Enrichment of Geoportal Interoperable Platform and Development of Thematic Applications for Land Use Management and Agricultural Land Use Planning

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Abstract - *Geoportals is a modest way to share online open Geo-spatial data and to develop Geo-Information Management System. The role of Geoportals is to provide possible advancements in Digitizing Agricultural or any other spatial data. This paper presents a review of the literature concerning Geoportals and serves many primary and secondary purposes. The paper will mainly focus on developing a hybrid-based Geoportal model. The strength of this Geoportals will lead to a full-fledged online Geoportal Interoperable Platform that could provide better data sharing and dissemination solutions to the challenges. The main focus of this project will be on sharing the data in the form of service but not actual data. Actual sharing of data might cause tampering with the data so it might affect the confidentiality of the data of a specific organization. So this project will fully be concentrated on service-oriented architecture. The proposed system will be able to view, analyze, and read data in the form of a map. Users will also get the facility to view data diagrammatically with the help of charts. This data will include vector data such as points, lines, polygons, and also raster data. All the data will be uploaded on GeoServer present in the specific organization. This data will be shared by developing a user-friendly User Interface and will be hosted on a special Server within the organization. An end user will be able to provide feedback and give any suggestions. It will be helpful to strengthen the Geoportal.*

Key Words: *GeoServer, Geoportal, Geo-spatial data, Geo-Information, Agriculture, Data Analysis, GIS.*

1.INTRODUCTION

Spatial data analysis has become increasingly popular in most disciplines including public health, economics, crime, population, social science, agriculture, etc. Geoportals are the standardized way to find and access geospatial information and associated geographic services for researchers and users. Typically, these Geoportals also provide various functions for users to explore and analyze the data online. Geoportals are a consolidated web-based solution to provide open spatial data sharing and online geo-information management. The Geoportals share information in the form of maps. A Map is an important and major source of geographic information. It is a symbolic representation of selected characteristics of a place, usually drawn on a flat surface. The map presents information about the world in a symbolic, simple, visualizing way depicting important geographic factsfor a certain place which is used extensively, for planning, analysis for decision-making by scientists, planners, administrators, policymakers, engineers, natural resources mapping, and monitoring institutes or agencies, academicians, ministries, social group sand, etc.

Geoportals are successful in linking multi-source data, but it is unrealistic to integrate the growing list of open-source tools in one place. A Geoportal has to be flexible in integrating user's data and third-party analytical functions to become a workbench, where users could process and model the data simultaneously. Compared with desktop GIS software which is often prepared for professional GIS users, Geoportals that links with open-source tools could provide a very useful and lightweight workspace for researchers that don't have adequate knowledge in GIS, especially in the area of spatial social science. The integration of open-source tools allows easier integration of big data sources. Geoportals normally include baseline data such as censuses and surveys. The purpose of this paper is to elaborate on the concepts of Geoportals in a wider and more informative way. Thispaper will show how Geoportal is developed and integrated using different open-source tools. This Geoportal will be able to visualize vector and raster data. This Geoportal will be interlinked with GeoServer. Along with sharing and visualizing data, this portal will show how to do a query on vector files. This portal will also be able to show data diagrammatically i.e., pie chart, line chart, bar chart, etc. This Geoportal will be able to integrate with different GeoServers from different locations, which means this portal will work on an Interoperable platform. This proposed scenario will be very much useful to many users and researchers to go out in one place i.e. Geoportal and collects different information such as horticulture, animal, fishery, soils, crop, etc according to their requirement.

2. OBJECTIVES

- To provide a gateway to web-based geospatial resources, enabling a user to discover, view, and access geospatial information and services made available by the organizations.

- Likewise, data providers can use Geoportal to make their geospatial resources discoverable, viewable, and accessible to others.

- Instead of storing surveys in isolated, individual files, Geoportals allows surveyors to store all survey data in one database, providing easy access to past work that can be efficiently reused and overlaid with new data.

- To enables to visualization of various point, line, and polygon thematic layers on soil and land resources.

- To provide an interoperable platform to integrate different Geoportals on a single platform, so that users should not visit different Geoportals to collect information.

3. PROPOSED PLAN WORK

The proposed system will integrate many factors from collecting the data from the field and doing the needful modification using GIS tools and publishing it on GeoServer. GeoServer is an open-source platform to publish and share Geospatial data in the form of Web Map Services (WMS) or Web Feature Services (WFS). This data would be collected by the surveyor, analyst, soil scientist, student, or intern. This data might be within the organization or outside the organization. The collected data has been modified using ArcGIS and QGIS or other GIS tools and software according to the requirement. This data might be the point, polygon, line, etc. Data might be vector or raster. This modified data willbe uploaded on GeoServer. GeoServer will be responsible for publishing this data on portals. To view this data portal would be developed using different programming languages like HTML, CSS, JavaScript, PHP, jQuery, ReactJS, Angular,etc. A Database such as MySQL, PostgreSQL, Oracle, etc. would be used. A server like WampServer, XAMPP, and Apache Tomcat will be responsible to publish this developed system and user interface.

The following procedure will be followed throughout the implementation of the whole project.

- Data such as soil, crop, weather, etc. will be collected from different locations by the surveyor.

- Some data may be collected by researchers using a satellite with the help of Google Earth Engine or some other source.

- This collection will be modified by using ArcGIS, and QGIS.

- This standardized vector data will be converted to ". shapefile" and raster data will be converted to ". geotiff".

- Later 'Styled Layer Descriptor' is prepared by using QGIS or by using XML code.

- This data will be imported into the PostgreSQL database.

- This data will be uploaded on GeoServer which is an open-source platform.

- User interface for Geoportal will be developed by using different programming languages like HTML, CSS, JavaScript, PHP, jQuery, ReactJS, Angular, etc.

- Different REST APIs will be developed to fetch services from different portals.

- Some required data will be imported into the MySQL database.

Finally, all these components will be integrated within a single frame to develop a Geoportal. Also, data can be fetched from multiple GeoServer with the help of APIs to develop an "Interoperable Geoportal Platform". Different GeoServer would be located in different locations or different institutes. Each institute will have control over its data and GeoServer. Only data will be shared in the form of service. This service-oriented architecture will lead to the development of a big platform that will be able to share multiple information from different institutes on a single portal.
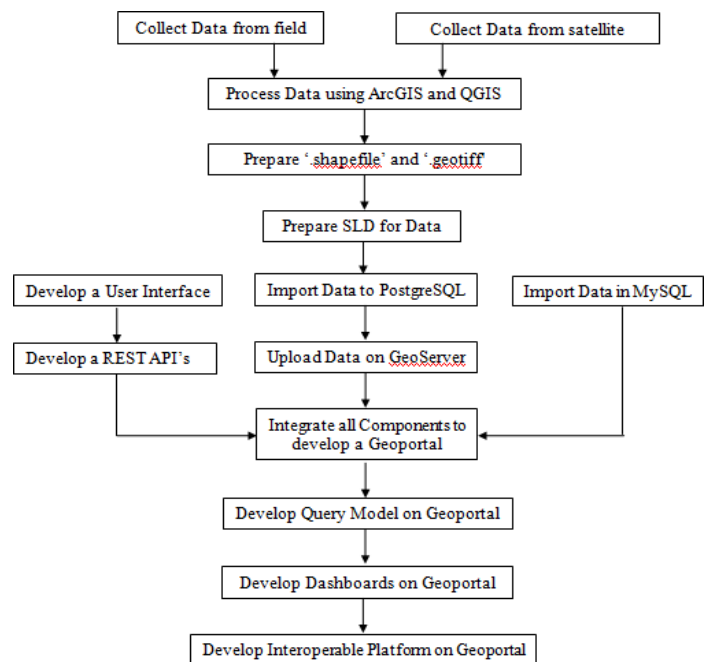

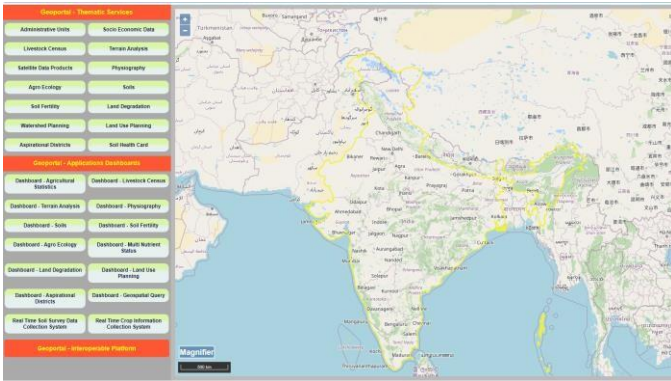**Fig - 1:** Flow Diagram for Proposed Geoportal System

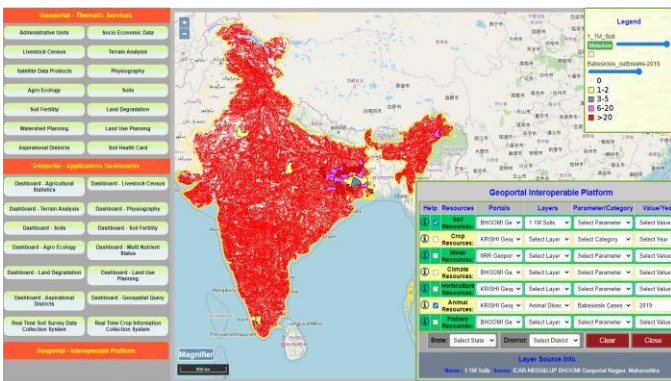**Fig -2:** Homepage for Proposed Geoportal System

Fig -3 : Interoperable Geoportal Platform

Fig - 1 shows a flow diagram to build the proposed Geoportal. This will illustrate how the data will be collected and processed, published and Geoportal is developed. Fig -2 shows the homepage for the proposed Geoportal. This homepage shows User Interface for Geoportal which has different services and applications. Finally Fig - 3 shows how Interoperable Platform Concept works. This platform can collect different layers from different Geoportals such as BHOOMI Geoportal, KRISHI Geoportal, and IIRR Geoportal located at different institutes. These all institutes have their Geoservers which are located in their organizations and have their controls. With the help of APIs, data is fetched from these Geoportals in the form of WMS or WFS Services and is shown on a single platform. The data is shown in the form of a map. This data is for viewing and analyzing purposes. Data might be shared or allowed to download by providing authentications depending on the policies of the data owner or institutes. Data security concepts would also be implemented to secure the data from hackers or other threats.

3. CONCLUSIONS

The Geoportal is a resource for analyzing, collecting, and retrieving information on a single domain. This review will hopefully facilitate research attempts to address online data-sharing issues through Geoportals. In the long run, the

Strength of Geoportals could lead to a full-fledged online Digital Earth system that could provide better solutions for spatial data sharing, geo-information management, and Earth science knowledge generation. This article also presents the recommendations, in terms of the architectures, services, and techniques proposed for future Geoportal projects. Basic functionalities of Geoportals are identified and should be kept, such as metadata catalog, data discovery, data visualization, data sharing, and data downloads. Besides that, these Geoportals would be capable of connecting multiple distributed systems under hybrid system architecture. The other benefits of this Geoportal are its impressive display and design style, it is for the aspirants or prospective candidates who want to make their career in web designing such as websites, webpages, and others. Also, this Geoportal is much more helpful to farmers who do not have much more knowledge about their soil, crop, animals, weather, etc. This proposed system will also lead the concept of an Interoperable Geoportal Platform which will interconnect different Geoportals.

Future Scope

Following are some future scopes to enhance and improve the existing system. It will provide a much more easy way to collect and share information.

- In the existing system data is collected by a surveyor, scientist, or analyst but in the future data might be collected by using Artificial Intelligence.

- The use of Drones might produce much enhancement in the current system.

- Agriculture Robots could provide immense improvement in the field of Geoportals in the future.

- Crop Yield Prediction and Data collection might be done using Artificial Intelligence, and collected data might be shared through Geoportals.

- In recent times many institutes are developing separate portals. They might think about developing a single hybrid platform so that end users don't have to refer to individual portals. Single Geoportal will be able to provide complete information for farmers.

- Recent portals have much information and data but it is somewhat complicated. This data and information should be simple and understandable to farmers in the village area.

REFERENCES

[1] Hao Jiang, Hyeongmo Koo, John Lodewijk van Genderen "Current status and future directions of geoportal".

[2] Dr. Vaishali Malode (Wadnerkar) "Major Geo-portals of India: A Study"

[3] Yewati V. Meshram, Prajakta V. Nagrare, Rasika V. Kale,

G.P. Obi Reddy, T. Satish and Praveen Sen "Prototype Android Based Real Time Crop Information Collection System"

[4] Fabian Schmidt, Arne Droge, Rothaar , and Andreas Rienow Development of a Web GIS for small‑scale detection and analysis of COVID‑19 (SARS‑CoV‑2) cases based on volunteered geographic information for the city of Cologne,Germany, in July/August 2020"

[5] Karolina Golicz, Stephen Hallett, Ruben Sakrabania, Joy Ghosh **"Adapting smartphone app used in water testing,for soil nutrient analysis"**

[6] Sabrina Marx, RevatiPhalkey, Clara B Aranda-Jan, Jörn Profe1, Rainer Sauerborn,and Bernhard Höfle1 **"Geographic information analysis and web-basedgeoportals to explore malnutrition in Sub-SaharanAfrica: a systematicreview of approaches".**

[7] Frank W. Davis,Dale A. Quattrochi, Merrill K. Ridd, Nina S-N Lam, Stephen J. Walsh, Joel C. Michaelsen, Janet Franklin,Douglas A. Stow,Chris 1. Johannsen,Carol A. Johnston**" Environmental Analysis Using l ntegrated GIsand Remotely Sensed Data: Some ResearchNeeds andPriorities".**

[8] Hao Jianga, John van Genderen, Paolo Mazzetti , Hyeongmo Kooand Min Chene **"Current status and futuredirections of geoportals"**

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