Government of the People's Republic of Bangladesh
Department of Public Health Engineering
Office of the Executive Engineer
Survey Investigation and Research Division

Terms of Reference for the Engagement of IT Firm for the Development of web based real time data acquisition, analysis and decision-making application known as **Aquawatch**

1. Background

Bangladesh continues to face significant challenges in ensuring safe and sustainable water supply, especially in rural and coastal areas, due to both natural and human-induced factors affecting water availability and quality. To address these issues, the Department of Public Health Engineering (DPHE), the key government agency in this sector, is actively involved in implementing water supply projects and conducting research on potentiality of groundwater and ground water quality.

To strengthen the decision making capacity, DPHE—through Survey investigation and Research (SIR) Division and Research & Development (R&D) division developed a concept of web-based platform called "Aquawatch" to modernize ground water resource data collection, screening, preservation, validation and overall management system. This platform incorporates advanced features such as gap analysis, smart data visualization, dynamic form of data generation, secure user access, intelligent data approval workflows, automated notifications, and tools for seamless data migration during system upgrades.

Building on this foundation, it is highly demanded to Implement and Enhance of Aquawatch". This initiative aims to enable accurate and real-time monitoring of groundwater levels, surface water quality, and rainfall patterns—data that change frequently and require timely updates for effective decision-making.

The web based easily accessible platform will function as a centralized hub for water data collection, screening, storage, analysis, and visualization. It will also support features such as survey management, trend analysis, shapefile mapping, technology selection and comprehensive reporting. Integrated into the DPHE website, the system will improve access for both internal users and external stakeholders—thereby promoting data-driven planning and sustainable water supply solutions.

2. Objective of the Assignment

The primary objective of this assignment is to develop an enhance, centralized online water data collection and monitoring platform for DPHE that -

- Facilitates real-time and historical data collection on groundwater, surface water, and rainwater and any other survey as and when necessary.
- Enables trend analysis of ground water table, GIS-based mapping respecting of water quality parameter, water source, potential technology and aquifer layer etc.
- Supports survey operations and AI-based recommendations on water source, layer and technology selection.
- Integrates with existing water databases and offers user-friendly reporting tools.

3. Scope of Work

Implementation and enhancement of Aquawatch' includes the following components:

a) **Dynamic Survey and Data Collection:**
Enable real-time data entry on groundwater levels and water quality parameters (e.g., pH, arsenic, iron, chloride, manganese, microbial contamination etc.) through the system.

b) **Data Integration System:**
Develop a backend system to manage groundwater, surface water, rainfall data and other alternative options using an open-source database with spatial capabilities.

c) **Trend Analysis:**
Analyze seasonal variations and long-term trends in water table, quality and quantity using historical datasets.

d) **GIS-Based Visualization:**
Provide a mapping interface with spatial analysis capabilities at national and micro-administrative levels, including unions where necessary.

e) **Web-Based Mapping Tool:**
Implement both static and dynamic map services through OpenLayers and QGIS Server, integrated with PostgreSQL/PostGIS for spatial data.

f) **Automated Reporting System:**
Generate reports and alerts based on contamination levels and data differences, accessible to both technical users and officials.

g) **AI-Powered Insights:**
Utilize AI algorithms to suggest appropriate water supply technologies for specific regions based on data-driven insights.

h) **User Management and Authentication:**
Secure login system with role-based access, password recovery, and user management modules.

i) **Shapefile generation and Download:**
Allow authorized users to download spatial datasets generate (e.g., groundwater points, sampling locations, boundaries) in shapefile format,

Training on the use and operation

a) Preparation of user manual
b) Video tutorial for users
c) Training for updating and handling of the application system.

Other services

a) Technical Support for databases (update, backup, restoration and maintenance) will be up to the contract period, which will start from the date of final installation and delivery.
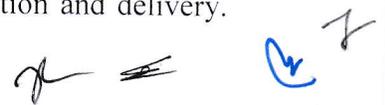
System should have the provision for updating data in higher version of server with improved Environment.

b) System should be developed in English.

c) Troubleshooting, tuning, data export-import, backup etc. for databases.

d) Technical Support for installation, configuration, and deployment of application servers.

e) Technical support for the Web Application (deployment of updates) will be up to the contract period, which will start from the date of final installation and delivery.

f) IT Firm will provide SSL Certificate for secured protocol of the Web Application.

g) IT Firm will create and set up a Google Play store for Android and Apple store for mac version.

h) Technical support for mobile applications (deployment of updates) will be up to the contract period, which will start from the date of final installation and delivery.

i) Bug fixing and upgrading of the Web Application and Mobile Application.

j) Ownership: Once the web and mobile application has been completed, tested and validated as per Govt. ICT policy, handover and accepted by the DPHE, the software and apps with source code, Database and architecture become property of DPHE.

4. Warranty and O&M

One year after handover/development will be considered as free warranty and O&M period.

5. Infrastructure Management

Vendor needs to arrange a proactive infrastructure team to handle all infrastructure related issues continuously for ensuring smooth service of this platform across the country as well as globally.

- Configure necessary Staging & Production server.
- Continues server monitoring sizing and tuning.
- Security: Protection & security of content, hosting environment, servers, network elements, access & network must be ensured.
- Ensure Instant Modular expandability of cloud computing resources using cloud resource control & configuration panel.
- Ensure System software back-up.
- Ensure 24X7 Customer Care Support.

6. Technology Specification

Open-Source Technologies: PostgreSQL, Python, Java, QGIS, OpenLayers, Leaflet.js, Mapbox, and Google Maps API.

Data Formats: GeoJSON for spatial data and Shapefile (SHP) for GIS mapping.

Security Measures:

- Protection against SQL Injection, Cross-Site Scripting (XSS), and other cyber threats.
- Strict input validation and authentication mechanisms.
- Data encryption and compliance with government security policies.

7. Security

The vendor should follow any of the industry standard secure development methodology such as (but not limited to) Comprehensive Lightweight Application Security Process (CLASP) by OW ASP etc.

- The IT Firm will be expected to ensure the system is configured in such a way that data/information security and the security standards maintained according to industry standards.

- The vendor should consider (but not limited to) common vulnerabilities such as SQL Injection, Cross Site Scripting (XSS) etc.

- Vendor will undertake responsibility for Input Validation Controls, Authorization/ Authentication Control and other security controls in place in both test and production environment of Maintenance of the Platform:

Major responsibilities under maintenance will be as follows:

- The selected vendor has to provide proactive maintenance and support services that will cover the following (but not limited to) areas:

- Continuous monitoring of query execution in Database, tuning database and tuning codes & queries to minimize response time.

- Fixing all bugs in the system irrespective of its nature and complexities.

- Updating manual by adjusting the changes in the system.

- Adjust and update system in compliance with any security test, load test or IT audit conducted by the client.

8. Multi-Layered Support from vendor

Vendor will provide multi-layered user support which will cover the following activities (but not limited to):

Support from Vendor:

Layer 1

- Attain Phone Calls, checking emails
- List problems and initial troubleshooting
- Classify problems

Layer 2

- Investigate issues
- Update Issue Tracking Tool (CRM)
- Escalate issues to Layer 3

Layer 3

- Bug Fixing: Source Code Modification, DB structure Change
- Transactional Data Fixing
- Corrections of wrong activities
- System Monitoring
- Investigate third layer issues and resolve with necessary change Management.
- Regular System Maintenance

9. Minimum Service Level Agreement (SLA) Terms to be complied:

Vendor needs to comply the minimum SLA Terms & Conditions (subject to further discussion) during Maintenance Period which are given below:

- Deploying dedicated Support Engineers (without Holiday) to address complaint issues.
- A service failure or severe server degradation when users are unable to access any portal will be treated as **Critical Issue Level-1** and vendor should respond immediately which shall not exceed 12 hours.
- A partial service failure or mild degradation when a bug is creating a significant impact to existing portal or application integration will be treated as **Critical Issue Level-2** and the vendor should respond immediately which shall not exceed 24 hours (subject to the discussion).
- General Issues when users are able to access all portals but working in a certain part is disrupted will be treated as **Critical Issue Level-3 and** vendor should respond immediately, which shall not exceed 72 hours.

10. Guidelines for system development and design

a) The IT Firm shall adopt the design principles of Service Oriented Architecture (SOA) throughout the system.

b) It should have web services-based Architecture to ensure flexibility and scalability.
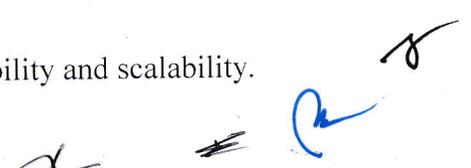
c) The system shall be designed in a simplified manner to avoid the need for specialized users and high maintenance overheads.

d) The system should be robust to cope with errors during execution and cope with erroneous input.

e) The proposed solution should be secured. The web applications will be hosted under the secure environment and could only be accessed through secured protocol.

f) The system should be designed in such a way that it can be extended for larger dataset and map points without changing the core architecture and implementation.

g) The web and mobile application should be easy to navigate, or in other words, to be able to find the expected data/information/section within the soonest possible time.

11. Technology Specifications

Open-Source Technologies: PostgreSQL, Python, Java, QGIS, OpenLayers, Leaflet.js, Mapbox, and Google Maps API.

Data Formats: GeoJSON for spatial data and Shapefile (SHP) for GIS mapping.

Security Measures:

- Protection against SQL Injection, Cross-Site Scripting (XSS), and other cyber threats.
- Strict input validation and authentication mechanisms.
- Data encryption and compliance with government security policies.

Coordination

The **IT firm** will provide necessary support to the IT firm, including access to program-related information and documents.

12. Payment details:

- **Technical and Financial Proposal**: Must include all expenditures related to IT services, including Tax, VAT, and other charges as per Government rules.
- **Payment Schedule**: As per completion and acceptance of the deliverables.

13. Qualifications of IT Firm & Staff

- **Company Experience**:
  a) Minimum 5 years of experience in ICT business.
  b) Proven experience in developing digital service platforms for the Government of Bangladesh or corporate sectors.
  c) Valid Trade License, RJSC registration, VAT, TIN, and BASIS certification.

- **Required Personnel**

Sl. No	Position	Nos.	Academic Qualification	Desirable years of professional experience
1	**Team Leader**	1	Minimum M.Sc in Computer Science / Computer Engineering (CSE)/any relevant engineering	Minimum 10 years total working experience in ICT industry focusing responsibility on Technology management and planning;
2	**Software Developer**	2	Minimum B.Sc in Computer Science / Computer Engineering (CSE).	Minimum 5 years total working experience in ICT industry focusing responsibility on Technology management and planning;
3	**Junior Programmer**	2	Minimum B.Sc in Computer Science / Computer Engineering (CSE)/ Diploma in Computer Science.	Minimum 3 years total working experience in ICT industry focusing responsibility on Technology management and planning;

14. Reports

- Inception Report;
- Quarterly Progress Report;
- Mapping report of Water quality, Water source, Potential water production technology and aquifer layer etc.
- Completion report.

15. Deliverables:

Sl No.	Item	Modules
D1	Dynamic Survey and Data Collection: Enable real-time data entry on groundwater levels and water quality parameters (e.g., pH, arsenic, iron, chloride, manganese, microbial contamination etc.) through the system.	1
D2	Data Integration System: Backend system development for centralized management of groundwater, surface water, and rainfall data using an open-source database (PostgreSQL/PostGIS) with spatial data handling, data retrieval, and visualization features.	1
D3	Trend Analysis: Analyze seasonal variations and long-term trends in water quality and quantity using historical datasets from 1986 onward.	1
D4	GIS-Based Visualization: Provide a mapping interface with spatial analysis capabilities at national and micro-administrative levels, including unions if needed.	1
D5	Web-Based Mapping Tool: Implement both static and dynamic map services through OpenLayers and QGIS Server, integrated with PostgreSQL/PostGIS for spatial data.	1

D6	Automated Reporting System: Generate reports and alerts based on contamination levels and data differences, accessible to both technical users and officials.	1
D7	Shapefile Generation and Download: Allow authorized users to download spatial datasets (e.g., groundwater points, sampling locations, boundaries) in shapefile format.	1
D8	User Management and Authentication: Secure login system with role-based access, password recovery, and user management modules.	1
D9	AI-Powered Insights: Utilize AI algorithms to suggest appropriate water supply technologies for specific regions based on data-driven insights.	1