between the Geodatabase of the LGU and the GIS desktop application in the LGU machines.

D.4.2. USERS TRAINING:

- The consultant must provide a training methodology and approach describing the training of a minimum of 70 trainees (two from each LGU and two from MoLG), covering all aspects of functional and technical requirements.

- The Consultant must setup the system training environment.

- The consultant must provide a detailed training plan to train the trainees. It should describe the necessary actions to be undertaken taking into consideration the massive number of backgrounds of different users, their capacity, their computer literacy, and their locations. And it should also describe the training material, duration, expected outcome, evaluation, feedback, and prerequisites and required skills (if needed) for each group of trainees based on the type of training they're going to receive.

- The Consultant must develop the training material covering the functional and technical aspects.

- The Services Provider must provide the required training as described in the approved training plan.

- The Consultant must provide any necessary training tool that is needed to deliver the required training.

- On-Job Training: during the assignment life cycle, the consultant is responsible to conduct on-job training for at least two employees (IT and GIS) in each LGU on use, maintain, and update the Geodatabase for their LGU and the SUGDB.

D.4.3. TESTING:

- In addition to the Consultant standard check-out and set-up tests, the Consultant in coordination with the committee assigned by MoLG must perform the following tests on the System:

  - Functionality & Requirements testing.

  - Integration/interoperability testing.

  - Recoverability testing

  - Security & User Access Control testing.

  - Performance and stress testing.

- The consultant must develop User Acceptance Test (UAT) procedures/ scenarios, covering all system functionalities. UAT will include step-by-step actions to be taken, inputs, and expected system performance and expected results and outputs for each test case.

- ICUD and MoLG will conduct the UAT by using scenarios that consider all various user types.

- Test results should be documented; any errors or problems must be fixed by the Consultant.

- All system documentation including all related user manuals must be available prior to the UAT phase in Arabic.

- All Acceptance Criteria must be documented prior to entering acceptance test. Acceptance criteria and any interpretations or clarifications must be discussed and documented prior to beginning of testing.

- At the beginning of the UAT period, a Test Kick-off Meeting will be conducted to discuss with stakeholders and test participants how testing will be managed, the individual roles and responsibilities of the participants in the testing process, and expectations for documentation, participation, time commitment and test schedule.

- The results of each test will be recorded, and all appropriate outputs will be gathered to show proof of successful test completion, or specific errors/anomalies encountered.

- When all tests are completed and no other re-tests are needed, prepare the Test Summary Report. The summary will include a recommendation for either exit from

the test phase, or re-execution of the test phase due to errors. The report will include or reference an analysis of test and requirements traceability.

D.4.4. INTEGRATION AND INTEROPERABILITY

- The Consultant is fully responsible for system integration and interoperability with the key systems (web applications and the SUGDB, GeoMOLG, PLA). This integration requires the Consultant to provide APIs or web services (WMS/WFS) that will be used by developed web applications to upload the relevant information to the SUGDB.

- The Consultant is expected to use a standard system integration architecture and technology to implement data interfaces.

- Consultant should ensure the interoperability of heterogeneous Information of the developed systems with the different governmental agencies in Palestine by complying with Zinnar that provides a scalable solution that allows Information Systems in the Palestinian ministries and agencies to exchange data.

D.5. PHASE 5: SUPPORT AND WARRANTY

D.5.1. WARRANTY

- The Consultant must provide ICUD and LGUs with one year support after completion of the development stage (Free of charge), the free warranty period will start upon ICUD approve the system development and implementation; the warranty will include: system technical support, removing the defects/bugs during the warranty period and maintenance of products, databases, collection (or make sure that changes in any feature is reflected in the SUGDB) and applications, whenever required by ICUD or relevant LGUs. The consultant is responsible to contact each LGU for updates in all shared features in at least in monthly basis.

- During the warranty period, the Consultant:

  o Must make qualified personnel available to MoLG /LGUs by telephone or email for the reporting of non-conformities or other problems with the products, and technical assistance requirements.

  o Will be responsible for making any software modifications required by the MoLG within the scope and functions of the system.

D.5.2. GO-LIVE & IMPLEMENTATION PLAN

- The Consultant must perform the following:

    o Finalize training material that will be used by LGU and MoLG staff to further train other staff to use the system in all user levels and locations.

    o Finalize the final version of database design (data models) and documentation of all system components.

    o Prepare and finalize fully functional and tested final version of system Source Code including all libraries and compiled blocks source code for both web applications and SUGDB.

    o Ensure Go-Live readiness with all system functionalities.

    o Define roles, staffing levels for operating and maintaining the system.

E. DELIVERABLES AND LEVEL OF EFFORT

E.1. LEVEL OF EFFORT:

The assignment is expected to last for (8) calendar months' period, and the estimated level of effort for performing this assignment is estimated to be 20 man-month that will be distributed among the required team.

E.2. DELIVERABLES AND DUE DATES:

Phase	Key Deliverables of this Stage	Deliverable Due Date - from contract signing date
Phase 1: Mobilization and inception phase	**Inception Report** (In English): including the assessment of existing and proposed functional areas and services that require development, as well as: • Detailed work plan • Staffing plan • Communication plan • Training plan	2 weeks

	• Anticipated risks and risk management plan	
Phase 2: Planning, Requirement Analysis and Design	1. **SUGDB System Design and Prototype Forms (Report),** describing all functionalities, Conceptual design of the geodatabase, Integration methodology and approach between the LGU existing and developed GIS systems and the SUGDB and all testing and training methodologies. 2. Workshop to present the phase outcome	9 weeks
Phase 3: Development and implementation Phase	1. 4 live SUGDB Systems functioning over Web (four Clusters) 2. User Manual 3. Technical manual	27 Weeks
Phase 4: Training, Testing, Implementation and Handover Phase	1. Training Report describing the given on-job training, number of trainees in each LGU, evaluation and recommendations. 2. Training of relevant staff on the solutions for the following groups: ○ On-Job Training for the IT technicians ○ On-Job Training for the GIS technicians ○ Training users on the use of the system 3. User Acceptance Test (UAT) procedures/ scenarios 4. Full developed functional system launch/Go Live 5. Final Report that describes the overall activities undertaken in the whole life cycle of the project	32 Weeks
Phase 5: Support and Warranty	provide MOLG with one year warranty, the warranty period will start upon MOLG approves the system development and implementation; the warranty will include attending to the defects/bugs during the warranty period and maintenance of products, databases and applications, whenever required by MOLG.	One-year support after completion of the development stage (Free of charge)
Others	Monthly Progress Report that summarizes the achievements of each month, obstacles encountered during the reporting period and mitigation measures,	On monthly basis

	and an outline of the planned steps during the following reporting period (with respect to the submitted work plan).	

- All deliverables will be in English; the list of the technical reports will be agreed upon with ICUD during the inception period.
- Review and approve of the deliverables by the team of ICUD will take 5 to 10 working days for each deliverable.

F. METHODOLOGY AND WORK PLAN

- Provide an initial high-level Project Management Plan which scope will cover MOLG's business requirements for the system mentioned above.

- Provide a proven development and implementation methodology to be used during this project.

- Indicate system development and implementation project timeline with main phases and milestones, as per the recommended methodology throughout project lifecycle: design, blueprint, realization, testing, data conversion, piloting, transitioning, training, roll-out phases, etc. ICUD must accept and approve the output of every phase in order to proceed to the next one.

- Provide staffing plan indicating the level of effort for each staff as mentioned below.

Other Activities

1. Hardware Requirements:

   - ICUD will make sure that all required cloud servers and hardware at the relevant LGUs will be available to run the system.

   - The cloud service specifications are based on Microsoft Azure cloud system:

Service type	Region	Description	Q
Virtual Machines	West Europe	B2MS (2 vCPUs, 8 GB RAM, 512 GB HDD); AHB for Windows Server – (OS Only); 3 years reserved (All LGUs except those mentioned below, and an additional of four servers dedicated for SUGDB per urban area)	23

| Virtual Machines | West Europe | B4MS (4 vCPUs, 16 GB RAM, 1TB HDD); AHB for Windows Server – (OS Only); 3 years reserved (Hebron, Dura, Halhul, Bethlehem, Beit Jala, Beit Sahour, Ramallah, Al Bireh, Betounyia, and Nablus) | 10 |

G. OTHER REQUIREMENTS

- Other functional, non-functional, and technical requirements are listed in Annex V, VI and VII. These annexes are considered as main parts of this TOR.
- Assessment Report is an integral part of the functional requirements of this assignment.

H. BIDDER QUALIFICATIONS AND EXPERIENCE OF KEY EXPERTS

H.1. QUALIFICATION REQUIREMENTS FOR BIDDERS

- Has been operational for the last three (3) years in Palestine.
- The bidder must furnish documentary evidence – including references and contact information to demonstrate that the bidder:
  - o Has satisfactorily completed at least two (2) contracts in the past (5) years in software development and GIS based systems, at least one of them in the public sector.
  - o Has a technical support during the project life cycle including maintenance and warrantee period.

H.2. KEY STAFF:

The consultant must provide all resources and staff needed to complete the tasks in this assignment within the given timeframe, with the below minimum key staff number and qualifications.

No.	Title	Qualifications
1	(1) Project Manager	1. At least BA/BSc in software engineering, information systems, computer science or equivalent. 2. Senior expert with a proven record of minimum 12 years in technical project management in the public sector preferably with local governments. 3. Proven record of experience in the ICT full project lifecycle from analysis to post deployment support.

2	(1) Analyst and Designer	1. At least BA/BSc in software engineering, information system, computer science or equivalent.
		2. Minimum of 8 years of proven record technical experience in system analysis and design.
		3. Proven record of solid experience in:
		• System analysis and design, technical architecture, ICT infrastructure and HW/SW specifications for Web systems/applications, and analytical skills.
		• Architecture frameworks (TOGAF, 4+1 view model, or similar)
		• Software architecture design tools (Sparx System Enterprise Architect, Rational Software Architect, or similar)
		• IT Security standards
		• Database design, analysis and implementation
		• UML and related tools
		• SOA and micro-services architecture patterns
		• Component-based software architectures.
		• System integration/interoperability and related technologies (JBoss ESB, Mule, or similar)
		• Business Intelligence and reporting tools (Jasper reports, Pentaho, BIRT, or similar)
3	(1) Database Expert	1. At least BA/BSc in software engineering, information systems, computer science or equivalent with a valid DBA certification.
		2. Minimum of 5 years of proven record in senior database administration position.
		3. Proven record of solid experience in:
		• Object-relational DBMS (Oracle, MySQL, MS SQL, PostgreSQL or similar).
		• Geospatial databases (Oracle Spatial, PostGIS, or similar)
		• Database administrator (DBA) tasks
		• Designing conceptual, logical and physical data models
4	(1) Software Engineers/ Developers	1. BA/BSc in software engineering, information systems, computer science or equivalent.
		2. Minimum of proven 5 years progressively responsible experience in user interface development and design in commercial web-based software.
		3. Knowledge and working experience with
		a. Backend development and modern object-oriented programming languages
		b. Frontend development and scripting programming languages
		c. Web development

		d. Business Intelligence and reporting tools (Jasper reports, Pentaho, BIRT, or similar) e. O/R mapping (Hibernate, EJB, or similar) f. CI/CD pipeline

5	(2) GIS Expert	1. Hold a degree in information systems, computer science, geomatics, surveying, geography, urban planning, or relevant field, having a professional degree in GIS is plus.
		2. Proven work experience as a GIS specialist.
		3. Knowledge and experience with
		    a. Desktop and WebGIS products/packages
		    b. **Web servers in geospatial domain (GeoServer or similar)**
		4. ETL and related tools (FME, Talend, or similar)
		5. Proven work experience with local government sector for at least 3 years.

6	(1) GIS Developer	1. BA/BSc in software engineering, computer science, geomatics, geography, urban planning, or related field.
		2. Proven solid experience and skills in GIS programming, data management, spatial analysis and algorithms.
		3. Knowledge and experience with
		    a. Programming languages (Java, Python, or similar)
		    b. Geospatial databases (Oracle Spatial, PostGIS, or similar)
		    c. WebGIS development
		    d. O/R mapping (Hibernate, EJB, or similar)
		    e. CI/CD pipeline

I. CONTRACT TYPE AND PAYMENT SCHEDULE

The contract is a lump-sum contract, the bidder should take into consideration that this contract should cover one year maintenance and warranty period (free of charge).

Payments will be arranged according to the following:

Payment to be made	Milestone
Payment against Assignment Scope of Work	
Payment1: 15% of the contract value	Will be made after the submission and approval by the MoLG of the inception report

Payment2: 20% of the contract value	After the completion of phase 2 of the project **(Planning, Requirement Analysis and Design Phase)**
Payment3: 30% of the contract value	After the completion of phase 3 of the project **(Development Phase)**
Payment4: 20% of the contract value	After the completion of phase 4 of the project **(Testing, Implementation and Handover Phase)**
Payment5: 15% of the contract value	After the submission to and approval by MoLG of the final report.

J. APPENDICES

APPENDIX I: LIST OF ACTIVITIES TO BE IMPLEMENTED THROUGHOUT THIS ASSIGNMENT

Cluster	Item	Number of Units	Description
Hebron	SUGDB Web Application	1	Purchased GIS-WEB-Based Application for Hebron Cluster
	Data Manipulation/Standardization	5	Halhoul, Beit kahel, Tafouh, Hebron, Dura
	Annual Support for the GIS application (2yrs)	2	Two years
	Annual Support LGUs data manipulation (2yrs)	2	Two years
Bethlehem	SUGDB Web Application	1	Purchased GIS-WEB-Based Application for Bethlehem Cluster
	Data Manipulation/Standardization	6	Al Kahder, Ad Doha, Artas, Bethlehem, Beit Jala, Beit Sahour
	Annual Support for the GIS application (2yrs)	2	Two years
	Annual Support LGUs data manipulation (2yrs)	2	Two years
Ramallah and Al Bireh	SUGDB Web Application	1	Purchased GIS-WEB-Based Application for Ramallah/Al Bireh Cluster
	Data Manipulation/Standardization	4	Betoniya, Surda-Abu Qash, Ramallah, Al Bireh
	Annual Support for the GIS application (2yrs)	2	Two years
	Annual Support LGUs data manipulation (2yrs)	2	Two years
Nablus	SUGDB Web Application	1	Purchased GIS-WEB-Based Application for Nablus Cluster
	Data Manipulation/Standardization	14	(14 LGUs)
	Annual Support for the GIS application (2yrs)	2	Two years
	Annual Support LGUs data manipulation (2yrs)	2	Two years

APPENDIX II: ASSESSMENT REPORT

Assessment of the LGUs IT infrastructure V3.docx

APPENDIX III: THE MAIN REQUIRED URBAN MINIMUM FEATURES

a. Urban Master Plan boundary

b. Zoning and Planned Land use

c. Built UP Area

d. Cadastral geospatial data (Blocks and Parcels)

e. Aerial-photo

f. Buildings

g. Utilities

h. Roads (all types)

i. Infrastructure Networks (Water, Electricity, telecommunication lines)

j. Environmental information

k. Geopolitical Data (such as: Separation Wall, Checkpoints, Settlements … etc.)

l. Cultural Heritage and Tourism Data

m. Landmarks

n. Other features as require by the IUCD project team or relevant LGU during the implementation of the assignment.

APPENDIX IV: SCHEMATIC DIAGRAM

This diagram represents the overall suggested solution. Each part of the diagram one type of targeted LGUs and their GIS capabilities and how these LGUs within each Cluster will be connected with the SUGDB. The most important note in this diagram is the GIS components within each LGU as well as in SUGDB as quoted from ESRI literature. The consultant shall take into consideration and to make sure that the five GIS components (Software, hardware, data, people, and methods/protocols) are established during the implementation period, this will be done with coordination and under supervision of ICUD and MoLG.
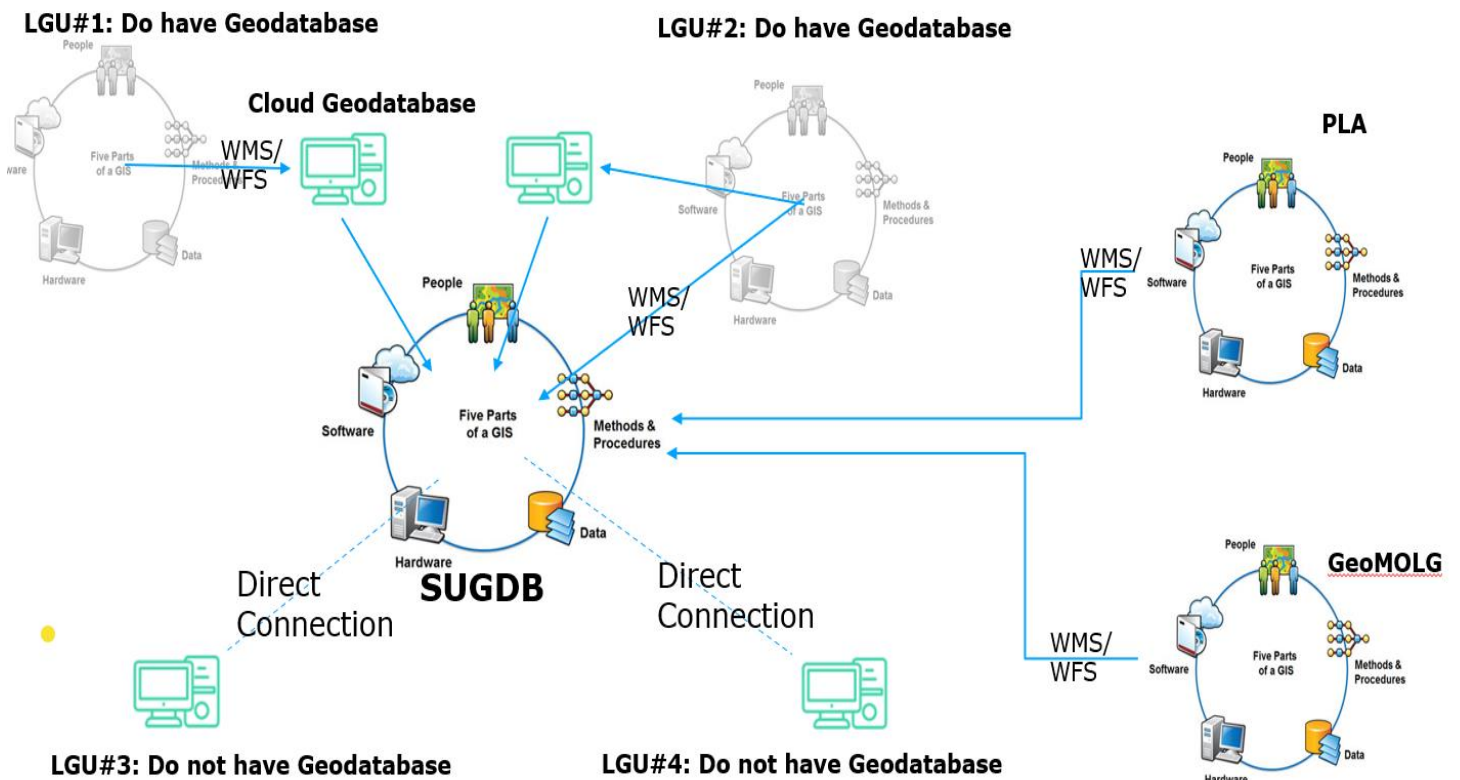
APPENDIX V: FUNCTIONAL REQUIREMENTS

This section contains the system functional requirements as well as the overall general functions of the requested system solution.

1. The GIS-WEB-Base application shall compose of the following components:
   a. Main Map page (Main WebGIS GUI): presenting all features with the agreed attributes within the cluster equipped with basic map tools (pan, zoom, scale, measure, draw, turn on/off, turn all on/off, print, clean, identify, normal search, dynamic search and any tool may be requested by the ICUD project team. This page can be only assessed though by login.
   b. Public Map page (Public WebGIS GUI): some or all features could be presented to the public in a special map page with limited attributes as assigned by the ICUD project team or/and the technical committee of each cluster. This map shall be similar to the main map page and can be accessed by public without login.
   c. Database: this part is composed of several web pages that communicate with features attributes. This means that the attribute of each feature can be edited through its related page without using any desktop GIS application. The number of these pages will be determined during the system development and with full coordination with the ICUD project team. These pages shall be able to load attachments (pdf and Images) to any specific feature. User can also zoom to the targeted feature in by a side view map or/and by opening the main map page in a separate window. The pages shall be grouped based on its category.
   d. Reports: A set of pages to generate dynamic reports based on a several criteria and filters. These reports shall be equipped with necessary tables, charts, maps as required by the ICUD project team. All reports shall contain headers and footers as requested by the technical committee of the targeted clusters; the system administrator can modify/update them by the application by himself.
   e. Security/Settings components: the consultant shall develop the needed security pages to manage users, managing features, and making the necessary auditing of the system as agreed with the ICUD project team or by the technical committees of the four clusters.
   f. The number of requested pages (forms) shall reflect or communicate at least the main features listed in the annex III in addition to all pages needed for reporting and security components.
2. Additional features/tools/functions:
   a. The Identify tool in the main Map page shall:

      i. Present the main attributes of the targeted feature as defined by the system administrator.

      ii. Present the attached image to the targeted feature.

      iii. List all attachments to the targeted feature.

      iv. Open the related page to the targeted feature

      v. Able to print the identified data in official report with map showing the location of the identified feature.

b. Print tool: shall be developed to print out any area required by the user in official format.

c. Search tools: shall be developed in different formats that allow the user to make dynamic search with many attributes with all types of search tools (and, or, equal, contain, similar, etc.). user can then zoom to any selected feature by click on the feature.

d. Provide the web application with the functions and tools needed to store, analyze, and display geographic information, the key software components are:

      i. Tools for the input and manipulation of geographic information.

      ii. A database management system (DBMS).

      iii. Tools that support geographic query, analysis, and visualization.

      iv. A graphical user interface (GUI) for easy access to tools.

      v. Graphical User Interface (GUI) in Arabic and English languages for data entry and associated activities. The interface must be user friendly, clear, predictable, consistent and efficient, with the ability to generate reports in Arabic/English.

      vi. Tools and means for enquiring and viewing of the data by developing a dedicated Graphical User Interface. The interface must be user friendly, clear, predictable, consistent, and efficient.

      vii. The ability to generate, print, and/or save different types of reports including predefined routine reports as well as ad-hoc reports. The reporting capability must include the generation of reports using multiple criteria.

3. Cartography/styles: the consultant shall develop the necessary styles for all features (Color, label, thickness, shape, transparency, etc.) with full coordination with the ICUD project team. These styles shall be reflecting the purpose/nature of features and consider the standard styles used by the MOLG or any theme could be agreed between all stakeholders. It is recommended to develop function in the application that let used to customize the styles in dynamic way through providing the users the ability to change

some of style features/properties/attributes. However, this shall be agreed on during the implementation of the application.

5. The SUGDB will be established over Cloud and will use the Internet Infrastructure as the main channel for service delivery.

6. Municipalities are free to share their GIS features as a Web service or as a direct connection with the cloud geodatabase.

7. Assessment Report (Appendix II) is considered as an integral part of this functional requirements.

8. A Customized GIS Web application will be designed, developed and installed on the Cloud (4 clusters) to be used by LGUS through Mobile or Computers over WEB.

9. Technical committee will be formally established in each cluster to follow up the establishment of the Shared geodatabase, consequently, all LGUs are requested to nominate a GIS expert and IT expert (a group of LGUS might share one GIS expert and one IT Expert) to contribute in the management and development of the SUGDB.

10. Geodatabase: Open Source

11. WebGIS Server: Open Source

12. GIS Desktop application: Open Source

13. GIS Application: Responsive application can be used through Mobile or Computers equipped with the following components (see section 2 for more details):

- Master page
- View page: to review the features with the following tools:

  i. List of features with turn on/off, turn on all, turn off all functions

  ii. Tools: zoom in/out, zoom window, pan, scale, measure distance, measure area, clean, identify, print, and any other basic tools

  iii. Select/search tools, should be dynamic, different search methods, zoom to searched item, able to print results as report, etc.

CLOUD

Spatial data storage — Software platform — Web/GIS servers — GIS application

END USERS
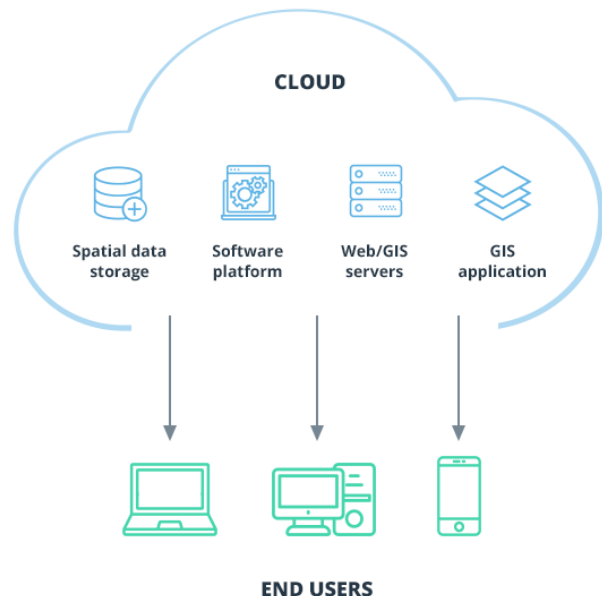
    iv. Download function: to download features n several formats including (PDF, Xlsx, Docx, TIFF, Jpeg, bmp, etc.)

- Reporting pages: equipped with different dynamic reports.
- Security pages to manage:
  - i. Users
  - ii. Features
  - iii. connections
- The LGUs will be connected with the Cloud SUGDB as one of the possible options:
  1. Connection as a Web Service, this option is applicable to all LGUs have their own GIS system.
  2. Direct connection with Cloud SUGDB: where each LGU will have a schema on the CLOUD geodatabase, a database connection with the GIS expert workstation will be established to update the LGU features.

- Other Requirements:
  - Capacity to automatically visualize data by drag and drop attributes, charts, and graphs
  - The ability to upload data from different resources such as Excel sheets or connect to different databases (Oracle, MySQL, SQL Server ..etc.)
  - Capacity to save reports and dashboards as PDF or images.
  - Easy to use, required no specialized IT resources or support.
  - Utilize advanced BI technology to perform the needed statistics and reports mentioned in page 18, the consultant will choose between COTS and OSS components based on the development fundamentals used.

- General Features
  - The system should provide detailed audit trails of transactions and tracks the user ID, date and time of the transaction.
  - The system should provide the ability to warn users of errors on-line before posting.

APPENDIX VI: NON-FUNCTIONAL REQUIREMENTS

1. Security

The proposed system technical architecture must include specifications to secure the hosting environment from external intrusion and attack. The Consultant must specify the tools, devices and systems to implement and/or configure (if available) that will ensure confidentiality, including but not limited to:

- Intrusion Detection and Prevention.
- SSL protection,
- Encryption of key user authentication data (user passwords) stored in database.
- Protection against web spiders and agents, and detection and protection against denial-of-service attacks.
- Complex Password requirement: The system must enforce a password that contains at least:

  o One lowercase and one uppercase letter.
  o One special character (!@#$%^&*)
  o One number (0–9)

- Limit on consecutive unsuccessful attempts to enter a password:

  o The system should be able to prevent password guessing attacks; the number of consecutive attempts to enter an incorrect password must be three (3) unsuccessful attempts, then the user account will be suspended until fixed by the Systems Administrator.

- Adhere to the following security requirements:

  o Confidentiality - ensuring that information is only accessible to those with authorized access.
  o Integrity - safeguarding the accuracy and completeness of information and processing methods.
  o Availability - the system must provide access to authorized users with 99% uptime.
  o Compliant use - ensuring that the platform meets all legal and contractual obligations.

o Responsible use - ensure appropriate controls are in place to enforce ethical and law-abiding behavior, conservation of common resources, and respect for other users within the system.

2. Usability

- The System should use the most recent best-practice web application design principles. The following guidelines should be considered in the design of the system web functions:

  o User interface should support Arabic and English languages
  o Should have terms of use, privacy statement and contact's page
  o Once logged in users should on average, be able to reach their target in 3 clicks or less
  o The main menu should be well-designed with no more than 10 items
  o All service forms should have a printable version to enable users to print and save them as documents of different type (PDF, DOC, DOCX, XPS, etc.)
  o All user transactions should have acknowledgments of success or failure of submissions

APPENDIX VII: TECHNICAL REQUIREMENTS

1. General Technical Requirements:

- The system will use the Internet Infrastructure as the main channel for service delivery.
- The system should be scalable and upgradeable as and when the number of users and content increases.
- The Consultant will use a responsive web application design technique in development that will allow the system to run on different devices and platforms including computers, tablets and mobiles.
- The system must support multiple access of several authenticated users at the same time, with unlimited number of concurrent users.
- Must provide the ability to allow both internal and external users to access the systems without the need to download any additional software.
- Audit Trails: The system must provide a secure and automated audit capability for recording activities in the system as well as changes made to data records. All suspicious activities must be logged and reported to the Administrator or authorized users. The proposed system must record the following audit trail activities: nature of the event, identity of the user or system component, point of origin of the event, date and time, and identity of data or system resources affected.
- The Consultant will be responsible for developing and providing fully developed, tested and properly documented Application Programming Interfaces (APIs) or web services (WMS/WFS) that will allow future integration with the system.
- The system modules and database package must be fully compatible with Windows Server 2012 and beyond on the server side.
- The software should provide a look-up capability for frequently entered information; and, once selected the information will automatically populate the corresponding data record.
- The system should provide the ability for the user to create a PDF format for all reports, and grid forms among other formats.
- Reporting: Built in, web-based report generator, which can be exported into multiple format (i.e., Microsoft Word, HTML, PDF Adobe Acrobat and Microsoft Excel for statistical analysis and Manipulation)
- Ability to import and export data from (or to) standard file formats, including, but not limited to: HTML, XML, PDF, CSV, MS Excel, MS Access and ASCII files.
- Ability to import and export data using web services and/ or APIs.

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- Ability to post/ update data in real-time.
- The screen transition time is sub-second for all modules and applications.
- The Consultant is committed to respond positively to future requests by MOLG to give access to the systems as requested without extra charge to facilitate other Consultant to connect to the system and related databases.

2. System Administration & Customization:

- Ability to allow authorized users to configure and maintain all system settings from any workstation on the local/wide area network.
- Ability to allow centralized deployment of system updates and system maintenance.
- The Consultant shall notify MOLG IT staff or an officially designated staff by MOLG of any updates and changes to production 72 hours prior to implementation and adhere to MOLG Change Management policy if exists.
- The Consultant shall notify MOLG IT of third-party software releases that are known to create problems with the actual version of the systems.

3. Disaster Recovery Plan

   Backup & Recovery:

- Backup of information is fundamental to the reliability and recoverability of the system (SUGDB and the web applications.
- A documented backup plan which defines the backup routines of the system shall be provided.
- A backup plan aims at ensuring that information in backups is complete and sufficient.
- The system should automatically perform regular backups of all critical items including; data, system logs, reports and the database in an encrypted format. The backups shall be stored in an off-site storage location or preferably a secure cloud storage. The backups will regularly be tested to ensure integrity of the backups.

   Disaster Recovery Management:

- Provide a disaster recovery plan which is properly documented, tested and maintained to ensure that in the event of a major failure of the systems or a corrupted database, essential level of service will be provided that will ensure high availability of 99%. The plan should include:

- o Establishing a disaster recovery site (Local or leased hosting, hardware required, connectivity, backup, etc...)
- o Emergency procedures, describing the immediate action to be taken in case of a major incident.
- o Fall back procedure, describing the actions to be taken to relocate essential activities or support services to a backup system.
- o Restoration procedures, describing the action to be taken to return to normal operation at the original system.
- o Implement, install, and run the system at the disaster recovery site as determined by MOLG in accordance with the Disaster Recovery Management Plan.

4. Ownership of Source Code and software artifacts:

- The Consultant is required to hand over the final product at the end of the assignment. The final product: all source code, intellectual property, documentation and all items specific to this product will be under the client's (MOLG) exclusive ownership.
- Final working Source Code of the whole Solution including any third-party tools or modules used in design, development, or implementation is the sole property of MOLG, and should be handed over to MOLG by the end of the assignment.
- The Consultant will be responsible for software license fees including database access licensing if any.
- Database's components including designs, schemas, scripts, procedures, queries, templates, data dictionaries, reference data, symbols and any other code or software associated with the data produced, used and stored by the system should be owned by MOLG.

The consultant is required to provide MOLG with the source code every time the system is updated to ensure that MOLG has always the recent published system.