

# WebGIS: A Smart Approach to Optimize Spatial Data Dissemination

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**Abstract:** A Web-based Geographic Information System (WebGIS) is a powerful tool that facilitates geospatial data dissemination and provides data at the client level with ease. Unlike conventional GIS services, WebGIS can disseminate geodata from different branches like Geotechnical, Geoengineering and Remote Sensing, with the assistance of internet services in a dynamic manner. WebGIS has further advantages, including cloud-based storage, real-time data updates and iterative mapping in dynamic ways. Moreover, it facilitates data accessibility and can lead to a more straightforward decision-making process at the policy-making level. Hence, Geo-Information for the Implementation of a Climate Change-Resilient Urbanisation (GICU) project takes the initiative to host a WebGIS that contributes to the development of a proper linkage between research, government and the public, which ultimately leads to sustainable geodata development in Bangladesh.

**Keywords:** WebGIS, Internet, Geospatial information, Spatial data management, Community engagement.

## Introduction

A Geographic Information System (GIS) is a platform for gathering, managing, and delivering spatial data to users in graphical form, having components including hardware, software, etc.

WebGIS, an advanced form of GIS, has evolved into a robust and versatile tool for geospatial data management over the past years. Unlike traditional desktop GIS, WebGIS leverages the internet to provide immediate access to spatial data and services, thereby fostering efficient dissemination of information to a broad range of users. By enabling rapid visualisation and management of maps and thematic datasets, WebGIS ensures effective interaction between server and client (Peng and Tsou, 2003, Haklay et al., 2008, Fu and Sun, 2010).

The application potential of WebGIS is wide-ranging: urban development planning, disaster risk assessment, agricultural monitoring and other domain-specific challenges can be supported by WebGIS solutions. The ability to combine different spatial layers dynamically, to enrich them with real-time data, and to make them available across platforms and end-user devices

highlights the growing significance of this technology for data-driven decision-making processes.

The Geological Survey of Bangladesh and the Federal Institute of Geosciences and Natural Resources (BGR) have initiated a technical project called the GICU project that will provide an opportunity to work together in a multi-branch environment for the capacity building of the Geological Survey of Bangladesh (GSB) and to improve the geological services to the stakeholders in a sustainable approach. The major objective of the GICU project is the dissemination and implementation of knowledge on the quality assurance of geo-information for urban development planning, and WebGIS can ensure a significant role in achieving this target.

## GICU implementation

The implementation of the GICU WebGIS follows a modularised architecture, based on Docker containers, which ensures scalability, portability and the straightforward integration of additional study areas. The system builds on a comprehensive catalogue of raw geospatial data, including relational databases, shapefiles and raster datasets. These heterogeneous inputs are funnelled through a standardised preprocessing and visualisation pipeline (Figure 1), which functions as a quality assurance step and guarantees the consistency of data products.

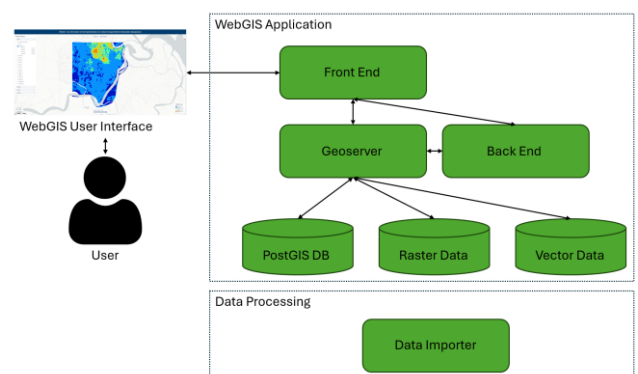


Figure 1, Components of GICU WebGIS implementation.

The processed outputs are presented as rendered maps, while the authority responsible for the data (GSB) retains full control over the raw inputs. At the user level, the system emphasises interactivity: features such as layer control, on-demand pop-ups for bar plots or metadata, zooming, overlaying, opacity adjustments and flexible index weighting to combine multiple layers enable intuitive data exploration (Figure 2). This design ensures that end-users can explore, analyse and interpret complex spatial relationships in a responsive, browser-based environment, without requiring specialised GIS software.

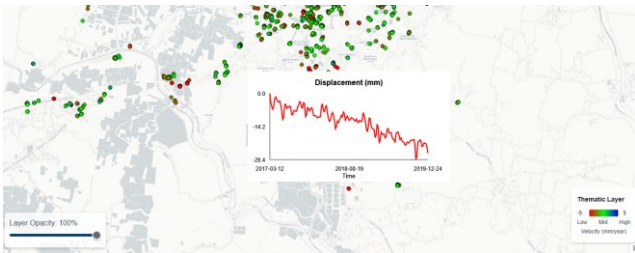


Figure 2, Visualisation on the WebGIS platform of the GICU project: example of PSI chart pop-up.

A WebGIS-implemented Index Weighting feature enables the systematic adjustment of the relative significance of different spatial factors (Inundation Potential, Ground Subsidence, Seismic Hazard and Bearing Capacity, Figure 3) in evaluating the Building Ground Suitability of a site, thereby ensuring that the assessment reflects the heterogeneous priorities of stakeholders involved in urban development.

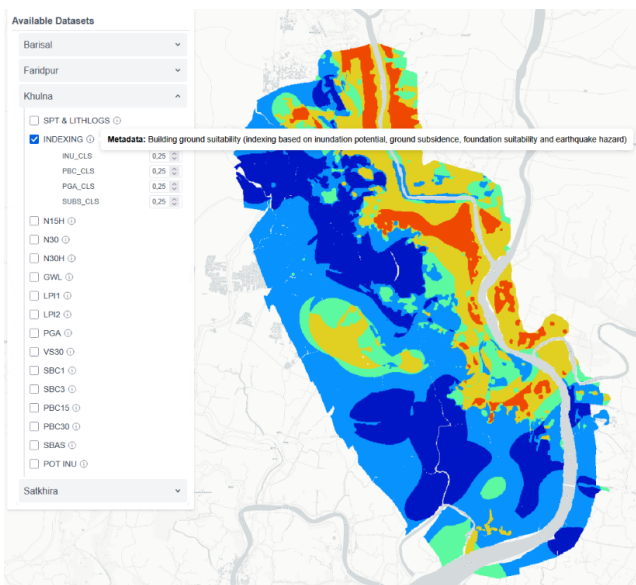


Figure 3, Index weighting and metadata pop-up in GICU WebGIS.

## Challenges

WebGIS is a strong platform for disseminating data at the client level, but it also has some difficulties in developing and maintaining the structure. Some of the concerns are:

1. The initial cost is an issue for preparing the WebGIS structure, including server and software (Bonham, 2008).
2. Fluctuation of the internet in 3<sup>rd</sup> world countries like Bangladesh may hamper the activities.
3. Maintenance cost is the issue in this context for ensuring long-term service, i.e., a financial source should be confirmed to enjoy the uninterrupted service of this technology.

## Conclusion

WebGIS is a smart, organised, and scalable approach enabling a simplified management of complex geospatial data dynamically, ensuring sustainable data management. Furthermore, it improves the visibility of the institutional data products while supporting quality assurance. Finally, this approach facilitates full data control during dissemination and an appropriate visualisation to the managing institution.

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