

# Generation of Web Based Geo-Information System at Panchayat Level of Natural Resources using Open Source Software's and Libraries

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**Abstract**— Generation of large amount of Geo-spatial data and its sharing on internet through server for use in various planning processes requires a large amount of spending. In this study generation and sharing of data is accomplished using open source software's. Creation of web GIS for geospatial information system of KORWA Panchayat of Kalsi block, Dehradun, Uttarakhand and used some functionality which is interactive directly by browser. Web GIS provides some functionality like zoom in, zoom out, pan and access others information from database. Client can easily access spatial data from server and can easily access, find, and update the data using query. Open source GIS software, Web server and data base can freely use this Web GIS application. In this study, high resolution images (CARTOSAT & LISS IV merge) has been used for the preparation of large scale base map of KORWA Panchayat, Kalsi district, Uttarakhand at scale 1:10000 in GIS environment, supported with extensive field survey. In order to make a cost effective implementation, operation and maintenance of spatial information over the web, a cheaper yet feature rich alternative to commercial software is required which can be fulfilled by Open Source GIS software (HTML, Postgre SQL, Geo server, QGIS, Hyper text transfer protocol (HTTP) ).

**Index Terms**— GIS, GPS, Remote Sensing, Open source software's, Decision Support System.

## I. INTRODUCTION

A geographic information system (GIS) is a computer-based tool for mapping and analyzing feature events on earth. GIS technology integrates common database operations, such as query and statistical analysis, with maps. GIS manages location-based information and provides tools

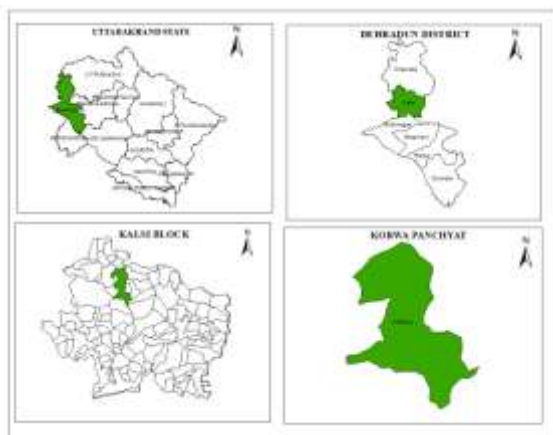
for display and analysis of various statistics, including population characteristics, economic development opportunities, and vegetation types. GIS allows you to link databases and maps to create dynamic displays. Additionally, it provides tools to visualize, query, and overlay those databases in ways not possible with traditional spreadsheets. These abilities distinguish GIS from other information systems, and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.

Web GIS is most important application for distributing the thematic layers such as shape files, KML and other spatial file format. Web mapping interact directly to client side that easily understand maps and find the other geo details. We can easily upload geospatial data with the help of web GIS. It can easily be accessed by other users on worldwide and easily understand data.

During the recent years a lot of studies had been conducted in the development of open source GIS and web-server software and many open source GIS and other software's are developed for the use in the generation of GIS database and its sharing on internet.

## II. STUDY AREA

The study area had been selected from the hilly state of Uttarakhand which is about 80% hill. Study area is Korwa Panchayat in Kalsi block of Dehradun district which lies between 30° 37 28.014 to 30 39 26.116 latitude and 77 50 39.119 to 77 52 33.004. Total area of study area is 4.272644 sq. km. This area is mostly covered by forest, agriculture and Settlements. Amlava River is flowing through this study area which is confluence with major river Yamuna in Kalsi block. Climate of this area are cool, heavy rainfall in monsoon. Major crops of this area are wheat, rice, mandua, dals etc.



**Fig1:** Study area of Korwa Panchyat

### III. MATERIAL USED

#### A. Data used

- CARTOSAT 1 and LISS IV merge with 2.5 meter resolution.
- Existing maps of kalshi Block of Dehradun district.
- Legacy data of 2010 and 2015.
- Administrative data.

#### B. Software, Computer Programming and Libraries used

##### 1. Open Source GIS Software

**Quantum GIS:** QGIS is a geographic Information System that runs on Linux, Unix, Mac OS X, and Windows. The QGIS supports vector, raster, and database formats. It can access database like PostGIS, in addition to the dozens of other vector and raster formats. It supports feature labeling and has a great user community. Extensibility is provided through a plug-in environment.

**uDig :** User-friendly Desktop Internet GIS (uDig) is an open source spatial data viewer/editor, with special emphasis on the OpenGIS standards for internet GIS, the Web Map Server (WMS) and Web Feature Server (WFS) standards.

##### 2. Open Server and library

**GeoServer :** GeoServer is an open source software server written in Java that allows users to share and edit geospatial data. Designed for interoperability, it publishes data from any major spatial data source using open standards.

**OpenLayers:** OpenLayers is an JavaScript library for displaying map data in web browsers. It provides an API for building rich web-based geographic applications

similar to Google Maps and Bing Maps. The library was originally based on the Prototype JavaScript Framework.

**Wamp server :** WampServer is a Windows web development environment. It allows you to create web applications with Apache, PHP and the MySQL database. It also comes with PHPMyAdmin to easily manage your databases. WampServer installs automatically (installer), and its usage is very intuitive.

##### 3. Database Software

**PostGIS:** PostGIS is an open source, freely available, and fairly OGC compliant spatial database extender for the PostgreSQL Database Management System. In a nutshell it adds spatial functions such as distance, area, union, intersection, and specialty geometry data types to the database.

**PostgreSQL:** PostgreSQL is an open source relational database management system (DBMS) developed by a worldwide team of volunteers. PostgreSQL is not controlled by any corporation or other private entity and the source code is available free of charge

##### 4. Programming

**HTML:** Hyper Text Markup Language (HTML), the main markup language for web pages was used for scripting. Usually HTML elements are the basic building-blocks of web pages and allow images/objects embedding to create interactive forms. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts in languages such as JavaScript which affect the behavior of HTML web pages.

**JavaScript:** JavaScript is a prototype-based scripting language that is dynamic, weakly typed and has first-class functions. It is a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. JavaScript was formalized in the ECMA Script language standard and is primarily used in the form of client-side JavaScript, implemented as part of a Web browser in order to provide enhanced user interfaces and dynamic websites. This enables programmatic access to computational objects within a host environment.

#### IV.METHODOLOGY

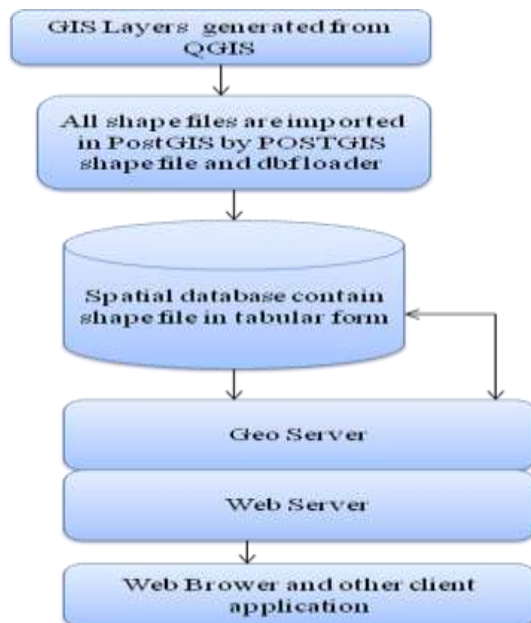


Fig2: Flow chart for Methodology

Different steps involved in this study are as follows

##### 1 .Digitization of Existing maps

All thematic layers are generated using CARTOSAT and LISS IV merged data including land use/land cover, Roads, Drainage, Forest and Settlements layers. Secondary data is generated from field survey of house hold information, infrastructure, population, education, cattle population and other information using GPS (Ground Control Points) of this study area.

##### 2 . Importating Shape Files to Spatial Database

'Shape File to PostGIS Importer' tool of PostGreSQL is used for converting all generated shape file in SQL tabular format. All the tabular data of shape files thus generated is stored in a database of PostgreSQL in the database generated in PostGreSQL. Server side programming language can directly access spatial data in SQL tabular format stored in database of PostgreSQL tables and information can fetches, inserted and updated using database queries.



##### 3.Sharing data through GIS and web Servers

Web GIS based land information System is used in Client side contains web pages which are designed by HTML, JavaScript and open Layers. Second steps is server side application where Wamp server handles HTTP request and other is Geoserver which handles map requests which is send by client side. Next steps is Database layer which stores all shape files which is converted in tabular form using POSTGIS extension of PostgresSQL . Client side request is send to Wamp server which is transfer to query in geoserver where server fetch the search data from PostgrSQL database and send to response to wamp server to client side browser.

#### V.RESULT

There are some main functionalities of this geospatial web portal which are given below:

Search tool which can be performed on the map layer wise and result is shown in geographical form. Pan and zoom tool gives facility to handle zoom level and handling map.Layer Selection Panel gives facility to select and deselect the layer.Main web page shows different thematic layers on the map in different layers.Screen shot of some of the Webpages showing the thematic resource layers of Sainj Adgaon Panchyat of kalshi block of Dehradun district:



#### IV. CONCLUSION

The advancement in the use of GIS and Remote Sensing technology During the recent years had proved to be very effective and timely management. During the more recent time period different organisations had developed open source softwares and GIS servers to make this technology more cost effective. Thus under this study a complete process of generation of database till its sharing in internet using open source software and open source servers.

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